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Organization and Responsibilities of the International Joint Commission

by

General The Honourable A. G. L. McNaughton, M.E.I.C.

Chairman, Canadian Section
International Joint Commission

An address presented at the inaugural meeting of the Belleville Branch of The Engineering Institute of Canada on December 8, 1950.

Set up by treaty in 1909, and patterned after the International Waterways Commission it replaced, the International Joint Commission reviews water problems along the common frontier of the United States and Canada under authority above that of national law. Its objective is the adjustment and settlement of disputes before they reach the controversy stage.

Various categories of boundary waters are here described and methods of dealing with each are discussed, with reference to typical cases dealt with in the past. Procedure to be followed in reaching decisions is outlined. The author draws attention to the primarily engineering character of the Commission's work, as a reason why it should be of continuing interest to engineers.

I have been asked to say a few words to you about the International Joint Commission, the body set up by the Treaty of 1909, and designed to provide a continuing mechanism, with authority transcending that of national law. Through this commission problems between the United States and Canada, arising along the 5,655 miles of boundary between them, can be brought under review at their inception. They can thus be dealt with before they might magnify and enlarge through controversy, thus alarming and embittering public opinion in either country, making their eventual solution increasingly difficult.

Certainly this wise conception of dispelling trouble in advance was uppermost in the minds of James Bryce and Elihu Root, the plenipotentiaries who negotiated the Treaty. This is shown by the opening paragraph of the preamble, which refers to the High Contracting Parties as "being equally desirous to *prevent* disputes regarding the use of boundary waters and to settle all questions which are now pending . . .; along their common frontier, and to make provision for the adjustment and settlement of all such questions as may hereafter arise. . . ."

I venture to speak to you on this subject, because the problems which have arisen along the boundary, and which have been referred to the Commission for solution during the 38 years of its existence, have mostly been concerned with the use of water. Use of water is primarily a matter for engineers.

Certainly all the questions which have come to the Commission, whether they dealt with water or with other subjects, have involved important engineering considerations. It has invariably been through engineering methods of analysis and deduction that the way has been found to the solutions which have evolved and have been adopted.

Boundary Waters

"The waters from main shore to main shore of the lakes and rivers and connecting waterways . . . along which the International boundary . . . passes" for more than half its long course from the Atlantic to the Pacific are defined as "boundary waters". The duties and authority vested in the Commission by the Treaty of 1909 distinguishes sharply between these waters and those waters which "in their natural channels would flow into" or "from" the boundary waters, or "the waters of rivers flowing" from one country to the other "across the boundary".

The text of the Treaty shows that those who drafted it had a clear conception of the varied character of the questions likely to arise in each of these several categories of waters. Certainly they have provided the Commission with authority which has proved apt in each one of the particular sets of circumstances which have had to be met.

The use to be made of "boundary waters" is a matter of deep concern to the inhabitants of the region, regardless of which side of the boundary they may happen to live. It is important that, whatever individuals or communities may do with these waters for their own advantage, they should not prejudice the welfare of others or put anyone at an unfair disadvantage.

Furthermore, these lakes and

rivers along the boundary are not minor features of the landscape. They are vast assets of far-reaching and enduring importance, on the proper use of which depends the future economic development and prosperity of the whole region in both countries.

Navigation to Remain Free

The Treaty recognizes these intimate joint interests of the two countries in these boundary waters. It provides that their navigation "shall forever continue free and open for the purposes of commerce" to the inhabitants and to the ships, vessels, and boats of both countries". It will be "subject, however, to any laws and regulations of either country within its own territory, not inconsistent . . . and applying equally and without discrimination".

These rights of free navigation, so long as the Treaty remains in force, extend also to "the waters of Lake Michigan", which is not a boundary water, "and to all canals connecting boundary waters, now existing or which hereafter may be constructed . . ." "Free", means free in the sense of free to use, and not in the financial sense, because tolls may be charged provided they "shall apply alike", and both "High Contracting Parties shall be placed on terms of equality. . . ."

The Treaty also implicitly recognizes the difficulties which would be presented to the inhabitants on the two sides of boundary waters in coming together and making adequate arrangements for the development of their joint interests. In such cases they would have to proceed separately through the ordinary national economic and legal systems of their respective countries. For the better and more convenient regulation and development of these interests the Commission is given "jurisdiction", and is required to "pass upon all cases involving the use or obstruction or diversion of the waters" in question.

Priority for Use

It is provided that, in the exercise of this jurisdiction by the Commission, "the High Contracting Parties shall have, each on its own side of the boundary, equal and similar rights in the use of . . . boundary waters". In order that past arrangements should not be called in question, it is prescribed that "existing uses of boundary waters on either side" are not to be disturbed. The Treaty seeks to avoid controversy as far as possible by far-sighted legislation based on convenience. It specifies that, wherever conflict occurs, the use of water for "domestic and sanitary purposes" shall have priority over "navigation". It provides that use for navigation shall take precedence over "uses for power and for irrigation". It also provides that . . . "boundary waters and waters flowing across the boundary are not to be polluted on either side to the injury of health or property on the other".

By the Treaty, and except as may be "provided for by special

General McNaughton

agreement . . ., no further or other uses or obstructions or diversions, whether temporary or permanent, of boundary waters on either side of the line, affecting the natural level or flow of boundary waters on the other side of the line, shall be made except by authority of the United States and the Dominion of Canada within their respective jurisdictions, and with the approval of the International Joint Commission".

By these provisions the power to initiate plans for "the deepening of channels, the construction of breakwaters, the improvement of harbours" and the like is left to the respective Governments on their own side of the line, provided . . . that the results "do not materially affect the level or flow . . ."

Patterned After Waterways Commission

These far-reaching and quite novel provisions, vesting wide jurisdiction and authority in the International Joint Commission, are based on the experience of its predecessor, the International Waterways Commission. That Commission was set up by the concurrent legislation of the United States (1902) and of Canada (1905), for the purpose of investigating and reporting upon the condition and use of waters adjacent to the boundary. It had no executive responsibility, however.

The fundamental new conceptions underlying the Treaty of 1909 are largely due to the inspiration of a great Canadian, Sir George Gibbons, who had been chairman of the Canadian Section of the International Waterways Commission. His insight into the causes likely to lead to controversy and his views as to proper methods for the resolution of such difficulties as might arise, were closely followed by the plenipotentiaries in the drafting of the Treaty.

Two Categories of "Waters"

I have referred to the authority of the Commission over "boundary waters", where evidently jurisdiction in the joint interest of those concerned in both countries — individuals, communities and governments — has been given in wide measure, without precedent in international affairs.

I will now refer to those waters which "in their natural channels would flow across the boundary, or into boundary waters", or which flow "from boundary waters". In these cases the waters in question originate from a region which is essentially national in character, and go to another which has the same character. While they are in the boundary zone they are only of passing and limited international concern, except should any action by one government result in damage on the other side.

When these streams have or resume their purely national character, the competence of the riparian governments to legislate is supreme. It provides full authority on which to base effective administration to reflect the desires and the interests of all those who are primarily concerned.

There was some suggestion that streams crossing the boundary should be dealt with as boundary waters. Fortunately, I think, these practical considerations were recognized, and the Treaty leaves the national authority in these waters entirely undiminished. It does, however, require that this national authority shall itself provide the means whereby, if any one on the other side is aggrieved, he may obtain redress.

Typical Cases Dealt With

Cases may occur of "interference with or diversion of waters on the other side of the boundary, the effect of which would be productive of material injury to navigation interests on its own side". In the Treaty each nation reserves "any right which it may have, to object . . .". Close technical co-operation exists between the Departments of the two Governments charged with the development and maintenance of navigation facilities on the lakes and streams along the boundary. In such an atmosphere this reservation has proved merely an extra precaution which in practice there has never been any occasion to use.

In the case of waters "flowing from boundary waters or . . . flowing across the boundary", the principal cause for dispute which was feared was the possible construction of some work downstream from the boundary, "the effect of which is to raise the natural level of waters on the other side". Works of this character and effect are not permitted unless "the construction or maintenance thereof is approved by the . . . International Joint Commission".

The Treaty of 1909 defined the agreement reached in cases of the diversion of waters at Niagara for the generation of power, and the division of the flow of the St. Mary and the Milk River in Montana and Alberta for irrigation. In both cases a formula was sought which would give equal benefits to each country.

The Niagara provisions have now been superseded by the Niagara Diversion Treaty of 1950, which has been ratified by both countries. Under this Treaty substantial increases of flow are made available to each country for the power, now so urgently required for our defence preparations. All the rights acquired by Canada have been made available (Agreement dated 27 March 1950) to Ontario. This is in accordance with the established policy that the Canadian Provinces should have rights to power in their rivers, even if these rivers are in part international in character.

In the Niagara Diversion Treaty, in order to ensure the preservation of the scenic beauty of the Falls by the construction of works to redistribute the flow, the Commission is invited "to make recommendations as to the nature and design of such remedial works and the allocation of the task of construction as between Canada and the United States". Ontario has agreed to construct such works in Canada as may be decided upon.

The St. Mary-Milk River agreement, after interpretation by the Commission, has stood the test of time. Large sums of money have been and continue to be invested in putting the divided water from these rivers on the land in the respective countries. Vast areas are now under crop where formerly there was little but sage brush.

Neither side was entirely satisfied by the original arrangement. It now seems proved, however, that the important thing was a firm decision which would allow the work of irrigation to proceed. That was the view of our authorities, who are averse to re-opening this matter because of the resulting uncertainty which would trouble the minds of those who farm the lands in question.

Limitations to Decisions

In addition to the provisions giving the Commission jurisdiction in regard to "boundary waters . . . waters which flow therefrom, and . . . waters which cross the boundary", the Treaty of 1909 provides that . . . "any other question or matters of difference involving the rights, obligations, or interests . . . along the common frontier . . . *shall* be referred . . . to the . . . Commission for examination and report, whenever either . . . Government shall request. . . ."

In these cases the Commission is required to proceed to investigate and report in accordance with the terms of the particular reference made to it by the Governments. It is specified that "such reports . . . shall not be regarded as decisions of the questions or matters so submitted either on the facts or the law, and shall in no way have the character of an arbitral award".

At first sight these limitations may seem formidable. In practice they have in no way compromised the useful results which have been secured. In fact the opposite is the case, because these carefully drawn conditions have given the Commission a useful frame of reference for its work. The Commission relies on a thorough study of the facts which are counter-checked and amplified in open hearings, held to provide a "convenient opportunity" in the localities concerned, "for all parties interested" to be heard.

At these hearings any individual with a bona fide interest can appear, either in person or by counsel, to have his say with complete freedom. Repeated experience has shown that where a complex situation is thus reduced to a statement of verified technical facts, there is little difficulty for the Commission to arrive at an agreed recommendation. And, with an agreed recommendation the subsequent agreement of the Governments is greatly facilitated.

Procedure

As a result, in its long history there is only one case of a division in the Commission, and this was on a point of procedure and not of substance. Also in the completed References there is only one case in which the Governments have not acted on the Commission's recommendations.

The Treaty of 1909 contains a provision which further broadens the authority and functions of the Commission. With a view to meeting a possible requirement, foreseen but never used so far, the Treaty provides that "any questions or matters of difference . . . may be referred for decision . . . by the consent of the two Parties, it being understood that on the part of the United States any such action will be by and with the advice and consent of the Senate and on the part of His Majesty's Government with the consent of the Governor-General in Council".

If this provision is invoked the Treaty further provides that "a majority of the Commission shall have power to render a decision . . ." and if ". . . the . . . Commission is equally divided" then the Commission's report "shall thereupon be referred for decision . . . to an umpire chosen in accordance with the procedure . . . of the Hague Convention . . . dated October 18, 1907. Such umpire shall have power to render a final decision . . ." That is, if such a course is embarked upon to deal with a difference or dispute it must proceed to finality and the governments have agreed in advance that the decision will be accepted.

Such are the powers and duties assigned to the International Joint Commission, a body comprised of

(*Continued on page 12*)

Gas Turbines In Industry

by

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A paper presented before the Peterborough Branch of the Engineering Institute of Canada, on October 23, 1950

The engineering profession has shown great interest in development of the gas turbine. The fact that the gas turbine is ready for application now should be of special interest to management in industry because of the large quantities of oil and natural gas now available in Canada.

The combustion gas turbine is a self-contained prime mover suitable for driving electric generators, pumps, compressors, chippers, grinders, and other machinery. It requires little auxiliary apparatus, can be built to operate without water and, based on experience to date, it is expected that the gas turbine will compare very favourably with other prime movers from the standpoint of maintenance.

It is a very simple prime mover consisting of the compressor, combustion chambers, and turbine. Atmospheric air is compressed in the compressor and then passes into the combustion chambers. In the combusion chambers fuel is burned with the air required for combustion and the resulting gases are mixed with excess air to reduce their temperature before they pass through the turbine.

The combustion gases are expanded through the turbine and exhausted to atmosphere. In such a gas turbine, using a turbine inlet temperature of 1300 to 1500 deg. F., and with compressor and turbine efficiencies higher than 85 per cent, approximately two-thirds of the turbine output is required to drive the compressor and one-third for useful work.

History of the Gas Turbine

Gas turbines power the turbo-superchargers and jet engines so extensively used in aircraft today. Because of the publicity given these during World War II, we are sometimes inclined to consider the gas turbine as a new idea. It is not. In 1680, it was discussed by Bishop Wilkins in a book called "Mathematical Magick". The claims for his gas turbine were that it was suitable for "turning a spit, reeling of yarn, the chiming of bells, the rocking of a cradle, and diverse other 'domestick' functions."

In the years that followed, various other ideas were proposed, and attempts were made to find a satisfactory gas turbine or, for that matter, any prime mover that would operate successfully on combustion gases. In 1895, Mr. Charles G. Curtis secured patents in the United States on his idea of a gas turbine. In 1902, the late Dr. Sanford A. Moss operated the first gas turbine wheels in the United States at Cornell University. In 1904, combustion gas turbines were built by the General Electric Company and tested in both their Schenectady, N.Y., and Lynn, Mass., plants.

Research continued in America and abroad and, at the time of World War I, gas turbine-driven superchargers were developed for internal-combustion aircraft engines. Efforts to perfect the gas turbine continued, with the result that knowledge and experience were gained in the design and manufacture of efficient compressors and turbines, and in the production of materials which would withstand normal design stresses at the high operating temperature needed for the gas turbine to serve as an efficient and reliable prime mover.

Efficiencies of the component parts, and allowable temperatures of the turbines were so low in many of the earlier gas turbine units, that the entire output was required by the compressor and nothing was left for useful work. In many instances the turbine could not even drive its own compressor.

High-strength materials suitable for operation at high temperatures, and high-efficiency turbines and compressors for this application were not commercially available until the 1930's, 250 years after Bishop Wilkins first discussed the gas turbine.

Early Non-Military Applications

Some European manufacturers have been very active in the gas turbine field. A gas turbine for power generation, driving a 4000-kw. generator, was installed in Switzerland about 1939. A locomotive gas turbine of approximately half this rating was placed in service about 1941.

Outlining the early developments of gas turbines for non-military uses, the author describes open-cycle, regenerative-cycle and compound-cycle types in turn, and explains the concept of overall efficiency.

The many uses to which gas turbines may be applied in industry are discussed, and performance compared with steam turbines and steam engine plants.

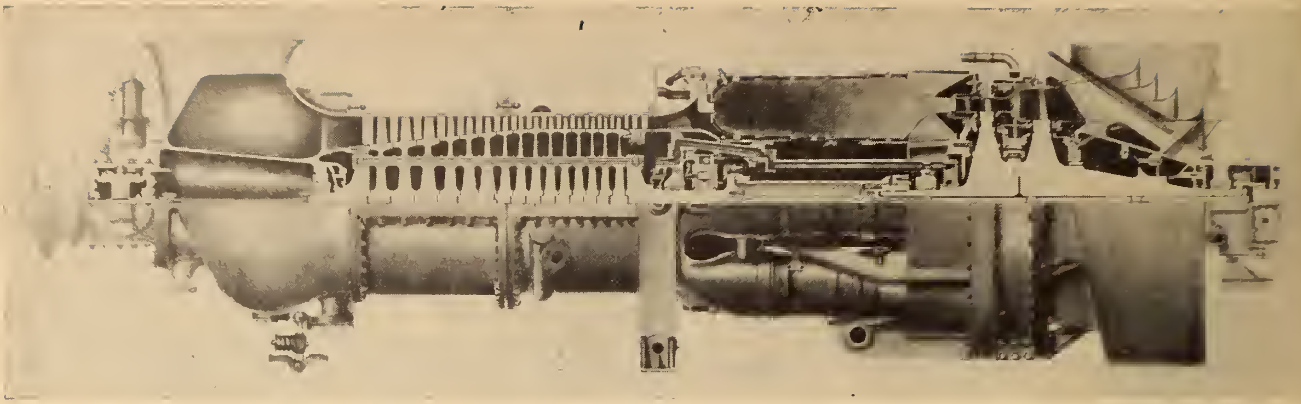


Fig. 1. 3,500-kw., simple, open-cycle gas turbine.

The first non-military applications of "combustion" gas turbines in the United States were in 1949. These applications included a gas turbine-powered electric locomotive used on the lines of the Union Pacific Railroad, and a gas turbine used for power generation in a station of the Oklahoma Gas and Electric Company. A third unit, installed for power generation in 1950, is now in service in a station of the Central Maine Power Company. The performance of these units has been very satisfactory. A fourth unit is now being installed in a plant of the Bangor Hydro Electric Company in Maine.

The Simple Open-Cycle Gas Turbine

Many different cycle arrangements have been considered for the gas turbine. There is the open-cycle, in which atmospheric air is used once in its passage through the compressor and turbine; the closed-cycle where the same atmospheric air is used over and over, and is heated from an external source; and combinations of the two in varying degree. The efficiency of any of these cycles will depend upon the extent to which intercooling, regeneration, and other refinements are employed.

When all things are considered, the open-cycle arrangement has many very desirable features, and this is the cycle selected for the first units developed by the General Electric Company. Three types of combustion gas turbine power plants have been developed by that company for industrial, locomotive, pipe line pumping, and utility applications. In describing these types, kilowatts will be used as a measure of the net turbine output even though the gas turbine units available are equally well suited for driving pumps, compressors, and other such equipment.

One type—a 3500-kw. unit, operates on the simple open-cycle described earlier. Three such units are now in commercial service and their performance has been most satisfactory. A cross section of this unit is shown in Fig. 1. Atmospheric air is compressed to approximately 80 p.s.i.a. in the compressor, fuel is mixed with the air and burned in the combustion chambers and then expanded through the gas turbine. Note the rugged compact construction of this unit. The turbine drives the compressor at approximately 6700 r.p.m. through a coupling at the high-pressure end, and the load through a coupling at the exhaust or low-pressure end. Gas turbine units may be used to drive mechanical loads direct or through suitable reduction gears, such as are used when driving generators.

Advantages of Compactness and Heat Energy Recovery

This type of gas turbine powers the electric locomotive in service on the lines of the Union Pacific Railroad. A gas turbine power

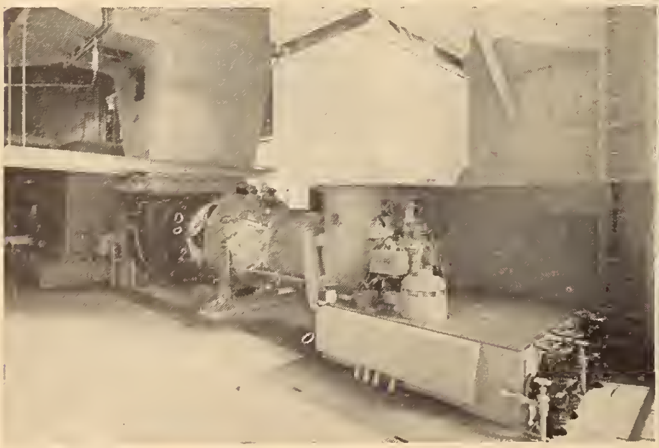


Fig. 2 (left). 3,500-kw. gas turbine generator set at Arthur S. Huey power station of Oklahoma Gas and Electric Co.

Fig. 3 (right). Building housing 3,500-kw. gas turbine set at the Arthur S. Huey power station of the Oklahoma Gas and Electric Co. Heat recovery equipment and exhaust stack are in the left foreground.

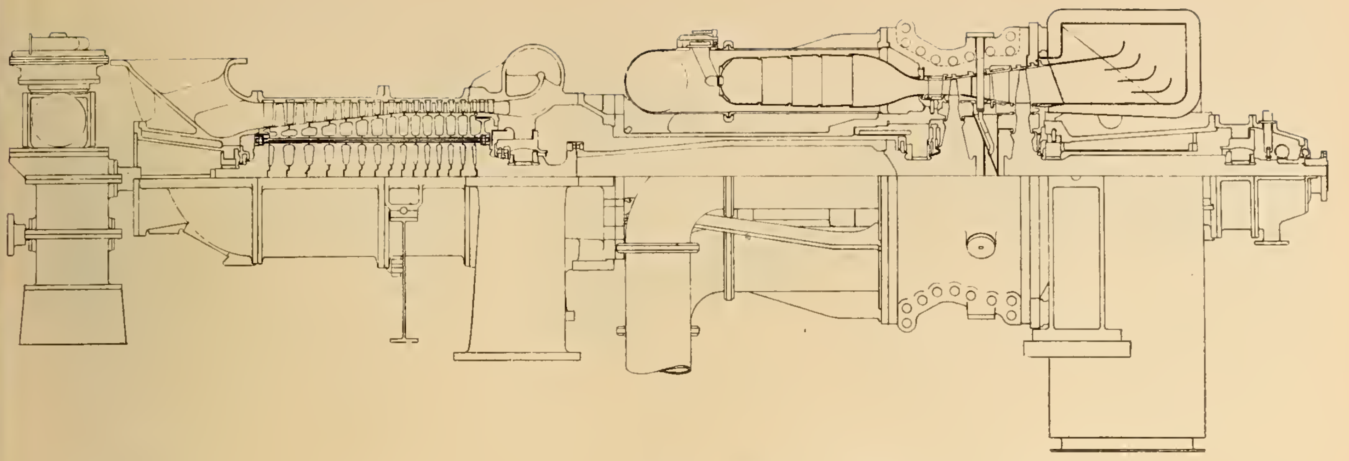


Fig. 4. 3,500-kw. regenerative-cycle gas turbine.

plant of this type, as installed for electric power generation in a plant of the Oklahoma Gas and Electric Company, is shown in Fig. 2. This is a 3500-kw. gas turbine-generator unit complete with all required auxiliaries, compactly arranged and requiring a floor area of only 8 ft. 9 in. by 47 ft. No basement is necessary, and the required foundation is very simple.

Greatest fields for application of the simple open-cycle unit are where space and weight are of prime importance, such as in a locomotive; where a unit is required for standby service, such as to supplement a hydro system or to take peak loads; or where there is a use for heat energy which can be recovered from the exhaust gases. Efficiency of this unit is approximately 15 per cent without heat recovery from the exhaust gases. By recovering heat from the exhaust gases, plant efficiencies higher than 70 per cent can be realized. All efficiencies discussed will be based on the higher heating value of the fuel. Depending upon the fuel used, efficiencies based on the lower heating value will range 4 to 10 per cent higher than efficiencies based on the higher heating value.

Gas turbine cycle efficiency for the Oklahoma installation was approximately 65 per cent, because heat recovered from the exhaust gases was utilized to heat feedwater for an existing steam plant. A view of this heat recovery equipment is shown in Fig. 3 located just outside the turbine room, with gas turbine exhaust gases passing through the feedwater heater and exhausting to atmosphere through the stack in the background.

This simple open-cycle gas turbine unit has applications in paper, rug, textile, chemical, petroleum, and other industrial plants which require heat energy, such as process steam, in addition to electric energy. The application here would be similar to that of an extraction type or non-condensing steam turbine. In such plants, application of equipment should of course be selected to provide all plant requirements with a minimum total expenditure for fuel, purchased power, fixed charges, and other operating expenses.

Concept of Overall Efficiency

To consider the cost of electric energy or heat energy separately is not sufficient—the overall fuel and operating dollars are most important. For plants using the same type of fuel and generating all heat and electric energy requirements within the plant, fuel dollars are directly proportional to overall plant thermal efficiency. This efficiency is very useful for evaluating various plant cycles, and is defined as the

$$\frac{\textit{Total available and useful output}}{\textit{Total actual input}}$$

This concept of plant thermal efficiency clearly recognizes both heat energy and electric energy; the useful electric energy can be converted into an equivalent heat basis. High thermal efficiency is an important factor in overall operating costs.

In one industrial plant recently, a gas turbine was considered for the generation of power, using heat from the exhaust gases for drying large fibre boards. Overall gas turbine cycle efficiency for this application was approximately 66 per cent, and even though fuel costs were only 15 cents per million b.t.u., an annual return of 40 per cent on the initial investment was indicated.

In another industrial plant, waste heat boilers were to be used, recovering heat from the gas tur-

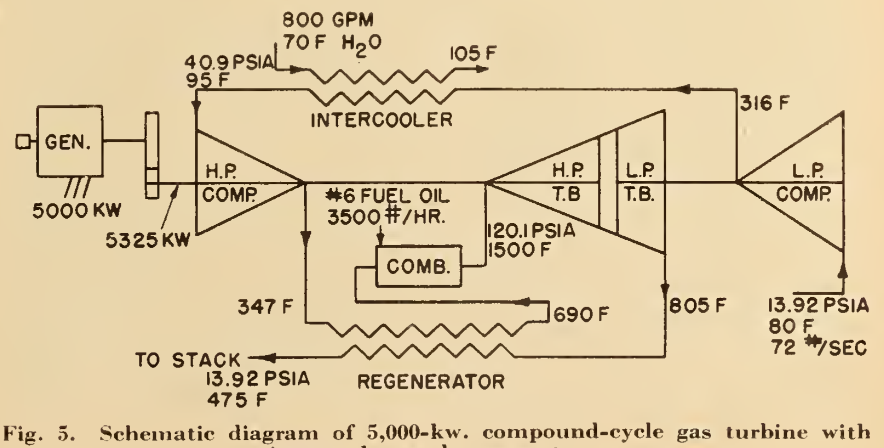


Fig. 5. Schematic diagram of 5,000-kw. compound-cycle gas turbine with intercoolers and regenerators.

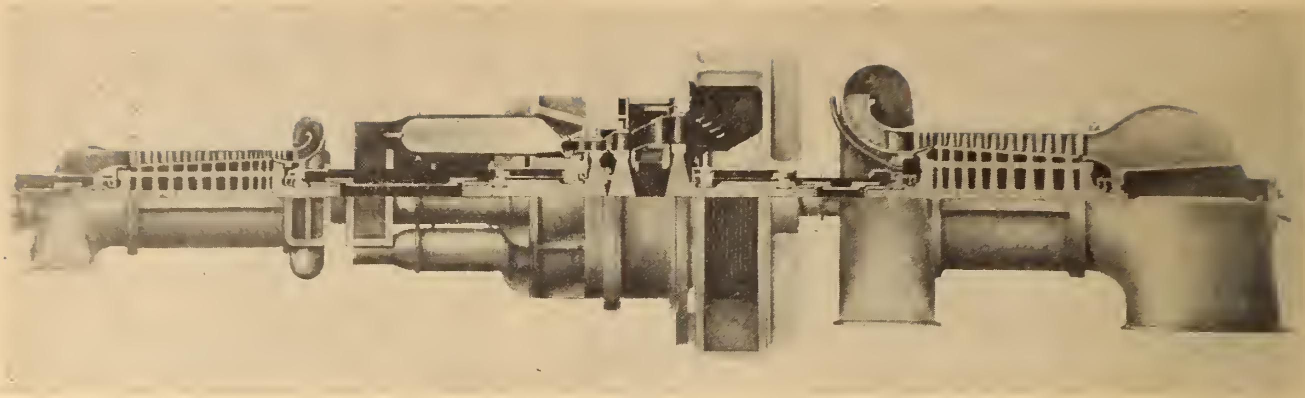


Fig. 6. Gas turbine for 5,000-kw. turbine-generator set.

bine exhaust gases to generate steam. Heat in the turbine exhaust gases was to be recovered for the generation of steam in two boilers at two different pressures —175 p.s.i.g. and 40 p.s.i.g. From the last boiler, the exhaust gases pass through an economizer to heat feedwater for the boilers before exhausting to the stack. This arrangement would provide a total of 39,000 lb. of steam per hour and 3500 kw. of electric energy. Overall gas turbine cycle efficiency for this steam and power generation is approximately 70 per cent.

The Regenerative-Cycle Gas Turbine

The second type developed was a self-contained 3500-kw. (5000 hp.) regenerative-cycle unit. This unit is very similar to the simple-cycle unit just described, except that a regenerator is used to heat the air after compression by recovering heat in the exhaust gases. The regenerator reduces the fuel required and improves the cycle efficiency without the use of waste heat boilers or other heat recovery equipment, as described earlier for the simple-cycle unit. Efficiency of this unit without additional heat recovery equipment is 22.4 per cent.

A cross section of this unit is shown in Fig. 4. This gas turbine power plant actually consists of two turbines — the high-pressure turbine driving the compressor and the low-pressure turbine driving the load. Both turbines are located in the same casing thus eliminating high-temperature external gas piping.

The regenerative-cycle gas turbine is applicable in Central Electric Stations for power generation, and for driving compressors on gas pipe lines. By using waste heat boilers instead of the regenerator, it may be used to supply both process steam and electric power in an industrial plant.

The Compound-Cycle Gas Turbine

The third type developed was a self-contained 5000-kw. compound-cycle gas turbine power plant complete with intercoolers and regenerators. These units are particularly adapted for applications requiring the generation of electric power only.

The cycle of this unit is shown diagrammatically in Fig. 5. In this unit we also have two turbines—the high-pressure turbine driving the high-pressure compressor and the load, and the low-pressure turbine driving the low-pressure compressor. Intercoolers are located between the low-pressure and high-pressure compressors, to reduce the work of compression. Regenerators heat the air after the final stage of compression before it enters the combustion chambers, and further reduces the fuel required by recovering heat from the exhaust gases.

Having a picture of the cycle and heat exchange equipment, an actual cross section of the turbines and compressors is shown in Fig. 6. Compressors and turbines have the same rugged construction as the 3500-kw. units. The combustion chambers are similar and, even though we have both a high-pressure and a low-pressure turbine, high temperature external gas piping is eliminated by placing both turbines in the same casing. The efficiency of this gas turbine plant, without additional heat recovery equipment, is 26.3 per cent, comparable to the best condensing-steam turbine plants of equal rating. A fourth type, now in the design stages, is a compound cycle unit rated 15,000-kw.

Controls

Controls for the gas turbine and its auxiliaries are conveniently arranged on a single panel. The simplicity of these units makes automatic control of the gas turbine plant practical, and either manual or automatic controls can be provided.

Fuels

With apparatus available today, the most practical fuel for these turbines is bunker "C" oil or gas. The unit cost of these fuels is comparable to and even lower than solid fuels in parts of Canada. In such areas the gas turbine plant should compare very favourably with other fuel fired plants. Because of the efficiency, simplicity, lower installed cost, and expected low maintenance of gas turbine plants, they also have applications in many areas where oil and gas fuels are more expensive than fuels suitable for other plants.

The cost of Diesel oil, as used in most internal combustion engine plants, is 1½ to 2 times the cost of "Bunker C" oil suitable for the gas turbine—this in itself is a sizeable factor in favour of the gas turbine plant.

Many Uses in Industry

So much for the gas turbine designs available—where can these be used to advantage in industry?

First

The gas turbine unit is particularly well suited for application in the pulp and paper, the textile, meat packing, refinery, and other industries requiring heat energy— usually in the form of process steam — in addition to electric energy. Power costs in such industries are minimized, because overall plant thermal efficiencies higher than 70 per cent are realized when heat energy recovered from the turbine exhaust gases is used in process.

Where continuous process operations are a "must", the gas turbine with its quick starting characteristics can be used for standby, emergency, or peak load service even in plants where it is not used to supply the normal daily plant load.

Second

In many areas where hydro power is not available at low cost, because of the distance from areas of generation, and electric power generation from fuel is considered, gas turbine generators may be applicable. The simplicity and efficiency of the gas turbine plant may indicate an increase in the number of thermal generating stations, to limit the use of long transmission lines from hydro systems.

Third

Gas turbine units have been applied in the States as standby for hydro systems in case of low water supply, or for peak load demands. Low standby operating and supervisory expense is possible because gas turbines may be shut down without the maintenance of hot boilers for instantaneous or daily load peaks. The combustion gas turbine can be started, put on the line, and operated at full load in less than 10 minutes. Such an installation is shown in Fig. 7.

Fourth

Because of its operating speeds, the gas turbine is particularly well suited as a mechanical drive unit for blowers, compressors, pumps, and other such equipment. Industries such as steel, gas pipe line pumping stations, and refineries should have wide use for the gas turbine. When desired, use of automatic or semi-automatic controls for the gas turbine makes it practical to install the unit in remote locations with a minimum of operating and supervisory expense.

Fifth

The gas turbine as a power plant for locomotives has many very desirable features. A 4500-hp. locomotive is built in a single cab when powered by the gas turbine. This is two to three times the power of other single cab locomotives extensively used today. This higher horsepower per ton is an advantage on many lines, particularly those which do not operate on steep mountainous grades. Simplicity and expected low maintenance also favours the gas turbine as a locomotive power plant.

Comparison with Steam Plants

Many of the gas turbine applications mentioned above are applications where steam turbines, internal combustion engines or steam engines are used at the present time. From the standpoint of space required, weight, initial cost, simplicity, and cooling water requirements, the gas turbine plant would now be favoured for many of these applications.

As for fuels, the steam turbine or the steam engine plant may be favoured in certain areas where the cost of coal or other solid fuels is lower than oil or gas. The burning of coal in gas turbines presents some problems at the present time. Research is now being conducted to perfect methods for the successful use of coal as the fuel for gas turbines. No doubt, at some future date, satisfactory equipment will be developed so coal can be used commercially as the fuel for gas turbines, as it is now used in other thermal plants.

In thermal plants supplying electric power only, gas turbine plant efficiencies compare favourably with other plants of comparable size. In plants requiring both electric energy and heat energy, selection of prime mover to give the highest plant thermal efficiency will depend on the ratio of electric power requirements to heat energy or process steam requirements. Gas turbines, steam turbines and internal combustion engines can be operated at high cycle efficiency when heat recovered from the exhaust can be used in process.

In many such industries, the use of electric energy has increased more rapidly than process steam or other forms of heat energy. The gas turbine is favoured in these industries because the ratio of electric power to process steam is high. In the intermediate range of process steam requirements, the condensing extraction turbine, the gas turbine utilizing waste heat boilers with supplementary firing, or a combination of the two may be selected.

(Continued on page 22)

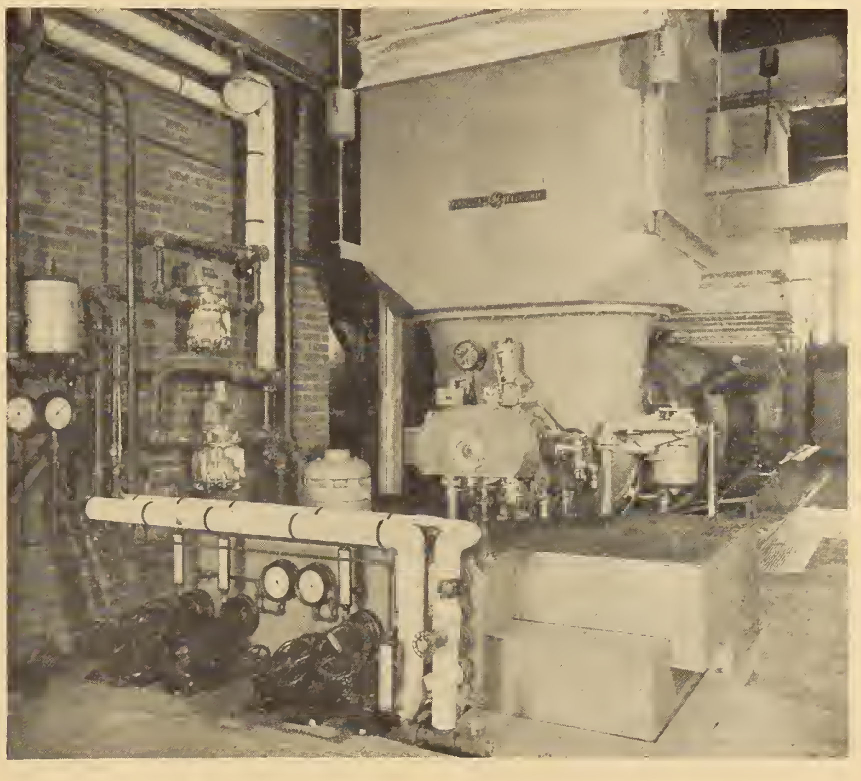


Fig. 7. 3,500-kw. simple-cycle gas turbine power plant installed to supplement hydro system.

Fig. 1. Model showing principal features of the festival area on the south bank of the Thames.

Britain's Royal Festival Hall

An abstract of a paper which appeared in "The Consulting Engineer", October, 1950.

The Abercrombie plan for the development of the County of London stressed the need for dealing with the dreary south bank of the Thames as a whole, suggesting in a general way what form this development might well take. It was natural then, that when it was decided to celebrate the centenary of the Great Exhibition of 1851 by holding another exhibition to show Britain's progress during the hundred years, this area should be chosen as the site, especially since many of the exhibition buildings will be permanent.

One of the principal structures of the exhibition group will be a concert hall, the Royal Festival Hall, which is now under construction, and which is described in some detail in an article by Messrs. Scott and Wilson, M.M.I.C.E., the consulting civil engineers for the building, in the October, 1950, issue of *The Consulting Engineer*. While in general its design follows conventional lines, some of its features seem to us unique and it is of these that we shall write.

The upper floor is entirely occupied by the main hall which will seat 2,900 people; with all standing space occupied its capacity is 3,450. A smaller hall under the main hall will accommodate 750. There are also the usual foyers, a bar and restaurants. The slope of the site is such that entrances are provided at separate levels for the main hall and for the other rooms.

It was originally intended that the frame should be of structural steel, but delivery difficulties made a change to reinforced concrete desirable, except that the roof is carried on steel trusses. To save steel, joints in reinforcement are welded instead of lapped. A concrete mat foundation covers the whole area of the building; its bottom is about 13 feet below normal ground water level and therefore the walls and floors of the basements are water proofed. Dewatering the site by means of well points proved eminently successful.

The outstanding feature of the structural design of the Royal Festival Hall is the extraordinary care which has been taken to reduce nuisance from unwanted sound. This may come from the exterior of the building—there is a busy railway bridge close by and Waterloo Bridge is not far away — noises might be transmitted from one hall to the other, noises originating in the building might be heard in either hall, noise from ventilating fans and other service apparatus would be objectionable.

The main hall is a box within a box. Interior roof, walls and floor are entirely separated from the exterior elements, either by adequate air spaces or by fibre glass where they would normally come in contact. The inner floor has a ventilating chamber under much of its area; over the small hall where it is only of single thickness it is supported by columns which are insulated from the rest of the structure, resting on footings which are also insulated. The loads from the small hall are carried by tubular columns, surrounding those just referred to, and resting on footings on top of the main footings. These features are well shown in the accompanying illustration. (Author's longitudinal section.)

The walls of the main hall are double, separated by insulation wherever they come into direct or indirect contact. The roof is of precast concrete slabs and is double with an air space and fibre glass between the layers. There is also a suspended ceiling over the main hall at the level of the lower chords of the trusses. The space between the upper and lower chords of these trusses is used for ventilating ducts, lighting circuits and for access to the ceiling, in case it becomes necessary to "doctor" it to improve the acoustic properties of the hall itself.

Special precautions were taken to muffle the ventilating system by lining ducts with acoustic materials, by jacketing them with similar materials in some locations and by silencing fans and motors as far as practicable.

This double construction naturally introduced some interesting problems into the structural design, notably in providing for the support of the cantilevered main balcony and in assuring the stability of the tall and relatively thin walls of the main hall, all of which were successfully solved, though in some cases they required methods of calculation which were unusual, to say the least. It is a tribute to the ability and co-operation of the architects and the various consultants that design had advanced far enough in about six months after the inception of the scheme to start on the construction of the foundations.

When finished, the Royal Festival Hall will cost about $4,800,000 and will involve 63,000 cubic yards of excavation; 31,800 cubic yards of concrete, plain and reinforced; 2,600 tons of reinforcing steel and 2,900 tons of structural steel. √

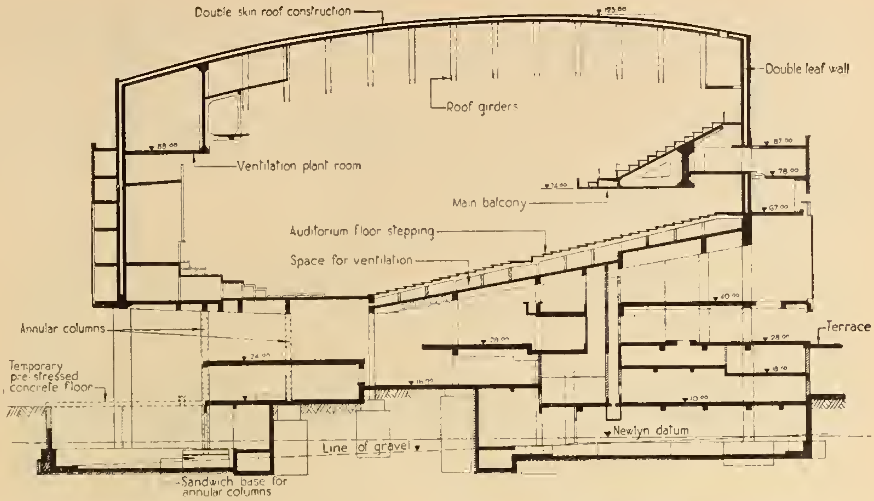


Fig. 2. Longitudinal section of the Royal Festival Hall showing the auditorium and the rooms and corridors beneath.

Fig. 3. Construction of the Royal Festival Hall showing erection of roof girders nearing completion.

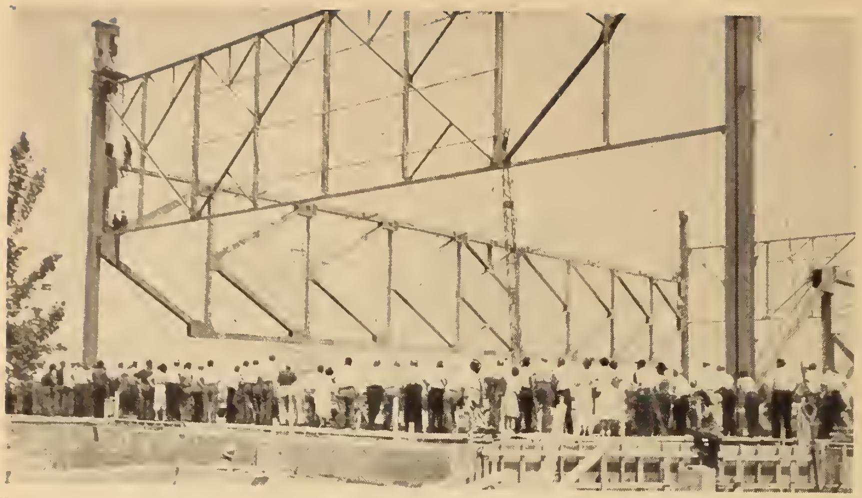


Fig. 1. On the way up: note the top column extension and guys, and the 115-foot trusses in place.

Erection of Long-span Trusses

The photos on this page show two interesting stages in the erection of 8,600 tons of structural steel required for the new Kitchener (Ont.) Auditorium. The central part of this building is 115 x 220 feet, with a single column at each corner only. Thus the main roof is outlined by two 220-foot trusses and two of 115 feet span each. The long trusses are 28 feet deep, are fabricated from wide-flange shapes and weigh about 80 tons each.

The erection of these heavy trusses posed a problem which was simply and neatly solved by using the permanent corner columns, temporarily heightened by 11-foot extensions at their tops, as gin poles, after the 115-foot trusses had been set by moto-cranes. These short trusses, of course, partly braced two columns in one plane; additional stability was secured by four guys from the top of each column to previously set deadmen in the building foundations.

The long trusses were assembled in vertical planes on timber blocking on the ground between two columns. Temporary outriggers and cables provided for lateral stiffness while these trusses were hoisted into place with heavy blocks and tackle at each end. It took about ten minutes to hoist each truss the 40 feet from the ground to its final position, where it was first bolted, then rivetted in place.

Jenkins & Wright, of Kitchener, are the architects for this building, C. C. Parker, M.E.I.C., of Hamilton, consulting engineer, and the Dunker Construction Co., Limited, of Kitchener, general contractors. Steel was supplied by the Hamilton Bridge Co., Ltd. √

Fig. 2. A truss assembled on the ground; note the outrigger and cable stiffeners along the top chord.

Organization and Responsibilities of the International Joint Commission

(*Continued from page 4*)

three Commissioners appointed by each of the two countries. The Commission largely determines its own procedure to fit the needs of particular references. It may call upon the technical services of either government for assistance. Evidence may be taken on oath and the attendance of witnesses may be compelled, but these extreme powers have never, so far as I am aware, had to be used.

Membership Drawn from Professions

Today the membership of the Commission comprises one lawyer formerly a state governor and member of the United States Senate; there are four professional engineers; the sixth member is a gentleman who in his former capacity as Director of the Prairie Farm Rehabilitation Administration has had extensive practical experience in engineering of a character which is particularly relevant to an important part of the Commission's work, that is the use of water for irrigation. He is an Associate Member of this Institute. Thus down the years, the Commission seems to have acquired a professional character in keeping with the work it has been called upon to perform.

Time does not permit a recital of the many references received by the Commission from the two governments. The work of the Commission has been primarily engineering in character. On one reference or another it has involved considerations relevant to every branch of engineering—civil, electrical, mechanical, hydraulic, sanitary, meteorological—to mention a few. May I suggest that this Commission and its work is of prime and continuing interest to this Institute. Its sole object is to find out and to do what ought to be done in accord with the principles of justice and equity, and thus to fulfil its mission to promote peace and concord on the border. √

Flood Control in California

W. R. Slater **Howard Curtiss** **Paul A. Oliver**

Bureau of Reclamation, U.S.A.

From a paper presented at the Sixty-fourth Annual General and Professional Meeting of The Engineering Institute of Canada and the Annual Summer Meeting of the American Society of Civil Engineers, at Toronto, Ont., July, 1950.

Construction of three big features authorized in the Boulder Canyon Project Act, approved December 21, 1928, were Hoover Dam, Imperial Dam, and the All-American Canal. Imperial Dam and the All-American Canal system were built during the period 1935-1947 at a cost of approximately $40,000,000. The over-all length of the All-American Canal is 204 miles, of which the Coachella Canal comprises a 123-mile branch. The alignment of the canal system is shown in Fig. 1. At its intake the All-American Canal has a capacity of 15,155 c.f.s.; its branch, Coachella Canal, starts with a capacity of 2,400 c.f.s. and extends northwesterly along the east slopes of Imperial Valley and the Salton Sea, enters Coachella Valley with a capacity of 1,300 c.f.s. and crossing the valley floor and turning southward to end at mile 123.5 above Indio, serves 17,000 acres of presently developed land and 58,000 acres of new land to be brought under cultivation on completion of the project. An underground concrete pipe distribution system to serve the land is under construction.

In the 45-mile reach of the canal, immediately upstream of its entrance to the valley, 32 wash siphons serve to pass flood waters from the adjacent mountain washes across the canal. The last 37 miles of the Coachella Canal is concrete lined.

High-intensity storms, centred over the steep mountain areas above the canal, occur during the summer and fall, and because of lack of vegetation result in large flash floods which carry heavy debris loads out of the steep mountain canyons to be deposited in great debris cones which form a portion of the irrigable land. Initial plans for the development of Coachella Valley contemplated the construction of overchutes and siphons for the passage of storm water across the canal. Although such a plan would protect the canal, it would provide no protection for the agricultural land and its irrigation lateral system lying on the lower side of the canal. For this reason protection dikes Nos. 1 and 2 to impound floods have been built for 26 miles along the upper, or easterly, side of the lined portion of the canal.

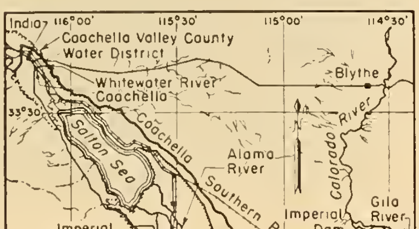


Fig. 1. Coachella Canal carries Colorado River water 123 miles from All-American Canal to irrigate 75,000 acres of valuable date and citrus crops in Coachella Valley County Water District. Canal capacity is 1,300 c.f.s. as it enters Valley.

The design and construction of these flood control works are the subject of this article.

The maximum probable flood for washes crossing the Coachella Canal in the valley was determined by assuming the occurrence of a storm of maximum probable magnitude at a time when ground conditions are conducive to maximum runoff. The protective works were designed on the basis of these floods. The size of the drainage areas, shown in Fig. 4, indicated that the maximum probable flood would be produced by a cloudburst type of storm. Since records of rainfall in Coachella Valley were inadequate to determine the size of such a storm, a study was made of the record of cloudburst storms in the Southwest. One at Avalon, Calif., on October 21, 1941, of 5.53 in. in $3\frac{1}{4}$ hours, was considered large enough to be a probable maximum, and hydrographs of floods from the drainage areas shown in Fig. 4 for such a storm were derived and used to design the works.

The methods used for deriving and applying unit graphs and distribution graphs were substantially

Fig 2 (above). Wasteway No. 1 Outlet.

the same as that described in the U.S.G.S. Water-Supply Paper 772. The unit hydrograph for an area is an expression of the time distribution of runoff resulting from unit effective rainfall. Unit quantity usually represents an average depth of one inch over the area. Unit duration is usually expressed in hours or minutes.

As used here, the distribution graph shows, in per cent of unit runoff, the average rates of runoff by successive unit-time intervals. The basic runoff and rainfall data for the drainage areas tributary to the Coachella Canal are inadequate for the derivation of any distribution graphs. Distribution graphs were derived for nine other drainages in the general region by a trial and error reproduction of recorded major floods.

The general method of determining the synthetic unit hydrograph described in the report is in most respects similar to that developed in transactions of the American Geophysical Union, Part I, 1938, pages 447-454, and Part II, 1940, page 626. The method is used in determining the time distribution of runoff (represented by distribution graphs) in drainage areas for which no concentration point hydrographs are available for a direct determination of this kind. It provides for transposition to those areas of the characteristic time distribution of runoff in regional drainage areas for which such distribution can be determined. In application, the characteristic time distribution to be transposed usually represents an average of those for several streams. Use of the method is practicable when the assumption may logically be made that drainage areas within a given region are physiographically and hydrologically similar.

Since no two drainage areas are alike in physical characteristics such as area, dimensions, stream-channel pattern, channel length, and stream slopes, the respective runoffs from these areas never concentrate in an exactly similar manner and only by chance are

Fig. 3 (below). Concreting Wasteway No. 1 Channel.

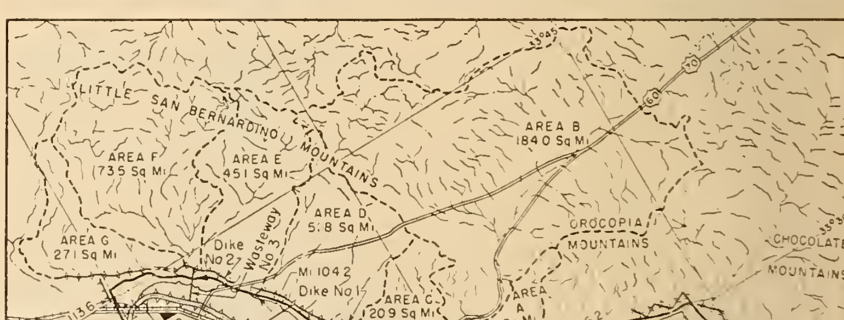


Fig. 4. In Coachella Valley. Coachella Canal and irrigated lands below it get protection from flash cloudburst floods by 26 miles of dikes about 25 ft. high, forming detention basins above canal.

ıeir respective distribution graphs xactly alike. Therefore, direct :ansposition of distribution graphs rom one area to another is usually voided. However, most distribuıon graphs are similar to a coniderable degree, and the introuction of a factor (parameter) alled "lag" will bring arrangeıent of ordinates along the basis ıf distribution graphs into a genrally consistent relationship.

Lag as used herein constitutes ın empirical expression of the ›hysical characteristics of the lrainage area in terms of time. In he method used in this report, the irst step required in evaluating ag for an area in which the charıcteristic time distribution of runıff is known, consists of constructng a curve called the "summation ıydrograph". The definition of lag tself involves the discharge time elationship expressed by such urves. The relationship of lag to lischarge plots in the form of a urve called the "S-graph". The ıverage S-graph for a number of lrainages is the principal tool used n the transposition process.

Summation hydrograph — The ummation hydrograph for an area s a hydrograph of the runoff that vould result from the continuous generation of unit excess rainfall ›ver the area. It is derived by ılgebraically adding a series of ınit hydrographs consecutively paced one unit period. Thus the ime required for the summation ıydrograph to reach ultimate maximum) discharge is equal to he length of the base of the unit hydrograph less one unit period. For convenience in application, discharge is plotted in per cent of ultimate discharge.

Fig. 6. Riprapping Dike No. 1.

Lag—Lag for an area defined herein is the elapsed time (in hours) from the beginning of unit excess rainfall to the point where the summation hydrograph for that area reaches 50 per cent of the ultimate discharge. When the lags determined from observed hydrologic data for several natural drainages are correlated to the physical characteristics of those drainages, an empirical relationship is usually apparent. This relationship can then be used to determine the lags for other natural drainage areas for which the physical characteristics can be determined, but for which the distribution graphs for concentration points cannot be determined because of inadequate hydrological data.

Measurement of lags for drainage areas in southern California demonstrate that the lags for these areas could readily be expressed by the empirical formula:

$$\text{Lag (in hours)} = \left[\frac{C_t \quad L \times L_{ca}}{S^{\frac{1}{2}}}\right]^m$$

Where C_t and m = constants.

L = length of longest watercourse, in miles.

L_{ca} = length along longest watercourse, measured upstream to a point opposite centre of area, in miles.

S = Overall slope of drainage between the headwaters and the collection point in feet per mile.

With the benefit of extensive studies made in 1943 by the Los Angeles office of the Corps of Engineers, the Bureau plan provided for the concentration of two dikes forming storage basins and three concrete-lined wasteway channels for the evacuation of the impounded water, as shown in Fig. 4. The first basin is formed by Dike No. 1 extending for 16.4 miles along the 45-ft. contour immediately uphill from the canal. Dike No. 2 extends for 10 miles along the 60-ft. contour to form Basin No. 2, with its floor 27 ft.

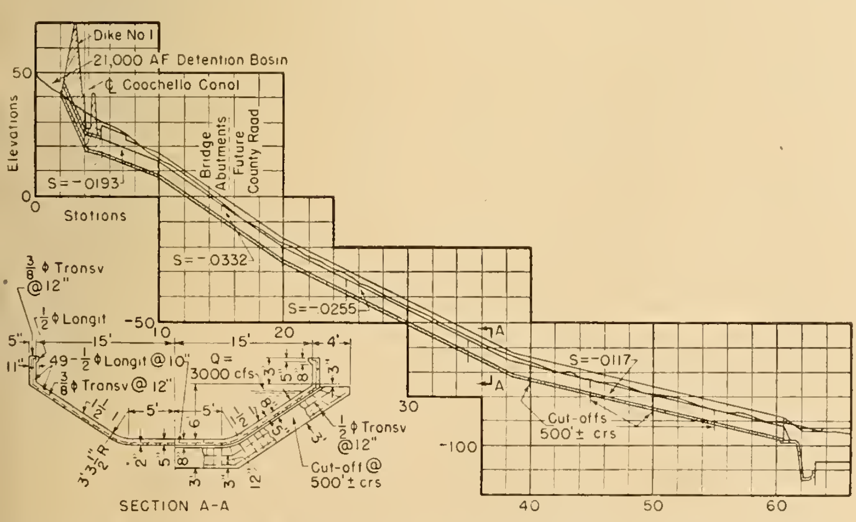


Fig. 5. Wasteway No. 2, shown in section and profile, carries flash-flood waters under Coachella Canal and into Whitewater River storm channel leading to Salton Sea. Wasteways Nos. 1 and 3 are of similar construction.

higher than the canal water surface.

When a storm is centred over one of the drainage areas shown in Fig. 4, the rainfall and runoff from adjacent areas are reduced. The storage basin above Dike No. 1 was estimated to be subject to a runoff of 19,000 acre-ft. from drainage areas A, B, C and D; and that for Dike No. 2 was estimated at 16,000 acre-ft. from areas E, F and G. Ten per cent was added to this pondage to take care of silting. Basin No. 1 is provided with two wasteway channels and Basin No. 2 with one. Wasteway No. 1, which is 15,300 ft. long, discharges on the beach of Salton Sea. Wasteway No. 2, which is 6,150 ft. long, and Wasteway No. 3, which is 9,150 ft. long, discharge into the Whitewater River Storm Channel.

The area between the dike alignment and the successive contour intervals upward from the contour on which the dikes rested were planimetered on a topographic map and the volumes added until the storage volume behind the dikes equalled the design pondage. For Dike No. 1, resting on contour 45, the required water surface for 21,000 acre-ft. stood at El. 64. Allowance for settlement and for freeboard set the elevation of the top of Dike No. 1 at about El. 70, making this dike 25 ft. high. Similarly the crest of Dike No. 2, resting on the 60-ft. contour, was determined at El. 89.5 for detention of 18,000 acre-ft. The typical dike-section adopted has a crest width of 20 ft. and slopes of 2:1 on the lower face and 3:1 on the upper face. The embankments were built with excavating and hauling equipment and placed in layers not over 8 in. thick. Borrow was taken from within the basins.

The storage basin behind Dike No. 1 is in reality formed of four sub-basins connected by channels constructed between the dike and spurs from adjacent hills. To provide rapid dispersion of floods within a basin without undue velocity, these channels are constructed with a minimum base width of 200 ft. Where velocities in excess of 5 f.p.s. are anticipated, the 3:1 upper slope of the dikes is protected with a layer of asphalt 6 in. thick. A concrete cutoff wall 4 ft. deep was constructed at each end of the asphalt mat, and a riprap blanket extends a minimum of 50 ft. beyond each cutoff. The toe of the dike is also protected by extending the asphalt mat from 4 to 6 ft. below the dispersion channel floor and covering this extension with riprap.

Wasteways Nos. 1, 2 and 3 consist of a culvert under the dike and canal, an automatic wasteway from the canal discharging into the culvert box, a concrete-lined wasteway channel, wasteway outlet structures and suitable outfall channels in earth. The wasteway channels are concrete lined and utilize a section designed to obtain the economy of a trapezoidal section, in which concrete lining can be placed by modern slip-form methods, plus the splash resistance of a rectangular flume section. The section adopted is shown in Fig. 5, which also shows the profile of Wasteway No. 2. Inside and at the top of the vertical walls splash copings are provided. The water at maximum discharge varies in velocities between 25 and 35 f.p.s. as it passes down the slopes in the wasteways, and in all cases the maximum water depth is below the top of the trapezoidal part of the section.

Construction of the flood works by contract was initiated in February, 1945 with the start of earthwork operations on the initial section of Dike No. 1 and its dispersion channels. This construction together with that for Wasteway No. 1, which was started in November, 1945, provided protection to 9 miles of canal. The sequence of flood-work construction was such that where practicable the dikes and wasteways would be built concurrently with and immediately adjacent to the canal. Pending the resolution of questions relative to the repayment obligation of the Coachella Valley County Water District, construction was limited to the completion of a section of Dike No. 1 and to Wasteway No. 1, until January, 1948, when construction was started on the final portion of Dike No. 1 simultaneously with that on Dike No. 2. Contract work on Wasteways Nos. 2 and 3 was started in May, 1948. As the two dikes were completed somewhat in advance of Wasteways Nos. 2 and 3, the work on the wasteways was jeopardized by rain storms in the winter of 1948-1949. However, the wasteway contractor was able to complete all work on the channels and structures by January, 1949 and was only slightly inconvenienced by a few minor rain storms.

Operations connected with the construction of the dike proceeded quite uniformly. At peak operation and when material was most accessible, the contractor was able to place an average maximum of 350,000 cu. yd. per month.

Beginning in January, 1948, the second and final section of Dike No. 1 was built with tractor and scraper units with pusher tractors assisting in the loading at the borrow pit. In heavy cuts, where such equipment could be advantageously used, the contractor employed a 2½-cu. yd. dragline and three 12-cu. yd. bottom-dump trucks. As on the Shea Co. section of Dike No. 1, this latter equipment was used primarily for topping out operations.

As the source of supply for rock was too remote to make riprap economical for slope protection, an asphalt mat was substituted. The contractor set up an 80-ton-per-hour hot-mix plant and, using screened native material from the alluvial fan on the nearby Thermal Wash, was able to lay down a very acceptable product. The mat material was hauled from the plant in trucks and transferred by bucket to a canal paver modified to lay down a flat strip of mat 10 ft. in width. The lay-down on the slope was made in strips parallel to the dike centre-line.

By proper weighting of the paver, the mat density obtained before any supplemental rolling, was at or above that obtained in the laboratory determinations of the maximum probable density for the material. A supplemental rolling up and down the slope, or at right angles to the lay-down direction, was effective in smoothing and binding the mat at the joints between lay-down passes, but this rolling was found to have little effect in increasing the overall mat density. When the mat was inspected after it had been in place a year and a half, effects of weathering were not discernible.

Construction of Dike No. 2 was started in January, 1948. The contractors elected to throw the maximum of equipment into the work in an attempt to complete it all as quickly as economically possible. Fine material and borrow pits exposed to the wind caused delaying sandstorms. The contractor was forced to wet down the borrow area to reduce lost time. At times his monthly rate of bank placement totalled 800,000 cu. yd. and his monthly average was 600,000 cu. yd.

Wasteway No. 1 included 3.3 miles of channel, of which 2.9 miles were lined with concrete and 0.4 mile was in open cut. Also included was a concrete and structural steel railroad bridge, a reinforced concrete highway bridge and the channel-outlet and stilling-pool structure. All excavation of channel and structures was accomplished with little delay by tractor and scrapers and by dragline. The channel subgrade was trimmed to neat line by an endless-bucket type of subgrade trimmer, and the concrete lining was placed with a slip-form paver machine. Concrete was batched at a centrally located plant. The paving mix was dry batched for mixing at the paver, while the structural concrete mix was batched into transit-mix trucks and placed at the structures by dragline or buggy.

Because of wartime depletions the supply of construction materials was critical and considerable difficulty was experienced by the Government in securing adequate quantities for the work. An extension of time commensurate with the delay caused by failure of the Government to furnish materials on time made it necessary for the contractor to carry on the operation of paving the channel during an extremely warm period. In order that the temperature of the concrete at time of placement would not exceed the specification limit of 90 deg. F., it was necessary for the contractor to start his work day in the early morning hours and also to cool the mixing water with ice.

As the rate of placement was approximately 225 cu. yd. per day, and air temperatures on many days exceeded 100 deg., the quantity of ice used was considerable. In the placement of concrete in the channel lining, the mix was batched to the slip-form machine from a 34-cu. ft. paver equipped with boom and dump bucket. A trailer-mounted water tank was pulled behind the mixer, and ice was added to the water which passed through this tank from the supply line to the mixer.

Even with air temperatures up to 110 deg. and aggregate temperatures considerably in excess of 100 deg., it was possible at all times to maintain the temperature of the mix at the time of placement under a maximum of 88 deg. by the use of this cooling method. The contractor was able to complete all channel lining and parapet wall construction on this contract by September 14, 1946. As the period starting about July 15 and extending through September is considered to be one when cloudburst storms are probable, it can be understood that considerable concern was felt by the contractor and by the Bureau during this time.

Wasteways Nos. 2 and 3 were started in May, 1948. As the contractor rented the machines for trimming and lining the channels, the Wasteway No. 1 contractor, construction methods and equipment were very similar to those for that wasteway, and hence no list of equipment is given for construction of Wasteways Nos. 2 and 3. The method of supplying concrete to the slip form differed in that transit-mix material was used instead of dry batching to a paver at the slip form.

By making alterations in the slip form such as the use of an endless conveyor from the mixer to a distribution hopper, the rate of placement was increased to a maximum of 300 cu. yd. per shift. This contractor's average for several weekly periods equalled the Fisher contract's daily maximum. Concrete material for structures was obtained from the same source as for the lining.

On completion of Wasteway No. 3, the contractor was directed to remove the shoo-fly dike built on Dike No. 2 for protection to this wasteway. Construction was completed without major incident in May, 1949. √

France's Oldest Engineering School

L'Ecole Centrale des Arts et Manufactures (The Central School for Constructive and Manufactured Works) called more simply "l'Ecole Centrale" and "Piston" by students is the principal French school for the training of engineers in all branches. It was instituted when French industry was beginning to develop. At the School's centenary in 1929, it had produced 16,000 engineers and out of the 24 courses provided for at the beginning 22 were still in existence, though necessarily adapted to the development of industry and the progress of science.

A private school originally, it taught pure applied science, but its students were soon to be an essential part of modern society. In 1857 the School was passed over to the State.

Bousquet. a former student, was the inventor of the bogies used under railway carriages. Sautter built more than 2,000 lighthouses. Darblay substituted wood pulp for rag in the manufacture of paper.

Eiffel built bridges and that famous tower for the 1889 Exhibition. Berges and Fredet harnessed the first waterfalls and water-power. Boivin discovered sugar-refining with hydrocarbonate of lime. All these were "centralites".

The School system is a hard one; the course of study is three years and the final diploma carries with it the title of "Ingénieur des Arts et Manufactures." Every year 230 new students enter school after a very stiff competitive entrance examination and go to lectures in the morning, and in the afternoon do practical work. The students have to be present regularly at 8.15 a.m. every day and "clock in" as in factories; what is more they must never "skip" lectures or the amphitheatre!

Laboratories of industrial chemistry and mineralogy; thermic and electrotechnic machines; machine tools and hydraulic workshops; metal and material resistance; radioactivity and reinforced concrete; waves and television; such are the forms of specialization open to the future engineer at the "Central." Thus there is nothing to prevent the student who has graduated as an erecting engineer or metallurgist from becoming a chemist, but the tendency is for increasingly greater specialization for engineers. √

SARNIA
Where The Twain Will Meet

by

J. R. Nicholson, O.B.E.

Executive Vice-President, Polymer Corporation, Sarnia, Ont.

A paper presented to the Montreal Branch of The Engineering Institute of Canada, November 2, 1950.

The discovery of oil in the Canadian West, the plans for the movement of vast quantities of that oil to the Sarnia area, and for the erection there of new and greatly increased refinery units, will make available to the growing petro-chemical industry, new and vital raw materials from a Canadian source.

You will recall the oftly quoted language of Rudyard Kipling: "East is East and West is West, and ne'er the twain shall meet". The poet Kipling was referring to differences in the mental outlook of the peoples of the Orient and the Western Hemisphere and not to the exchanges of products between two great hemispheres, or to the movement of commodities between eastern and western Canada.

These oil discoveries, however, mean the opening of a new chapter in the economic life of our country. The existing refineries in Southwestern Ontario, and the petro-chemical industry, so firmly established in Sarnia, need and welcome this new supply of oil. This development means more to the Sarnia area than to any other centre in Eastern Canada. Sarnia is the place where the twain, Western oil, and Eastern equipment to process it, are to be brought together; for it is at Sarnia that the first oil from the West will be refined, and from which products made therefrom will be distributed.

Imperial Oil's Role

The story of what has taken place in the Sarnia area since the turn of the century, more particularly in the last 10 years, is one of real accomplishment; it holds great promise for the future. Such a story of industrial development is usually a story of certain companies. Three companies have to date played the most important roles in the developments at Sarnia, viz. Imperial Oil, Polymer Corporation and Dow Chemical of Canada.

It would be helpful to briefly outline here the nature of Imperial Oil's refinery operation at Sarnia, with special reference to its part in the production of petro-chemicals. The primary refining units separate the crude oil into the following principal fractions—gaseous hydrocarbons, natural gasoline, kerosene, gas oils, etc. The gas oil and some of the heavy gasoline are used as feed for the cracking units. The gases from these cracking units, and the light pressure distillate which is separated from the crude gasoline, are combined to provide feedstock for the giant Polymer Corporation plant. This feed stream consists of a mixture of light hydrocarbon chemicals, including methane, ethane and ethylene, propane and propylene, butanes and butylenes. I would like to direct your attention particularly to these, since the basis of the petro-chemical operations presently centered in Sarnia is found in these interesting materials.

Polymer Conceived After Pearl Harbour

Within a few weeks of Pearl Harbour in December, 1941, approximately 90 per cent of the rubber producing areas of the world passed into enemy hands. The lack of this critical and strategic material presented the greatest threat to the success of the Allied cause. Unless within a few months an answer could be found to this critical problem, the Allied war effort and the domestic economies of the U.S.A., Great Britain and Canada would collapse. In December, 1941, the Canadian Government, acting on the recommendation of the Rt. Hon. C. D. Howe, then Minister of Munitions and Supply, made a courageous and far reaching decision. It decided to build a synthetic rubber plant in Canada of sufficient capacity to take care of the nation's wartime rubber requirements. Out of that decision came the Polymer Corporation.

The advent of Alberta oil will be of great importance to Sarnia. Here Canadian oil and Canadian chemical plants will together build up an all-Canadian petro-chemical industry.

Here the author tells how Imperial Oil, Polymer, Dow Chemical, Sun Oil and other corporations are working together to this end, and the role each one plays. He shows the importance of styrene and the peacetime products made from it. He tells how Polymer's output of styrene finds an added outlet through polystyreue plants built by Dow and Monsanto, while sales of by-products and surplus power are helping to reduce operating costs.

Showing how integration and informal co-operation have produced a uniquely efficient and economic petro-chemical industry, the author looks to the future for further developments that may make Canada ultimately independent of chemical imports.

The Polymer plant consists of seven main units, or rather groups of units. It involved an original expenditure of approximately $50 millions in the amazingly short period of less than two years. During the past five years a further $8 millions has been spent in extensions and additions designed to improve quality, diversify production and make the best economic use of its by-products. Extensions involving the expenditure of a further $7½ millions have recently been announced. They will be completed within the next twelve months.

Polymer Corporation was incorporated in February, 1942. It was charged by the Government with the responsibility for the construction and operation of an integrated synthetic rubber plant capable of taking care of Canada's wartime requirements. The new corporation had no technical knowledge which would enable it to produce either synthetic rubbers or the basic chemicals necessary for their manufacture. It, therefore, proceeded to enter into agreements with three operating companies having, or readily able to acquire, the necessary technical "know how". The capital investment in the plant was made by Polymer and the operating companies were each paid annually by Polymer a "management fee" for their technical knowledge and plant management. The three companies were:

1. St. Clair Processing Corporation Limited, a subsidiary of Imperial Oil, which had the task of recovering and purifying the ethylene, isobutylene and butadiene needed for the manufacture of the two principal types of rubber, Buna S and Butyl, and of making Butyl rubber. St. Clair Processing also operated the steam, power and water facilities and the central machine shop.

2. Dow Chemical of Canada Limited, a subsidiary of Dow Chemical Company of Midland, Michigan, which prior to Pearl Harbour was the only company in America, and one of the two or three companies in the world, that had ever produced styrene monomer on a commercial scale.

3. Canadian Synthetic Rubber Limited, a subsidiary of the four largest Canadian rubber companies, namely, Dominion, Firestone, Goodrich and Goodyear. This company was to train Canadian personnel and to operate the large Copolymer Plant, in which butadiene and styrene were to be made into rubber.

Polymer Today

Today the operating set-up of the Polymer plant is similiar to what it was when operations began nearly seven years ago, except that St. Clair Processing Corporation no longer operates any of the Polymer units. By agreement with and entered into at the request of Imperial Oil, Polymer itself on May 1st, 1946, took over the operations formerly handled by St. Clair.

Sarnia was chosen as the site for the Polymer plant for a number of reasons; it is the location of the largest refinery in Canada and the only refinery of any size in Canada that was fed by pipeline at that time; benzene, one of the two principal ingredients of styrene, was readily available from the coke ovens of the steel companies at Algoma and Hamilton; coal for the generation of steam and power was also readily available from the Northern Ohio lake ports; salt brine needed for the production of rubber was available from salt wells already in operation at Sarnia; and the St. Clair River had a ready supply of the tremendous quantities of cooling and process water required for the operation.

The principal product of the Polymer plant is the general purpose rubber, Buna S, sold in Canada and abroad under the trade name of Polysar S. As previously mentioned, it is made from butadiene and styrene. The manufacture of butadiene from petroleum involves the separation and purification of a series of light hydrocarbons of the C_4 group. You first recover reasonably pure butylene from the mixed C_4 cut. This step necessitates, first, the extraction of the isobutylene from the stream and then the removal of the normal butylenes, leaving only the butanes and certain other chemicals. To produce styrene you must, in addition to benzene, have large quantities of ethylene. This can be recovered from the mixed gas stream itself, or made through cracking ethane, propane or other components of that stream.

Large and expensive installations of equipment and highly trained technical operators are needed to carry out these intricate and expensive operations. To keep the operations on an economic level involves tremendous throughput. Consequently everything possible must be done to make the best economic use of the by-products and waste products of the plant, and to use any incremental production capacity in the several units to the best possible advantage.

What Research Division is Doing

Before the war came to a close, it had been decided that Polymer should continue into the post-war period. It was evident that the company would have to face the competition of natural rubber. The Canadian industry would be unable to absorb the entire output of the Canadian plant when natural rubber was again available in substantial quantities. It was decided in 1944 to organize a research and development division at Polymer which would be responsible for the improvement of existing products and the development of new ones. It was also decided that immediately after the termination of hostilities an energetic export programme must be initiated. New outlets must be found for the hydrocarbon by-products and for the steam, power and other utilities which were available in excess of Polymer's own requirements.

Polymer's research organization now consists of approximately 100 people, and is headed by one of Canada's most brilliant young research chemists. It has done an outstanding job in developing a series of new and interesting rubbers of different types, each intended for some specific purpose. This staff operates two well equipped pilot plants and other facilities, installed at a cost of over $1 million. In addition to the two basic types of rubber produced during the war, namely, Polysar S and Butyl, Polymer now produces oil resisting rubbers of the Buna N family and high styrene rubbers of high quality. It also produces latices of various kinds, as well as the new so-called cold rubber, which has attracted so much attention in the newspapers and technical periodicals. Approximately 60 per cent of Polymer's $25 millions worth of rubber is exported from Canada annually. Last year this rubber was exported to 32 different countries, and new markets are opening almost every month.

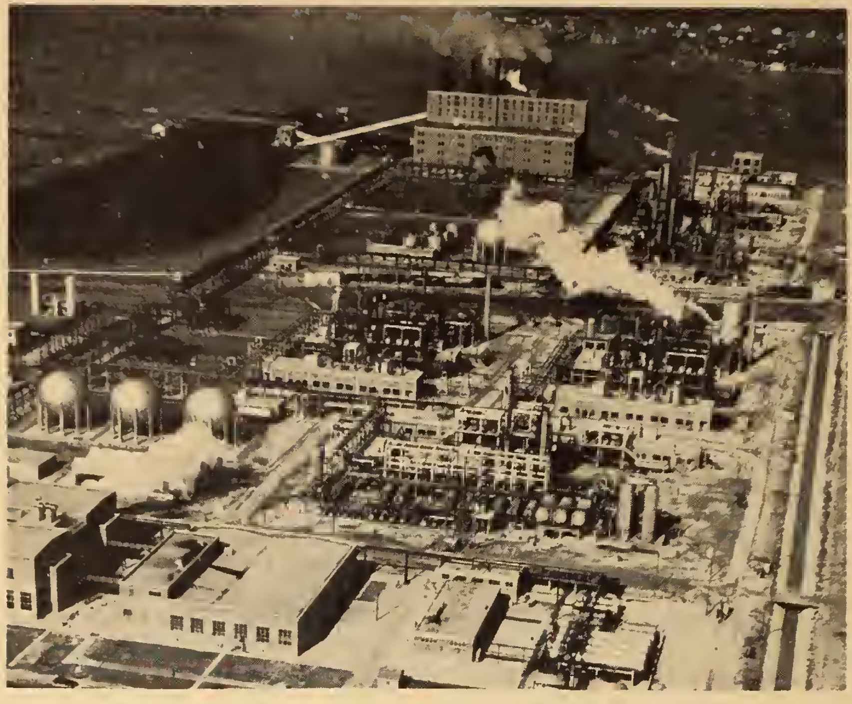


Fig. 1. An aerial view showing part of the eight-acre layout of the Polymer plant at Sarnia.

another oil refinery now operating in the Sarnia area, the Canadian Oil Refinery at Petrolia. Some materials from it have been used by Polymer and its associated companies during recent years, but the part it has played so far in the developments in Sarnia are small compared to what lies ahead. Canadian Oil has oil rights and interests in the new Western oil discoveries. A month ago the President of Canadian Oil Companies announced that a contract had been let for the erection of an $18 million-oil refinery on the St. Clair River, 3 miles south of where the Dow-Polymer plants are located. This new refinery will use Canadian oil. It will be linked by pipeline with Polymer and Dow. It will inevitably play an important part in the expansion and development of a better balanced and more diversified petroleum chemical industry.

Styrene—Peacetime Material

Of equal importance to what has been done in the so-called synthetic rubber field is what has been done since the war in other petro-chemical and plasti-chemicals fields. Styrene is made from benzene and ethylene. To keep the larger of the two copolymer (the strictly rubber) units at Sarnia operating at capacity, less than 12,000 tons of monomeric styrene is required per annum. Consequently, during the war it was never found necessary to recover more than 25 per cent of the ethylene in the feedstock from the Imperial Oil Refinery to provide the styrene needed for maximum rubber production.

Due to improved operating techniques, and to a combination of other factors, it became apparent during the war period that over 20,000 tons of monomeric styrene could easily be produced in the styrene unit, provided the necessary ethylene was available. It later became apparent that by removing bottlenecks and making a relatively small expenditure in the styrene plant itself, production of monomeric styrene could be increased to approximately 30,000 tons per annum. Still later the plant's actual capacity looked more like 36.000 tons.

When the second Great War broke out in 1939, the large scale use of styrene in the production of plastics, costume jewellry, insulation and refrigeration equipment

Dow Chemical and Sun Oil

Dow Chemical of Canada is the third essential member of the Sarnia family. It makes styrene moulding powders with a wide variety of colours in its new, modern factory. It uses large quantities of ethylene (supplied by Polymer) in the manufacture of ethylene glycol and other products. It supplies Polymer by pipeline with the tremendous quantities of salt brine, which Polymer requires for its operations. It supplies caustic soda to Polymer. Sun Oil, the fourth member, provides light hydrocarbon feedstocks.

More should be said of the contribution that this corporation, Sun Oil Company, has made to the Sarnia development. For the past five years one-third of the feedstocks consumed by Polymer have come from the Sun Oil Refinery at Toledo, Ohio. These feedstocks have been coming in by tank car but there is now under construction a pipeline at a cost of over $4 millions which will carry feedstocks from Toledo to Sarnia. It is believed that that pipeline is the forerunner of another large refinery, which will form part of the integrated chemical industry.

Integration of Six Corporations

Thus there are four large companies working closely together at Sarnia in Canada's only large scale integrated petro-chemical operation. Imperial serves as the keystone of the integrated workings. It refines more than 50,000 barrels of petroleum a day. As a result, large quantities of valuable light hydrocarbons formerly burned as fuel only, are now available and being used in the manufacture of valuable chemicals. Polymer plays the highly important part of processing these light hydrocarbons. It also uses ethylene, isobutylene and normal butylenes for the manufacture of its principal product, rubber. Additional quantities of ethylene, butane, isobutylene and styrene are sold by Polymer to other companies. It also supplies chemicals, steam and water to Dow and Fiberglas and steam to Imperial Oil.

Mention might be made here of the other new chemical industry in Sarnia, namely, Fiberglas of Canada. Because substantial quantities of steam, fuel gas and oil are required in the manufacture of fiberglas, that company built at Sarnia during the years 1947 and 1948 a $2½-million plant. Thus, production of another chemical product, fiberglas, was begun for the first time in Canada in the Sarnia area in December, 1948. The plant is now working at capacity, and has unfilled orders on hand that will keep it going at capacity for the foreseeable future. An expansion is being considered.

Mention must also be made of

and other materials was just getting underway on this continent. Because of the exigencies of war, it was impossible to develop the market potentialities of this interesting and inexpensive material. It was realized, however, long before the war came to an end, that there would be a tremendous demand for styrene monomer and other plasti-chemicals in Canada and elsewhere as soon as hostilities ended. Polymer realized the importance of making maximum use of the incremental production capacity that existed in its styrene plant and in certain of its other equipment. The Company also realized the necessity of recovering maximum quantities of ethylene and other chemicals in order to reduce the cost of production.

Dow and Monsanto for Polystyrene

Negotiations were therefore opened with Dow Chemical of Canada, with a view to having the latter build a modern polystyrene plant and other chemical plants at Sarnia. Within a few weeks of the end of the war in Europe, agreement in principle had been reached between Dow and Polymer on a programme which involved not only increased production of styrene monomer by Polymer, and the erection of a modern polystyrene plant by Dow; it also involved the expansion of Polymer's ethylene recovery and purification facilities and the erection of chlorine, ethylene glycol and caustic soda plants by Dow. Shortly thereafter, Monsanto of Canada entered into a joint programme with Polymer. This programme involved the erection of a second polystyrene plant by Monsanto in Montreal, with Polymer supplying the monomeric styrene needed for that operation.

Dow and Monsanto originally estimated they would need monomeric styrene to keep their plants operating at economic levels. To produce even the modest quantities of this material necessitated expenditures of substantial sums by Polymer for compressors, refrigeration and other equipment necessary to recover the additional ethylene needed to operate the styrene monomer plant at the higher level capacity, and Dow's glycol plant at design capacity. Subsequently, Dow's and Monsanto's estimates of what they would require for their Canadian customers, and to take care of their rapidly expanding demands for polystyrene for export, were revised upwards.

It is no secret that today both companies could use more than twice the quantities of monomeric styrene that were provided for in their original contracts negotiated with Polymer less than five years ago. To meet these expanding demands Polymer has put in additional equipment to recover all the ethylene that could be recovered economically from the mixed gas stream coming to Polymer from the Imperial Refinery. It has also spent more than $1 million in new facilities to crack ethane and propane, and make ethylene therefrom to meet the increased demands. Further substantial expenditures to remove bottlenecks and build up production from the 30,000- to the 36,000-ton level in the styrene plant proper, are included in the $7½-million expansion programme referred to earlier.

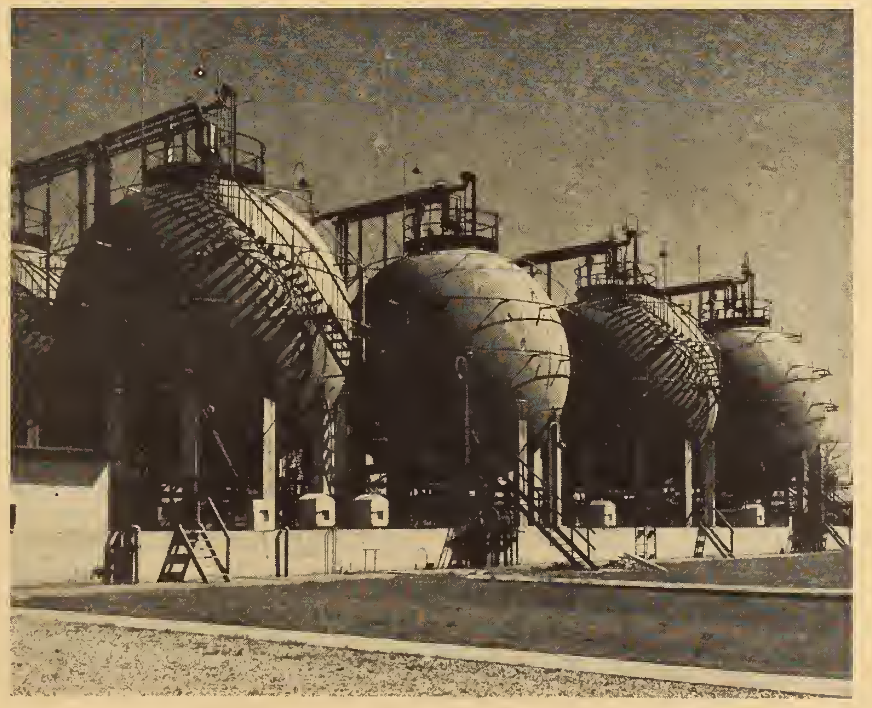
By-products and Surplus Power Cut Costs

The cracking of ethane and propane to satisfy its own ethylene requirements and those of its principal styrene customers, Dow and Monsanto, as well as Dow's private requirements of ethylene for the manufacture of glycol, involves the production of propylene as a by-product. The production of styrene from ethylene and benzene involves the production of hydrogen as a by-product. The production of styrene of the high degree of purity necessary for the plastics industry, and also for synthetic rubber, involves the production of toluene as a by-product. The use of large quantities of high pressure steam to crack and separate the several hydrocarbons involved in the intricate operation requires the production of tremendous quantities of high pressure steam.

A great deal of electrical energy is also required in the operations. By installing turbo-generators, and by passing the high pressure steam through these generators, Polymer has been able to produce sufficient electric power to take care of its own requirements and those of other industries nearby. It is also now supplying under a long term contract a substantial block of electrical power to the Hydro-Electric Power Commission of Ontario. This arrangement is a reasonably profitable and beneficial one for Polymer, since it enables it to make maximum use of the steam and power facilities which were installed as an essential part of Polymer's own operations.

It has been of great assistance also to Hydro and to the people of Ontario during the periods of the year when the power shortages have been most troublesome. Increased earnings from the sale of surplus butadiene, surplus ethylene, incremental styrene and utilities, by-product toluene and by-

Fig. 2. Pressure tanks for storage of Butadiene at the plant of Polymer Corporation, Sarnia.



product butane have tended to reduce Polymer's operating costs. This reduction has gone a long way towards enabling Polymer to successfully sell its principal product, rubber, in competition with natural rubber.

Team Work Has Brought Success

The type of integration that exists between Imperial Oil, Dow Chemical, Fiberglas, Sun Oil and Polymer today is unique, in that it involves five entirely separate corporations, not one of which has any financial or stock interest in any of the others. Yet, without that inter-relationship there could be no efficient and economic petro-chemical industry in the Sarnia area, and Canada today would not be the proud possessor of such a prosperous and rapidly expanding petrochemical industry. What has been done in the short space of a few years is but an indication of what may still be done at Sarnia. Time does not permit considering the full potentialities of methane, ethylene, propylene, butylenes, butadiene and the other chemicals that will be made available in increasing quantities in the area in question. Each and every one of these materials offers a great challenge to the chemist and the chemical engineer. Consequently, one hesitates to predict what the future has in store for Sarnia.

Based on what has taken place in the petroleum industry over the past 12 years, on the discovery of oil in increasing quantities in Western Canada, and on the completion of the pipeline to the head of the Great Lakes, it is inevitable that the years ahead will see great progress in every branch of the petroleum field in this country. With Imperial's great interest in these new oil fields, it is not unreasonable to expect great changes in and additions to Imperial's Sarnia refinery and in the not far distant future.

Since the production of synthetic rubber is still in its infancy, it is to be expected that still greater changes will take place in Polymer's own operations. Further diversification of rubber production is likely to lead to the construction of new and different types of units, to enable the production of new rubbers, latices and masterbatches. Expansion of Polymer's activities as a supplier of base chemicals to the chemical industry, including the synthetic detergent and the synthetic fibre industries, may also be expected. Dow's huge, modern chlorine plant, its caustic soda plant, its ethylene glycol plant, its polystyrene plant, its solvents plant are now all in successful operation. In line with what has happened in the other large scale petro-chemical industries elsewhere in the world, further expansion on the part of Dow of Canada is a certainty.

Independence from Chemical Imports Possible

The combined investments of Imperial Oil, Dow Chemical and Polymer at Sarnia total between \$130 and \$160 millions. The new refining and other facilities to be built within the next two years will cost \$50 millions more. These companies, together with Monsanto in Montreal, working together, have made Canada independent of the rest of the world for its requirements of the cheapest and most interesting plastic yet to be discovered, namely, polystyrene. That product is undoubtedly being used to a greater or lesser extent by nearly every firm in the plastics business in Canada. What has been done in the polystyrene plastic field is and will continue to be done with other plasti-chemicals.

There are a number of chemicals being currently imported into Canada which could be manufactured from materials available in the Sarnia area. The erection of a carbon black plant to supply black for incorporation in black masterbatch is also indicated. The erection of facilities at Sarnia to oxidize waste lignin from the Canadian pulp and paper industry, and thus provide a Canadian filler for another interesting plasti-chemical, lignin masterbatch, is another probability. A plant for the production of another interesting plasti-chemical, polyethylene, is indicated when the demand for that material warrants such an undertaking. The erection of one or more plants in the Sarnia area to produce superior types of rubber and plastics products that can best be made from man-made rubber and allied materials, are also just around the corner.

The West can now supply the principal basic raw material, oil. Since growing domestic and export markets exist and the design for a successfully integrated petrochemical industry already exists, the future of the industrial area of Sarnia is assured. That design has, in fact, been put into successful operation. I bespeak the wholehearted co-operation and support of the engineers and other technically trained men assembled here tonight, in our efforts to round out and improve the design for that industry. Our common objective is to enable an intelligent and industrious Canadian people to reap the benefits to which they are entitled, from their rich and precious heritage of raw materials. √

Gas Turbines in Industry

(*Continued from page 9*)

This ratio of process steam per kilowatt hour varies widely in different plants, ranging from plants having no requirement for heat energy, to plants requiring an equivalent of 40 lb. or more of steam per kilowatt hour. Today, the average in industrial plants is perhaps no more than 20 lb. of steam per kilowatt hour and, with the rapid increase in the use of electricity, the ratio is likely to decrease still more in the future. In many new plants, and particularly in the expansion of existing plants, the ratio of process steam to electric power requirements may be quite low. A low ratio favours the gas turbine.

From the gas turbines described and the applications enumerated, it can therefore be seen that the gas turbine is a very useful additional tool for the power engineer in selecting prime movers, for new plants or for plant expansions, which will provide electric energy or both electric energy and heat energy at the highest overall plant efficiency. The gas turbine is a versatile prime mover, and its advantages should not be overlooked when a thermal generating station is being considered. √

FROM MONTH TO MONTH

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

A New Approach to Graduate Study

For the past year Nova Scotia Technical College has been conducting an interesting experiment in post graduate engineering study. By arrangement with Canadian Westinghouse Limited, graduate engineers enrolled in the Westinghouse Training Course in Hamilton meet one night per week, two hours per night for twenty-five weeks, for courses of lectures, recitations, and discussion. Instructors approved by the Committee on Graduate Studies at Nova Scotia Tech. are drawn from those in responsible charge of the problems and projects in the plant that are involved in the topics covered in the courses.

Attendance is taken, problems and test papers are set, and a final examination is given. Satisfactory completion of each course constitutes a credit toward a Master's Degree from Nova Scotia Tech.

With a satisfactory undergraduate record, completion of the full prescribed Graduate Engineers' Training Course at the Westinghouse plant, and satisfactory completion of not less than two of the graduate courses described above engineers may be admitted to candidacy for a Master's degree. The degree may then be granted upon satisfactory completion of a third graduate course and submission of a thesis satisfactory to the College. The third course may be one of those offered at the Westinghouse plant or an acceptable course taken at a university of recognized standing.

The courses presently offered or contemplated at the plant are:

Circuit Theory and Analysis, Symmetrical Components, Electrical Machine Design, Industrial Electronics, Welding Metallurgy, and Dynamics and Vibrations.

A total of twenty-five students successfully completed courses in the second term of the 1949-50 academic year and forty-five are presently enrolled in the first term of the 1950-51 year.

In a letter to the *Journal* Dr. A. E. Cameron, President of Nova Scotia Technical College, said in part:

"You will understand that these large registrations will only include a few of our own graduates. Practically every Canadian university giving electrical engineering is represented in the registration. This we take to be a clear indication that graduate work of this nature has a definite appeal. Obviously we have not yet had enough experience to prove the value of this scheme of education. The average quality of the candidates is high. They have been well screened, first by Westinghouse in its Selection Committee and then by our Committee on Graduate Studies."

Perhaps it is too soon to pass judgment on this somewhat revolutionary idea in Canadian engineering education. However, it would seem to approach the British system of apprenticeship training which many engineers favour, and the possibility of achieving a Master's Degree should add to the attraction of the Westinghouse Training Course. Perhaps also, higher degrees earned in the practical atmosphere of industry may free their holders from the "ivory tower" stigma which sometimes attaches to those who have spent five, six or even seven years in the seclusion of a university.

It will be interesting to follow the progress of the young engineers who have benefited from this scheme.

Cover Picture

In view of the prominence of the Sarnia area in the Canadian economy and the timely address by J. R. Nicholson (see page 18), this month's cover photo would seem to be particularly appropriate. It shows a piping and valve installation at the Dawn compressor and storage station of Union Gas Company of Canada Limited near Sarnia.—*Photo courtesy Peacock Brothers Limited.*

"A Wise and Gracious Custom"

On December 11, 1950 the Hydro-Electric Power Commission of Ontario, with appropriate ceremonies, renamed its transformer and frequency changer station at Pond Mills, near London, Ontario, the "E. V. Buchanan Station". Mr. Buchanan, general manager of the London Public Utilities Commission is a past councillor and past vice-president of the Institute and is currently president of the Ontario Association of Professional Engineers.

The ceremonies included an inspection of the station during which Mr. Buchanan threw the switch which brought in power from the Des Joachims plant on the Ottawa River over a new 375-mile transmission line. A luncheon followed at the Hotel London at which a number of distinguished speakers paid tribute to Mr. Buchanan and to the profession of engineering of which he is such a worthy representative.

The Institute agrees heartily with A. J. Rush, mayor of London, who said that the custom of naming Ontario Hydro's new developments after leading engineers is "a wise and gracious one".

Principals in the ceremonies at the new E. V. Buchanan transformer and frequency changer station. From left to right:—R. H. Saunders, chairman, Hydro-Electric Power Commission of Ontario; E. W. Curtis, chairman, London Public Utilities Commission; Mayor Allan Rush, of London; E. V. Buchanan; Councillor V. A. McKillop; J. B. Hay and R. W. D. Lewis, K.C., commissioners, London Public Utilities Commission.

British Aero Gas Turbines Favoured

The Wright Aeronautical Corporation, one of the major U.S. aircraft engine manufacturers has concluded an agreement with the Bristol Aeroplane Company of England, for the manufacture of Bristol aircraft gas turbine engines under licence in the United States.

This agreement follows a previous agreement by which the Wright Corporation is also licensed to build the Armstrong-Siddeley, Sapphire, Python, and Mamba engines. The Sapphire is claimed to be the world's most powerful aircraft gas turbine.

American firms have also taken out licences to build the Rolls Royce Nene and Tay engines.

News of Other Societies

Chemical engineers will meet in Toronto on February 19 and 20, 1951, for the Toronto regional conference of the chemical engineering division of **The Chemical Institute of Canada** (18 Rideau St., Ottawa, Ont.).

The 34th annual conference of The Chemical Institute of Canada is planned to take place in Winnipeg, June 18 to 20, 1951.

The Maritime branch of the Canadian Section of the **American Water Works Association** was formed recently, replacing the Maritime Water Works Association. W. R. Godfrey, director of works for Saint John, was elected president of the new body.

The spring meeting of the **American Society for Testing Materials** (1916 Race St., Philadelphia) will take place in Cincinnati, Ohio, March 5 to 9, 1951.

The Institute of the Aeronautical Sciences (2 East 64th Street, New York 21), announces the sixth annual flight propulsion meeting, March 16, 1951, at the Hotel Carter, Cleveland, Ohio.

Lawrence B. Richardson, rear admiral, U.S.N. (Ret.) director of research and development, Fairchild Engine and Airplane Corp., has been elected president of the Institute of the Aeronautical Sciences for the year 1951. S. Paul Johnston and Robert D. Dexter have been re-appointed director and secretary respectively.

The semi-annual meeting of the **American Society of Mechanical Engineers** (29 West 39th Street, New York 18, N.Y.) will be held in Toronto, Canada, at the Royal York Hotel, June 11 to 15, 1951.

General A. G. L. McNaughton, M.E.I.C., will speak at the annual banquet of the **Association of Professional Engineers of Ontario,** at the Royal York Hotel in Toronto, on January 27, 1951.

The banquet will conclude the two-day annual meeting of the Association, and will be presided over by E. V. Buchanan, M.E.I.C., president of the Association.

The Institution of Engineers, Australia, (Science House, Gloucester & Essex Streets, Sydney) will hold its annual conference in 1951 in Brisbane, from April 2 to 7, 1951. Members of The Engineering Institute of Canada, residing in Australia or visiting Australia during this period are invited to attend the Conference under the same conditions as members of the Institution, and both the Council of The Institution and the Committee of the Brisbane Division assure them of a warm welcome.

Elections and Transfers

At the meeting of Council held in Montreal, November 18, 1950, a number of applications were presented for consideration and on the recommendation of the Admissions Committee, the following elections and transfers were effected:

Members:

C. W. Adams, *Arvida, Que.*
F. C. Adsett, *Belleville, Ont.*
W. C. Benger, *Belleville, Ont.*
F. J. Bleackley, *Montreal, Que.*
J. E. Buchan, *Belleville, Ont.*
F. W. Collyer, *Belleville, Ont.*
J. W. Dolphin, *Winnipeg, Man.*
H. A. Erith, *Montreal, Que.*
T. E. Flinn, *Belleville, Ont.*
J. A. Grant, *Belleville, Ont.*
E. G. Gurnett, *Belleville, Ont.*
A. Hinds, *Montreal, Que.*
A. D. Janitsch, *Belleville, Ont.*
A. A. G. Johns, *Ottawa, Ont.*
J. P. Kirby, *Montreal, Que.*
J. H. Legate, *Belleville, Ont.*
W. A. Lowe, *Winnipeg, Man.*
J. G. Lucas, *Peterborough, Ont.*
B. H. McGregor, *Belleville, Ont.*
J. A. McLaren, *Sudbury, Ont.*
A. E. May, *Belleville, Ont.*
C. E. Meyers, *Belleville, Ont.*
F. E. Moore, *Belleville, Ont.*
D. Panar, *Edmonton, Alta.*
C. R. Phillips, *Belleville, Ont.*
J. C .R. Punchard, *Belleville, Ont.*
C. E. Rickards, *Belleville, Ont.*
O. H. Scott, *Belleville, Ont.*
W. T. Simpson, *Belleville, Ont.*
G. A. Tamblyn, *Belleville, Ont.*
G. B. Thompson, *Belleville, Ont.*
A. F. G. Tooth, *Belleville, Ont.*
B. W. Tyrrell, *Montreal, Que.*
W. B. Vandervoort, *Belleville, Ont.*
G. D. White, *Arvida, Que.*
A. S. Zakrzewski, *Toronto, Ont.*

Juniors:

H. A. Beach, *Belleville, Ont.*
J. W. Beaver, *Cobourg, Ont.*
P. P. Boisvert, *Montreal, Que.*
J. C. Brodeur, *Montreal, Que.*
F. P. Buchanan, *Copper Cliff, Ont.*
J. Celmins, *Sudbury, Ont.*
H. Chikofsky, *Sturgeon Falls, Ont.*
W. G. Cole, *Campbellford, Ont.*
H. J. Cox, *Belleville, Ont.*
G. W. Fleming, *Sudbury, Ont.*
G. A. Granger, *Montreal, Que.*
S. D. Hughes, *Hamilton, Ont.*
G. P. Kemp, *Hamilton, Ont.*
C. E. King, *Hamilton, Ont.*
A. Kofman, *Montreal, Que.*
M. S. Lipovscak, *Ottawa, Ont.*
E. L. Littlejohn, *Belleville, Ont.*
B. L. McIntyre, *Montreal, Que.*
J. L. McGregor, *Belleville, Ont.*
D. C. Smith, *Kingston, Ont.*

Affiliate:

R. H. Crawford, *Toronto, Ont.*

Transferred from the class of Junior to that of Member:

C. N. Cunningham, *Belleville, Ont.*
D. L. MacDonald, *Edmonton, Alta.*
W. R. McEown, *Fort Garry, Man.*
W. B. Rice, *Montreal, Que.*

The following Students were admitted:

A. L. Adams
F. W. Agnew
J. G. Allan
J. Allan
S. E. Allen
W. C. Allison
P. A. Anctil
S. F. Angus
J. D. Archibald
F. Armitage
P. G. Ashbaugh
B. E. Babcock
C. Bachovzeff
A. V. Bagnell
S. B. Baillie
A. R. Bancroft
L. Bardanis
N. Barker
J. A. Barnes
B. L. Barry
I. Barsky
M. Bar-Urian
F. A. Bell
S. L. Bell
W. J. Bell
W. E. Bergstrand
D. J. Berry
F. Bisson
C. J. Blais
J. L. Blais
G. G. Boileau
F. J. Bollinger
J. J. Bouchard
P. P. Bourbonnais
R. D. Boyd
H. B. Bradford
A. J. W. Brady
M. P. Brault
H. F. Brewerton
C. I. Broadbent
L. R. Broderick
J. L. M. Brophy
D. L. Brown
L. M. Brown
R. Bruneau
E. L. Bryenton
G. E. Buckingham
K. C. Burley
A. G. Burrows
L. Caletti
F. J. Cameron
H. P. Cameron
W. Cameron
W. H. Cameron
H. Caplan
S. B. Carroll
G. B. Carter
J. Charasz
A. E. Chase
K. Christian
R. E. Churcher
B. P. Cirka
T. M. Cirka
J. Clark
G. L. Clayton
E. R. Cleveland
H. A. Coffin
H. G. Collins
J. D. Collis
J. Corey
G. A. Coslett
G. E. Cotter
G. Cousineau
J. L. Coutu
T. W. Creaghan
W. D. J. Crossley
D. H. Curling
J. E. Daccord
F. M. D'Angelo
A. T. Davies
A. H. Davis
W. J. De Coursey
C. De Forest
C. J. Deines
D. M. Del Campo
P. Demers
J. V. Desaulniers
J. A. Desjardins
L. P. Desjardins
M. E. Dickenson, Jr.
W. B. Dodd
T. LaGrave
P. Lam
J. Landriault
J. J. H. Lapointe
A. Laprade
R. E. Layman
S. R. Leavitt
M. E. Leclerc
E. R. Lefrancois
M. Lehnoff
L. E. Lemieux
W. A. Lemmon
R. F. Linklater
F. F. Lloyd
D. Z. D. Lock
D. J. Lockett
J. H. Logan
J. A. Long
J. F. Longley
J. B. Lucas
R. C. Lyon-Hall
M. N. McBain
C. F. McCallum
J. H. McClelland
J. E. McCombe
A. J. McDonald
A. McDougall
J. B. McEwing
J. D. McGeachy
A. J. MacGillivray
S. E. McGurk
A. J. McInroy
J. A. MacIntosh
G. D. Mackay
J. A. McKillop
V. L. McKinnon
W. R. MacLachlan
H. A. MacLean
F. J. MacNaughton
J. McNeill
D. H. McRae
M. E. McRae
Y. R. Maheu
J. W. Mahon
J. G. Malus
H. L. Majeau
A. Malomet
R. E. Martin
F. P. Mascarin
J. N. Matthews
N. Mau
H. J. Mayotte
J. S. Medves
F. Meier
G. I. Mennie
G. Mervyn
J. G. E. Metcalf
T. Miletics
L. E. Minogue
A. J. Moffat
Y. Montcalm
L. A. Moore
R. L. Moreau
J. C. Morin
S. Morita
H. C. Morris
J. P. Mosher
J. L. Mulas
R. L. Mullan
W. D. Murray
R. K. Nakagawa
R. M. H. Naudin
J. G. Needham
H. M. Nelson
S.A. Nemiroff
S. J. Nicholls
A. K. Noble
W. G. Nurse
G. O. Obembe
W. N. O'Brien
S. Olenick
D. A. Osborne
R. D. Osborne
H. E. Parker, Jr.
C. J. Partridge
T. Partyka
E. L. Pearson
R. Peters
J. W. Pfaff
C. G. Phipps
G. W. Piper
R. G. Doel
G. Dorion
M. M. Douglass
P. J. Dowling
J. E. Drouin
J. A. Dubuc
J. A. Dubuc
G. H. Duff
T. Dutaud
A. S. Engman
D. L. Eperjesy
C. Fanjul
W. J. Farrell
G. I. Fekete
G. M. Feldmann
W. R. Fell
W. R. Fennell
E. R. Fetterly
F. M. Figueroa
W. A. H. Filer
A. M. Filipov
D. U. Findlay
W. J. Finlay
E. L. Fletcher
J. E. Fletcher
J. D. Flintoft
G. T. Fowler
I. G. Fraser
W. M. Fraser
J. W. G. Free
R. G. Freeman
I. Friedman
G. Fulford
B. Gardavsky
J. C. Garneau
L. P. Gaudet
J. Gauthier
R. M. Gauthier
D. P. Geddes
S. N. Gell
E. R. Gentles
I. Gillmore
G. W. Glaholt
T. W. E. Goodger-Hill
R. C. Gougeon
D. H. Grant
A. Greenspoon
D. E. Greetham
R. G. Greggs
D. R. Grimes
R. B. Grimsdick
C. Gross
F. S. Gue
S. J. Guidice
R. B. Hamel
A. W. Haddon
N. A. Hamilton
C. Hampson
N. D. Hannah
R. G. Harding
D. A. Harper
J. B. Harper
R. G. Hatton
M. G. D. Hawkes
A. A. Hay
R. L. Hay
R. G. Heasman
W. G. Henchey
J. E. Henderson
E. C. Herbert
F. W. Herman
W. B. Hickman
R. F. Hill
R. G. Hines
J. R. Hosack
A. Hrapko
R. A. Hughes
J. M. Huneault
J. B. G. Illiffe
R. P. Inniss
M. Iwanciw
G. F. Johnston
H. S. Johnston
A. Jonsson
G. C. Julien
P. F. Karrow
J. M. Katrusiak
W. A. Kavanagh
W. F. Kelly
T. C. Kenney
L. A. Keyes
G. L. Kingston
S. Kobilnitsky
E. E. Koop
V. C. Korcz
J. W. Koshurba
B. G. Kowalski
J. F. Kyle
R. Lacey
C. Lacombe
F. J. Lacy
P. J. Lagendyk
A. D. Pittuck
R. V. N. Planck
R. J. Plotkins
A.Pohoreski
J. L. Polack
C. Poellhuber
D. H. Pollock
R. D. Porteous
L. G. Quesnel
F. H. Quirt
H. Rapaport
C. G. Renaud
P. D. Revey
H. F. Reynolds
E. R. Richard
J. C. Roberts
H. G. Rogers, Jr.
R. R. Rogers
G. V. L. Roney
J.L. Rose
D. J. Ross
F. J. Ross
G. Roy
J. R. Roy
M. M. Rudberg
D. E. Rudolph
D. A. Runciman
I. H. Rutherford
B. J. C. St. Onge
L. Sanscartier
A.W. Savery
W. B. Scott
E. A. Seaman
G. R. Shantz
P. J. H. Sheasby
J. M. Shepherd
B. P. Shields
D. A. Sigler
G. C. Simpson
J. Sinanis
A. G. Slade
R. D. Sloane
J. Slusarchuk
C. W. Smith
E. W. Smith
G. C. Smith
H. V. Smith
R. W. Smith
K. E. Sorensen
E. M. Spencer
R. C. Starr
W. C. Stethem
J. B. Stirling
W. E. Stollery
G. J. Stonehouse
P. Strashok
A. H. G. Sturton
F. H. Sutcliffe
H. J. Swinnard
G. T. Tamura
J. J. Tarnava
J. C. Taylor
G. K. Tench
J. D. Thexton
W. J. Thompson
J. W. Tostevin
G. F. Tremblay
A. W. Tubman
M. L. Tucker
R. H. Tully
E. I. Tupper
T. Turczeniuk
R. E. Turner
E. Tymkin
H. Uchida
L. R. Vachon
S. D. Valentine
V. V. Valentine
G. V. Vallance
R. Vidri
J. Vilcans
D. H. Walkington
F. Y. Walters
P. Warburton
G. A. M. Warne
C. R. G. Watson
J. Wexler
J. H. Whalen
L. T. Wheeler
C. D. Wickes
T. A. Wilcox
G. Wild
R. Wilde
C. E. Wilkinson
R. D. Winship
L. V. Woytiuk
G. E. Yano
N. Yarmoshuk
G. K. Yetman
G. Zames
E. Zervos
N. Zuk

Applications through Associations

By virtue of the co-operative agreements between the Institute and the Associations of Professional Engineers, the following elections and transfers have become effective:

ALBERTA

Student to Junior:

F. F. Newton, *Edmonton, Alta.*

SASKATCHEWAN

Students:

W. B. Anderson	P. M. Hunchak
J. I. Beggs	R. C. Hovdebo
H. G. Bird	L. A. Kaskowich
V. E. Campbell	P. B. O. McNally
R. C. Carlson	J. B. Motta
J. O. S. Clarke	O. Sawula
J. A. Cook	W. Shakotko
J. M. Crook	D. H. Simpson
R. J. Genereux	A. Soroka
W. H. George	A. J. Stuart
M. Grimsen	G. A. Swanson
A. A. Grindlay	E. Veidelek
S. J. Harper	W. L. Weber
G. W. Hart	F. J. Williams
T. G. Heron	Z. R. Zackaropoulos
W. M. Hughes	

Student to Junior:

M. W. Thompson, *Regina, Sask.*

NOVA SCOTIA

Junior to Member:

H. McClymont, *Halifax, N.S.*

QUEBEC

Member:

J. N. Bodtker, *Baie Comeau, Que.*

Meeting of Council

Secretary's Notes

A meeting of the Council of the Institute held at Headquarters on Saturday, November 18th, 1950, convening at nine-thirty a.m.

Employment of Engineers from Outside of Canada and Tariff Item 180e

The general secretary reported that on a recent visit to Ottawa he had again called on the Tariff Board to discuss the form of the formal presentation which the Institute was to make in January. He reported that he had been received very cordially and had gained considerable information that would be helpful.

Civil Defence

The general secretary reported that at the Digby meeting there had been a discussion with regard to uniform standards of screw threads for fire hose couplings and fire pumpers. He had been in touch with the Canadian Standards Association and the Coordinator of Civil Defence and had discovered that progress towards the acceptance of uniform standards both in Canada and the United States had not gone very far. Apparently Canadian standards and the United States standards were different and it may be some time before these differences can be ironed out.

Resolutions from the Branch Officers Conference

Mr. Wright reported that the minutes of the conference had been received recently but that the resolutions had not been specifically defined therein. However, he had gone through the minutes and picked out the five points which he believed represented the conclusions reached at that conference. They are as follows:

Resolution No. 1

This followed a long discussion on the quality and the cost of the recent membership directory. It states that: "Unqualified approval of the directory is given" and recommends that a similar one be published in about 5-year periods.

Resolution No. 2

This proposes that a nominal charge be made for the directory and that members be canvassed in advance as to whether or not they want a copy sent to them. On the voting there were five dissenting delegates who stated that they were in favour of the directory being issued at regular intervals but they were opposing a charge being made. In the subsequent discussion it was agreed that the motion would be interpreted to mean that consideration would be given to a charge being made.

Resolution No. 3

This followed a discussion of the proposal made by the Winnipeg branch executive that a new grade of "fellow" be established. The resolution records the opinion of the meeting that such action should not be taken.

Resolution No. 4

This followed a discussion as to whether or not junior members should be given the privileges of corporate membership. The resolution states that juniors should remain as non-corporate members but that they should be given the same voting privileges as accorded corporate members.

Resolution No. 5

This followed a discussion as to whether or not a better employment service could be rendered on a national basis if the Institute co-operated with the Canadian Institute of Chemistry and the Canadian Institute of Mining & Metallurgy, and any other organizations who were prepared to participate. The resolution gives approval to the suggestion.

Queen's University Board of Trustees

In view of the fact that the Institute each year presented a cash prize to Queen's University the Institute had been classified as a benefactor and thereby was entitled to make nominations to the Board of Trustees.

Accordingly, it was moved, seconded and agreed unanimously that the Institute should nominate D. K. MacTavish of Ottawa and R. D. Harkness of Montreal.

Report of Finance Committee

Mr. Heartz reported on the financial statement to the end of October, pointing out that income was substantially greater than for last year but that the expenses, too, were higher. He pointed out that the printing of the membership directory and the full year's operation of the Toronto office would produce an adverse effect on the year's surplus as compared to 1949. However, he was of the opinion that at the end of the year there would still be a small surplus. On Mr. Heartz's motion, the report was approved.

New Branch at Belleville, Ontario

Following negotiations which had been carried on by members of the Peterborough Branch and by engineers in the Belleville district, it had been decided to make application for a new branch with headquarters at Belleville. Accordingly, a petition signed by twelve corporate members of the Institute resident at Belleville was now submitted to Council as follows:

> "We, the undersigned corporate members of The Engineering Institute of Canada, do hereby make application for the establishment of a branch with headquarters at Belleville, Ontario.
>
> We feel that we could maintain and conduct a very successful branch to the mutual advantage of engineers in this district and to the Institute as a whole.
>
> Respectfully submitted.
>
> G. A. BRADFORD
> G. D. DIES
> A. O. DRYSDALE
> J. N. MCCAREY
> SYDNEY SILLITOE
> T. T. BOUTILLIER
> F. F. FULTON
> DOUGLAS W. BEWS
> W. L. LANGLOIS
> H. L. EASTON
> W. L. DICKSON
> C. R. WHITTEMORE"

On the motion of Mr. Finnemore, seconded by Mr. Eaton, it was unanimously resolved that the application be accepted, that the branch be authorized and that an expression of Council's appreciation of their efforts be extended to the officers of the Peterborough Branch.

It was noted that in addition to the members signing the petition, applications were being submitted to this meeting from twenty-eight engineers in the district who wished to become charter members of the new branch.

The provisional officers of the new branch were noted and approved as follows:

Chairman, F. F. Fulton; Secretary, S. Sillitoe; Treasurer, W. L. Langlois; Executive: E. G. Gurnett, G. A. Bradford, J. E. Buchan; Meetings and Papers, A. O. Drysdale.

On the recommendation of the provisional committee it was unanimously resolved that Mr. Douglas W. Bews be appointed councillor to represent the Belleville Branch.

Report of the Field Secretary

Colonel Grant reported that at every centre appreciation had been expressed of the Institute's recognition of these non-resident members. He felt that the Institute should continue with these efforts to reach non-resident members both in the maritimes and in other parts of Canada as well. In some instances it appeared as if a new branch would be justified and in others it was proposed that the branch to which the group belonged should hold meetings at those centres from time to time.

Speaking of other parts of Canada, Mr. Stirling inquired as to what branches members belonged who were in the Northwest Territories. He pointed out that the presence of Institute members in remote areas such as this and also in Prince Edward Island and Newfoundland indicated the widespread interests and influence of the Institute and emphasized its national character. He expressed great satisfaction with Colonel Grant's report.

Legislation Committee

The membership of the Legislation Committee, as submitted by the chairman, was approved unanimously as follows:

L. A. Duchastel, *Chairman*
Maurice Bourget
Paul Vinet.

Annual Meeting 1951

It was noted that the annual general meeting of the Institute would be convened at Headquarters on Thursday, January 25th, 1951, and would be adjourned to reconvene at the Mount Royal Hotel, Montreal, on Wednesday, May 9th, 1951.

Co-Operative Agreement with American Society of Mechanical Engineers

The general secretary reported that for some time the joint ASME-EIC committee had been discussing means by which the privileges of both societies could be made available to student members. Certain recommendations had been agreed upon at the meeting of the committee held in Toronto last July and he presented a communication from the secretary of the ASME which reported that that organization had approved of the recommendations as follows:

(1) That student members of the EIC attend ASME meetings in Canada or the United States under the privileges enjoyed by ordinary members for such meetings;

(2) That the list of Canadian schools where EIC had student members (in addition to Toronto, Queen's and British Columbia) be adopted as part of the ASME list of approved schools;

(3) That the same consideration for Junior membership according to the standard procedures of ASME be accorded EIC students graduating from Canadian universities where mechanical engineering is taught.

(4) That the subscription rate for Mechanical Engineering be $3.50 (plus bulk postage) to EIC students in Canadian engineering schools where there are no ASME student branches.

Following some discussion on the motion of Mr. Hamilton, seconded by Mr. Swinnerton, it was unanimously resolved that Council approve the granting of similar privileges to ASME students enrolled at Canadian universities and that the subscription for the Engineering Journal be $2.00 per year.

ASME Representation on Institute Council

It was noted that under the terms of the co-operative agreement, Mr. Chester B. Hamilton, M.E.I.C., of Toronto, had been reappointed as the ASME representative on the Institute Council for a further period of one year terminating on December 31st, 1951. This was approved unanimously.

CSA Committee on Structural Timber

On the motion of Mr. Jubien, seconded by Mr. Buss, it was unanimously resolved that Mr. Alan K. Hay, of Ottawa, be appointed the Institute's representative on the Canadian Standards Association Specification Committee on Structural Timber. Mr. Hay has agreed to accept the appointment.

International Conference of Naval Architects and Marine Engineers

The general secretary reported that the Institute had been invited to name two delegates to the International Conference of Naval Architects and Marine Engineers being held in Britain in June and July, 1951. W. H. Milne, M.E.I.C. and H. H. German, M.E.I.C. were planning to attend this conference, and on the motion of Mr. Geiger, seconded by Mr. Crawford, it was unanimously resolved that they be appointed as the official delegates of the Institute.

Corporation of Professional Engineers Of Quebec

The general secretary reported that the joint committee established under the co-operative agreement with the Corporation of Professional Engineers of Quebec had met recently and discussed several subjects of interest but without bringing in any recommendations to Council. Methods of further co-operation which were considered were:

(a) Invitation of all Corporation members to EIC branch meetings.

(b) The admission of members of the Corporation to the annual meeting of the Institute on the same basis as EIC members.

(c) Joint premises.

(d) Joint fees.

(e) Future meetings of the committee.

Council agreed that branches should be encouraged to invite non-EIC members of the Corporation to their meetings and approved also of inviting all such members to the forthcoming annual meeting in Montreal. The report was received as a progress report.

Manitoba Agreement

The general secretary read a letter from the secretary of the Winnipeg Branch from which it was noted that the ballot for the co-operative agreement between the Institute and the Association of Professional Engineers in Manitoba would be sent out to the membership of both bodies on December 4th. It was hoped that the agreement would become effective as of January 1st, 1951.

Provincial Institute of Technology and Art (Calgary)

The general secretary reported that a request had been received from A. A. Peebles, M.E.I.C., chief instructor, Department of Aeronautics, at the Provincial Institute of Technology and Art in Calgary, asking Council to accept as Juniors the graduates of a course in aeronautical engineering offered by that Institute.

Following a lengthy discussion, and acting on the recommendation of the Board of Examiners it was agreed that the Council would accept such graduates as Juniors of the Institute. It was emphasized, however, that each person becoming a Junior under this agreement should be impressed with the necessity of preparing to write an examination so that he could in due course be transferred to corporate membership, such examination to include English and economics as well as additional technical material.

Personals

Notes of the Personal Activities of Members of the Institute

W. M. Scott, M.E.I.C., chief commissioner of the Greater Winnipeg Water District and of the Greater Winnipeg Sanitary District, retired at the end of 1950.

Chairman of the board of commissioners for the water district from 1920 until 1949 and of the sanitary district from its inception in 1937 until 1949, Mr. Scott continued as a commissioner of both boards after his retirement as chief commissioner early in 1949.

Mr. Scott first went to Winnipeg, from Montreal in 1906, and he worked there on hydro development and in consulting engineering before joining the water district board.

He had worked in municipal engineering in the United States and in other parts of Canada after graduation from McGill University.

Major-General N. E. Rodger, M.E.I.C., quartermaster-general of the Canadian Army for the past five years will attend a senior officers' course in England. Maj.-Gen. Rodger was promoted to his present rank in 1946.

He is a graduate of Royal Military College (with honours), and a bachelor of science, McGill University, Montreal. Appointed to a commission in the Royal Canadian Engineers (Permanent Force) in 1928, at the outbreak of war in 1939 he held the rank of major. He then went from Kingston, Ont., to Canadian Military Headquarters in London, England. He received staff appointments with the First Canadian Infantry Division and the 1st Canadian Corps. From December, 1941 until September, 1942, with the rank of lieutenant colonel, he was personal assistant to General A. G. L. McNaughton. He was promoted then to rank of brigadier and appointed Brigadier General Staff, C.M.H.Q., London. From November, 1943 until February, 1944 he commanded the 10th Canadian Infantry Brigade, and then became Brigadier General Staff, 2nd Canadian Corps, in which capacity he served until the end of hostilities. An appointment to the Canadian Army Staff at Washington followed.

T. R. Loudon, M.E.I.C., head of the departments of civil engineering and aeronautical engineering at the University of Toronto completed forty years of teaching at Toronto recently.

A group of engineers who had studied with him forty years ago, met in his honour, to present him with a portrait in oils of himself.

Professor Loudon graduated from University of Toronto in 1905, in civil engineering. He joined the staff of the University in 1907 as a lecturer in the faculty of applied science and engineering. He has continued his association with the University and has also become widely known as a consultant. During World War I, Professor Loudon served with the Royal Canadian Engineers. In the recent war, with the rank of wing commander, he organized the R.C.A.F. School of Aeronautical Engineering in 1940, and was with the R.C.A.F. Test and Development Establishment until 1943. Then he returned to his academic work, and to the appointment as commanding officer of the R.C.A.F. University Air Training Corps, at University of Toronto.

He succeeded Dean C. R. Young as head of the department of civil engineering of the University in 1943 with the title of professor of civil engineering and aeronautics.

R. McIsaac, M.E.I.C., the division engineer at New Glasgow, N.S., for Canadian National Railways, has retired from C.N.R.

Mr. McIsaac has been associated with C.N.R. for many years, and was with the National Transcontinental Railway, and the Saint John and Quebec Railways, previously. He went to C.N.R. in 1919 as an assistant engineer on location.

A. V. Gale, M.E.I.C., has retired from the Gatineau Power Company, Hull, Que.

Mr. Gale was vice-president and general manager of the Hull Electric Company for many years, and in 1946 became manager of the Hull division of Gatineau Power Company.

F. H. Midgley, M.E.I.C., has retired from Canadian Pacific Electric Lines, Preston, Ont., and recently returned from a visit to Scotland.

Mr. Midgley is a councillor of the Institute representing the Kitchener Branch.

Since 1915 he has been associated with Lake Erie and Northern and Grand River Railway Company at Preston, Ont. (Canadian Pacific Electric Lines) where he has been in charge of construction and maintenance of way.

N. J. Good, M.E.I.C., who was attending University in Baltimore, Maryland, has returned to the Department of Health, in Victoria, B.C., to work in the division of environmental sanitation. He was assistant public health engineer for the Department of Health in Victoria before going to Baltimore.

E. M. Van Koughnet, M.E.I.C., is now associated with the Power Corporation of Canada Ltd., in Montreal.

He was previously with the Quebec Provincial Electricity Board at Montreal. He served as secretary-treasurer of the Montreal Branch of the Institute from 1946 to 1948.

Colonel L. G. C. Lilley, M.E.I.C., has been appointed director of Works and Accommodation, Department of National Defence (Army) Ottawa, Ont.

Colonel Lilley goes to Ottawa from Edmonton, where he was posted in the Western Command. He was the commandant of the R.C.E.M.E. School at Chilliwack in 1947 and 1948.

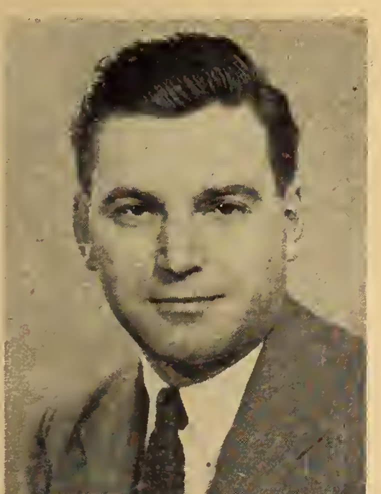
Garth Griffiths, M.E.I.C., of the B.C. Power Commission, has been appointed assistant chief engineer for the Commission at Victoria. He was previously the superintendent of the coastal region at Nanaimo, B.C.

C. E. Morrison, M.E.I.C., is general manager for G. L. Griffith and Sons Ltd., Stratford, Ont. Previously he was employed as engineer by Asbestonos Corporation, Ltd., at Montreal, Que.

J. J. Baker, M.E.I.C., who was with the National Harbours Board, working at the Montreal Harbour, is now employed by Montreal Locomotive Works.

Ernest R. Hammond, M.E.I.C., is on the staff of the National Research Council in Chalk River, Ont.

He has been with the Electric Tamper and Equipment Company of Canada Limited in Montreal since 1946, when



E. R. Hammond, M.E.I.C

he retired from active service with Royal Canadian Navy. He had received a master's degree in civil engineering in 1939, from Massachusetts Institute of Technology.

G. H. Hoganson, M.E.I.C., of Canadian National Railways, has been appointed assistant division engineer of the Moncton Division.

He joined the C.N.R. as a junior assistant engineer, research and development department, Montreal in 1947, after his graduation from Nova Scotia Technical College in civil engineering.

Brian M. Kenny, M.E.I.C.

Two years later he was promoted to instrumentman at Campbellton, N.B., and later in the same year was appointed assistant engineer in the regional engineering office at Moncton, the position he has held until his recent appointment.

Brian M. Kenny, M.E.I.C., has announced the formation of a new engineering company, Kenny Consolidated Engineering Industries Limited, Toronto, of which Mr. Kenny is president. The firm will handle sales and distribution of electrical and mechanical industrial equipment, particularly serving the process industries.

Mr. Kenny has been in the Canadian engineering industry for twenty years, the major part of his experience being with Canadian General Electric Company, Genelco Limited, and Waterous Limited, Brantford, Ont.

W. Gordon McLaughlin, M.E.I.C., is now working with the Ford Motor Company of Canada Limited, Windsor, Ont. He was previously with the contracting firm of Aiken & MacLachlan, Ltd., St. Catharines, Ont.

Julien Ricard, M.E.I.C., is with the Canadian Standards Association, Montreal, Que. Mr. Ricard was previously at Quebec City, an electrical engineer on the staff of the Rural Electrification Bureau of the Province of Quebec.

Paul M. Smith, M.E.I.C., is now employed by Surveyer, Nenniger & Chenevert, consulting engineers, Montreal, as a resident engineer at Parent, Que.

He returned to Canada early in 1949 from India, where he worked on several irrigation projects, and has since been in charge of repair of dams at Lake Kenogami, Que., for Concrete Repairs and Waterproofing Co. Ltd.

William J. Pearce, M.E.I.C., field engineer for Stone and Webster Engineering Corporation has been transferred from the Niagara Mohawk's Power Corporation's steam station at Dunkirk, N.Y., to a similar steam station under construction at Albany, N.Y., for the same power corporation.

George Ward, M.E.I.C., sales engineer with J. J. Marshall Limited in Vancouver, B.C., will specialize in lighting, heating and electronic equipment. He was previously a telephone power equipment engineer for Northern Electric Co., Montreal, Que.

Mr. Ward graduated from the University of British Columbia in 1947.

D. J. S. Irvine, M.E.I.C., who was a research engineer for Consolidated Mining and Smelting Co., Trail, B.C., is now employed by Dominion Tar & Chemical Company in Toronto, Ont.

D. J. S. Irvine, M.E.I.C.

Lionel Desert, Jr.E.I.C., is with the firm of Surveyer, Nenniger & Chenevert, consulting engineers, of Montreal, working at Senneterre, Que.

He was previously a resident engineer for the Department of Roads at Montreal, Que.

Bruce F. Keays, Jr.E.I.C., of Canadian National Railways, has been appointed division engineer for the New Glasgow Division at New Glasgow, N.S.

Mr. Keays graduated from University of New Brunswick in 1942 as a civil engineer. He had worked with the Canadian National Railways as timekeeper at Newcastle, N.B., from 1939. In 1943 he became a draughtsman in the engineering department at Campbellton, N.B., and the next year an instrumentman at Edmundston, N.B. Mr. Keays was appointed assistant division engineer of the Moncton division in 1948, which position he held up to the time of his present appointment.

Marcel L. Bussiere, Jr.E.I.C., is now employed with Merck and Company in Valleyfield, Que. He was previously with National Breweries Limited, Montreal.

J. S. Ellis, Jr.E.I.C., has recently commenced work with H. G. Acres & Co., consulting engineers, Niagara Falls, Ont. He received a B.Sc. (with honours) from Queen's University in 1948 and a master of engineering from McGill University in 1949. Mr. Ellis has been connected with the Shawinigan Engineering Company since 1947.

Joseph Anthony D'Angelo, Jr.E.I.C., is working with the Ford Motor Company of Canada in the time standards and methods department, of the industrial engineering department at Windsor, Ont.

He was previously with the production planning department of National Heating Products Sales Ltd., Montreal.

He graduated in 1946 in electrical engineering from University of Manitoba.

A. B. Jarvis, Jr.E.I.C., of McColl Frontenac Oil Co. Ltd., is on a temporary transfer from Montreal to Edmonton, Alta.

He graduated from Queen's University in the fall of 1948, receiving a B.Sc. in civil engineering.

G. L. Metcalfe, Jr.E.I.C., formerly assistant engineer with the Pacific Coast Pipe Co. of Vancouver, B.C., is now working in Calgary, Alta., for the Buchan Construction Co.

Mr. Metcalfe graduated with a B.Sc. degree in civil engineering from the University of Alberta in 1949.

E. G. DeWolf, Jr.E.I.C., previously employed as assistant plant superintendent of Maritime Industries Limited, Amherst, N.S., is now manager of salt production for Prairie Salt Co., division of Dominion Tar and Chemical Co., at Unity, Sask.

George Gardner Wellington, Jr.E.I.C., is now working with the Aluminum Company of Canada. He was previously employed by the Defence Research Board, at Victoria, B.C.

C. D. Worby, Jr.E.I.C., of the Canadian National Railways, has been transferred from Winnipeg, Man., to Prince George, B.C., as assistant division engineer.

He graduated from the University of Manitoba in 1947 receiving a degree of B.Sc. in civil engineering. He joined the C.N.R. in 1947.

W. B. Rice, Jr.E.I.C., has been appointed associate professor in the department of mechanical engineering of Queen's University.

Professor Rice obtained his bachelor of engineering degree from McGill University in 1944. He has been assistant professor of mechanical engineering at McGill since 1946. He served during the war as a lieutenant in the Canadian navy. He has also been on the staff of the Northern Electric Company, Montreal, and of Canadian Industries Limited.

Alfred J. Prell, Jr.E.I.C., has accepted a position with Dow Chemical of Canada, Limited in Sarnia, Ont., as a project engineer.

He graduated from the University of Toronto in 1948.

M. A. Waghorne, Jr.E.I.C., of Sarnia, is now manager of the plywood division of Mac Craft Industries Ltd., Sarnia, Ont.

Previously he was assistant manager for Dominion Plywoods Limited, in Southampton, Ont.

J. N. Booth, Jr.E.I.C., of Toronto, Ont., has gone to Windsor, Ont., to work for the Ford Motor Co. of Canada Limited, in the maintenance engineering department. While in Toronto he was an engineer for Canadian Brazilian Services Ltd., and prior to that he was a junior engineer for The British American Oil Co. Ltd., in Toronto.

W. K. Henshaw, S.E.I.C., is district representative for Reliance Petroleum Limited, in Hamilton, Ont.

He was previously employed as superintendent by A. Cope & Sons, Ltd., general contractors, Hamilton, Ont.

F/O K. E. McKenzie, S.E.I.C., a construction engineer (special projects) in the R.C.A.F. is stationed at Ottawa, Ont.

He graduated from the University of Manitoba in 1950 receiving the degree of B.Sc. in mechanical engineering.

J. J. Marlow, S.E.I.C., of Hamilton, Ont., has obtained a position as instrumentman for J. L. E. Price Construction Company in Toronto, Ont., and is working on the new Bank of Nova Scotia building in Toronto.

Mr. Marlow graduated from the University of Toronto, in 1950, with a degree of B.A.Sc. in civil engineering.

R. M. Taylor, S.E.I.C., of Montreal, is on a test course with the English Electric Co. Ltd., at St. Catharines, Ont.

Z. J. Czaplinski, S.E.I.C., is now working for St. Raymond Paper Co. Ltd., Desbiens, Que.

Mr. Czaplinski graduated from McGill University, last spring, with the degree of B.Eng. in chemical engineering.

J. F. Preston, S.E.I.C., has returned to Montreal to work for the C.I.L.

Upon graduation from McGill last spring he went to Ford Motor Co., at Windsor, Ont., as a design engineer.

E. J. Slotwinski, S.E.I.C., who graduated from the University of Toronto in electrical engineering in 1950, has joined Dow Chemical of Canada, in Sarnia, Ont., as a junior electrical engineer.

Giles Bissonette, S.E.I.C., is with the engineering department of Bepco Canada Ltd., Montreal, Que.

He has been with the Steel Co. of Canada at Hamilton, Ont., since his graduation in electrical engineering in 1950 from McGill University.

J. G. Hamel, S.E.I.C., who graduated from McGill University in civil engineering in 1950 has joined the staff of the Foundation Company of Canada and is located at Ottawa, Ont.

S. S. Archer, S.E.I.C., is working with the Ford Motor Company of Canada Limited, Windsor, Ont. Mr. Archer graduated in 1950 from the University of Manitoba in electrical engineering.

A. Lemelin, S.E.I.C., who graduated in 1950 from Laval University in electrical engineering, is now employed with the Department of the Inspection of Mines as an electrical engineer.

Jan J. Munk, S.E.I.C., has been appointed sales engineer in Eastern Ontario and Quebec for the Powertronic Equipment Limited.

Jan J. Munk, S.E.I.C.

Mr. Munk was educated in Vienna and London, England. He came to Canada in 1937. During World War II he served with the R.A.F. and the R.C.A.F. and graduated from McGill University in electrical engineering in 1950.

M. C. Jerrard, S.E.I.C., is working for the Ford Motor Company of Canada Limited, Windsor, Ontario.

Mr. Jerrard had been with the Bowden Machinery Company, Toronto, since graduating from the University of Manitoba in mechanical engineering in 1950.

Thomas Robert Marien, S.E.I.C., who graduated in civil engineering from McGill University in 1950, is working for the Pentagon Construction Company at St. Joseph D'Alma, Que.

A. W. Rowe, S.E.I.C., is now working as a sales engineer for Peacock Brothers, Montreal, Que. He graduated from McGill University with a degree in mechanical engineering in 1950.

D. G. Thompson, S.E.I.C., of Vancouver, B.C., is on the staff of the B.C. Power Commission at Vernon, B.C.

He graduated from the University of British Columbia in 1950 in electrical engineering.

W. E. Turner, S.E.I.C., of Medicine Hat, Alta., is now employed by the City of Calgary as a surveyor.

Mr. Turner graduated from the University of Alberta last spring in civil engineering.

Marc Vermette, S.E.I.C., who graduated from Laval University last year is now an engineer in training with the Canadian Genêral Electric Co. Ltd., at Toronto, Ont.

R. J. Ward, S.E.I.C., is with Canadian Westinghouse Co., presently at Beauharnois, Que. He will be located in Hamilton, Ont., early in 1951. He graduated in 1950 from University of B.C. in electrical engineering.

Louis Gaston Boucher, S.E.I.C., who was an engineering draughtsman with the Electric Tamper and Equipment Co. of Canada Ltd., in Montreal, is now with the Commonwealth Electric Company Limited, Montreal, Que.

Walter E. Webb, S.E.I.C., who is with the Canadian National Railways has been transferred from Montreal to Ottawa.

Mr. Webb graduated from McGill University in 1950 in civil engineering.

Visitors to Headquarters

E. V. Buchanan, M.E.I.C., London, Ont., November 21, 1950.

W. Ball, St. Paul l'Ermite, Que., November 21.

A. Antoine, Paris, France, November 29.

G. A. Blackburn, M.E.I.C., Ottawa, Ont., December 7.

J. V. Deane, M.E.I.C., Halifax, N.S., December 13.

W. E. White, M.E.I.C., Ottawa, Ont., December 13.

I. W. Martin, Toronto, Ont., December 13.

J. M. Fleming, M.E.I.C., Port Arthur, Ont., December 13.

B. A. Culpeper, Hamilton, Ont., December 13.

C. M. Cock, London, England, December 14.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

H. M. Dibblee, M.E.I.C., of Montreal, a life member of the Institute since 1940, died in Montreal on November 1, 1950. Mr. Dibblee had retired from active engineering work about ten years ago.

He was born at Woodstock, N.B., in 1871.

He went into railway work in 1886, working in the Maritimes and northeastern United States, and in 1898 he joined the Canadian Pacific Railway to work in Western Canada.

He remained with C.P.R. for many years, serving at posts in Manitoba, Ontario and Quebec, on engineering and construction. He was assistant engineer at Montreal in 1929, resident engineer for Quebec-Grand Mere section in 1930, and later an inspector in the Montreal Terminals.

Retiring from C.P.R., he did some engineering work for Dominion Construction, Digby, N.S., in 1942.

Mr. Dibblee joined the Institute as a Student in 1895, transferring to Associate Member in 1906, and to Member in 1940.

G. N. Houston, M.E.I.C., prominent Southern Alberta irrigation engineer died on November 12, 1950, at Olds, Alberta.

Mr. Houston was born in Windham, Conn., in 1870. A graduate of Princeton University in civil engineering in 1893, he went to Denver to engage in irrigation work, and later became assistant professor of civil engineering at Colorado College of Agriculture, Fort Collins. He was later appointed professor of civil engineering at the University of Arizona, at Tucson.

He was appointed superintendent of the Denver Sugar, Land and Irrigation Company, Colorado, and later became deputy state engineer of that state. He was in private practice in Denver, Colorado, before coming to Canada in 1913 as a consultant in irrigation engineering.

He returned to the United States during the first World War as a supervising engineer for the War Department.

After the war he returned to Canada — in 1918 — and became assistant commissioner and later acting commissioner of irrigation in the reclamation service of the federal department of the interior. It was during this time that he had much to do with extensive irrigation surveys in Southern Alberta and Saskatchewan. He helped the Lethbridge Southeastern project, now becoming part of the S.M.R.D.

Then in 1921, when the contract for the Lethbridge Northern Irrigation District project was awarded, Mr. Houston, along with L. C. Charlesworth, became the irrigation counsel for the Alberta government and for three years supervised construction.

In 1925 Mr. Houston accepted the post of superintendent of the Lethbridge irrigation project of the C.P.R.'s natural resources department, the original A.R. and I. project. He held this post until his retirement in 1936.

Since his retirement he maintained residence at Olds, doing some consulting work, lecturing at Olds School of Agriculture, and acting as secretary for the Olds Hospital.

For several years he was less active, but attended meetings of the Calgary Branch of the Institute.

He joined the Institute in 1914 as a Member and attained Life Membership in 1942.

R. M. Smith, M.E.I.C., who was president of the Canada Culvert Company Limited, Toronto, Ont., and a former Deputy

R. M. Smith, M.E.I.C.

Minister of Highways for Ontario, died at his home in Toronto, on November 16, 1950.

Mr. Smith was born in Kingston, Ont., in 1887. He attended the Kingston Collegiate Institute and Queen's University where he received his degree in civil engineering. He joined the staff of the Department of Mines in 1911 and spent three years on geological survey work in Northern Ontario. He was transferred to the Department of Public Works in 1914 and in 1916 when the Highways Branch was separated from that Department, he was made a member of the newly formed Department of Highways. In 1925 he became chief engineer of this Department, and in 1927 he was named deputy minister. When the Department of Northern Development was amalgamated with the Department of Highways in 1935, Mr. Smith became deputy minister of the combined departments.

Under Mr. Smith's direction, the Province constructed and maintained a network of trunk highways and secondary roads. Outstanding among these has been the Queen Elizabeth Way from Toronto to Fort Erie, Ont. He also contributed to the adoption of the Highway Improvement Act and the Highway Traffic Act. Mr. Smith played an important part in the development of northern Ontario, opening up an extensive agricultural and mining area through a network of modern highways. This work culminated in 1942 in the last link of an all-Canadian highway from coast-to-coast — of which 1,400 miles lies within Ontario.

When the Alaska Highway project was started, the United States requested that Mr. Smith assist by supplying help on the aerial survey of the route of the highway and later in the direction of the construction of 350 miles of the main highway within Canadian territory. After leaving the Department, and after temporary retirement for reasons of health, he joined Canada Culvert Company in 1945.

In 1943 he was honoured by Queens University in the granting of an LL.D. In 1942 he was awarded the Julian C. Smith Medal of the Institute "for achievement in the development of this Dominion". He was also presented with honorary life membership in the Ontario Good Roads Association at its annual meeting in 1947.

Mr. Smith joined the Institute in 1921 as an Associate Member, transferring to Member in 1940. He was a member of the Executive of the Ontario Good Roads Association and was the Canadian member of the American Highway Research Board for some years. He also served on the Ontario Civilian Defence Committee, and on the Toronto City Planning Board. He was a member of the Association of Professional Engineers of Ontario.

Robert E. Lembcke, M.E.I.C., assistant engineer for the Texas & Pacific Railway Co., Fort Worth, Texas, died on October 17, 1950, at Fort Worth.

He was born at Philadelphia, Pa., in 1888. He graduated from North Dakota Agricultural College, receiving a B.Sc. degree in civil engineering in 1910. Upon graduation he worked with Morgan Engineering Co., Memphis, Tenn., in

Mississippi and Arkansas. In Canada he worked on municipal projects in St. Boniface, Man., in 1911-12; and he was superintendent of construction for the Guilbault Co. Limited in works at various locations in Manitoba.

He joined the Engineering Institute in 1914 as an Associate Member, transferring to Member in 1940, and attaining Life Membership in 1950.

Joseph W. Simard, M.E.I.C., former Montrealer, died in Paris on October 16, 1950.

He was born in Montreal in 1885, studied at St. Mary's College, McGill University, and Ecole Polytechnique, Montreal.

After graduation from l'Ecole Polytechnique in 1908 with a degree in civil engineering, Mr. Simard was associated with Messrs. P. A. Masson and Wilfrid Hamilton in bridge and road construction and other public works. From 1918 to 1927, he devoted his time to investment banking dealing mostly in municipal and industrial financing. He went abroad in 1927 as representative of financial interests.

In 1930, he joined La Société de Forage LAYNE-France as engineer in

Joseph W. Simard, M.E.I.C.

charge of sales with residence in Paris, France. He continued in that position until the German invasion of 1940.

In that period he took part in a huge ground water supply development for the City of Paris and also for the suburbs of that city, the latter work being done by Layne-France for two private water supply companies, namely, La Société Lyonnaise des Eaux and La Compagnie Générale des Eaux. He was also instrumental in the carrying on of many other important water well drilling contracts, both municipal and industrial, throughout France, particularly at Bordeaux and Rochelle. Wells often reached a depth of over 1000 meters and were of the well-known gravel wall type drilled by the rotary method, the main difficulty consisting in the setting of a screen surrounded with filter gravel in the water bearing formation at deep levels. He did similar work in Germany, England, Tunisia, Algeria, Morocco and Senegal. Two other companies were formed for the development of ground water in Africa and Asia. Two hundred installations were completed in France alone.

During the Second World War, Mr. Simard was with International Water Supply, Ltd., the Canadian affiliates of the Layne organization. He was for a while their Eastern Canadian district manager and in that capacity was connected with various defence installations and municipal projects. During the same period, he was also stationed at Washington, D.C., intermittently, where he looked after the interests of Layne-France and other subsidiaries in the French colonies.

In 1946, he returned to France as president and managing director of Layne-France, which position he occupied until his death.

Besides being a member of various professional organizations, Mr. Simard has been president of Le Cercle Universitaire and a member of the Montreal Rotary Club, the Canadian Club, and other community and social clubs both in Montreal and Paris, France. He was chairman of the Paris Branch of the British Chamber of Commerce from 1937. During the last war, he was sent as a representative of the Canadian Government on an inspection tour of the social services of the Canadian Army Overseas. On frequent occasions, he served as the representative of the Engineering Institute of Canada at European professional meetings. He wrote several papers and gave many lectures on the subject of ground water development. In his extensive travels he had made many friends in the public administration, municipal and industrial fields.

Mr. Simard became a Member of the Engineering Institute in 1940.

Charles E. Legris, M.E.I.C., consulting engineer of St. Jean de Brebeuf, Que., died recently.

Mr. Legris was born at Arctic, West Warwick, Rhode Island in 1886. He studied at McGill University, Montreal, receiving a bachelor of science degree in civil engineering in 1914. Upon graduation he worked with Stone & Webster, Boston, Mass., as a structural and concrete draughtsman. He was in private practice in civil engineering in West Warwick, R.I., for a time, and from 1915 to 1916 he was town engineer of West Warwick.

With the Duke-Power Company from 1917-1923 he was engaged on hydro-electric projects in the United States and in Canada, as resident engineer and field engineer. Among those projects was construction work for the Aluminum Company of Canada at Arvida, Que. He returned to his civil engineering practice at West Warwick in 1928.

He was with the War Department in Kansas City and St. Louis, Mo., in 1929-30, engaged on flood control investigations and channel rectification work on the Missouri and Kansas Rivers and in 1930 to 1931 he worked with the Interstate Commerce Commission, Washington, D.C., on railway inventories. For a period of nine years, up to 1942 Mr. Legris was construction engineer, Public Buildings Administration, Federal Works Agency, in Washington, D.C., engaged on the supervision and construction of Federal Buildings, and repair and maintenance of buildings. He was then engaged by Reconstruction Finance, Defence Plant Corporation, and the Office of Defence Plants, as a supervising engineer on construction of war industrial projects. Under his supervision has come the construction of such plants as that of the United Engineering & Foundry Company, New Castle, Penna., and that of the Aluminum Company of America at Cleveland, Ohio.

In 1947 he returned to private practice as a consulting civil engineer, in Providence, R.I. He has resided in the Province of Quebec since 1949.

Mr. Legris joined the Institute as an Associate Member in 1923, transferring to Member in 1940.

NRC's Aircraft Ski Research

Development of improved types of aircraft skis is a problem of considerable importance in Canada, and work in this direction undertaken at the National Research Council has resulted in a theory of ski friction which gives a satisfactory explanation of the behaviour of aircraft skis under varying conditions.

The theory is based on the idea that the contact between ski and snow takes place at a large number of very small areas and that the heat generated by friction causes sufficient melting to provide water lubrication at the points of contact. It is further considered that each contact area is enclosed in a water drop which does not move appreciably with respect to the snow, and that the remainder of the ski bottom is in contact with air. Thus, in the case of dry snow, the friction component of ski resistance is made up of (a) solid friction, most of which occurs near the toe of the ski, (b) viscous drag due to shearing in the very thin film of water between the ski and the areas of contact and (c) drag due to surface tension forces acting at the perimeters of the water drops in contact with the ski bottom.

Early in the tests, it was found that sliding resistance and adhesion were far more dependent upon snow conditions than on the design of the ski. Further, the skiing quality of snow varies continually and it is not unusual to observe marked changes taking place in less than an hour. More than 2,000 sliding resistance tests have been made using a towing dynamometer, drawn by a half-track.

Trials are continuing during the current winter.

News of the Branches

Activities of the Thirty-three Branches of the Institute and abstracts of papers presented at their meetings

Belleville

S. Sillitoe, M.E.I.C.
Secretary-Treasurer

The inaugural meeting of the Belleville Branch of the Institute was held at the Quinte Hotel in Belleville, December 8th, 1950 with 170 ladies and gentlemen present at dinner. The principal speaker of the evening was General the Honourable A. G. L. McNaughton who was introduced by the Chairman, Brigadier F. F. Fulton.

Dinner began with Grace said by Mr. Frank S. Follwell, M.P., who was one of the head table guests. Others at the head table included Mr. J. M. King, chairman of Peterborough Branch; Mr. and Mrs. James A. Vance; Mrs. F. F. Fulton; Mrs. A. G. L. McNaughton; Colonel L. F. Grant, field secretary; Mr. J. S. Cameron; Miss M. McLaren; Mr. W. D. Laird and the members of the Belleville executive and their wives; Mr. and Mrs. S. Sillitoe; Mr. and Mrs. W. L. Langlois; Mr. and Mrs. J. E. Buchan; Mr. and Mrs. E. G. Gurnett; Mr. and Mrs. G. A. Bradford; Mr. and Mrs. A. O. Drysdale; and Mr. D. W. Bews, councillor.

The Chairman acknowledged the best wishes of Colonel R. D. Harkness and Mr. A. B. Hunt of Montreal and expressed the regrets of Dr. O. Holden, Mr. E. V. Buchanan, and Dr. L. Austin Wright who were unable to attend. Mr. Fulton welcomed many guests from out-of-town, including Mr. Ross-Ross of Cornwall, Mr. W. E. Brown of Hamilton, Mr. F. H. Midgley of Kitchener. A large group had come from Toronto including Mr. Cross, Mr. Geiger, Mr. MacLaren and others; and a large group from Peterborough who had fostered the formation of the Belleville Branch, including Mr. J. M. King, chairman, Mr. Herzog, Mr. Killaly, Mr. Pope, Mr. Fanjoy, Mr. Dobbin, and many others; Mr. E. Russell Eaton of Sudbury, Mr. Paul Buss of Niagara Branch, Mr. G. T. L. Andrew of Kingston, Mr. R. E. Heartz of Montreal and a large number of others including Mr. and Mrs. I. R. Tait, Mr. and Mrs. R. N. Coke, Mr. and Mrs. R. C. Flitton, Mr. C. A. Peachey, Mr. E. B. Jubien and others. Mr. and Mrs. John Stirling represented Saint John and Montreal.

The meeting was addressed by Mr. W. D. Laird, assistant general secretary who discussed the events leading up to the formation of the Belleville Branch. This was followed by a short address from Mr. J. A. Vance, president of the Institute, who made the presentation of the Charter.

Mr. Edgar Cross of Toronto presented a donation of $25.00 as a token of good-will from the Toronto Branch. Mr. E. Russell Eaton presented a head table ash tray as a gift from the Sudbury Branch. The next speaker was Mr. J. S. Cameron, vice-president of the Northern Electric Company and Mayor of Westmount, who expressed the thought that the formation of a Belleville Branch would result in a great contribution to the life and activity of the whole Belleville community. Mr. J. M. King, chairman of the Peterborough Branch dwelt upon the formation of the Belleville Branch from the time it was planned in Peterborough and called upon those members of the Peterborough Branch, Mr. Dobbin, Mr. Killaly, and Mr. Pope, who had been active from its inception. He made the presentation of a Lectern on behalf of the Peterborough Branch. Colonel L. F. Grant addressed the gathering for a short time and pleased everyone with his dry humour.

General McNaughton addressed the gathering on the subject of the International Joint Commission and dealt with the early history of the original boundary commission and the problems connected with this important subject. He showed how engineering considerations were of extreme importance in arriving at any decision in connection with the International Boundary, and traced the progress made in the last 38 years. He showed how powers and responsibilities of the Commission had a profound effect upon the navigation, irrigation, and sanitation problems in the waters of United States and Canada.

His address was fully reported in the press and was rebroadcast over Radio Station C.J.B.Q., Belleville on Sunday, December 10th, at 3:30 p.m.

The gratitude of the meeting was expressed by Brigadier J. E. Genet, C.B.E., M.C.

During the dinner the musical background was provided by Mr. Dean Whalen at the Hammond Organ. A thoroughly successful social evening, together with an extremely informative paper by General McNaughton was enjoyed by all those present.

Cape Breton

G. W. Ross, M.E.I.C.,
Secretary-Treasurer

S. G. Naish, M.E.I.C.,
Branch News Editor

On December 12th Mr. L. Love of Railway Power & Engineering Company showed moving pictures in color of various types of centrifugal pumps. In particular the films featured a new design of submersible pump with the motor below the pump, at the bottom of the borehole.

At the end a film was shown covering earth moving equipment. The speaker was introduced by C. N. Murray, and W. S. Wilson proposed a vote of thanks. R. Bradley was chairman of the meeting.

Cornwall

John A. Sargeant, Jr.E.I.C.,
Secretary-Treasurer

A. A. B. McMath, M.E.I.C.,
Branch News Editor

The annual dinner meeting of the Cornwall Branch was held at the Cornwallis Hotel on December 7th. Twenty-three members attended and heard reports from the various committees. W. P. Nesbitt of the nominating committee reported that G. G. M. Eastwood had been elected chairman again for another year. He also announced that the following members had been elected to the Executive for two years: A. S. Holder, F. R. Warner, H. W. Nickerson. Executive members who still have one year in office are D. Ross-Ross, R. H. Wallace, P. H. Nasmyth, F. E. Trewartha and A. A. B. McMath.

In his report for the Membership Committee, L. P. Stidwill mentioned that the branch now has 58 members and 9 affiliates. Chairman G. G. M. Eastwood related some of the proceedings at the Annual General Meeting held in Toronto last July. Councillor D. Ross-Ross reviewed some of the Institute's history.

Three excellent films were shown to complete the programme. "Wealth of the Andes" described mining activities in Peru, and illustrated the spectacular nature of the railway which runs from Peru back into the mountainous mining country. "Ducks Unlimited" showed how the organization of that name is working to preserve ducks and other wild fowl in Western Canada. "Bamboo" covered scenes in Java. The extensive use of this material for buildings and bridges was depicted. Various structures shown brought out the ingenuity of the native craftsmen, who are forced to lash bamboo members together, since they cannot be nailed.

Charter Night at Belleville

Top—Some of the guests at head table were, l. to r., F. S. Follwell, J. M. King, Mrs. Vance, President Vance, Mrs. Fulton, General McNaughton, Brig. F. F. Fulton, Mrs. McNaughton, Lt.-Col. L. F. Grant, J. S. Cameron, Miss May McLaren, W. D. Laird, Mrs. Buchan, J. E. Buchan, Mrs. Drysdale, A. O. Drysdale, Mrs. Langlois, W. L. Langlois, D. W. Bews.

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Left—Principals in the inauguration ceremonies, General McNaughton, President Vance and F. F. Fulton.

Bottom, opposite page—Others at the head table were, l. to r., G. A. Bradford, S. Sillitoe, Mrs. Sillitoe, Mr. Follwell.

At top and bottom on this page are shown some of the 170 guests who attended the inaugural dinner.

Right—President Vance and branch chairman F. F. Fulton, after the presentation of the Branch charter.

Hamilton

G. L. Schneider, jr.e.i.c.,
Secretary-Treasurer

John H. Mitchell, m.e.i.c.,
Branch News Editor

A symposium on **Iron Ore Resources in Labrador, Ontario and Mesabi** was conducted by three eminent authorities, Dr. R. D. MacDonald, Queens University, Dr. E. G. Pleva, University of Western Ontario; Dean H. S. Armstrong, McMaster University, to the enjoyment and interest of over one hundred members of the Hamilton Branch and their guests members of the Association of Professional Engineers of Ontario. Chairman Sentance introduced the panel and then called on Dr. Pleva to start the symposium.

Dr. Pleva traced the history of Mesabi back to the time that the Merrit Brothers, timber prospectors, sunk a mine at Iron Mountain and discovered that great Lake Superior ore body known as Mesabi.

Eighty per cent of American iron ore comes from the Lake Superior area and about four-fifths of that originates at Mesabi. Mesabi's ore runs about 51.5 per cent, but as a supplier of high grade ore its days are numbered.

Second on the panel, Dean Armstrong said that three well-defined bodies of ore are evident in Ontario . . . Steep Rock, Mishipicotan and Goulais River.

The three workings at Steep Rock, Hogarth, Errington and Inland Steel run about 58 per cent and expect to boost production to 6 or 7 million tons per year in five years.

Dr. MacDonald stated that Labrador was first tried in 1936-1939 by Hollinger Explorations who were gold prospecting at that time. The ore body is similar to Mesabi, close to Hamilton River with a potential hp. of 5,000,000, but 360 railroad miles from the St. Lawrence. The markets include Eastern United States, British Isles, and Central United States if the St. Lawrence Seaway is approved.

Stripping costs are low and taxes on profits only 5 per cent. Potential is 100,000,000 tons per year in about 10 to 20 years. The years 1954 and 1955 may see ore out of Labrador.

Mr. Sentance asked the audience to direct their many and varied questions to the respective authority. Mr. W. J. Dawson expressed the interest and delight with which the members and guests received the three speakers.

Mr. Sentance invited the group to light refreshments and declared the meeting adjourned.

Kingston

J. T. Provan, jr.e.i.c.,
Secretary-Treasurer

S. H. Rochester
Assistant Secretary

The Kingston Branch, E.I.C. held its regular monthly meeting on Tuesday, 21st November in the old Arts Building of Queen's University with Mr. G. T. Andrews in the chair.

The speaker for the evening, Lieut.-Colonel P. C. King, m.e.i.c., r.c.e.m.e., was introduced by Professor A. Jackson. Lieut.-Colonel P. C King, who has recently assumed the post of professor of mechanical engineering at the Royal Military College, was formerly officer in charge of the Track Section of the Vehicle Development Establishment in Ottawa, and has studied the problems of vehicle propulsion and advanced tank design for many years.

Lieut.-Colonel King's subject was entitled **Some Problems in the Design of Northland Vehicles** and commenced with an explanation of the type of terrain encountered north of the line in Canada's Tundra Belt. This was supplemented by a film illustrating Arctic conditions, particularly the muskeg with its varying depths to the permafrost.

The speaker went on to explain the difficulties in crossing muskeg with heavy vehicles both tracked and with standard tired wheels and illustrated the limitations in size and weight imposed upon armoured fighting vehicles operating over this type of terrain, with particular references to the advantages of light alloys in vehicle design.

Colonel King continued with an explanation of the type of suspension used on tracked vehicles and how effective steering can be achieved with a well designed power train. In discussing the relative advantages of the Diesel and Gasoline Engine in vehicle propulsion, Colonel King said that the additional weight of the Diesel engine was compensated by fuel savings, but in many cases the gasoline engine was found to be more satisfactory.

In conclusion the speaker surveyed the operation and maintenance of auxiliary equipment and mentioned the use of oil dilution as a means of improving cold weather starting of vehicles.

Following a lively question period, the speaker was thanked by Dr. R. D. Bennett, and the meeting was then adjourned.

Lethbridge

D. Cramer, m.e.i.c.
Secretary-Treasurer

J. T. Dokken, jr.e.i.c.
Branch News Editor

Members and guests of the Lethbridge Branch E.I.C. gathered at the Marquis Hotel on Saturday, November 18, 1950, to hear Mr. R. A. Reagh, chief engineer of Radio Station C.J.O.C., talk on the subject of television.

Mr. Reagh traced the development of television from its beginning in about 1873 in a very crude form. Television took a big step when the Cathode ray tube was designed, and has taken great strides since 1936 with the development of the Orthicon tube.

The type of broadcasting most popular today is a combination of films and studio entertainment. Films used are similar to those put through a standard projector used in theatres. It is possible to take a film of an event and have it ready for broadcasting in twenty minutes.

The distance over which television can be broadcast depends on the line of sight between the sending antenna and the receiving aerial. A two hundred foot tower would have a range of fifty to sixty miles. There are two alternatives for carrying television over distances. One is the use of land lines in which the co-axial cable is used and the other is the use of F.M. repeater stations.

The speaker thought that the main reason that television has not developed in Canada is because the C.B.C. has refused to license private stations for television broadcasting; however, he thought that the large areas of sparsely settled country in Canada would hold up development. Mr. Reagh thought that it would be feasible to operate a television station in Lethbridge. Such a station would involve an initial outlay of $100,000 to $200,000.

Following his address, Mr. Reagh showed a film called "Sight Seeing at Home" which illustrated some of the technicalities involved in television broadcasting.

Mr. Reagh was introduced by Mr. A. R. Niven and a hearty vote of thanks to the speaker was moved by Mr. A. J. Branch.

Prior to Mr. Reagh's talk the members were entertained with piano selections by Mr. Norm Thomas, and vocal selections by Miss Jackie Boyle and Mr. Thomas. Community singing led by R. S. Lawrence was enjoyed by all present.

Mr. P. E. Kirkpatrick was in the chair.

Peterborough

G. W. Herzog, jr.e.i.c.,
Secretary-Treasurer

M. V. Powell, m.e.i.c.,
Branch News Editor

The November meeting of the Peterborough Branch on Thursday, November 23rd was addressed by Mr. A. E. Davidson, engineering consultant, Hydro Electric Power Commission of Ontario. This illustrated lecture was entitled **Hydro-Electric Development in Sweden** but the speaker included many interesting comments on Sweden and its people. Swedish State Power Board Representatives have visited Canada and the United States several times in the last few years and at the invitation of the Board, a return visit of some fifteen engineers from Canada and the United States was made last June.

The speaker was impressed with the interest of workmen in the various projects and the provisions made for their welfare by their employers. There is a considerable trend toward public ownership of utilities although there are many private power producers selling power throughout Sweden. The forests are very carefully supervised and harvested and fires are almost unknown. It was surprising to the audience to hear that one of the great new developments, Harspranget was north of the Arctic Circle.

Most of the engineers in Sweden are young and progressive and the many novel and advanced features encountered are partly due to this. In northern Sweden, most modern dams are built of earth with a concrete core and some clay backfill to control seepage. One dam had a concrete curtain between piers and is now undergoing extensive repairs to the exposed down-stream side. At one time ice was a serious problem and in some cases 25 per cent of the power from a plant was used in warming the racks. A novel feature of most Swedish power developments is that almost all equipment excepting of course, the dam, is underground and usually in the solid granite. This practice is defended economically and certainly would have a great advantage in case of air raids.

Long transmission lines are common in Sweden and even an undersea power cable 60 miles long is to be laid to the Island of Gottland in the Gulf of Bothnia. The 380,000 volt, 600 mile transission line from Harspanget was of pecial interest. As well as having a igher voltage than has been used in merica, dual cables spaced about 18 nches apart are used to control corona. Two spacers are placed in each 1,000 ft. pan after the cables are in place by men ravelling along on the cables in trolley arriages.

Mr. D. T. Bath moved a vote of hanks. The Chairman, Mr. J. M. King hen called for nominations of candidates for next year's executive.

Saguenay

F. E. Hogg, M.E.I.C.
Secretary-Treasurer

On Tuesday, November 21, Mr. J. V. Leach, of the technical service department of Imperial Oil Limited, Sarnia, addressed the Saguenay Branch of the Engineering Institute of Canada. Mr. Leach is in charge of the Engine Testing Laboratory at Sarnia, which is concerned with both laboratory testing and road testing. Mr. Leach spoke on the **Lubrication of Gasoline and Diesel Engines.**

Mr. Leach explained that gasoline and Diesel engines differ in their requirements for lubricating oils. He described the duties that lubricating oils must perform in different parts of an engine. He explained how the qualities of a fuel will affect the specifications for the lubricating oil and he described methods of developing lubricating oils for various purposes, such as Diesel electric locomotive lubrication, etc.

Mr. Leach showed some slides. The talk was followed by a question period, covering a broad field, which demonstrated the general interest in lubricating problems.

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Junior Section

R. H. Singleton, M.E.I.C.
Secretary

A successful smoker was held by the Junior Section in the Saguenay Inn Tuesday evening, November 28. Mr. S. F. White, of the Aluminum Company of Canada, presented a very interesting and entertaining talk on **The Development of a Public Speaker or a Conference Leader.** Mr. White proved to be an extremely able speaker himself. It was stressed that a speaker must know exactly the purpose of his speech, whether to convince, to humour, or provide illustration for his audience. Methods of speech preparation and delivery were discussed in a general way. The development of a public speaker follows only after much study and, particularly, practice. The audience was asured that "stage fright" was common to nearly all beginners and could be overcome by concentrating more on the contents of the talk than on its method of delivery. One of the main secrets of good delivery is naturalness. The subject was particularly timely since a large number of junior members have been asked to speak during the coming season. A very lively discussion period followed. The refreshments were enjoyed after the usual fashion.

The speaker was introduced by the chairman, Mr. H. V. Page, and ably thanked by Mr. J. E. Pickering.

It was announced by the chairman that the following Junior Section officers had been elected at the annual business meeting held in the Laboratories auditorium on October 24, 1950: chairman, H. V. Page; vice-chairman, M. Fredericks; secretary-treasurer, R. H. Singleton; committee members, C. Loutit and D. M. Archer.

St. Maurice Valley

C. M. Williams, S.E.I.C.,
Secretary-Treasurer

C. De Tonnancour, M.E.I.C.,
Branch News Editor

Saturday afternoon, November 18th, a group of 40 members and friends of the St. Maurice Valley Branch of the Engineering Institute of Canada caravanned up to Montauban where the lead and zinc mines and concentration plant of the Anacon Lead Mines were inspected in detail.

Greeted at their arrival by Mr. Douglas Parent, works manager, and his technical assistants, the group was briefed on the historical and technical details of the operations, and then, clad in the latest miner's styles, including helmet, light, rubber suit, etc., were lowered to the 500 foot level, which now stretches half a mile in various radial directions from the main shaft and hoist. The main gallery was explored to the point where a new shaft is in progress, both from underground and surface, to an underground level of 700 ft. The mine is very dry due to the absence of faults in the rocky formation, which lies close to the edge of the Laurentian shield and is a paradise for the initiated due to the rich variety of rocks and minerals found, some of which are unique to Montauban.

The ore, consisting of zinc and lead sulfide, with trace of pyrites, native and alloyed gold and silver, is separated from the rock in a flotation process, at the rate of 45-50 tons a day of concentrates, coming from approximately 600 tons of rock. Further separation sends the zinc to England and the lead to Trail, B.C.

Developments done on recovery of mica were also disclosed. This deposit was known since 1910 and exploited by various interests until two years ago when the present owners started expanding to the present scope of operations.

Members of the party reached home for the most part enriched with a new experience and after further exploration, on the surface this time, with road map in hand, through the back roads of the counties of Portneuf and Champlain.

Vancouver

A. G. Fletcher, Jr.E.I.C.
Secretary-Treasurer

Stuart S. Lefeaux, M.E.I.C.
Branch News Editor

The annual dinner meeting of the Vancouver Branch was held in the Hotel Georgia on Saturday, November 25th with approximately ninety members present. Chairman Sidney Hogg introduced the head table guests and carried on the business meeting. The chairman's annual report of the Branch activities disclosed that the total Branch membership is now 984; over 50 per cent are students. The annual general meeting of the Engineering Institute of Canada will be held in Vancouver in May, 1952. Mr. Hogg asked for the continued support of the steady members and a drive to have more members take an active part in Branch affairs.

Mr. George Allan, Branch councillor, reported for the Nominating Committee that the following slate of Branch officers had been elected: chairman, J. E. Macdonald; vice-chairman, S. H. deJong; secretary-treasurer, Stuart S. Lefeaux; executive committee, E. L. Hartley, H. Libbey and C. Scrymgeour (2-year terms). Mr. F. R. Adams and Mr. R. Walkem are members of the 1951 executive by virtue of their election for a two year term at the last annual meeting. Mr. J. A. Webster, M.E.I.C., was elected to serve a further one-year term to replace Mr. deJong.

Mr. Percy Buchan, M.E.I.C., gave the auditor's report for the Branch and was once again elected as auditor for 1951. Mr. Alan Fletcher, the secretary-treasurer gave the financial statement for the branch which showed expenditures of $1,139.00 and receipt of $1,328.00 for the year ending November 15th. Mr. W. N. Kelley introduced Mr. A. P. Fenton, the 1950 winner of the W. N. Kelley shopwork Prize at University of British Columbia. Mr. Sid Hogg then turned the meeting over to Mr. Jack Macdonald the chairman elect.

Mr. Macdonald introduced the Reverend William Hills of St. George's Parish, Cadboro Bay, Vancouver Island, the guest speaker for the evening. Mr. Hills received his theological training at the University of Toronto and was ordained in eastern Canada. During the war he served as a padre with the Royal Canadian Navy. Mr. Hills has earned an international reputation as an outstanding public speaker and advocate of democracy.

Mr. Hills told of his recent speaking tour through Illinois and Wisconsin and emphasized the superiority of Canadian democratic institutions. He believes that the one thing to guard against in Canada is too much government with the subjection of the individual and individual initiative.

Mr. Hills was thanked for his inspiring address and all agreed the topic to be most timely and important to engineers.

Victoria

W. A. Bowman, Jr.E.I.C.,
Secretary-Treasurer

T. A. J. Leach, M.E.I.C.,
Branch News Editor

The use of the Multiplex in topographical mapping was described to members of the Victoria Branch on Friday, November 17, 1950, by Col. W. K. MacDonald, D.L.S.

Col. MacDonald who is engineer in charge of multiplex operations for the Provincial Department of Lands illustrated his address by slides.

The Multiplex was originally developed by the Zeiss Company and first appeared on the market in 1933. About 1938 Bausch and Lomb obtained a license from Zeiss to manufacture and sell the equipment on this continent. Various improvements have been made over the intervening years and the Multiplex is today generally accepted as a precision mapping accessory.

The operation of the Multiplex utilizes the principles of direct optical projection of two or more overlapping aerial photographs. In effect the light rays that formed the photographs are projected in the reversal of their direction at time of photography.

The pictures are projected on a table.

each pair in complementary colour and observed through spectacles having correspondingly coloured lenses. The optical model which appears on the board can then be examined by means of a floating mark and measurements made in three directions.

In order that the photographic negative (5" x 5") may be used in the Multiplex it must be reduced to one quarter of this size by a special reduction printer. The tiny pictures are known as diapositives and one is inserted in each of the Multiplex projectors. Finally by tipping, tilting, lengthening or shortening the model the projected images of the control points are brought into coincidence with their map positions.

The measurements of the space model are made on a small circular plate which can be adjusted vertically. Directly beneath the floating mark on the plate is a pencil which draws lines on a plotting surface as the dote is made to follow some contour.

In multiplex work the desirable minimum control for five overlaps is a horizontal and vertical control at the start and finish photos and in addition two other points fixed vertically on the same photos.

Col. MacDonald in concluding his address pointed out that the cost of obtaining control against Multiplex operating time presents a problem in economics that must be considered when planning each Multiplex mapping project.

A long and lively discussion period followed his address after which the speaker was thanked by Mr. D. MacLean.

Reminder

The 1951 Annual Meeting of the Engineering Institute will be held at the Mount Royal Hotel, Montreal, May 9, 10, and 11.

First Meeting of Engineers in P.E.I.

On October 30, during a tour of Maritime branches and branch non-resident areas, the field secretary, Lt.-Col. L. F. Grant met with a group of engineers at the Charlottetown Hotel in Charlottetown, Prince Edward Island.

As far as can be determined, this was the first organized meeting of engineers in that province and much credit is due to V. A. Ainsworth, general manager, Maritime Electric Co., for his part in the arrangements.

The accompanying photograph was taken during the meeting and includes:—

Back row, left to right: C. A. MacVey, M.E.I.C.; J. C. McIntosh; W. S. Veale, S.E.I.C.; D. I. D. Rozman, M.E.I.C.; T. B. McLennan, Jr.E.I.C.; K. C. Martin, S.E.I.C.; H. A. Messervey; Wm. MacDougall; J. H. Hearn, S.E.I.C.; R. H. Nicholson; E. J. MacLeod, M.E.I.C.; J. Van Maarion.

Middle row, left to right: R. B. Smith, S.E.I.C.; C. H. Stewart, Jr.E.I.C.; H. E. Miller, M.E.I.C.; R. G. White; R. S. MacBeath; L. F. Grant, M.E.I.C., field secretary of the E.I.C.; V. A. Ainsworth, M.E.I.C.; J. A. Reardon; E. S. Chandler; B. D. Elderkin; G. L. Smith, Jr.E.I.C.

Front row, left to right; W. R. Brennan; J. A. Spinney, Jr.E.I.C.; C. F. Buckingham, S.E.I.C.; D. E. MacLean, Jr.E.I.C.; H. R. Miller, Jr.E.I.C.; L. W. Hacker; A. H. Gillis, Jr.E.I.C.; G. J. Hayer; C. W. Currie.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CHEMICAL

YOUNG CHEMICAL ENGINEER required by firm located in Montreal, engaged in the manufacture of sponge rubber and brake linings. Excellent opportunity offered in growing concern. Salary open. Apply to File No. 1699-V.

CIVIL

CIVIL DRAUGHTSMAN required by large well established Canadian company. Minimum of 10 years experience in concrete. Location Toronto. Apply to File No. 1687-V.

CIVIL ENGINEER, English speaking, preferably some surveying experience on road or transmission line location or other topographic work. For training in photogrammetry and subsequent employment as ground surveyor and control engineer for aerial mapping. Apply in writing stating experience to File No. 1691-V.

CIVIL ENGINEER, French speaking for training as operator of photogrammetric plotting machines and subsequent employment as operator in Montreal office. Good long term prospects for right man with executive ability. Initial salary during probationary and training period $200.00 per month. Apply to File No. 1692-V.

ELECTRICAL

ELECTRICAL ENGINEER required by large well established Canadian company minimum 2-3 years experience. Calculations stability studies and relaying applications including operation calculating board. Prefers masters degree. Location overseas. Apply to File No. 1687-V.

FOUR ELECTRICAL ENGINEERS required by a large well established Canadian company. C or D class. Minimum 1-3 years experience, preferably in powerhouse electrical layout. Location Toronto. File No. 13651. Apply to File No. 1687-V.

ELECTRICAL ENGINEER required in Montreal with experience in communications and/or electronics. Recent graduate or one with several years experience. Salary according to qualifications. Apply to File No. 1693-V.

FOUR ELECTRICAL ENGINEERS with five years or more experience in design, specifications, estimates, layout, inspection and testing, etc., for distribution work. Location Toronto. Reply stating age, education and details of work actually carried out in previous positions to File No. 1696-V.

MECHANICAL

MECHANICAL ENGINEER required by large organization in Montreal. Applicant should be between 30 to 35 years. Duties include general machine shop work and planning. Apply to File No. 1673-V.

MECHANICAL ENGINEER required for northern Ontario sulphate mill. Recent graduates would be considered. Excellent opportunities to gain experience and good prospect for promotion. Apply to File No. 1677-V.

MECHANICAL ENGINEER required for small manufacturing plant in Niagara Peninsula. Duties will consist of general draughting and machine design, particularly valves. Some previous experience would be advantageous. Apply to File No. 1681-V.

TWO MECHANICAL ENGINEERS for mechanical inspection in the field. Experience necessary in Hydro-Electric projects. Location overseas. Apply to File No. 1687-V.

MECHANICAL ENGINEER to act as sales engineer for large organization in Montreal. Salary range $5,000.00. Apply to File No. 1690-V.

MECHANICAL ENGINEER required by firm located in the Maritimes with some experience in steel design and construction. Apply to File No. 1695-V.

YOUNG MECHANICAL ENGINEER required as assistant superintendent by firm located in Montreal manufacturing spun nylon yarn and nylon wool. Apply to File No. 1700-V.

MECHANICAL ENGINEER to act as project engineer required by large organization in Montreal. Salary open. Apply to File No. 1701-V.

MECHANICAL (practical) Production Engineer, with thorough knowlwedge of metal working machinery, plant lay-out, processing, tooling and die making, production control for Western Canada manufacturer selling all across Canada to other manufacturers and to wholesalers. Prefer man of 40 or older. Permanent and good future for a good practical factory manager and producer. Apply to File No. 1704-V.

MISCELLANEOUS

TWO SALES ENGINEERS required to act as representatives in Montreal and Toronto by young progressive industry, interested in the sale of British made products and having some experience in pulp and paper industry. Apply to File No. 1674-V.

SENIOR PETROLEUM ENGINEER required by independent Canadian Oil Company with headquarters in Calgary. Applicant should be particularly experienced in reservoir engineering and production practices. No one with less than 7 years experience in the industry need apply. Give synopsis of education, training and experience and supply recent photo. Apply to File No. 1675-V.

YOUNG MECHANICAL OR CHEMICAL ENGINEER required in Montreal to take charge of production and sales for a small company engaged in the cleaning and glazing of bakers bread and bun pans. Salary open. Apply to File No. 1676-V.

MECHANICAL OR ELECTRICAL ENGINEER for supply inspection department of a large organization in Toronto. Applicant should have at least 12 to 15 years extensive practical shop and office experience in the manufacture of heavy mechanical and electrical machinery and equipment. Reply stating age, education and details of experience to File No. 1678-V.

SENIOR BUYER with 7 to 10 years diversified purchasing experience. Electrical engineering or engineering training desirable; also administrative or supervisory ability. Location Toronto. Apply to File No. 1679-V.

MECHANICAL OR CIVIL ENGINEER, 30-40 years of age with practical experience in the field on erection and installation of pulp and paper machinery and equipment. Will be responsible for supervising in the field either directly over the working personnel or to the contractor and will include meetings and discussions with the customers necessitating a good personality and diplomacy. Installations may be anywhere in Canada. Applicant will spend sometime in head office in Toronto. Apply to File No. 1680-V.

INSTRUMENT ENGINEER (electrical or mechanical preferred) required for large oil refinery in Montreal east. Applicant should have not less than three years experience as instrument engineer or not less than 5 years general electrical engineering experience. Would be expected to take charge of instrument department under general supervision of power engineer. Salary open. Applications will be treated confidentially and should include full particulars as to qualifications, together with recent photograph. Apply to File No. 1684-V.

RESIDENT ENGINEER wanted, for construction of proposed Granville bridge in Vancouver, B.C. Duration of work approximately two years, starting about March 1, 1951. Applications should be made by letter giving full details of experience, professional qualifications, age, etc., and salary expected. Apply to File No. 1685-V.

SALES ENGINEER or contact man required by a firm of inspection engineers in Montreal. Must have considerable experience and be between 30 and 40 years of age. Apply to File No. 1686-V.

RESIDENT ENGINEER required by large well established Canadian company, minimum 10 years experience in Hydro Electric construction, competent in design, construction experience in field. Age approximately 40 years. Location overseas. Apply to File No. 1687-V.

BRITISH ADVERTISER seeks Canadian engineering firm with reputation, willing to join with long established English counterpart. Enquirer to provide capital, select tools and supervise projects directed to both government equipment and rearmament programs. Also industrial manufacturer of small engines, motorcycles, etc. Apply to File No. 1688-V.

MECHANICAL OR CIVIL ENGINEER required by large engineering firm for their Toronto sales office. Age about 26 or 27 years. Applicant must have definite sales ability and would be away 50% of time. He should also have some practical experience with heavy equipment for paper mills, mines or quarries. Territory Northern Ontario district. Apply to File No. 1689-V.

DESIGN ENGINEER preferably mechanical required by large organization in Montreal. Applicant must have administrative ability. Salary range $5,000.00. Age 30 to 40 years. Apply to File No. 1690-V.

GRADUATE ENGINEER for design work on buses, required by large organization in Montreal. Apply to File No. 1690-V.

SALES ENGINEER required by a company engaged in the selling and servicing of fire protection and water conditioning equipment. Applicant should be preferably mechanical or civil engineer. Territory in and around Montreal. Apply to File No. 1694-V.

RECENT GRADUATE required by manufacturer in Winnipeg. Applicant must be interested in production planning, time and motion study, etc. Work will be in connection with the setting up of a modern production program. Training period. Salary open. Apply to File No. 1698-V.

YOUNG MECHANICAL OR MINING ENGINEER required in Ontario. Duties would consist of engineering and time studies of open-pit mining and milling operations with the purpose of improving methods and installing wage incentives. Firm would train the engineer in time studies. Excellent opportunity for advancement into supervisory production positions. Apply to File No. 1702-V.

AIRCRAFT HYDRAULIC DESIGNER required by large Montreal aircraft manufacturing firm. Must have 4-5 years experience and sound overall knowledge of system layout, flow calculations and detail component design. Apply to File No. 1703-V.

YOUNG ENGINEER to act as expeditor in the purchasing department of organization in Montreal. Applicant should be between 30 to 35 years and be free to travel 50% of the time. Material handled would be all types of heavy equipment in connection with smelting plant. Apply to File No. 1705-V.

WANTED

20 GRADUATE ENGINEERS AND DRAUGHTSMEN MECHANICAL — CIVIL ELECTRICAL

by

C. D. Howe Company Limited,

1421 Atwater Avenue, Montreal, Quebec.

For Projects in Ontario and Quebec. Apply to File No. 1697-V

or

by letter direct to Firm (Preference to those with 3 years practical experience)

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMICAL ENGINEER required in British Columbia. Applicant should be of research calibre, with broad interest, who is capable of planning and carrying out research connected with the construction and operation of a variety of processes. He should also be able to make engineering cost studies in connection with the industrial applications of such research projects. Apply to File No. 1596-V.

CHEMICAL ENGINEERS required by chemical division of large firm located in the United States. Senior and recent graduates required. Excellent opportunities offered. Salaries open. Apply to File No. 1613-V.

JUNIOR CHEMICAL ENGINEER required in Montreal, by organization importing industrial chemicals from abroad. Applicant would act as sales engineer. Apply to File No. 1637-V.

TWO JUNIOR OR INTERMEDIATE CHEMICAL ENGINEERS for the control department of pulp and paper industry in the Maritimes. Duties would be in connection with control and process work. Apply to File No. 1650-V.

CIVIL

CIVIL ENGINEER required by firm in Western Canada, fabricators of structural steel. Duties include designing and estimating and contacting various customers. Salary $250.00 to $300.00. Apply to File No. 1517-V.

CIVIL ENGINEER required in Montreal for specialized work travelling in the Province of Quebec. Applicant should have some municipal experience or experience in waterworks and have a working knowledge of French. Duties include survey in the field and the writing of analytical reports. Age not over 30 years. Apply to File No. 1604-V.

CIVIL ENGINEER, recent graduate with some construction experience required for municipal duties in Ontario. Apply to File No. 1607-V.

CIVIL ENGINEER with experience in design and construction of heavy reinforced concrete structures for hydroelectric development in Eastern Canada. Prefer three years' experience. Apply to File No. 1630-V.

CIVIL ENGINEER, experienced, well qualified, required immediately, for town in the Maritimes, to survey and superintend the installation of a water supply system. Reply in writing giving full particulars as to experience, qualifications, references and salary expected to File No. 1632-V.

CIVIL ENGINEERS wanted with experience in design and construction of municipal works. Salary $235.00 per month and up, based on experience and qualifications. Apply to File No. 1641-V.

CIVIL ENGINEER required by large firm in Ontario, with about 10 years structural experience. Applicant must be experienced and able to assume responsibility. Apply to File No. 1644-V.

CIVIL ENGINEER with some experience on structural design, preferably on transmission towers and switching yards. Duties include engineering calculations, design and investigations of structures and surveys. File No. 13466. Apply to File No. 1651-V.

YOUNG CIVIL ENGINEER required by conveying industry in Montreal. Applicant should have some experience in design and detail work on structural steel. Good opportunity for advancement offered. Apply to File No. 1663-V.

ELECTRICAL

ELECTRICAL ENGINEER required. Good opportunity for one who has had two or more years experience on sales and contract work in an electrical manufacturing company. This position offers excellent opportunity for advancement with a growing concern. Apply to File No. 1558-V.

ELECTRICAL ENGINEER required in Montreal. Applicant should have some experience in radio work and draughting. Apply to File No. 1595-V.

ELECTRICAL ENGINEERING GRADUATES to be trained as field engineers in applied illumination by a firm located in Ontario. Excellent opportunity offered for mature-minded graduates who are seeking a lifetime career.

Technical Representative Required

in Montreal by

CANADIAN BRANCH OF BRITISH TEXTILE firm, manufacturing textile and cable machinery. Applicant must have executive ability as position offers exceptional opportunity. Apply to File No. 1706-V.

Several openings for young men as trainees or more mature former graduates who would be accorded an opportunity commensurate with their experience. Apply to File No. 1601-V.

ELECTRICAL ENGINEER required by paper company in Province of Quebec. Applicant should have some experience in heavy electrical equipment. Salary range $300.00 to $350.00. Apply to File No. 1605-V.

JUNIOR ELECTRICAL ENGINEER to act as design engineer and to do general electrical engineer duties, required by large organization in Montreal. Apply to File No. 1612-V.

ELECTRICAL ENGINEER required in Province of Quebec with a minimum of 4 or 5 years experience in supervising an electricians crew in an industrial plant. Applicant must have a proven record of success in industrial electrical maintenance. Salary open. Preference will be given to a man with pulp and paper experience. Apply to File No. 1615-V.

ELECTRICAL ENGINEER required in Ontario with some experience in distribution system planning and construction. Applicant must have personality and ability. Excellent opportunity offered. Apply to File No. 1625-V.

ELECTRICAL ENGINEER, well qualified graduate for position of assistant chief engineer of hydro-electric construction department with foreign branch of Canadian company. To be responsible for equipment layout, control circuit designs, specifications and procurement of all electrical features of power houses, pumping stations, switching stations and auxiliaries. A similar background and field experience would be desirable. Prefer familiarity with factory tests, N.E.M.A., and A.S.A. and A.C.I.E.E. standards. Apply to File No. 1630-V.

ELECTRICAL ENGINEERS with experience to assist the engineer of voltage-rated equipment. Duties include equipment layout, design, specification writing, procurement involving circuit breakers, disconnect switches, motors and related equipment, conduit and cables. Location overseas. Prefer experience with public utilities or electrical manufacturers. Apply to File No. 1630-V.

ELECTRICAL ENGINEERS with several years' experience for testing and field inspection of all types of electrical equipment. Should be familiar with N.E.M.A., A.I.E.E. and A.S.A. standards. Single men preferred. Location overseas. Good living conditions, housing supplied. Apply to File No. 1630-V.

.ECTRICAL ENGINEER with industrial experience, preferably with an electrical manufacturing firm, for inspection work in Toronto. Duties include engineering calculations, inspection of equipment during purchasing, and supervision of tests. Apply to File No. 1630-V.

.ECTRICAL ENGINEER with several years' experience, preferably with public utility or electrical manufacturing firm required by a large, well established company. Duties would include solution of engineering problems connected with design, testing, analysis or specifications; to assist in the development of new methods, designs and procedures; analysis of fie'd investigations and tests; report writing, and other engineering work. Prefer at least five years' experience. Location: Southern Ontario. Apply to File No. 1630-V.

RADUATE IN ELECTRICAL or radio engineering from a recognized university with a number of years experience with airborne radio and radar equipment. Previous experience with R.C.A.F. airborne equipment desirable. Apply to Fi'e No. 1642-V.

RADUATE IN ELECTRICAL or radio engineering required in Ottawa, with a number of years experience in radio and radar, or allied fields. Ability to write good technical English essential. Previous experience in the writing of technical manuals and reports is desirable. Apply to File No. 1642-V.

LECTRICAL ENGINEER for position as relay engineer with foreign branch of Canadian company. Prefer several years' experience with an operating company. Appointment would be initially for three years. File No. 13510. Apply to File No. 1651-V.

OUNG ELECTRICAL ENGINEER required in Montreal for inside sales work on transformers. Apply to File No. 1654-V.

OUR ELECTRICAL ENGINEERS, recent graduates with some experience in power required by large firm in Montreal. Apply to File No. 1658-V.

LECTRICAL ENGINEER required by company in Montreal, with a minimum of 2 years experience in design and layout work. Applicant should also have some knowledge of construction. Duties include design and repair of work in the field and office. Salary range $350.00. Apply to File No. 1664-V.

MECHANICAL

IECHANICAL DESIGN ENGINEER required by large organization in Montreal. Applicant should have 10-15 years experience. Apply to File No. 1593-V.

SCIENTIFIC OFFICERS WANTED

OTTAWA - ONTARIO

Applicants should be Canadian citizens who are graduates in science, preferably with post graduate training. Research or general experience in some particular scientific field is desirable in certain positions. War service will be considered an additional qualification in some positions and a requirement in others.

DUTIES: The main duties will pertain to the co-ordination, control and dissemination of scientific information in most of the major fields of science and technology.

SALARY: $2,700 - $3,800, depending upon qualifications and experience.

APPLY TO: Box 1274, Station B., Ottawa, Ontario.

MECHANICAL ENGINEER required by large firm in Montreal to act as railroad car engineer. Applicant should have 2 or 3 years (or more) of experience in the design of tank cars, as defined by the Association of American Railroads. Familiarity with the requirements of the A.A.R., the I.C.C., the Bureau of explosives and the Board of Transport Commissioners is essential. Salary open. Apply to File No. 1600-V.

MECHANICAL ENGINEER required by large firm in Montreal. Applicants should have experience in the pulp and paper industry, particularly in the design and/or operation of paper making machinery. One or two years experience desired. Salaries open. Apply to File No. 1600-V.

MECHANICAL ENGINEERS with design experience and ingenuity required for an aggressive Canadian firm manufacturing electronic and mechanical controls and instruments. Project engineers and junior engineers required. Salaries open. Apply to File No. 1609-V.

MECHANICAL ENGINEER required immediately for sales department. Large company requires the immediate services of mechanical engineer, for its sales department, preferably bilingual. This is a permanent salaried position, with well established company. State age, education and outline all experience. All replies treated in confidence. Apply to File No. 1620-V.

MECHANICAL ENGINEERS required by large manufacturing firm located one hundred miles from Montreal. Excellent opportunities for experience and promotion in time study standards department eventually leading to shop management. Apply to File No. 1621-V.

MECHANICAL ENGINEER for inspection of hydraulic turbines and associated plant equipment. Prefer at least five years shop experience. Location Southern Ontario. Apply to File No. 1630-V.

MECHANICAL ENGINEER with considerable experience for design and layout of large air-conditioning systems. Duties include supervision of engineers and draughtsmen, solution of engineering problems, development of new designs and methods, analysis of field investigations; investigations, designing and report writing. Apply to File No. 1630-V.

MECHANICAL ENGINEER required to introduce French equipment in Canada; various machine tools and instruments. Applicant should be English speaking with a working knowledge of French. Excellent opportunity offered. Products manufactured to Canadian and American standards. Apply to File No. 1631-V.

MECHANICAL, heating and ventilating engineer required by internationally known manufacturer of heating equipment to take over Eastern Ontario territory, out of Ottawa. The same territory for other prominent manufacturers' lines is open to the right man. Apply to File No. 1646-V.

MECHANICAL ENGINEER required in Province of Quebec with some plant experience. Duties include design and plant layout work. Apply to File No. 1648-V.

MECHANICAL ENGINEER required in Ontario. Applicant should be young and aggressive with B.Sc. Canadian university for position as service manager. Must be capable of dealing with public and of instructing men in overhaul and maintenance of diesel equipment. Apply by letter only, stating age, height, weight, marital status, military service, university, religion, business experience and enclose photograph. Apply to File No. 1652-V.

MECHANICAL ENGINEER with knowledge of industrial steam power plant design, heating system design and application of steam, air and hydraulics as applied to processes, required by large established company. 5 years or more experience desirable, location Montreal. Salary open. Apply to File No. 1655-V.

MECHANICAL ENGINEER, required by new Electric Smelting Metallurgical p'ant at Sorel, Quebec. Applicant should have considerable experience in design, construction and operation of heavy industrial plants, preferably steel. Apply to File No. 1668-V.

MISCELLANEOUS

ENGINEER required by a firm of consulting engineers in Montreal with experience in mechanical equipment for building, for work on heating and plumbing. Apply to File No. 1549-V.

ASSISTANT PRODUCTION SUPERINTENDENT, press operations required in Ontario. Applicant should be familiar with die equipment and be able to assume responsibility of a production shift consisting of two foremen and approximately eighty men. He must have a thorough knowledge of standards, production control, cost control, labour relations, etc. Apply to File No. 1559-V.

ASSISTANT PRODUCTION SUPERINTENDENT, finishing operations, required by firm with the following finishing operations on various types of steel: polishing, chromium, and buffing and be in a position to assume responsibility of a production shift consisting of four foremen and approximately one hundred men. He therefore must have a thorough knowledge of standards, production control, cost control, labour relations, etc. Apply to File No. 1559-V.

PETROLEUM ENGINEER required by large firm in Montreal. Applicant should be graduated in mechanical, or petroleum engineering and should be familiar with the design and use of well head equipment especially Xmas trees and well head pumping equipment. Salary open. Apply to File No. 1600-V.

DEVELOPMENT ENGINEER by nuclear engineering branch to do experimental and development work in the field of mechanical engineering related to the design of atomic energy reactors and associated equipment. Applicants should have an engineering degree with high academic standing and five or more years engineering development experience. Apply to File No. 1602-V.

PLANT ENGINEER, with about 2 or 3 years experience required by an industrial firm manufacturing roofing materials, etc., in Montreal. Two production engineers also required with experience in time studies, job evaluation. Salaries open. Apply to File No. 1610-V.

EQUIPMENT ENGINEER to supervise small draughting office and take responsibility for communication equipment layouts and drawings. Preferably graduate with five to ten years experience in wire communication equipment layouts and drawings. Apply to File No. 1614-V.

JUNIOR ENGINEER PHYSICIST required for varied and interesting research and design program, recent graduate, preferably with excellent academic standing. Location Montreal. Apply to File No. 1614-V.

PUMPS ENGINEER with established contacts, under 35 years, required as assistant to factory representative by leading British manufacturers of centrifugal and process pumps to prepare tenders, visit clients. Toronto area. Apply to File No. 1618-V.

FACTORY REPRESENTATIVE, experienced, under 45 years, required by leading British manufacturers of centrifugal and process pumps to develop and supervise sales in Canada. Apply to File No. 1618-V.

STRUCTURAL STEEL DETAILER required for a Maritime steel fabrication company with at least 5 years experience. State full particulars in first letter and when available. Salary open. Apply to File No. 1619-V.

GRADUATE ENGINEER OR ARCHITECT required by Montreal publishing house, with 5 to 10 years practical experience in building field for position as editor of monthly national building paper. Writing experience essential. Top flight opportunity for right man. Write giving details of background, experience and salary required to File No. 1623-V.

HYDRAULICS ENGINEER (civil or mechanical) with post-graduate study or experience for water utilization studies with foreign branch of Canadian company. Practical or teaching experience of interest. Apply to File No. 1630-V.

ENGINEER required in Ontario with about 5 years experience as estimator in general contractors office and with a knowledge of general office routine. Apply to File No. 1634-V.

SMALL WELL ESTABLISHED ELECTRICAL MAINTENANCE BUSINESS in Montreal for sale at moderate price. Excellent opportunities for expansion under progressive management. Thorough investigation invited. Apply to File No. 1635-V.

JUNIOR MECHANICAL OR ELECTRICAL ENGINEER, preferably mechanical, for engineering department of manufacturer in Montreal of temperature controls, as applied to heating and ventilating systems. Apply to File No. 1636-V.

SALES MANAGER required by firm located in Montreal. Applicant should have sales experience and a thorough knowledge of the operation of steel plants. Apply to File No. 1637-V.

ELECTRICAL AND CIVIL ENGINEERS with about 1 year experience, required by large organization in Montreal. Apply to File No. 1639-V.

MECHANICAL OR CIVIL ENGINEER required for the position of plant engineer for Montreal. Age 25 to 30 years, English speaking Canadian. Position offers better than average opportunity for applicant who is more interested in management than the practice of engineering. First few years applicant would be plant engineer with full responsibility of maintenance, product design, tooling, etc. Apply to File No. 1640-V.

PUMP DESIGNER wanted by large pump manufacturing firm in Montreal district. Excellent opportunity with wide scope for someone with initiative. Apply to File No. 1643-V.

FIRM, PRESENTLY LOCATED IN GERMANY, founded in 1908 and specializing in the design and manufacture of water treatment plants for boilers as well as for industrial purposes, wishes to contact firm or individual in Canada interested in forming a company here to use their designs for the benefit of Canadian industry. Willing to train an engineer, expenses paid in Germany. Apply to File No. 1645-V.

RATE SPECIALIST for foreign branch of Canadian company. Prefer man experienced in rate setting and retired from a hydro public utility. Duties during 2 or 3 years appointment, would be to serve as a consultant during organization of a rate department. File No. 13513. Apply to File No. 1651-V.

SCIENTIST WANTED in Ottawa, with engineering degree or science, preferably with post-graduate training in aeronautical engineering. A wide knowledge and at least 5 years experience in aeronautics is essential. The applicant must have served in the R.C.A.F., preferably in a position of responsibility in aeronautical engineering in armament work. Experience in research and development work will be considered an additional qualification. Must have ability to work well with others. Canadian citizen. Apply to File No. 1656-V.

SALES ENGINEER, for a permanent position in Toronto office. Preferably one who has had some experience in fan application work such as heating and ventilating, mechanical draughting, etc. Salary open. Apply to File No. 1657-V.

FULLY QUALIFIED structural design engineer required by firm located in Toronto. Apply to File No. 1659-V.

HYDRAULIC AND STRUCTURAL DESIGN ENGINEERS required in Ottawa. Work assignments may have to do with the development of major waterworks. Salary up to $7,500.00 depending on qualifications. For further details, write to The Civil Service Commission, Ottawa, and request information circular, 50-616. Apply to File No. 1660-V.

ENGINEER REQUIRED in Montreal full experience in the design and construction of filter plants and water reservoirs. Apply to File No. 1661-V.

MECHANICAL AND CHEMICAL ENGINEER required in paper mill located in Newfoundland. Experience is not absolutely essential, but one or two years in industry, not necessarily the paper industry, would be preferred. The applicants must be single and starting salary would be $300.00 to $325.00 a month depending on qualifications. Apply to File No. 1667-V.

ENGINEERS REQUIRED by chemical firm in Ontario; mechanicals with one to three years experience in the chemical or petroleum plant design and civil or mechanical engineer with 2 or 3 years experience in general plant construction. Apply to File No. 1669-V.

GRADUATE ENGINEER required in Ontario, with experience in design, construction, service and application of internal combustion engines, particularly diesel engines. Apply to File No. 1670-V.

PURCHASING AGENT required by internationally known manufacturer of power equipment, presently establishing a new factory near Montreal. Applicant must be capable of organizing own purchasing department to handle the purchasing of factory equipment, raw materials and prefabricated parts for the production of large and small electric power equipment, and must be familiar with Canadian market. Attractive salary offered with security and opportunity. Apply to File No. 1671-V.

ASSISTANT FACTORY MANAGER required by internationally known manufacturer of power equipment, presently establishing a new factory near Montreal. Applicant must have good technical background and extensive experience (including several years management) in the mechanical or preferably the electrical engineering field, and be familiar with labour relations, employee training, cost estimating and accounting, factory organization and maintenance, modern production methods and equipment and be preferably bilingual. Please include photograph. Apply to File No. 1671-V.

Situations Wanted

PROFESSIONAL GRADUATE ENGINEER, M.E.I.C., will work part time on production difficulties, organize production systems; improve product design; advise on heat treatment, materials; factory lay-outs; design of hydraulical and ventilation systems; finishing problems for furniture industry. Apply to File No. 140-W.

CHEMICAL ENGINEER, B.Sc. 1942, M.E.I.C. Equal knowledge of English and German, fuel technologist (petroleum and gas) 9 years experience in research and process development work, including design and operation of pilot plants; in charge of most work. Desire position with research organization, or process engineer with oil company or gas manufacturing company. Available in one month notice. Apply to File No. 1314-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., of executive calibre, is interested in becoming associated with progressive company, manuacturers of mechanical equipment or fabricators of metal products, in technical sales, production or engineering capacity. Background of over thirteen years experience includes seven years in designing, detailing, estimating and sales of metal building products plus business and general engineering. For complete details apply to File No. 1840-W.

YOUNG REGISTERED CIVIL ENGINEER with ten years army, administrative and municipal experience desires spare time employment to help him gain additional technical experience. Available Lower B.C. Mainland approximately 20 hours per week, including limited time during weekdays. Draughting and surveying assistance can be arranged. Apply to File No. 2377-W.

MECHANICAL ENGINEER, Jr.E.I.C. (McGill 1947). Age 25, married and family of two. Experience consists of four years of summer work as instrumentman on highway construction; several months as sales engineer in pumps and allied electrical equipment; one year including specialized training in fire inspection work for United States fire insurance company. For the past two years have been a full partner in a road building outfit in Western Canada. Desires permanent position where responsibility, organization and sales ability are important qualifications. Starting salary and location are secondary factors. Available immediately. Apply to File No. 2858-W.

ELECTRICAL ENGINEER, M.E.I.C., P.Eng. Age 31, married. Electrical Engineering, Toronto; business administration, Western. Profit minded and capable. Ten productive years experience in electrical industry; broad background in manufacturing, sales and market research, on both industrial and consumer durables. Apply to File No. 2946-W.

MECHANICAL ENGINEER, M.E.I.C., Queens 1936, age 38, married. Currently engaged in research work, 2 years, desire to return to industrial or commercial field. Have had the following experience since graduation: about 10 years diversified work in plant engineering embracing — dust control, 2½ years, application of control to metallurgical processes (primary metal producers), 3 years, industrial ventilation and air-conditioning, 1 year, general plant maintenance, 3½ years; about 2 years steel forging experience in small plant covering purchase, installation, and operation of equipment. Would be available at one month's notice to present employer. Apply to File No. 2966-W.

GRADUATE DRAUGHTSMAN, designer, Jr.E.I.C., B.Eng. Desires a position in the structural design field, preferably reinforced concrete and design. Age 24, McGill (Civil) graduate 1948. Two years experience in structural steel and reinforced concrete detailing and design. Prefer employment in Montreal area, will consider good position elsewhere. Presently employed. Available on short notice. Apply to File No. 3026-W.

MECHANICAL ENGINEER, B.Sc. 1941, single, veteran of R.C.A.F. Experience in laboratory work, aircraft maintenance, design of heavy machinery with emphasis on welding and applied stress analysis. Willing to work outside Canada. Apply to File No. 3058-W.

MECHANICAL ENGINEER, 1947, Jr.E.I.C., age 26, two years of experience in maintenance and one and one-half years of experience in design and installation in industrial plants. Desires quality control or industrial engineering work in Montreal. Apply to File No. 3208-W.

ELECTRICAL ENGINEER, M.E.I.C., P.Eng. Six years experience in design, manufacturing, sales and application engineering, including electronic test equipment design, manufacture of public address equipment, preparation of sales information and technical writing, application of motors, controls, transformers, switchgear, etc. Desires permanent position in power field, in design, operating or application engineering, not sales. Aims to advance into management or advisory engineering. Location preferred, Southern Ontario or British Columbia. Apply to File No. 3326 W.

MECHANICAL ENGINEER, S.E.I.C., graduate N.S.T.C. 1950. Veteran, married, age 24. One summer's experience in petroleum industry. Available immediately. Willing to work anywhere. Apply to File No. 3356-W.

MECHANICAL ENGINEER, Toronto 1946, Jr.E.I.C., A.S.M.E., A.S.H., P.Eng. Age 28 years, married. Desire a position in production engineering where initiative is required to overcome production difficulties and cut down production costs. Presently employed as engineer in charge of production and development but wish to change for better position where all out effort is appreciated. Past experience includes 4½ years of 2 cycle gasoline engine design and subsequent supervision of production tooling, gauging routing, etc. Familiar with production processes involving ferrous and non-ferrous alloys, and production machines. Would prefer location in Ontario. Apply to File No. 3361-W.

ADMINISTRATIVE SUPERVISOR, B.A.Sc. in metallurgy (hon.) M.E.I.C. Presently employed in chemical production. Ten years experience in production and fabrication of chemical and metallurgical products. Seeks position as managerial assistant in a smaller center. Apply to File No. 3362-W.

MECHANICAL ENGINEER, S.E.I.C. 1950, Nova Scotia Technical College. Age 27, single, in good health. R.C.N.V.R. veteran. Experience: Six months office clerk, 18 months machinist apprentice, also three smummers in large steel plant. Will work anywhere in Canada or U.S.A. Available immediately. Apply to File No. 3363-W.

MECHANICAL ENGINEER, M.E.I.C. now fully employed in Montreal, desires part time work at home, evenings and weekends. Ten years varied experience at draughting, designing and estimating of plate and machine work. Apply to File No. 3367-W.

PRESTRESSED CONCRETE SPECIALIST, B.Sc., A.M.I.C.E., M.Soc., C.E. (France), British ex R.E.M.E. Captain, bilingual. Experience Britain, France, Switzerland, Spain, Egypt. Arriving Canada New Year, invites offers now. Apply to File No. 3368-W.

VIL ENGINEER, M.E.I.C. 17 years experience in the design of industrial buildings, oil refinery plants, reinforce concrete: bridges, jetties, heavy foundations, shell roofs and domes, etc., desires part time work. Apply to File No. 3369-W.

OCESS ENGINEER, M.E.I.C. chemical and metallurgical. Extensive experience in metal-working industry in both production and development. Desires senior position in technical or administrative field. Apply to File No. 3374-W.

ECTRICAL AND MECHANICAL ENGINEER, B.Sc., M.I. Mech E., M.I.E.E., A.M.I.C.E., seeks employment in Canada as from May next. Aged 47, married, three children. Experience include oil-field electrification, consulting engineering, govt. inspection, operation and management of hydro-electric undertakings, valuation. Recently in India visiting all hydro-electric schemes on behalf of major oil company. Present annual salary equivalent to $9,000.20 basic $12,000.00 with allowances. Available near Halifax early May. Apply to File No. 3378-W.

ETALLURGICAL ENGINEER, M.E.I.C., P.Eng. (Ontario). Age 35, married, located in Toronto, desires sales post leading to administrative position in metallurgical or allied field. Ten years experience in industry includes technical control, process and methods application in light manufacturing, production supervision and administration. Currently employed in consulting capacity contacting industry throughout Ontario. Available after reasonable notice to present employer. Apply to File No. 3381-W.

IVIL ENGINEER (B.E.N.Z.) 32, married, ex-service pilot. Experience in railroad, hydro-electric, highway, and airdrome construction, water supply, sewage disposal work. Also some experience in structural design and mechanical workshops. Seeks employment with consulting or structural engineers construction company, or Federal or Provincial organization. Presently in charge of airport project, available in mid-January. West Coast location preferred, but go anywhere. 2½ years experience of Canadian conditions. Expect to obtain Canadian registration at early date. Apply to File No. 3382-W.

CIVIL ENGINEER (Toronto 1949) P.Eng. Age 30. Married. R.C.A.F. veteran. Experience in hydraulic, hydrologic and hydroelectric fields including soil and foundation exploration, power and economic studies, flood control, and specification writing. Desires position in similar field. One month notice required to present employer. Apply to File No. 3383-W.

CIVIL ENGINEER, S.E.I.C., B.A.Sc., Toronto University, 1949, married, age 25, at present employed in London, Ontario. Desire permanent employment with opportunity for advancement. Experience in surveying, light construction work, draughting and general engineering duties. Willing to work anywhere in Canada but continuous travelling not desirable. Apply to File No. 3384-W.

METALLURGCAL ENGINEER, S.E.I.C. Graduate of 1950, McGill. Age 26, veteran, single. One year of practical experience in steelmaking with electric furnaces. Desire position leading to responsibility. Quite willing to work outside of country if so desired. Available on short notice. Apply to File No. 3385-W.

CIVIL ENGINEER, P.Eng. of Ontario, U.N.B. 1949. Age 30, married, with car, desires a position with an engineering and general contracting firm in southern Ontario. Have had 4 years experience in construction work as labourer, timekeeper, foreman, field engineer, estimator, and owner's representative. Presently situated in southern Ontario. Available on reasonable notice to present employer. Apply to File No. 3386-W.

GRADUATE ENGINEER, M.E.I.C. Married. Approximately 14 years industrial plant and construction experience including positions as resident construction engineer and plant engineer. At present employed and would consider changing only if offered a similar or better position with suitable opportunity for advancement. Apply to File No. 3387-W.

SENIOR PRODUCTION ENGINEER, M.E.I.C., of internationally famous engineering concern would like to assist small or medium size engineering firm in Montreal area in quickly clearing up design, production, or estimating difficulties Available Saturdays or evenings. Temporary assignments considered. 10 years wide experience, fully qualified. Apply to File No. 3392-W.

MECHANICAL ENGINEER, S.E.I.C. Graduated with honours from U.B.C. in May, 1950. Age 24, single and in good health. At present employed in non technical work in Ontario receiving supervisory training. Would like design development on research work anywhere in Canada. Available on short notice. Apply to File No. 3395-W.

ELECTRICAL ENGINEER, honours degree, A.M.I.E.E., M.A.I.E.E. 10 years experience world famous electrical manufacturing company wishes permanent position anywhere in Canada. Very adaptable having broad range of interests. At present in Great Britain. Available early 1951. Apply to File No. 3396-W.

ELECTRICAL ENGINEER, S.E.I.C. Graduated University of Alberta, 1950. Veteran, age 29; married, no children, desires permanent position anywhere in Canada. Have Naval electrical experience and training (E.A. 3rd Class) also experienced in electrical servicing. Have good technical background and excellent personality records. Available immediately. Apply to File No. 3403-W.

CIVIL ENGINEER, Jr.E.I.C. 31 years, B.A.Sc. Toronto, 43. 7 years experience in industrial and housing construction both in field engineering and job supervision. Desire position in Southern Ontario in construction or related industry. Apply to File No. 3404-W.

GRADUATE CIVIL ENGNEER, M.E.I.C., P.Eng. (Ont.) Age 38, married, family 2. Experience includes 10 years mining and 6 years pulp and paper covering—construction, plant engineering and design. Presently employed as assistant resident engineer. Ontario or Quebec province preferred. Available on reasonable notice. Apply to File No. 3409-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., age 25, five years experience in highway and bridge construction. Presently employed but desires position with more varied experience. Am interested in any type of engineering and will work anywhere. Available in three weeks. Apply to File No. 3411-W.

Attention, Members

Please telephone in advance and make an appointment if you propose using the Institute's Employment Department.

This will result in a better service to everyone concerned.

TELEPHONE PLATEAU 5078

Except in special cases all interviews will be arranged between the hours of 9 and 12.

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Reviews — Book Notes — Abstracts

BOOK REVIEW

CONTEMPORARY STRUCTURE IN ARCHITECTURE:

Leonard Michaels. New York, Reinhold, 1950. 240 pp., illus., $10.00. Reviewed by J. Morrow Oxley, M.E.I.C., F.R.A.I.C.

This book is a plea and a stimulant to both architect and engineer for a closer co-ordination, in the conception of a building or project to fulfill a given need, and co-operation in its execution.

To quote in part from the "Foreword" by Eric Mendelsohn, "Recent developments in the knowledge of steel and reinforced concrete have confirmed the visions of the structural and architectural pioneers of contemporary building. Both POST and BEAM (the ancient static principal) and BUTTRESS and VAULT (the medieval dynamic principal) are being superseded by the elastic principal of continuity of our time . . . This is the structural meaning of "organic" architecture.

To take his rightful place in this creative art, the Engineer, beyond his scientific computations, must be as sensitive to form as the Architect to structure — the only way for structure and form to challenge each other."

The development of the author's theme in Section I — CONTEMPORARY STRUCTURE — starts with the one dimensional elements of the post and beam (the skeleton frame), and leads through the two dimensional structural slab (horizontal or vertical) to the three dimensional shell (space-frame or dome).

The invention of a durable material strong in tension was the first step in freeing the builder from the limitations imposed by lack of continuity. Steel, developed as an economically practical material near the end of the last century, for use in structural shapes and as reinforcement for concrete, enabled that step to be taken. Simpler, more direct methods of stress analysis, applicable to steel, concrete, timber or aluminum, and the use of welding for steel, and split ring connectors and glueing for timber, have all increased the scope of design for continuity, until it is accepted as a matter of course for any important structure to-day.

The first sixty-nine pages deal chiefly with single storey structures composed of linear elements (beam and column, rigid frame, vierendeel truss, cantilever, arch) but include a few examples of multistorey frames, space frames and rotational structures.

Each of the principal structural materials — steel, concrete, and timber, is illustrated by numerous examples in a variety of forms, and is followed by a discussion of applicability and, in some cases, of economic factors.

All of the standard types are shown as well as some of rather special design such as that applied on an all welded frame for a factory at Waltham Cross, England.

THE HORIZONTAL INFILLING — floor and roof slabs, is discussed and illustrated in nine pages dealing with one-way and two-way systems of poured in place, pre-cast and combination methods of using reinforced concrete, and of diagonal grids of light steel sections.

Section I — Part 2 — BEYOND THE SKELETON FRAME to quote "the realization of continuity and mutual support in framing members lends itself to an ultimate fusion in which the frame is transformed into an elastic diaphram or slab . . . This development is of the greatest significance in the spanning of space . . .

Examples of arches, flat slabs, and slab-bands are shown followed by FOLDED SLABS and the STRUCTURAL SHELL.

Section II — STRUCTURE IN ARCHITECTURAL DESIGN — opens with the statement that "The divorce of engineer and architect in the nineteenth century displaced structure from its traditional place in architectural evolution, and it is only in recent years that pioneer work has shown the way in which contemporary structural development can form the basis of a new and vigorous architecture."

This theme is discussed under the headings of Plan, Section, Massing, Structural Form and Expression, and many examples of its application are illustrated.

The APPENDIX in twenty-seven pages describes Contemporary Structural Materials in a brief survey of Steel, Reinforced Concrete, Timber and Aluminum Alloys. It covers, for each material, an historical note, structural characteristics, jointing and assembly, development in application, and trends for the future.

As the author says, the architect to-day, being remote from the manufacture of the materials from which his buildings are made, must come to terms with the situation by a close understanding of that factor which governs the realization of structural creation — the nature of available materials.

Throughout the book the illustration by photograph and explanatory diagram is comprehensive, giving examples of practically all types of modern building structure, and a few that are yet only ideas but nevertheless tend to stimulate thought.

This volume will be valuable to all engineers who are concerned with structural design for buildings, and to all students who look forward to an intelligent interest in the subject.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Architects' and Builders Size Book:
H. M. Tansley. London, Newnes, 1950. 206 pp., illus. 17/6.

Australia, 1950:
Melbourne, United Press, 1950. 800 pp., illus., $3.25.

Basic Electrical Measurements:
M. B. Stout. New York, Prentice-Hall, 1950. 504 pp., illus., $7.75.

Chemical Thermodynamics:
I. M. Klotz. New York, Prentice-Hall, 1950. 369 pp., illus., $6.00.

De re Metallica:
Georgius Agricola. New York, Dover, 1950. 638 pp., illus., $10.00.

Design of Electrical Apparatus: 3rd ed.:
G. H. Kuhlmann. New York, Wiley, 1950. 512 pp., illus., $8.45.

Electric Circuit Theory:
H. Tropper. Toronto, Longmans, Green, 1949. 164 pp., illus., $3.00.

Electromagnetic Waves and Radiating Systems:
E. C. Jordan. New York, Prentice-Hall 1950. 710 pp., illus., $10.00.

Encyclopedia on Cathode-ray Oscilloscopes and Their Uses:
John F. Rider and Seymour D. Uslan. New York, Rider, 1950. 982 pp., illus., $9.00.

Engineering Hydraulics:
Hunter Rouse. New York, Wiley. 1950. 1039 pp., illus., $15.00.


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Non-members may consult the library, but may not borrow material.

Fundamentals of Acoustics:

L. E. Kinsler. New York, Wiley, 1950. 516 pp., illus., $6.00.

Illustrating for Tomorrow's Production:

J. H. Farmer. Toronto, Macmillan, 1950. 203 pp., illus., $5.75.

Industrial and Safety Problems of Nuclear Technology:

M. H. Shamos. New York, Harper, 1950. 368 pp., illus., $4.00.

Interplanetary Flight:

A. C. Clarke. London, Temple Press, 1950. 164 pp., illus. 8/6.

Life of an American Workman:

Walter P. Chrysler. New York, Dodd. Mead, c1950. 219 pp., $3.00.

Low-temperature Properties of Ferrous Materials:

New York, Society of Automotive Engineers, 1950. 97 pp., illus., $2.00 to SAE members, $4.00 to non-members.

Neue Theorie des Stahlbetons: 3rd ed.:

Rudolf Saliger. Vienna, Verlagsbuchhandlung Franz Deuticke, 1950. 135 pp., illus., $2.80.

Pattern Making:

J. G. Horner. Toronto, Ambassador Books, 1950. 390 pp., illus., $4.50.

Phenolic Resins — Their Chemistry and Technology:

P. Robitschek and A. Lewin. London, Iliffe, 1950. 261 pp., illus., $6.75.

Problems in Engineering Drawing:

J. M. Arnold. New York, Prentice-Hall, 1950. $4.35.

Problems in the Theory of Viscous Compressible Fluids:

Lagerstrom. Pasadena, Durand reprinting committee, 1950. $2.00.

Process Heat Transfer:

D. Kern. Toronto, McGraw-Hill, 1950. 871 pp., illus., $9.50.

Reviews of Petroleum Technology, v. 9, 1947:

London, Institute of Petroleum, 1950. 340 pp., 27s 6d.

Secretary's Handbook, 7th ed.:

Sarah Augusta Taintor and Kate M. Monro. Toronto, Macmillan, 1950. 573 pp., $4.00.

Snow Melting:

T. N. Adlam. New York, Industrial Press, 1950. 224 pp., illus., $4.50.

Television:

Princeton, Radio Corporation of America, v. 5: 1947-1948, 461 pp., illus., $2.50; v. 6: 1949-1950, 422 pp., illus., $2.50.

Television Servicing:

W. H. Buchsbaum. New York, Prentice-Hall, 1950. 340 pp., illus., $5.35.

Tool Engineering:

L. E. Doyle. New York, Prentice-Hall, 1950. 499 pp., illus., $6.35.

Transit Modernization and Street Traffic Control:

John Bauer. Chicago, Public administration service, 1950. 271 pp., $5.00.

Transmission Lines and Filter Networks:

J. J. Karakash. Toronto, Macmillan, 1950. 413 pp., $6.00.

Ultra High Frequency Engineering:

T. L. Martin. New York, Prentice-Hall, 1950. 456 pp., illus., $8.00.

Walls and Wall Facings:

Denzil Nield. London, Spon, 1949. 276 pp., illus., 18s.

TECHNICAL BULLETINS, PAMPHLETS, ETC.

Aluminum Company of Canada. Publications:

Use of aluminum bus conductor. Bus conductors and fittings. Price list No. 5.

American Society for Engineering Education. Publications:

Research is learning.

Association of Professional Engineers of Saskatchewan. Membership Lists:

Membership list 1950.

Bituminous Coal Research, Inc. Reprints:

Coal, by H. J. Rose. (From Encyclopedia of Chemical Technology, v. 4).

British Society for Research in Agricultural Engineering. Publications:

Crop drier engineering development abstract 1. Reprints of tests No. 1-3, 5-27.

British Welding Research Association. Recommendations:

No. T. 23—Recommendations for the metal arc welding of butt welds in steel pipelines for power plants. No. T. 26—Recommendations for the design and fabrication of arc welded structural steelwork, built-up girders and compression members.

Canadian Chamber of Commerce. Publications:

Policy declarations and resolutions of the Canadian Chamber of Commerce.

Canadian Potteries Ltd. Publications:

Consolidated pocket book of roughing-in dimensions.

Engineering Societies Library. Bibliographies:

No. 6—Bibliography on non-metallic bearings. No. 7—Bibliography on domestic and industrial applications of solar heating.

Institute of Metals. Reprints from the Journal of the Institute of Metals:

No. 1253—Corrosion and related problems in sea-water cooling and pipe systems in H.M. ships.

North East Coast Institution of Engineers and Shipbuilders. Papers:

A preliminary investigation of the discrepancies between the calculated and measured wavemaking of hull forms, by John R. Shearer.

U.S. Department of the Interior. Engineering Monographs:

No. 5—Soap lake siphon, by Robert Sailer.

...Structural Research Laboratory Reports:

No. SP-26—An analysis of the stress distributions in and near stress gages embedded in elastic solids.

...Hydraulic Laboratory Reports:

No. Hyd.-245—Hydraulic model studies of the cedar bluff dam outlet works regulating gate and stilling basin — Cedar bluff unit — Missouri river basin project. No. Hyd.-282—Field tests to study the pressure variation induced by wave action on the Miter gate leaves of the bucket caisson drydock at Grand Coulee dam — Columbia basin project.

...Materials Laboratories Reports:

No. C-517—Effect of iron concretions selected from Bixby dam aggregate on the durability of concrete. No. c-524—Laboratory tests of the effect of hot water and air-entrainment agent requirements of concrete mixes.

U.S. Highway Research Board. Current Road Problems:

No. 13-R—Use of air-entrained concrete in pavements and bridges.

...Bulletins:

No. 24—Requirements for off-street automobile parking facilities in zoning or other local ordinances. No. 25—Controlled access expressways in urban areas.

BOOK NOTES

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.S.T.M. PUBLICATIONS:

.merican Society for Testing Mateials, 1916 Race Street, Philadelphia, ennsylvania:

Bibliography and abstracts on electrical contacts, sixth supplement to. 28 pp., 75c.

This supplement lists written material n recent work done in various parts of ie world. Of particular note is some work n the fundamental physics of contact pplication.

Electron microstructure of steel. 50 pp., $1.35.

Among other features, this report inludes 47 specially prepared figures contituting electron micrographs of various teel constituents. It is printed on special aper to bring out the details of the microraphs.

Standards on plastics. 624 pp., $4.85.

This fifth edition presents in convenient p-to-date form some 120 A.S.T.M. specications and test methods covering a wide ange of plastics and related materials. he compilation includes 11 recommended ractices. In addition there are definitions f terms relating to plastics; descriptive omenclature of objects made from plasics; and code for designating form of maerial. The methods of test cover the ollowing properties of plastics: strength, ardness, thermal and optical properties, nd permanence.

Symposium on turbine oils. 56 pp., $1.50.

This is a review of past progress and uture problems in the field of turbine ubrication. Inhibited turbine oils are iscussed, together with their selection and ests to determine the remaining useful ife of such oils when they have already een used.

BRITISH STANDARDS:

British Standards Institution, 24-28 Victoria St., London, S.W.1.

B.S. 240; Part 2, 1950—Steel balls for Brinell hardness testing, 2/-.

Specifies the hardness of balls used in carrying out the tests, and having diameters of 10, 5, 2 and 1 mm. Also gives pecifications concerning the two methods of testing, namely: the diamond pyramid ardness test, and the reciprocal pressure est.

B.S. 1675: 1950—Weft pirns (paper fit) for direct spinning of cotton.

Gives basic dimensions for weft pirns manufactured from wood, light alloys or plastic materials for spinning, on the ring frame, cotton yards onto pirns for direct use in the shuttle of non-automatic of shuttle changing automatic looms.

DECAY OF TIMBER AND ITS PREVENTION:

K. St. A. Cartwright. Brooklyn Chemical Pub. Co., 1950. 294 pp., illus., $7.50.

Originally prepared by the British Government Forest Products research laboratory, this book appeared in three separate parts: Decays affecting oak, 1936; softwoods, 1938; British hardwoods, 1942. This material has since been revised, with additions, and published by permission of H.M.S.O. by Chemical Publishing Co.

The inestimable value of this book lies in the fact that its information comes from Scientific research in almost every part of the globe. Different types of decay are treated, the resistance to decay of various composite wood materials discussed and factors responsible for the natural durability of timber is described.

Wood preservatives and methods for their application, as well as staining of timber by fungi and methods for its prevention are considered.

Anyone either doing research work on timber preservation, or actually involved in the storage of wood material will find this a valuable addition to their book shelf.

DESCRIPTIVE GEOMETRY ESSENTIAL PRINCIPLES AND APPLICATIONS FOR STUDENTS OF ENGINEERING AND ARCHITECTURE. 3rd ed.:

Floyd A. Smutz and Randolph F. Gingrich. New York, Van Nostrand, 1950. 142 pp., illus., cloth, $3.90.

In this text, an attempt has been made to include the methods and theories that are required of a draftsman and to exclude much of the material that is purely mental gymnastics. At the risk of being monotonous through repetition, all the problems of the text are stated, analysed, and solved. A sufficient number of exercises for class assignment have been included to make it possible to carry several similar courses without duplication of assignments.

DIESEL ENGINE FUELS AND LUBRICANTS:

Edward Wright and H. F. Purday. London, Constable, 1950. 153 pp., illus., cloth, $3.00.

Whilst improvements to Diesel engine fuels and lubricants have been achieved with the help of all the resources of modern science, this book does not intend to be a scientific treatise. Its aim is practical — namely, to serve as a handy reference for the use of engineers and managers in charge of Diesel engines. The authors have tried to include enough information on the chemistry and physics of fuels and lubricants to facilitate mutual understanding between Diesel-engine users and oil suppliers.

ELECTRIC RESISTANCE WELDING. A PRACTICAL GUIDE TO SPOT; SEAM, PROJECTION, AND BUTT WELDING METHODS:

H. Butler. London, Newnes, 1950. 182 pp., illus., cloth, 17/6.

This book surveys the various electric resistance welding processes and their applications to engineering manufacture. A chapter has been devoted to each of the main processes mentioned in the title. Chapters 2 and 3, in addition, are devoted to the various types of control gear, while Chapter 5 deals with the specially important subject of light alloy welding.

EXAMINATION OF WATER AND WATER SUPPLIES (Thresh, Beale and Suckling), 6th ed.:

E. W. Taylor, rev. London, Churchill, 1949. 819 pp., illus., 70/-.

Assuming the public to be entitled to "a water supply which, besides being safe, is also of high 'aesthetic' quality, being reasonably soft, clear and bright in appearance and free from taste and odour", Mr. E. W. Taylor now presents his findings in this sixth revision of the original volume by Messrs. Thresh, Beale and Suckling.

Special attention has been paid to sources of water supply, gathering grounds and underground supply, and the increasing importance of biological considerations.

Chapters rewritten from former editions to keep pace with recent additions to our knowledge include those on water-borne disease, bacteriology of water samples, and disinfection of water supplies.

Format and presentation of information has been kept as uniform as possible with former volumes, which will be familiar to many of our readers.

PHYSICAL MECHANICS. AN INTERMEDIATE TEXT FOR STUDENTS OF THE PHYSICAL SCIENCES:

Robert Bruce Lindsay. New York, Van Nostrand, c1933. 436 pp., illus., cloth, $6.50.

The present work is intended to serve as an intermediate text suitable for students who have had a year of general physics and the two-year course in general college mathematics now customary for students intending to concentrate in the physical sciences. The material presented includes not only particle dynamics and statics with an introduction to rigid bodies, but also enough of kinetic theory, elasticity, wave motion and the behavior of fluids to justify the title.

THEORY AND DESIGN OF GAS TURBINES AND JET ENGINES:

E. T. Vincent. New York, McGraw-Hill, 1950. 606 pp., illus., cloth, $9.75.

This book has been written to provide a text in the field of gas turbines in which the theory and practical application of that theory to specific design problems are included. The presentation is in such a manner that a senior undergraduate or graduate student should be capable of solving an average design problem in a reasonably workable manner. In this text an effort has been made to bring the aerodynamic and "gas dynamic" problems down to a point where the general engineering student without aeronautical background can understand the main problem involved.

WORKS MANAGEMENT AND ORGANIZATION:

P. S. Houghton. London, Spon, 1950. 269 pp., ilus., 25/-.

There arises in every establishment the need for careful planning of the whole organization, so that instead of "just growing" it will develop according to plan, function smoothly with the minimum of expenditure and energy. Thus waste, in its many forms, is subjected to a strict control. The purpose of this book is to help the chief personnel in making a careful study of the basic principles underlying successful management. The methods or procedure described are typical of the modern well conceived practice.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

CAPACITORS FOR INDUSTRY:

By W. C. Bloomquist, C. R. Craig, R. M. Partington and R. C. Wilson. John Wiley & Sons, New York, 1950. 246 pp., illus., linen, $4.50.

Of interest to industrial plant engineers and electricians, utility power salesmen, consulting engineers, and industrial power application engineers, this book provides practical capacitor application data in tabular and curve form. In most cases, the answer can be obtained directly without the solution of the right triangle or the use of complex algebra. Numerous examples are included illustrating the use of data and, where necessary, the step-by-step procedure for the solution of practical problems.

ELECTRICAL ENGINEERS' HANDBOOK, Electric Communication and Electronics. (Wiley Engineering Handbook Series.)

Edited by H. Pender and K. McIlwain. 4th ed. John Wiley & Sons, New York, 1950. Sections separately paged, illus., $11.05.

The new edition of this standard handbook, prepared by seventy-eight specialists, is entirely rewritten to reflect the rapid widening of the electronics field. In particular, frequency modulation and all the pulse techniques in both the communication and radar fields are now covered for the first time as are radio aids to navigation. The range of topics covered is demonstrated in the section headings which include mathematics and symbols, properties of materials, electron tubes and circuit elements, electrical instruments and measurements, acoustics and acoustical devices, optics and optical devices, telephony, telegraphy, television, and medical applications of electricity.

ELEMENTARY THEORY AND DESIGN OF FLEXURAL MEMBERS:

By J. Vawter and J. G. Clark. John Wiley & Sons, New York; Chapman & Hall, London, 1950. 215 pp., illus., cloth, $4.00.

Appropriate for an elementary design course, this text presents the basic theory of flexure as applied to the design of members in bending. Although separate chapters treat the use of different materials, emphasis is placed on the fact that the same basic laws govern any of the common structural materials. Certain peculiarities of the various materials are also taken into consideration. Illustrative examples and problems are incorporated in each chapter.

ENGINEERING ECONOMY:

By H. G. Thuesen. Prentice-Hall, New York, 1950. 501 pp., illus., cloth, $6.65.

The importance of considering thoroughly the economic as well as the technical aspects in the solution of engineering problems is stressed throughout the book. To this end the several chapters deal with the basic mathematical factors, the treatment of estimates, various kinds of costs and accounting methods, bases for comparison or alternatives, evaluation of replacements, economy of operations, utilization of personnel, and the application of engineering economy studies to public activities. Illustrative numerical examples are extensively used.

FOUNDATIONS AND AERODYNAMICS:

By A. M. Kuethe and J. D. Schetzer. John Wiley & Sons, New York, 1950. 374 pp., illus., linen, $7.48.

Stressing an understanding of basic concepts, this book treats perfect, viscous, and compressible fluid flow theory with applications to problems in aeronautics and other fields of engineering. Among the topics discussed are thin airfoil and finite wing theory, one dimensional flow, flow around wings, shock waves, laminar and turbulent boundary layers, turbulence and transition. No previous knowledge of aerodynamics is assumed, but undergraduate physics and mathematics through advanced calculus are required. Problems are grouped in sections at the end of the text.

FOUNDATIONS OF STRUCTURES:

By C. W. Dunham. McGraw-Hill Book Co., Toronto, 1950. 679 pp., illus., linen, $9.10.

Written for civil engineering students, this book discusses in considerable detail the planning and dimensioning of foundations encountered in ordinary engineering practice. It shows how to obtain and interpret data regarding soils, how to plan the support of a structure upon them, and how to devise means for the construction of the foundation. A wide variety of foundation problems is illustrated, and there is an extensive treatment of bridge piers and abutments.

HIGHWAY ENGINEERS' POCKET BOOK:

By F. G. Royal-Dawson. E. & F. N. Spon, Ltd., London, W.C.2, 1950. 113 pp., illus., cloth, 12s. 6d.

Technical data are provided for the design and lay-out of all types of roads which will be used by fast traffic. The book contains all the essentials of the theory of transition curves based on the lemniscate curve, and includes tables from which direct results can be obtained for both horizontal and vertical curves.

INDUSTRIAL ACCIDENT PREVENTION:

By H. W. Heinrich. 3rd ed. McGraw-Hill Book Co., Toronto, 1950. 470 pp., illus., cloth, $6.05.

Placing special emphasis on the human factor in safety work, this book provides full coverage from fundamentals through specific methods and devices to the setting up and carrying out of full-scale safety programs. New chapters on motor-vehicle fleets, supervision, personal protective devices, and a short-form safety course are included in this edition. New material is also added to the sections on accident hazards and production faults, supervisory control of employee performance, and cause analysis of boiler and machinery accidents.

INSTALLATIONS ELECTRIQUES A HAUTE ET BASSE TENSION, Volume II. (Electrotechnique Appliquée):

By A. Mauduit. 2nd ed. Dunod, Paris, 1950. 1302 pp., illus., fabrikoid, 4,850 frs.

This second volume of a two-volume set provides a full treatment of both theory and practice in connection with switches, interrupters, circuit-breakers, and relays of various types. The problem of line protection is discussed with detailed consideration of overcurrents and overvoltages. The practical operation of distribution systems is described, dealing with the central station, sub-stations, and overhead lines. The final chapter is devoted to system stability, interconnection, costs and rate-setting. The two volumes together provide coverage of both low- and high-tension installations.

LINEAR INTEGRAL EQUATIONS:

By W. V. Lovitt. Dover Publications, New York, 1950. 253 pp., diagrs., tables, 8¼ x 5½ in., linen, $3.50.

The general theory of linear integral equations is presented in a systematic manner together with applications to differential equations, calculus of variations, and some problems in mathematical physics. The discussion is purposely confined to those equations which are linear and in which a single integration occurs. This edition is a reprint of a 1924 book which has been out of print for some time.

REFRIGERATION ENGINEERING:

By H. J. Macintire and F. W. Hutchinson. 2nd ed. John Wiley & Sons, New York, 1950. 610 pp., illus., linen, $6.50.

This revised, modernized and expanded edition provides basic data on the essential principles of refrigeration, and includes recent advances in commercial machinery. Eight new chapters, over 70 illustrative figures, more than 30 full-page graphical solutions, and 160 new problems are provided. The new material covers the topics of reversed cycle theory, analysis of transient phenomena, the heat pump, and radiation effects in determination of equilibrium cold-storage temperature.

STRUCTURAL THEORY:

By H. Sutherland and H. L. Bowman. 4th ed. John Wiley & Sons, New York, 1950. 394 pp., illus., linen, $5.00.

Emphasizing structural stress analysis, this book serves as an introduction to the basic concepts of structural theory which relate to trusses, rigid frames, and space frames. Major revisions in this fourth edition occur in the chapters dealing with slope and deflection, and with rigid frames. New material is included on the solution of compound trusses by means of the Williot-Mohr diagram, fixed points in continuous beams, and on members of varying moment of inertia. The treatment of the Norris Method is expanded.

SURVEY OF MODERN ELECTRONICS:

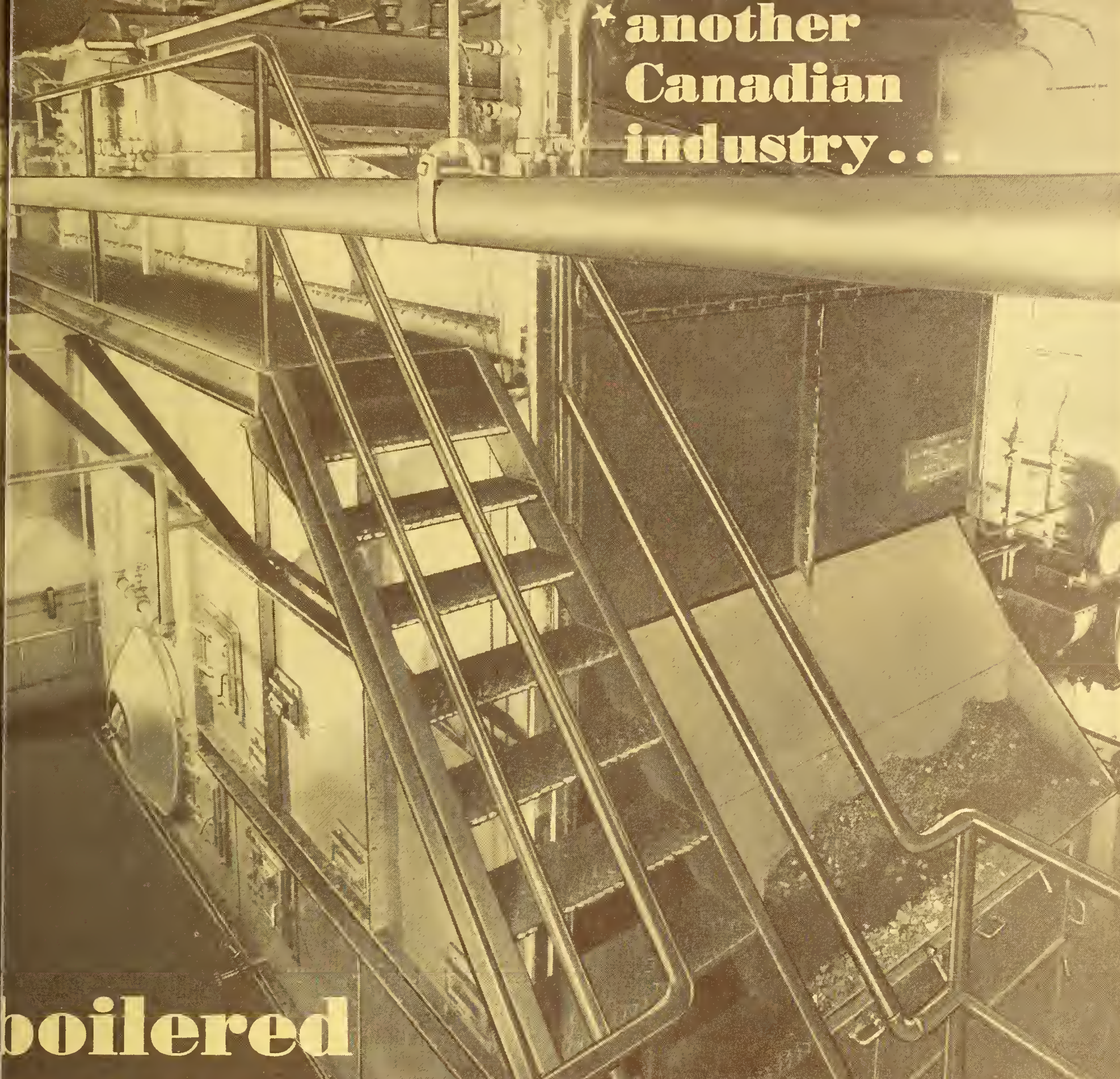
By P. G. Andres. John Wiley & Sons, New York, 1950. 522 pp., illus., cloth, $5.75.

Providing a descriptive rather than mathematical treatment, this book explains the fundamentals of electronics and provides a summary of applications. It is intended as a text for a short course in electronics for non-electrical engineering students. The basic principles of construction, operation, and application of electron tubes are stressed. A knowledge of elementary physics, d-c fundamentals, and some a-c fundamentals is assumed. General references are included in the appendix, and specific references and problems are placed at the end of the chapters.

THEORY OF FLOW AND FRACTURE OF SOLIDS, Volume I:

By A. Nadai. 2nd ed. McGraw-Hill Book Co., Toronto, 1950. 572 pp., illus., cloth, $13.00.

Emphasizing mathematical principles and mechanical laws governing flow and fracture, this book is the first of a two-volume revision of the author's earlier work, "Plasticity". The scope of this edition is broadened by a survey of the general conditions causing fracture in materials and by a discussion of some of the details and results of research on the yielding and fracture of ductile metals under combined stress. The second volume is to deal with applications of the principles set forth in Volume I.



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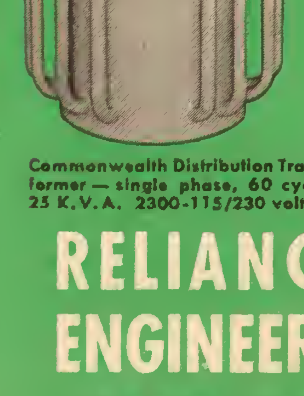

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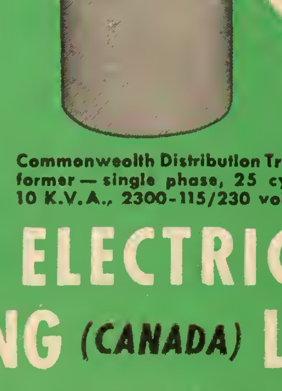

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Business & Industrial Briefs

A Digest of Information

received by

The Editor

Appointments and Transfers

I. A. Leishman.—M. A. Leishman has een appointed chief engineer, of the lamilton Works of the Steel Company f Canada Ltd. Mr. Leishman was ormerly the Company's electrical en-ineer.

●

. D. Elmhirst.—A. D. Elmhirst is now ıanager of the Canadian Westinghouse

A. D. Elmhirst

office at Swastika, Ontario. Mr. Elmhirst joined the company in 1929 and has served in Swastika since 1936.

●

Hackbridge New Address.—The Hackbridge and Hewittic Electric Company of Canada Ltd. now has plant and offices at Ville LaSalle, Montreal. The address is 103 Elmslie Street, Ville LaSalle, Montreal 32, Quebec.

●

Wilkinson & McClean. — Wilkinson and McClean Limited of Calgary and Edmonton have just completed arrangements whereby they will work in close collaboration with the Vancouver engineering group comprising Vancouver Machinery Depot Ltd., Vancouver Engineering Works Ltd., and Vancouver Iron Works Ltd.

E. M. Wilkinson, will be managing director of Wilkinson and McClean Ltd., Lucey Export (Canada) Ltd., and Cummins Diesel Service Co. Ltd. Allan McClean will serve as managing director of Northern Asbestos and Building Supplies Ltd. and R. F. Butler is a director and sales manager of Wilkinson and McClean Ltd.

George W. Sweny has accepted the office of president of Wilkinson and McClean Ltd. and Northern Asbestos and Building Supplies Ltd. He is also president of Vancouver Machinery Depot Limited and its subsidiaries, Vancouver Iron Works Limited and Vancouver Engineering Works Ltd. Hugh Harper has been named a director of Wilkinson and McClean Ltd. and he will specialize in the development of business with the oil and chemical industries. Donald B. Grant, who is secretary-treasurer of the Vancouver companies, will serve in the same capacity in the Alberta company.

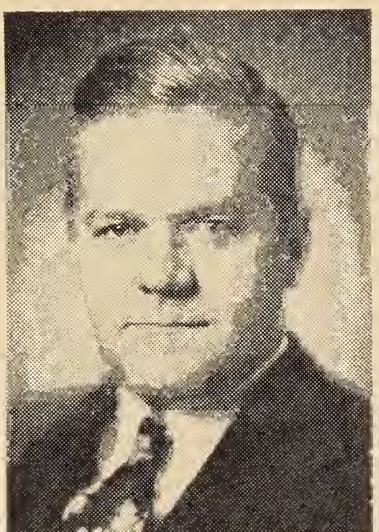
●

Stelco Appointments.—Lee T. Craig has been appointed vice-president of the Steel Co. of Canada Ltd. Mr. Craig has been associated with the Company for the past thirty years most recently in the position of general sales manager. Harry E. Stipe has been made general sales manager, Western Division. Mr. Stipe has been with Stelco for the past thirty-eight years. Before his new appointment he was assistant general sales manager.

●

K. S. Harris.—Kenneth S. Harris has been named director of the steel division of the Department of Trade and Commerce.

●



KEITH W. SHAW J. HOWARD POPE

Following a meeting of the Directors of Imperial Oxygen Ltd., December 21st, Mr. R. C. Holbrook, Company President, announced the following appointments:

Mr. Keith W. Shaw, formerly of the firm's Toronto branch, has been elected Vice-President and a Director of the Company. He will take up his new duties in Montreal.

Mr. J. Howard Pope, formerly of the Montreal Office succeeds Mr Shaw as Manager of the Company's Toronto operations.

Public Works — New Brunswick. — G. W. Cassidy has been appointed deputy minister of public works for the Province of New Brunswick. He succeeds A. W. Barbour who is now executive assistant to the minister, the Hon. W. S. Anderson.

•

Reliance Electric Appointments.—Following the establishment of Reliance Electric and Engineering (Canada) Ltd., of Welland, as successor to the Commonwealth Electric Corporation Ltd., the following appointments have been made: president, J. W. Corey; vice-presidents, J. N. Stanley and G. E. Bevis; and secretary-treasurer, C. G. Kilty. Mr. Corey is also president of the Reliance Electric and Engineering Co. of Cleveland, Ohio. Mr. Stanley and Mr. Kilty have been officers of the Canadian company since 1934. Mr. Bevis was formerly district sales manager for Reliance in Syracuse, N.Y.

•

W. M. McKie.—W. M. McKie has been appointed to the transformer division of Canadian General Electric Company's apparatus department. He will serve at the head office, Toronto.

•

Commercial Corporation Appointments.—C. A. R. Snell, of Winnipeg and Montreal, has been appointed general manager of the Canadian Commercial Corporation. He is on loan from Canadian National Railways.

W. R. Harris has been named assistant general purchasing agent. He will be succeeded as director of the emergency production allocation division by Group Captain Victor S. J. Millar, on loan from the R.C.A.F. J. M. Priddle has been appointed assistant to the managing director and C. A. Drouin is assistant to the general purchasing agent.

•

Monsanto Changes.—J. G. MacDermot of Vancouver, B.C., has been appointed assistant director of Monsanto Chemical Company's Foreign Department. He will serve in St. Louis, Mo. For a number of years he has been manager of western operations for Monsanto (Canada) Ltd., with headquarters in B.C. He will remain a member of the board of directors of the Canadian Company.

D.D. Stokes of Montreal, has been appointed manager of adhesive and resin sales in eastern Canada for Monsanto (Canada) Limited.

"Business & Industrial Briefs"

This section of the *Journal* is intended to keep readers informed on developments and changes in those business and industrial enterprises, and on new products, which affect the engineer.

If you write with respect to any of the items in this, or other sections, please mention

THE ENGINEERING JOURNAL

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Blast Cleaning.—A new bulletin "Continuous Blast Cleaning Can Reduce Your Cleaning Costs" is now available from American Wheelabrator and Equipment Corp., Mishawaka, Indiana.

The eight-page booklet explains the advantages offered by the continuous airless abrasive blast cleaning and cites actual production figures for the five sizes of Wheelabrator Continuous Tumblasts. Ask for bulletin No. 454.

●

Pump Bulletin.—Canada Pumps Limited, Kitchener, Ont., have recently released bulletin No. 976-D which covers their new line of Close-Coupled Pump units.

The pump end of these units is the new CC, CM, and CL line and can be fabricated in the standard cast iron bronze fitted construction or in special metals, as desired. The pump is close-coupled to the motor by means of a cast iron bracket designed for strength, accessibility to stuffing box, and compactness. The pump casing is bolted to the bracket in such a manner as to allow for changing the discharge in the field. The bulletin is well produced and contains valuable technical information. Ask for bulletin No. 945C.

●

Calcium Chloride and Concrete.—The Calcium Chloride Association of Washington, D.C. recently produced a bulletin "Calcium Chloride in Concreting". The publication is divided into sections—Calcium Chloride in Portland-Cement Concrete—How to use Calcium Chloride in Concrete—Practical Experiences with Calcium Chloride, Technical Abstracts and References, Specifications. Copies may be obtained through the courtesy of Brunner Mond Sales Co., Birks Building, 620 Cathcart St., Montreal, Que.

●

Tractor Tires.—Brunner Mond Canada Sales, Ltd., Birks Bldg., Montreal, have available copies of a small but highly interesting publication describing the use of Calcium Chloride for weighting tractor tires. It is claimed that the use of a calcium chloride solution in tractor tires provides better traction, less bounce, longer tire-life, non-freezing in temperatures as low as 40 deg. below zero. This little booklet will be very useful to those who are required to operate tractors under winter conditions.

●

Safety Appliance.—The complete line of Mine Safety Appliances Company's Safety Belts is described in a new 4-page bulletin. The bulletin is divided into sections describing: body-type belts, harness-type belts, bridge and structural steel workers' belts, linemen's belts, petroleum workers' belts and miscellaneous safety belts, which include

Scotchlite reflector belts and a forestry workers' belt. Copies of this new bulletin No. CF-26 may be obtained by writing to Mine Safety Appliances. Co. Ltd., 500 MacPherson Ave., Postal Station "E". Toronto, Ont.

•

Fiberglas Ducting.—Arrowhead Rubber Company, Division of National Motor Bearing Co., Inc. announces that a catalogue on Airtron, the company's line of flexible and rigid Fiberglas ducting hose, sleeves and couplings is now available.

The sixteen page manual gives the complete story on the ducting material which has enjoyed wide acceptance in industry in the few years since its development. Of particular interest to design engineers and others interested in the characteristics and performance specifications of Fiberglas ducting are the seven pages of engineering data which list, among other factors, weight, working temperature ranges, design working pressures, leakage factors, etc. For copies apply to the Arrowhead Rubber Co., Downey, California. Ask for catalogue No. 503.

•

Spray Valve.—The Farval Corporation, 3249 East 80th Street, Cleveland 4, Ohio, has just published a 4-page bulletin in which is described a new spray valve. It is claimed that by means of this valve, either grease or oil can be sprayed onto open gearing, slide surfaces, or any other area where it is desirable to apply a measured amount of lubricant at regular intervals. The valve can be operated wherever compressed air is available. Ask for bulletin No. 60, and apply to the Canadian agent: Peacock Brothers Ltd., Ville LaSalle, Que.

•

Locknuts.—The Locknuts section of Industrial Fasteners Institute, Cleveland, Ohio, has just released an 18-page two-colour bulletin describing various types of locknuts and their principles of operation. The publication is highly descriptive and well produced. For copies apply to the Institute at 3648 Euclid Ave., Cleveland, Ohio.

•

Dominion Oxygen Booklet.—A new eight-page illustrated booklet, "Powder Cutting and Scarfing Processes", is available from Dominion Oxygen Company, Ltd., 159 Bay Street, Toronto 1, Ont. The booklet describes application of these processes in the fabrication of stainless steel. Other uses discussed are the powder-cutting of heavy steel scrap and non-ferrous applications. The booklet may be obtained without charge.

•

Circuit Breakers.—The English Electric Company of Canada Ltd., St. Catharines, Ont., have just released a new leaflet describing the IAS and IBS Oil Circuit Breakers. The leaflet, No. 31.3, replaces and makes obsolete leaflet 3520 on the same subject. Copies will be forwarded on request.

•

Pickling & Washing Machine.—The B. F. Goodrich Rubber Company, of Canada Ltd., Kitchener, Ontario, offer copies of a well-produced leaflet in which is described the "B. F. Goodrich Pickling and Washing Machine", which "prepares your formed-metal products with fully-enclosed, high-pressure spray action".

It is claimed that the machine reduces man-hour costs from 30 per cent to 75 per cent and cuts pickling time up to 66 per cent. It eliminates odours, corrosive fumes, splashings, and drippings. It is rubber lined by a special B. F. Goodrich process. The machine was designed and constructed in Kitchener, Ontario, by the B. F. Goodrich Rubber Company of Canada Ltd. In association with Edward Curran, Engineering Limited, of Wales. The machines are now in operation in four Canadian industrial plants and are doing much to revolutionize the methods of treating domestic appliance parts preparatory to enamelling. Copies of a descriptive bulletin will be forwarded on receipt of written request to B. F. Goodrich Rubber Co. of Canada.

•

Building and Insulation. — Canadian Johns-Manville Co. Ltd., 199 Bay Street, Toronto 1, offer a folder "Build and Insulate with One Material". It deals with "Marinite", a sheet material composed of asbestos fibres, diatomaceous silica and an inorganic binder. The four-page illustrated folder specifically directs attention to the use of Marinite for breechings, for the construction of ovens and driers, and for the fireproofing of structural steel. Copies of the publication are available.

•

Gasoline-Burning Heaters.—Brief descriptions and specifications of the complete line of Hunter gasoline-burning cab and cargo heaters and dry-ice cargo refrigeration systems are given in a compact, 4-page, 8½-in. by 11-in., folder just published by the Hunter Manufacturing Co. It is well illustrated with photographs and drawings of various models and it also contains recommendations as to installation. Copies may be obtained from Monahan Supply Corporation, 191 Queen St. E., Toronto, Ont.

•

Fire-Fighting Equipment. — Ansul Chemical Company, Marinette, Wisconsin, offer a 4-page 2-colour folder describing their Dry Chemical Piped System, designed for total flooding and for local application. Ask for bulletin describing Dry Chemical Piped System. The dry chemical piped systems are specially recommended for the following types of hazards: paint dip tanks and spray booths, ovens, driers, oil quench tanks, flammable liquid pumping stations, transformers, diesel and gasoline engines, printing presses, loose textile stocks, oil storage tanks, flammable liquid storage rooms, marine hazards, asphalt saturators.

•

Heat-Treating Periodical.—A new publication, designed to present current technical and operating information on heat treating metallurgy and practice, has been instituted by Surface Combustion Corporation, Toledo, Ohio. This bulletin entitled "Heat Treat Review" will be published periodically by Surface Combustion and distributed to persons concerned with heat treating operations. It is intended to provide up-to-date information on heat treating processes as applied to all phases of the metal work-

ing field. To be placed on the mailing list apply on your official letterhead to the Editor, Heat Treat Review, Surface Combustion Corporation, Toledo 1, Ohio.

●

Fan Brochure.—Keith Blackman Ltd., have produced an excellent catalogue entitled "Fan Engineering Equipment". It has been designed to present, in concise but comprehensive form, the main fan engineering products of the Keith Blackman organization. These products are marketed in Canada under the brand name of "Tornado". The purpose of the catalogue is to supplement the more complete publications dealing with the individual types of fan equipment manufactured by the Company. For copies of this new publication, and of the more detailed publications communicate with Vokes (Canada) Ltd., 3801 Dundas Street West, Toronto, who are the Canadian distributing agents. Engineers residing in the vicinity of Toronto may obtain copies by telephoning Murray 7569.

●

Flame Hardening.—A new flame hardening apparatus catalogue has been announced by Air Reduction Canada Limited. Descriptions and illustrations of the latest Airco flame hardening equipment are contained in this 20 page catalogue. For copies write to Air Reduction Canada Ltd., 218 Front Street East, Toronto.

New Equipment and Developments

Canadian Expansion. — Private and public investment in Canada is estimated at $3.0 billion for 1950, an increase of $500 million over the total for 1949 and the highest level on record. The increase is in part due to a rise in construction and machinery and equipment costs, which for 1950 as a whole are estimated to be 7 per cent higher than in 1949. The remaining 7 per cent increase represents a rise in the volume of private and public investment.

Outlays on construction in 1950 are expected to reach $2.4 billion, as compared with $2.1 billion in 1949, reflecting a price increase of 8 per cent and a volume increase of 9 per cent. It is estimated that the value of machinery and equipment purchases will increase from $1.3 billion to $1.5 billion, a 10 per cent rise, consisting of a 6 per cent increase in price and a 4 per cent increase in volume.

●

New Canadian Companies.—Nearly two hundred manufacturing firms of foreign origin have been established in Canada during the last five years. 147 of these originated in the United States, 34 in the United Kingdom, and 16 in other European countries. The United States companies now in Canada employ over 10,000 persons those from Great Britain provide work for nearly 6,000, and those from other countries for between 300 and 400.

The new postwar firms are manufacturing many items which were not in production in Canada before 1946. Outstanding examples are jet aircraft, diesel locomotives, gas turbine engines, roller bearings, a variety of automobile parts, rock drill bits, and new types of electronic equipment.

●

Solvents Service.—Dow Chemical of Canada Ltd., 204 Richmond Street West, Toronto 1, have announced the establishment of a technical service in synthetic solvents. The service is designed to assist factory management in obtaining more efficient and more economical use of chlorinated solvents in metal degreasing or dry cleaning. The service includes cost analysis of cleaning methods, planning production flow charts, suggestions on equipment maintenance and operating procedures, as well as assistance on particular cleaning problems.

J. M. LeRoy has been appointed technical consultant. His services will be available to industries using synthetic solvents such as trichloroethylene, perchloroethylene and carbon tetrachloride for metal degreasing and dry cleaning. Mr. LeRoy speaks both English and French fluently. He will operate from the Company's Toronto and Montreal offices but his services will be available to industries across the country.

●

Space Heater.—A small, gasoline-burning, space and transport heater, developed for the U.S. armed forces, is now being used to overcome many military and semi-military heating problems. Measuring only 11 in. by 21 in. by 24 in. yet capable of producing 60,000 B.t.u.

and circulating heated air—fresh or recirculated—at 500 cubic feet per minute, enough to heat an average 5-room house, it is being manufactured by the Hunter Manufacturing Co., 1550 E. 17th Street, Cleveland 14, Ohio. Complete details may be obtained by writing to the Monahan Supply Corporation, 191 Queen Street E., Toronto.

The heater is equipped for radio interference suppression and it is, therefore, being used extensively in radar and radio vehicles and shelters. It is thermostatically controlled and its fuel consumption averages little more than one half gallon per hour.

●

Abitibi Expansion.—Early in December the Abitibi Power and Paper Company, Ltd., announced that it had acquired all the common shares of British Columbia Pulp and Paper Co.

●

Canadian Aluminum to U.K.—Arrangements have been made by the Ministry of Supply of Great Britain with the Aluminium Company of Canada Ltd. for the supply to the United Kingdom of 50,000 metric tons of virgin aluminium in addition to 150,000 metric tons already contracted for during the year 1951. In 1952 and 1953 the Company will deliver 220,000 metric tons each year. The U.K. Government has agreed to make a loan to the Company of 25 million dollars towards the financing of further expansion.

●

New Fire Extinguisher. — What is claimed to be the first pressurized extinguisher designed for hazardous metal fires has been developed by Ansul Chemical Co. It is known as the Ansul MET-L-X Dry Powder Extinguisher and it is claimed to be extremely effective on fires in magnesium, sodium, potassium, zinc, and powdered aluminum plants.

The extinguishing agent fuses and forms an air-excluding crust over the burning metal. The small particle size of the dry powder makes possible its use in a gas-pressure type extinguisher. The new extinguishing agent is moisture-repellent, free-flowing, non-toxic, non-corrosive, and non-abrasive. It does not conduct electricity and will not deteriorate under normal conditions.

The new Ansul MET-L-X Extinguishers are manufactured in 30 lb., 150 lb., and 390 lb. sizes. Larger units, including an automatic piped system are also available to meet special requirements. This new fire fighting equipment has been placed on defense order allocation by the United States Government.

●

Power Show Report.—Better economy in power production and far wider use than has ever yet been seen were forecast by the 19th Exposition of Power and Mechanical Engineering, presented under the auspices of the American Society of Mechanical Engineers in Grand Central Palace, New York. November 27 to December 2. Held in conjunction with the Society's annual meeting, the display was topical, packed with examples of advanced practice in every department, tuned to progress in industrial mechanization.

As in previous expositions, the exhibits included materials of engineering construction, component and auxiliary apparatus and distribution facilities, and controls associated with the generation of power. Supplementing such displays was a second group composed of tools and production equipment, most of which was associated with the production and maintenance of power plants.

Attendance throughout the exposition totalled 32,000.

●

Welding Torch.—A new, lightweight, air cooled Heliarc torch for inert gas-shielded arc welding is announced by Dominion Oxygen Company, Ltd. The torch, which has a two-position welding head and needs no water cooling, has a maximum current capacity for continuous duty of 75 amperes. It is designed for welding thin-gauge materials.

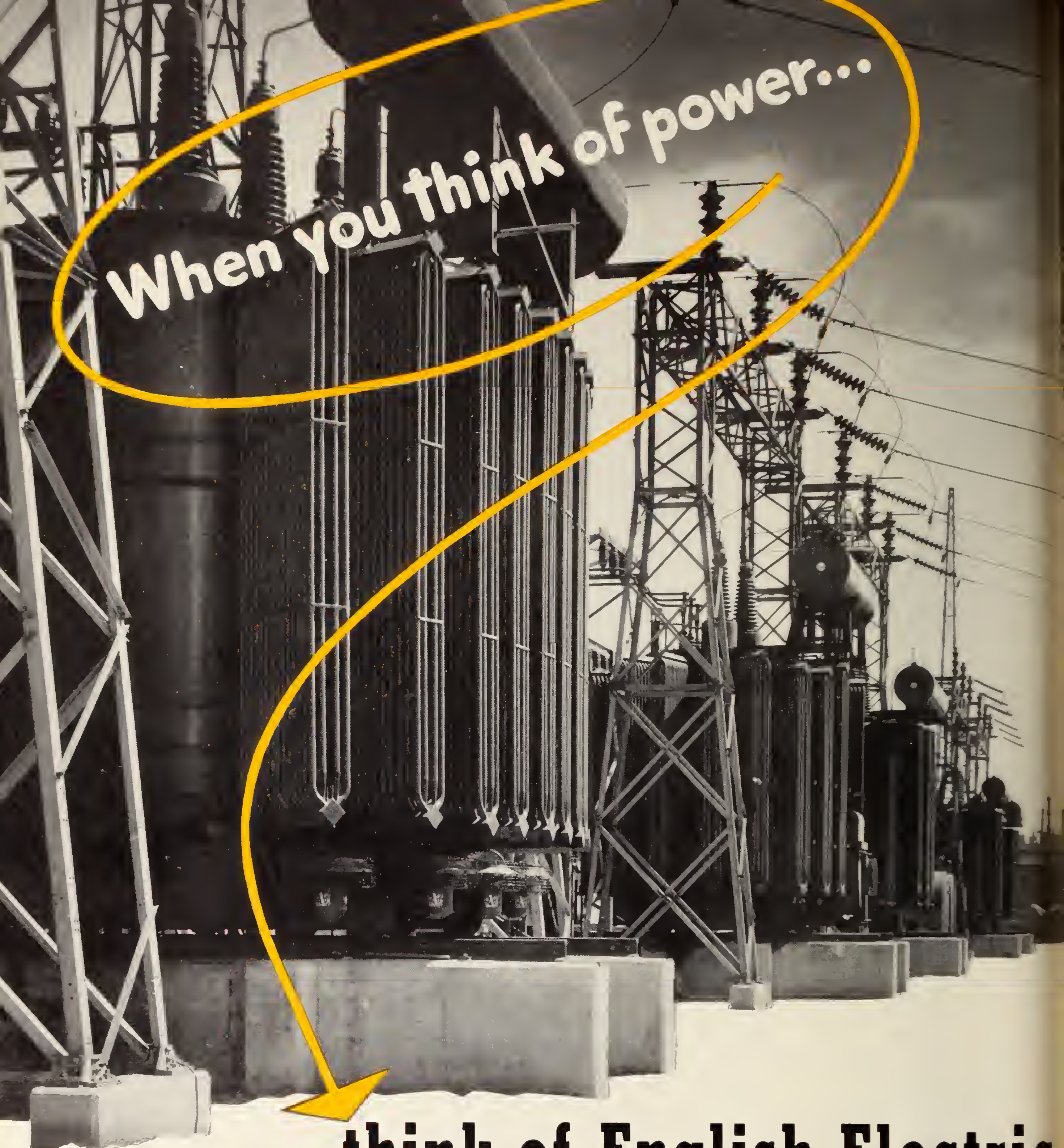
●

U.K. Electrical Equipment.—A Newcastle, England, firm has received orders totalling $8-million for the Ontario Hydro-Electric Commission's $30-million Toronto plant. The first contract, placed early this year with the firm was for two turbo-alternators, each 100,000 kw. A further contract for two similar units, has just been announced by Sir Claude Gibbs, the firm's chairman and managing director.

The first two generators are now in an advanced stage of construction, and should be working towards the end of 1951. The third unit will be supplying electricity in Toronto in November 1952 and the fourth in January 1953.

●

C.G.E. Equipment.—The first post-war blooming mill drive in Canada is to be installed at the Algoma Steel plant at Sault Ste. Marie. A 7,000-hp. 50-r.p.m. General Electric motor will replace a


When you think of power...

team engine on the main drive. Other lectrical equipment involved in this nportant installation includes a flywheel notor generator set and G.E. magne-last air circuit breakers.

A feature of the new installation is a ystem of "amplidyne control" which ermits accurate control of the reversing nain drive from one simple master witch with a choice of six speeds in ither direction. The drive, control and elated electrical equipment, will be en-ineered and built at the Peterborough Vorks of Canadian General Electric Co. The installation is planned for September 951. The rating of the main drive d-c notor is 7,000 hp.; 50 deg.; 50/120 r.p.m.; 50 volt; 430,000 lb. net weight. The m-g et is a 4-unit flywheel type, consisting of three 2,000-kw d-c generators, one ,000-hp. wound-rotor induction motor nd one flywheel of 170,000 hp. seconds tored energy.

An order for 16, 20,000 k.v.a. trans-ormers has been received by Canadian General Electric Co. for the new Alcan levelopment at "Chute de Diable" on he Peribonka River. The installation vill step up power from the new devel-opment, from 13,200 to 172,000 volts, for ransmission to the Arvida smelter. The ransformers are oil-cooled units employ-ng the exclusive G.E. shielded layer vinding. One bank of transformers has vindings of aluminum wire rather than he conventional copper. Installation is scheduled to begin in September 1951.

●

New Synthetic Fibre.—A British chemi-cal company is investing a very large sum of money on a new Wilton, north England, plant for the production of a new synthetic fibre known as "Terylene". It is claimed that this new product feels like silk and is twice as strong as cotton. The new plant will produce the material at the rate of a 11 million lbs. per year.

Terylene is chemically different from any other synthetic fibre. Its raw materials are the by-products of crude oil. It has excellent textile properties, drapes beautifully, and is pleasant and soft to the touch. Terylene fabrics can be easily laundered and quickly dried. Knitted goods made from it are warm to the touch as well as attractive.

●

Silicone Rubber Compound.—A new silicone rubber compound is available from the Chemical Division of Canadian General Electric Company. This compound permits rubber fabricators to mould silicone rubber parts more easily and with highly improved mechanical and thermal properties.

Designated as No. 81223 rubber compound, this new G-E silicone rubber is outstanding for its ease in processing. Many parts can be fabricated from it without prolonged oven-cure and it has excellent moulding and extrusion properties after only a five-minute warm-up. Because of the outstanding hot tear strength of G-E 81223 silicone rubber, parts with undercuts can easily be removed from moulds; and being neutral in colour, stock can be coloured for product identification purposes for individual fabricators.

Further information may be obtained by writing to the chemical division of Canadian General Electric Co. Ltd.

●

New Valves.—A line of valves for actuating air or hydraulic cylinders has just been introduced by Ledeen Manufacturing Co., Los Angeles, California. These valves embody rotating disc construction and are made in three types: for hand - operation, foot - operation, and finger or solenoid operation. This group of valves is available in 14 different models for 5 different cycles in 6 sizes and may be used for controlling the flow of air, oil or water. The hand-operated valves turn 45° each way from neutral, a total of 90°. The foot-operated valves turn 15° each way from neutral or 30° total. The finger or solenoid-operated valves are actuated by two simple poppets, which are depressed about ⅛" by light finger touch. Complete details may be obtained from the Company. The address is 1602 So. San Pedro St., Los Angeles 15, California.

●

Nordberg Diesels.—Nordberg Manufacturing Company, Milwaukee, Wisconsin, announces the addition of a two cylinder engine to supplement the Type 4FS1 single cylinder, 10 to 15 horsepower Diesel engine which is already on the market. This new engine, conservatively rated at from 20 to 30 horsepower within an operating speed range of 1200 to 1800 r.p.m., has a 4½-in. bore and 5¼-in. stroke. It is known as the 4FS2. Complete information may be obtained from the manufacturer.

●

New Thermometer.—What is claimed to be a new and different type of industrial thermometer is now being distributed in Canada by the Palmer Thermometer Company, Limited, of Toronto. The thermometer has an adjustable dial that can be rotated to any position for easy reading. The thermometer stem can be mounted at any angle and the dial rotated to any position. The instrument has an 11-inch scale, marked in bold, readable numbers.

●

Canadian Trade Fair.—Despite current unsettled world conditions, it is anticipated that the 1951 Canadian International Trade Fair will surpass all others both in numbers of participants and visitors. England is again a major exhibitor, with more space booked so far than any other country. The United States, Czechoslovakia, Italy, and Switzerland are also well represented and space has been taken by firms located in Australia, Scotland, Austria, France and South Africa. The new Industry Building, which, when completed will be one of the most modern exhibition buildings on this continent, will absorb the anticipated increase in exhibitors. Its additional 50,000 square feet of floor space will provide a total of 220,000 square feet for display purposes. The actual size of the Fair, including restaurants, lounges, the reception area, and other necessary services, is more than 500,000 square feet. Machine tools, plant equipment, textiles, and material handling exhibits promise, at the time of writing, to be the leaders in space taken and variety of products to be shown.

●

Foster-Wheeler Contracts. — Foster-Wheeler Ltd. of St. Catharines, Ont., has been awarded a contract for the extension of Imperial Oil's Edmonton refinery. The additions will be a fluid catalytic cracking unit with auxiliary gas recovery plant and a vacuum distillation unit.

Each of the two units will have a capacity of 10,000 barrels a day, and are part of a programme estimated to cost $5 millions. The new equipment will increase production of high octane gasolines, but will not add materially to the refinery's capacity nor number of employees.

The "cat cracker" will be the first of its kind in the world. Design is by Standard Oil Development Co. and has been subjected to exhaustive tests. The result is a catalytic cracker which is simpler to operate and more efficient.

Construction will begin as soon as possible in the spring and is expected to be completed in the summer of 1952.

●

Helicopter Helps Steeple Jack.—How to repaint a 150-foot stack with a minimum interruption in plant operation was demonstrated recently with the aid of a helicopter at the Monsanto Chemical plant in Everett, Mass.

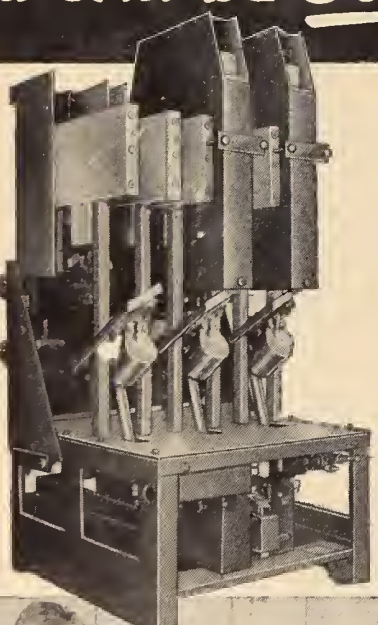
The steeple jacks went to the top of the stack in the helicopter, taking with them staging hooks, blocks and falls, and other equipment. A steeple jack leaned out the door of the machine and dropped his staging hook to the top of the stack. The necessary ropes were lowered to the ground and the steeple jack then went to the base of the stack, and hoisted himself into the bos'n's chair. Total time, including take-off and landing, was one half hour.

●

Industrial Management.—A gift of $5,250,000 from the Alfred P. Sloan Foundation Inc., for the establishment of a School of Industrial Management at the Massachusetts Institute of Technology was announced by Dr. Karl T. Compton, Chairman of the Corporation of the Institute.

Dr. Compton said "The concept of the school will be to correlate the complex problems of management in modern technical industry with science, engineering, and research. The objective will be to prepare young men of today better to meet the exacting demands of indus-

(*Continued on page 73*)



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Westinghouse type DH Air Circuit Breaker shown at left

EASIER MAINTENANCE: Horizontal dra out type breakers quickly removed as a un maintenance without interrupting service

GREATER SAFETY: Complete mechan interlocking; metal barrier isolation. Wes house developed safety features for protec of operator.

FOR FURTHER information write for ab booklet or contact your nearest Westingho office.

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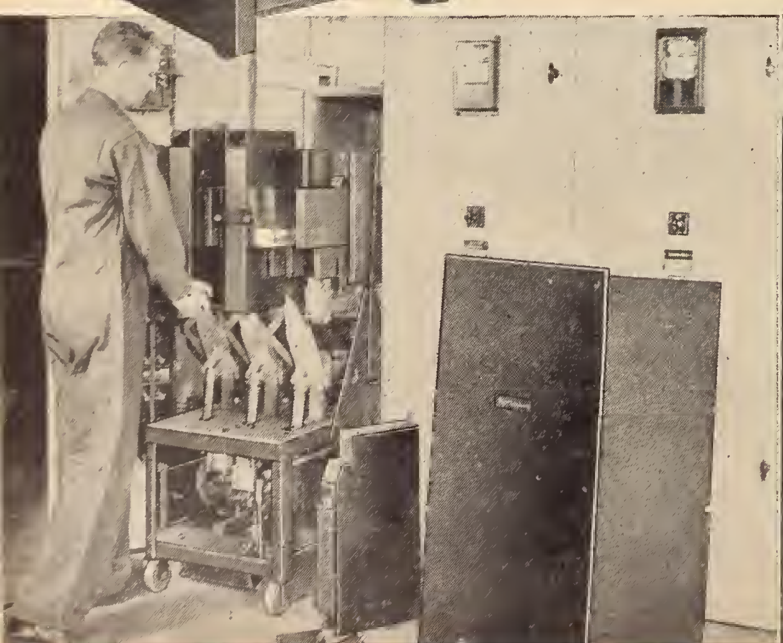

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 69*)

trial management as they become the industrial executives of tomorrow."

Wood-Treating Course.—The Ottawa Laboratory of the Forest Products Division, a unit of the Forestry Branch of the Department of Resources and Development, will conduct a five-day course in kiln-drying, commencing February 19th. Applications for attendance must be received by February 3rd as only a limited number of applicants can be accommodated. Only one person from any single firm will be accepted and vacancies will be allotted in the order that applications are received. If the demand is sufficient, a second course may be held in March. Applications should contain the following information: (1) Name and status of applicant; (2) Whether of not a hotel reservation is desired; (3) If hotel reservation is desired, state applicant's expected time of arrival in Ottawa.

Address applications to: The Superintendent, Forest Products Laboratory, Department of Resources and Development, Ottawa, Ontario.

Subjects to be dealt with during the course are: The significance of wood-using industries in the Canadian economy; commercial species of woods used in Eastern Canada and their identification; cellular structure of wood and its effect on seasoning; mechanical properties, moisture strength relations, and other factors; wood seasoning; air seasoning; kiln-drying; control instruments and other kiln equipment; drying schedules; seasoning defects and how to overcome them; storing and shipping of seasoned lumber; other methods of seasoning; decay and stain in lumber. There will also be visits to woodworking industries.

Iron Ore Reserves.—M. S. Fotheringham, president, Steep Rock Iron Mines Ltd., said recently, "The Steep Rock reserves of high quality iron ore are now known to exceed those of any other range old or new, on the continent".

Stainless Steel.—Stainless steels up to three times harder than those ordinarily available have been produced by a unique low temperature treatment at the Westinghouse Research Laboratories. By immersing the steel in liquid nitrogen baths at 300 degrees below zero Fahrenheit and then rolling or forging it at sub-zero temperatures, Westinghouse metallurgists have succeeded in superhardening the metal. It has been disclosed that even greater hardness has been achieved by following up the supercold treatment — called Zerolling — with heating at controlled temperatures.

Because the treated steel can withstand much higher "pull" and pressure loads than conventional stainless steels, the scientists predicted that it will find many new uses as a wear-resistant material in bearings, valve seats, springs, and other machine parts where high strength and corrosion resistance are required. Further information may be obtained by writing the Canadian Westinghouse Co., Hamilton, Ont.

Long Power Line Suspension.—The Consolidated Mining and Smelting Company of Canada, Ltd., recently announced a proposed extension of its power transmission lines to carry power from its Kootenay River plants near Nelson, to Kimberley, B.C. The project, which is estimated to cost nearly $3,000,000, will be started early in the new year and is expected to be completed in about two years. A 170,000-volt 75,000-k.v.a. transmission line will carry the power from Cominco's Corra Lynn plant on the Kootenay River up the West Arm of Kootenay Lake to a point between Ainsworth and Coffee Creek on the Main Kootenay Lake. The power will cross the lake to a point south of Riondel. The crossing, a distance of two miles, will be by overhead cables. This is believed to be the longest overhead span in the world.

Huge Clearing Press.—A 750 ton British Clearing Press recently installed at Armstrong Whitworth's plant in Coventry, England, is one of the latest examples of U.S.-U.K. co-operation in military production. The largest press of its type in an aircraft company in England, the press is of United States design and was built under licence in England by Vickers-Armstrongs at Newcastle.

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President

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197 Bannatyne Ave. E.
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Alberta
Waterous Ltd.
Edmonton, Alta.

British Columbia
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3300 Fraser St., Vancouver, B.C.

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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."

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CONTENTS

15,150 copies of this issue printed

Stewartville Spillway Performance Model and Prototype

by

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

Assistant Hydraulic Engineer,
Generation Department,
Hydro Electric Power Commission of Ontario

A paper presented to the Sixty-fourth Annual General and Professional Meeting of The Engineering Institute of Canada, and the Annual Summer Meeting of the American Society of Civil Engineers, Toronto, July 1950

This paper emphasizes the value of a model for pre-determining designs of hydraulic structures. Tests on a laboratory model of a dam and spillway disclosed best position for sluices and best location for training walls. It pointed the way to saving concrete by using lower walls with curved rolled-back lips. Best position, shape and size of baffles to dissipate energy were also determined.

For two main reasons, Stewartville spillway has been selected as the subject of this paper. The first reason is that the hydraulic design of the spillway was based entirely on model tests. As the spillway has now been in operation for some two years, sufficient time has elapsed to enable a comparison to be made between model and prototype performance.

The second reason is that two features of the spillway design are considered to be of general interest. These are: (1) rather unusual training walls, developed during the model test to guide satisfactorily flow at supercritical velocity, and (2) a somewhat unconventional application of baffle piers to obtain the necessary energy dissipation.

General Description of Spillway

The Stewartville development of The Hydro-Electric Power Commission of Ontario is located on the Madawaska river, about ten miles upstream from its confluence with the Ottawa river. Stewartville has an installed capacity of 81,000 horsepower, and operates under a head of 150 feet.

A general view of the development is shown in Figure 1, with the spillway on the left. Two sluices, 35 feet wide and with a normal head on the sill of 25 feet, are controlled by sluice gates, and two sluices 16 feet wide and with a normal head on the sill of 20 feet, are controlled by stop logs.

The discharge from these sluices issues onto an obliquely sloping rock hillside, and training walls contain and direct this stream into an open rock cut and thence to the river downstream. The rock cut is the open downstream portion of the tunnel used to dewater the site while the development was being constructed. In this cut, baffle piers are used to dissipate some of the energy in the stream before it is released into the erodible tailrace.

Scope and Description of Model Tests

The model tests of the spillway were carried out in the hydraulic laboratory of the University of Toronto in the summer of 1946. The location of the sluices, the location and design of the training walls and energy dissipating baffle piers, and the downstream river protection were all the responsibility of the model tests. All the spillway was reproduced, and also the downstream river for a distance of about 700 feet below the juncture with the spillway flow. The model was constructed to a 1:60 scale, and was undistorted.

In the first series of tests, a fixed bed was used in the channel downstream. The effort was concentrated in determining the optimum location of the sluices relative to the hillside and the most effective training wall locations. After considerable testing, the locations shown in Figure 1 were adopted. The rather unique training wall design developed in the tests is discussed in detail in the next section.

In a second series of tests, the fixed river bed was replaced by a moveable bed, and scour studies were carried out. While guiding the discharge from the sluices into the head end of the tunnel cut resulted in considerable energy dissipation in the resulting fall, the scour studies indicated that further energy dissipation was necessary. A great variety of energy dissipating devices was tried, but baffle piers in the tunnel cut were found to be the most effective. Destructive scour from the remaining energy released into the river could be prevented by heavy riprap on the far shore.

In Figure 2 is shown a view of the model with the sluices in their final position, and the training walls and baffle piers in place. The moveable bed tailrace is shown excavated to final grade. In Figure 3, the model is shown in action.

Training Wall Design

As mentioned before, the dis-ıarge from the sluices issued onto hillside which sloped both down-ream and to the left. The down-ream slope was sufficient to pro-ıce supercritical velocities at all nes, the velocities reaching about) feet per second at the end of e walls. The cross slope was suffi-ent, also, to cause a pile-up on e left wall, particularly if more an one sluice was open. It was und to be beneficial, also, that is stream be directed to the head ıd of the cut. This meant, there-re, that the training walls must ıntain this high velocity stream ıd also change its direction, rather ɔruptly in some cases.

Very high walls at first appear-l necessary for this purpose, as a ream of water rose to consider-ɔle heights along the wall when ıe direction of the flow was alter-l, due to the high energy content the water. It was noted, how-ver, that this stream was rela-vely thin. This suggested that if curved rollback lip were added) the top of the wall, then much ıwer walls might be possible. Such roved to be the case in the model, ıd prototype walls, dimensioned s shown on Figure 4, were con-ructed. In Figure 5 is shown the rototype in action with the right ate fully open and the rollback on ıe right wall in full operation.

The use of these rollbacks per-ıitted the wall heights originally ·quired to be reduced by half. As ır as it is known, this is the first me walls of this type have been esigned and built, and they ap-ear to offer real advantages if flow at supercritical velocity is to be changed in direction by the wall.

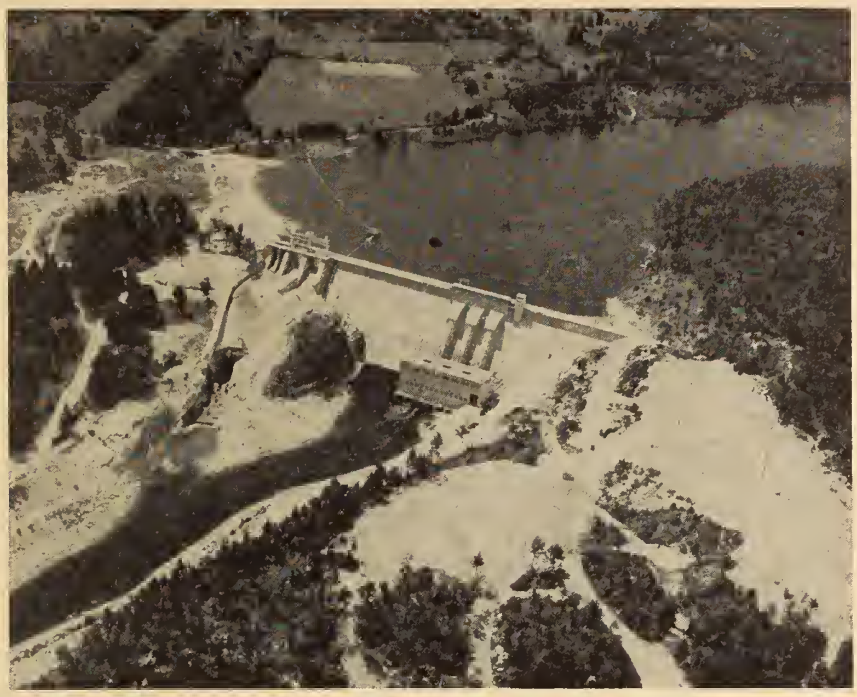


Fig. 1. General view of Stewartville Development showing spillway on the left.

Baffle Pier Design

Analysis of Energy Dissipation

By means of Pitot tubes, the energy line down the spillway and through the channel cut was measured, both with and without baffle piers in place. These energy lines are shown plotted in Figure 6, and permit an analysis of the energy dissipation. It may be observed from Figure 6 that even with no baffle piers in place, a large energy loss occurs from the stream falling into the rock cut. Scour studies indicated, however, that further energy dissipation was necessary if excessive scour was to be avoided in the erodible tailrace.

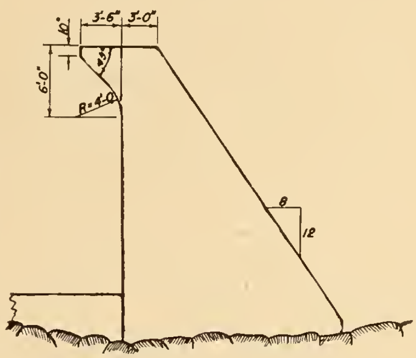


Fig. 4. Typical section of training walls showing rollback developed during model tests.

With the piers in place, it may be noted that the energy present in the stream issuing into the tailrace is near the theoretical minimum, and is considered to be the practical minimum considering the probably great non-uniformity in velocity distribution. This was confirmed by the fact that, regardless of the number of additional energy dissipating devices placed en route, the issuing energy remained the same. Under full flood flow, it may be computed from the diagram that the piers are absorbing some 85,000 horsepower which would otherwise be released into the tailrace.

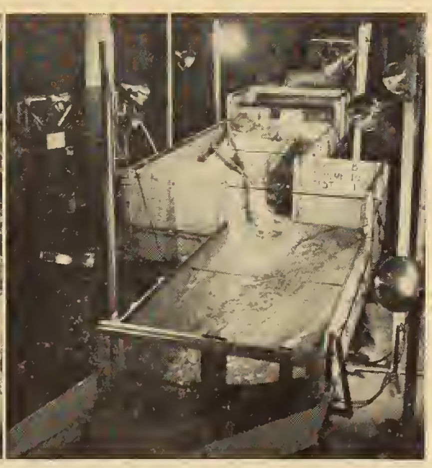
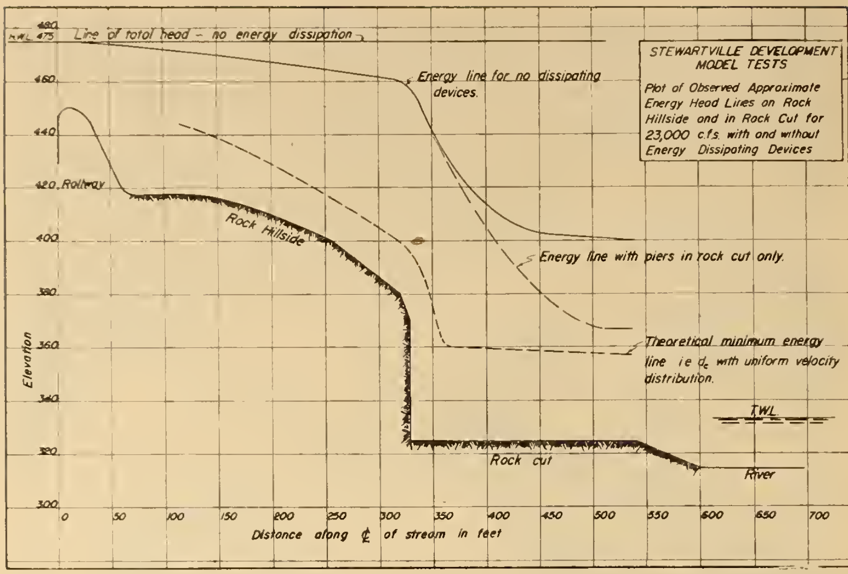


Fig. 2 (left). View of model with sluices in final position, and with training walls and baffle piers in place. Moveable bed tailrace shown excavated to final grade.

Fig. 3. View of model in action.



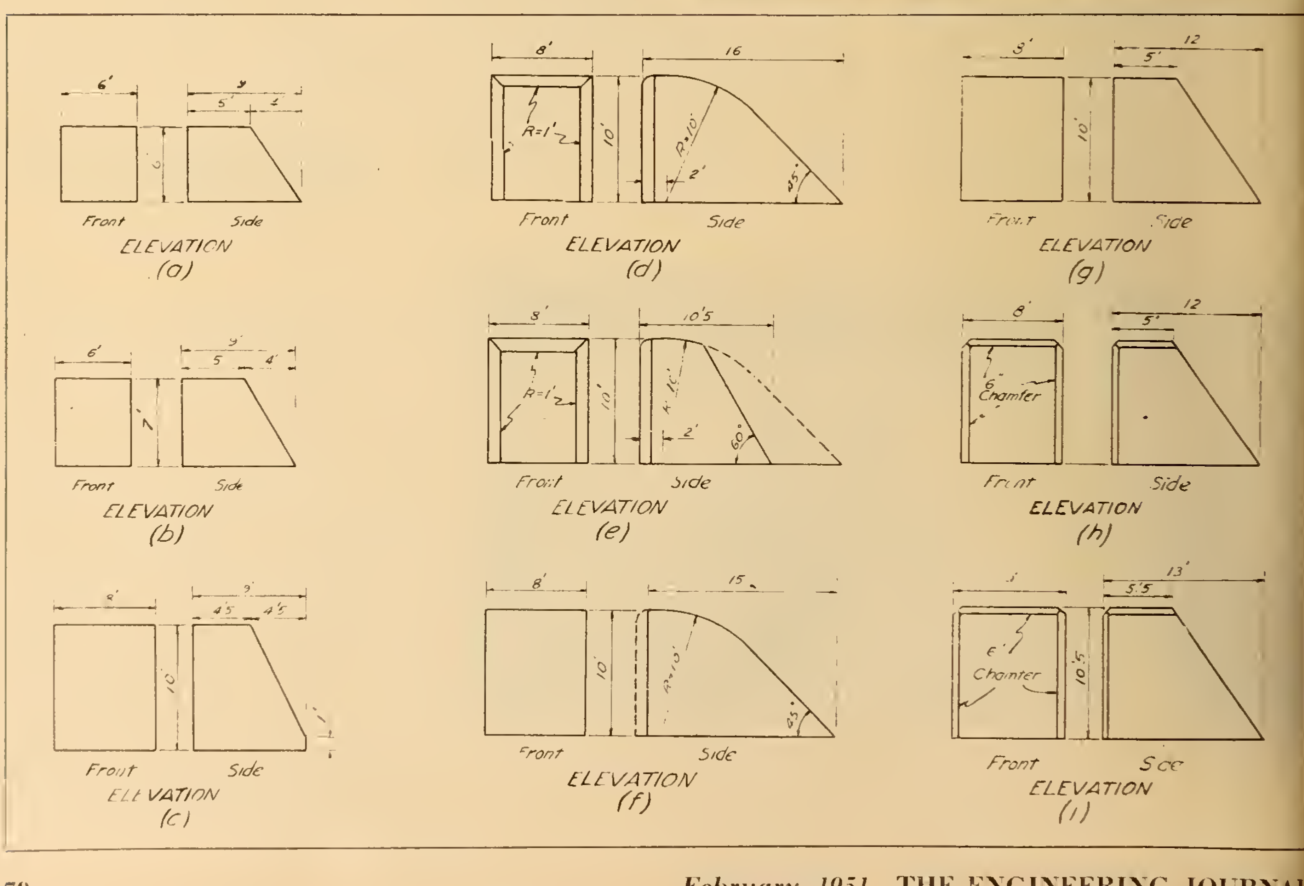
Baffle Pier Shapes Tested

A great many tests were made on the number, arrangement, and shape of the piers to give optimum results. It was established that eight piers gave the best results but a surprising feature was the great effect that the pier shape had on their efficacy. First sharp-cornered piers were tested, Figure 7 (g), then the various modifications shown in Figure 7 were tried in an effort to reduce possible cavitation. In every case, however, a departure from the sharp-cornered piers resulted in a markedly poorer performance. Hence the sharp-cornered design, Figure 7 (g), was adopted, and the corners framed with steel angles to discourage spalling

Fig. 5 (right). Training walls in action with 16,000 cubic feet per second discharge from right sluice gate. Note rollback on right wall in full operation.

Fig. 6 (above). Plot of spillway energy head lines.

Fig. 7 (below). Dimensions of baffle piers tested. Scale, 1 in. = 10 ft.



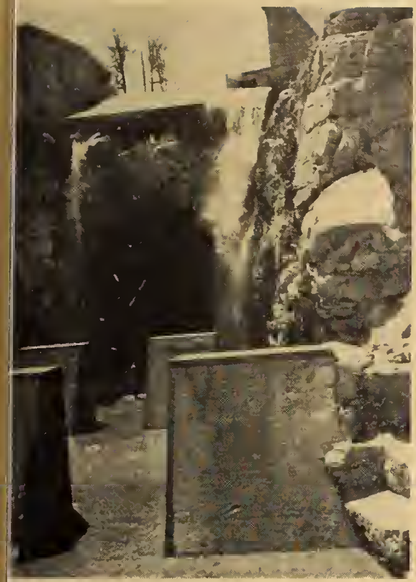


Fig. 8. View of baffle piers as constructed.

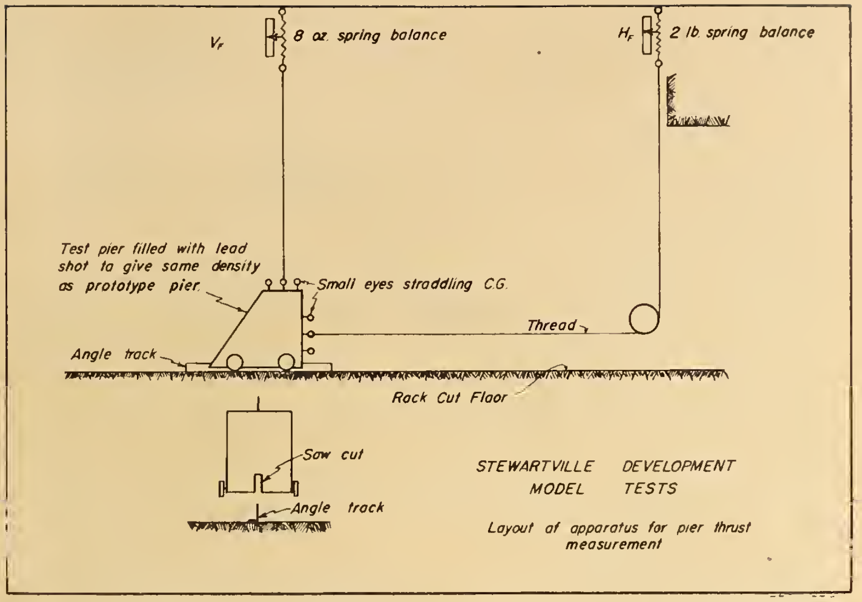


Fig. 9. Diagrammatic sketch of apparatus used to measure loading on baffle piers.

'igure 8 is a photograph of the iers as constructed.

leasurement of Forces Acting on Piers

To assist in the structural de-ign of the piers, an effort was nade to measure the forces acting pon them. While special equip-ient was not available for an ac-urate determination of the forces nvolved, an approximation was onsidered to be of value. The nethod used was to replace each ier in turn by a pier specially veighted to give the correct specific ravity, and free to move in a rack parallel with the channel's ongitudinal axis. In Figure 9 is hown a diagrammatic sketch of he apparatus, and spring balances s shown then measured the force arallel to this axis and also the vertical force on the pier. From these measurements it is believed that a reasonably accurate estimate of the forces involved became possible. Incidentally, the measured force acting downstream corresponded to that computed if a drag coefficient of 1.6 were used in the drag formula.

Prototype Performance

In May 1949, a test operation of the spillway was made, with each large gate being fully opened in succession. In Figure 5 is shown the right wall in full operation when the right gate was opened, and in Figure 10 is shown the left wall in action when the left gate was opened. In Figure 11 is shown the energy dissipation in progress with the right gate fully open, which corresponded to a spillway flow of 16,000 cubic feet per second.

Model-Prototype Conformity

As far as could be determined by visual observation, the action of the prototype appeared to agree in every respect with that predicted by the model. The height of water on the training walls and the action of the walls appeared identical with the model performance. While it was impossible to determine the actual energy dissipation, the flow pattern appeared to be the same, and the riprap protection on the far shore appeared adequate to resist the energy released into the tailrace.

It appears reasonable to conclude that model tests may be used with confidence in the solution of problems of this type. √

Fig. 10. Performance of left training wall with 16,000 cubic feet per second discharge from left sluice gate.

Fig. 11. View showing energy dissipation with 16,000 cubic feet per second discharge from right gate.

Strategic and Economic Factors Affecting Canada's Far Northwest

by

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This paper traces the development of the North Pacific Planning Project, outlining its original scope and its expansion to cover peacetime economic aspects and more territory.

Pointing out that Alaska is the key to the defence of the west coast of this continent, the author warns that in a general war Oriental or European enemies would not neglect these Arctic approaches. He interprets the physical geography of the North Pacific Region in terms of defence, and shows the importance of Prince Rupert as a major supply base.

A plea is made for giving the Pacific Northwest the greater attention it deserves as well as for heeding the Pacific Planning Project's recommendations today, when they are doubly pertinent due to the threat of war.

Through the middle and late war years a group of Canadian men, selected from academic, scientific and public service sources, with whom I had the honour to be associated, carried out an extensive survey of what is, perhaps, with the exception of the Arctic regions, the least understood and most incompletely appreciated area of the continent. This is the northwestern corner of the Commonwealth described in their final notes as follows:

> "This great expanse of mountain, valley, lake, and plain, designated herein as the North Pacific Region of Canada, comprising northern British Columbia, most of northern Alberta, and the District of Mackenzie with the entire Yukon Territory."

Despite the problem of dealing comprehensively with the economic geography of such an immense and little known region, the original conception of the project was much broader. It proposed a joint study by Canada and the United States of what we have referred to as the North Pacific Region, which would have incorporated in it the territory of Alaska.

It came about in this way: Following the landing by Japanese forces on the islands of Kiska and Attu, the cold realization dawned on both Canada and the United States of the significance of this violation of North American ground. Feverish defence preparations were made, first individually and then jointly, by the forces of the two nations. Canada's chain of interior landing fields was developed into the Northwest Staging Route, the Alaska Military Highway was built, measures were taken to secure a source of oil from the Canadian interior, and a rail line connecting the rail system of the continent with the Alaska Railway was surveyed. Canadian forces joined with United States forces in the routing of the Jap from the Aleutian Islands of Alaska.

Project Extended to Include Economic Aspects

In these joint undertakings it became apparent that there was a significance far beyond individual national defence interests. Suggestions were made, and developed at high national levels, that the two countries should undertake intensive studies of problems of mutual interest or concern in the economic development of this vast northwestern corner of the Continent.

These suggestions were passed through the Joint Economic Committees of Canada and the United States, whose self-effacing and little publicized work and influence was so vital in our common struggle. In 1943 they decided to sponsor a joint series of studies, to be known as the North Pacific Planning Project. The objective of this internationally conducted investigation was to study the possibilities for the economic development of the region; i.e., the Canadian North Pacific and Alaska, for the benefit of the two countries. The question would be viewed particularly from the defence standpoint—and directed to the welfare of the inhabitants of the area, with special attention to the problem of the post-war utilization of the facilities established n the area for military purposes.

The territory that originally came under this study comprised, including Alaska, 1,360,000 square miles, of which about 700,000 square miles was in Canada. The final Canadian area studied was expanded to take in about one million square miles. Dr. Charles Camsell, C.M.G., M.E.I.C., well known to all of you, was made Canadian director of the Project, and the United States director was Mr. James C. Rettie.

Study Mainly a Canadian Effort

To augment the limited information pertaining to the region, technical departments of both Federal and Provincial governments organized field surveys, to make special studies of the geology and mineral resources, forests, wild life, recreational resources, water power potentials, and to extend the topographical knowledge. Departments of Agriculture put in hand special soil surveys, completed and filed data on horticultural studies; the Fisheries services cooperated by furnishing the results of work done in the far hinterland; the Dominion Bureau of Statistics made some special studies, and a particularly painstaking and valuable piece of work was turned in by the Meteorological Division of the Department of Transport. In addition the Government of British Columbia carried out special work on the mineral resources and the forests of the northern section of that province. Corresponding departmental work was done in the United States.

It was unfortunate that, following certain departmental reorganizations at Washington and the wartime transfer of some of the key men, (a much larger and more ambitiously organized group than the Canadian) the United States panel was broken up and their work on Alaska, of which some 12 volumes had been filed, was suspended.

It was decided, however, that the Canadian group should not only continue the study of the Canadian territory, but that the territory should be expanded somewhat. As finally defined, it lies within the area bounded on the

Fig. 1. Aerial view of Prince Rupert, B.C.

Fig. 2. Prince Rupert Communications. Highway bridge over Bulkley at Hazelton.

Fig. 3. Prince Rupert's contribution to the Second World War included construction of naval vessels such as the one pictured here.

west by the Pacific ocean, on the south by a straight line drawn from the head of Bella Coola Inlet to headwaters of the Athabaska River near Jasper; eastward by the Athabaska River to the vicinity of Waterways, and thence by the 110th Meridian to Coronation Gulf in the Arctic; northward by Amundsen Gulf and the Beaufort Sea, and northwestward by the Territory of Alaska.

Project's Recommendations Should be Heeded Today

While the results of the work, due to disbanding of the United States panel, fell somewhat short of the early objective, the working plan was carried to completion and the results published in the form of a monograph entitled "Canada's New Northwest".

This work has had a limited edition and distribution and is comparatively little known. Yet its findings and recommendations seem especially pertinent in the situation in which the peoples of the United Nations generally, and the North American countries especially, find themselves today. Because of this I have thought some of the discussions, comments, conclusions, and occasional recommendations which it sets out are so timely as to be worthy of some mention at this time; and, from a viewpoint of five years after, with soldiers of our country engaged in another Pacific war with Orientals, that some of the observations may be worth noting.

It is not, however, my purpose to dwell in any detail on the findings of this work; it is rather my thought to develop a little further discussion of some of the aspects of political geography that it opened up in the light of developments that have followed the last World War. Until the second or Pacific phase of that war commenced, world political influence and military might had its geographical centre somewhere in Western Europe; Canada remained largely outside the zone of geopolitics. Today, Canada faces Soviet Russia northward across the partially navigable Arctic Ocean. Westward she faces across the main sea paths to the Orient. She forms, with Alaska, the great American land bridge and air path to the Asiatic continent. Thus the Canadian continental fringe becomes physically vital in any continental defence plans in which, doubtless, the United States will remain the dominant economic and political power.

Alaska the Key to Defence of West Half of Continent

In this geopolitical picture of the future, Alaska will stand out like the sore thumb that it resembles on the map of the world. Alaska, with the adjacent coastal fringe of Canada is the key to the defence of the Pacific shore of the continent. Alaska contains a great interior basin, in which an invader by land, sea, or air might well lose himself. With its vast chain of weather-cursed islands, the invasion of which represented so costly and so empty a victory for the late enemy, it forms a natural barrier. Furthermore, Alaska is an economic island. While its natural channels of land communications pass through Canada, it depends almost entirely for transportation on its sea connection with the northwestern ports of the United States.

The defence measures undertaken jointly and rather feverishly by the two countries following Pearl Harbor provided in the field of transportation:

a) The completion and expansion of a Canadian-built airway from Edmonton to Whitehorse and its extension to Fairbanks, Alaska, to form the Northwest Staging Route for the transfer of aircraft and equipment to Alaska and to our late Allies in Soviet Russia. This route connects the continental air centres with the extensive military air establishment of Alaska.

b) The Alaska Highway, built largely for the support of this Staging Route and so located that it can most conveniently serve it.

c) The establishment of an oil pipe line from Norman Wells in the MacKenzie valley across the MacKenzie Mountains through Yukon to a refinery established at Whitehorse, all now removed or abandoned.

d) Provision throughout the Canada-Alaska defence area of a system of communications.

e) The establishment of a forwarding depot for ordnance and supplies at the Port of Prince Rupert.

It should be mentioned here that while the Alaska Highway was under construction, the building of a military railroad to connect the Canadian rail system with the rail system in Alaska was considered by the United States Army Command, and with Canadian concurrence a route survey was made. This survey took advantage of a remarkable natural feature, the Rocky Mountain Trench. This valley lies just west of the main chain of the Rockies, and provides easy gradients and a straight alignment with few natural obstructions, from a junction with the Canadian rail system near Prince George, B.C., for nearly 500 miles to the Yukon border. Thence the proposed route crossed Yukon territory to Alaska making connections with the Alaska railway south of Fairbanks. Because of the improvement in the strategic and tactical situation in the North Pacific following the naval action at Midway, the railway project was abandoned. In any event, the original concept of such a work, to be completed in a year, would have been impossible of accomplishment.

Only Two Passable Gaps in Mountain Bastion

With the exception of the abortive attempts in the Aleutians, the opportunity offered either to possible Oriental or European enemies of attacking North America across our northwestern or northeastern Arctic approaches respectively, is not likely to be neglected in any future aggression against this continent. Such attacks would come either through Iceland-Greenland-Baffin Land, or through our North Pacific continental region of Alaska - Yukon - Northern British Columbia. It is, moreover, the opinion of some analysts of the late action in the Pacific that the failure of the Japanese was in their geographical concept of the military problem of North American invasion. Whatever might have been the final outcome of a major attack by the enemy on Alaska or the northern British Columbia coast, certain it is that little in the way of mechanics of defence or services of supply would have confronted them.

As a background, let us consider very broadly the physical geography of the North Pacific Region. It may be thought of as occupying part of two great physiographic provinces; first, the *Cordilleran*, represented in the Coastal Mountain System, the Interior Plateau, represented northward by the Yukon Plateau, and the Rocky Mountain System; and second, the *Great Central Plain*, including here the great Alberta Plain, which I have always thought of as the high prairie, the Peel River Plateau, and the MacKenzie Lowlands. To this might be added the great central basin of Alaska and the low-lying tundra-like northwest slope to the Beaufort Sea—corresponding to the Mackenzie Lowlands, but separated from them by the height of land between the Porcupine and Mackenzie Rivers.

It is a fact, obvious from the topography, that in all this far-flung coast from south of the United States border to the Alaska Islands, there are only two breaks in the Coast Range that, in the present development of land transportation economy, admit of the practical passage of a rail line. These are the passes cut through the coast mountains by the Fraser and Skeena rivers. Other passes have been surveyed; the Chilco, the Bella Coola, the Upper Nass-Portland Canal route—blocked by a glacier—and the Stikene route. All lack either

Fig. 4. Railway trestle on the Prince Rupert line near Smithers, B.C.

Fig. 5. Newly constructed naval vessel in Prince Rupert drydock during the Second World War.

physical or present economical feasibility.

Thus, from Puget Sound to the Aleutian Islands the grand old Coast Range raises its turrets challenging penetration except at two points, (1) the canyon of the Fraser River, the gateway to which is the Port of Vancouver, with the Port of New Westminster, with which should be associated the Squamish gateway to the Fraser Valley, (2) the canyon of the Skeena River, the gateway to which is the Harbour of Prince Rupert.

Prince Rupert Harbour Sheltered and Well Equipped

At this point let us note the situation of Prince Rupert with respect to ocean and coastal transportation. Nature has furnished along the Pacific Coast a sheltered waterway extending nearly 1,000 miles from Puget Sound, in the State of Washington, past Victoria and Vancouver, along the full length of the British Columbia coast and far up the inside of the panhandle of Alaska to Juneau, Haines (terminal of a branch of the Alaska Highway) and Skagway. Prince Rupert stands at the entrance to these Alaska waters, the most northerly Canadian deep-water harbour on the Pacific, and the only North American harbour north of Vancouver with rail access to the continental heartland.

Moreover, owing to the fact that the shortest routes from point to point over the earth's surface are the "great circle" lines connecting these points, the sailing distance from Puget Sound ports to Oriental ports is 465 miles or one and a half days' sailing time greater than from Prince Rupert. (Probably nearer three days in the case of convoys.) A saving of three days or more on the turn-around of a naval or supply ship or convoy in the wartime condition of shortage of bottoms is something to be reckoned with.

The advantage of Prince Rupert as a major supply base in support of military action in the Pacific was well demonstrated during the late war, when the United States Army made substantial extensions to the large existing deep-water dock and ocean sheds there, and established extensive cold storage, housing, administrative and other facilities including a large ordnance warehouse. This forwarding point served as a supply station for the entire Aleutian campaign. Not the least of the advantages to the Allied effort in the Pacific was the existence here of the Prince Rupert dry dock, and the ship construction and repair facilities of the Canadian National Railways. These include a heavy-duty floating pontoon dock. There is an associated shipbuilding plant in which eleven 10,000-ton Liberty type ships and a number of other craft were built during the war. There are also fully equipped marine repair shops and a foundry, where extensive repairs were made to war-damaged craft throughout the war.

This sheltered deep-water harbour, with its approach channel of 21 fathoms, would accommodate all the navies of the world. Good anchorage is obtainable in from 12 to 23 fathoms and the harbour is entirely landlocked and free from ice throughout the year. The main body of the harbour is about 10 miles long and a mile and a half wide. For the whole length of the city which has a peacetime population of about 9,500 it is about a mile wide. Mean tidal range is 20½ ft. There are 12 wharves, of which the 9 having 35 ft. low water depth alongside have a total berthing length of over 4,500 feet.

Advantageous Rail Rates

The existing equalization of rail rates from eastern and midwestern United States points to Seattle, Vancouver and Prince Rupert has some significance in the future of Alaska, the economic island, and, indeed, of Northwestern Canada. Prince Rupert is 640 miles nearer to Alaska than is Seattle, and about 530 miles nearer than is Vancouver. This shorter distance is reflected in steamship rates from Prince Rupert to points in southeast Alaska, which are very considerably below the rates to these points from Seattle. The differential in rates to Ketchikan and Skagway on a representative list of 88 common consumers commodities from points in midwestern and eastern United States shows a transportation cost differential on carload shipments favouring the Prince Rupert routing—i.e. rail to Prince Rupert and steamship to Alaska destination ranging from 4 to 15 per cent, with one maximum of 28 per cent. Of the 88 commodities studied only two; viz, bacon and shortening, did not favour the Prince Rupert routing.

A few samples, just as they come off the sheet, are representative:

Lard from Chicago to Ketchikan favours Prince Rupert by 7.2% to Skagway by 9.0%.

Cheese from Milwaukee to Ketchikan favours Prince Rupert by 8.9% to Skagway by 10.1%.

Power Transmission Belting. from Chicago to Ketchikan favours Prince Rupert by 6.2% to Skagway by 7.8%.

Men's shoes, from St. Louis to Ketchikan favours Prince Rupert by 4.0% to Skagway by 5.1%.

It will be seen that the spread in rates is great enough to merit careul study by shippers, especially shippers of defence goods who are delivering eastern-made goods to Alaskan destinations.

The reason why this advantageous rate situation has existed for years without notable increase in traffic, via the Canadian route, is not far to seek. The peacetime Alaskan market has been too limited to absorb carload shipments, which move into United States northwestern ports under carload rates. On the other hand, less-than-carload shippers would have to pay less-car rates via Prince Rupert, losing on the rail haul, all or possibly more than could be gained through the shorter water movement. There are various means by which this could be overcome, assuming adequate volume and frequency of connecting steamship service with Alaska. It will be sufficient for this discussion to point to the cost and time advantage of this routing, particularly as it may have a bearing on defence commodity movements.

Low Gradients — Moderate Curves — Heavy Standard Bridges

In various past discussions with defence and other governmental authorities of both Canada and the United States, there was obvious misconception of the quality and physical characteristics of the rail line to Prince Rupert, which joins the main transcontinental line at Red Pass Jct., 279.5 miles west of Edmonton. Because traffic, except for the war years, has always been light on this line, there seemed to be a vague general impression that it is a second grade line. The fact is that the line from Red Pass Jct. to Prince Rupert was built by the Grand Trunk Pacific Railway Company (completed in 1914) to the standards of a high-class main trunk line.

Since the G.T.P. and Canadian Northern Railway systems were consolidated for operation in the Canadian National system, the main terminus of that system has been at Vancouver, where much more rail traffic originates, terminates or is forwarded. Consequently, the so-styled "Rupert line" has had to assume branch line status. The traffic density is very low, population in the towns and villages directly on the route not exceeding 40,000, of which Prince Rupert accounts for 9,000 to 10,000.

However, the high standards of construction held the ruling grade to 4/10ths of one per cent, except for one relatively short eastward pusher grade of 1 per cent immediately west of Red Pass Jct. Compare this with the mountain gradients of some of the widely advertised North American roads. It might be recalled too, that the main line crossing of the Great Divide just east of Red Pass (Yellowhead Pass) is the lowest rail passage of the Rockies in North America. Steel bridges are of heavy standard construction—Coopers E 51 loading. The curvature of a standard maximum of 6 degrees is extremely moderate, having regard to the fact that this is mountain terrain almost throughout.

Oil-burning locomotives are used, and due to the light nature of the traffic these have been of 25,000-lb. tractive effort which, in practical terms, means handling trains of about 35 cars or 2,000 gross tons. Yard track capacity at terminals, while adequate for present day demands, is limited, but can be extended at all points without additional land commitments, as adequate provision was made in original construction. During the late spring, summer and autumn months there is a heavy express fish movement from Prince Rupert to eastern Canadian and United States points. In summer there is a fairly heavy tourist traffic over the line, which passes through some of the finest scenery in America.

Advantages Summarized

I think we may safely draw a number of conclusions:

1. The port of Prince Rupert is the only immediately practical land gateway to the Pacific from the interior production centres of Canada and the United States between Vancouver and the Aleutian Islands of Alaska.
2. The Prince Rupert land route provides an excellent channel of transportation for commercial as well as military purposes for the United States and Canada to Alaska and the countries of the Orient.
3. The Port of Prince Rupert —one of the world's greatest harbours — has highly developed port and marine facilities, capable of ready and swift expansion.
4. The rail line serving this port from the interior has been built to high railway standards, its present capacity can be readily amplified.
5. Under peacetime, no less than wartime conditions, the route through Prince Rupert offers large advantages in the movement of traffic between the United States and Alaska.

Moreover, not only is the over-all distance from points in the central and eastern United States and Canada to Oriental points shortened, as compared with other Pacific Coast ports, but of even greater significance is the saving

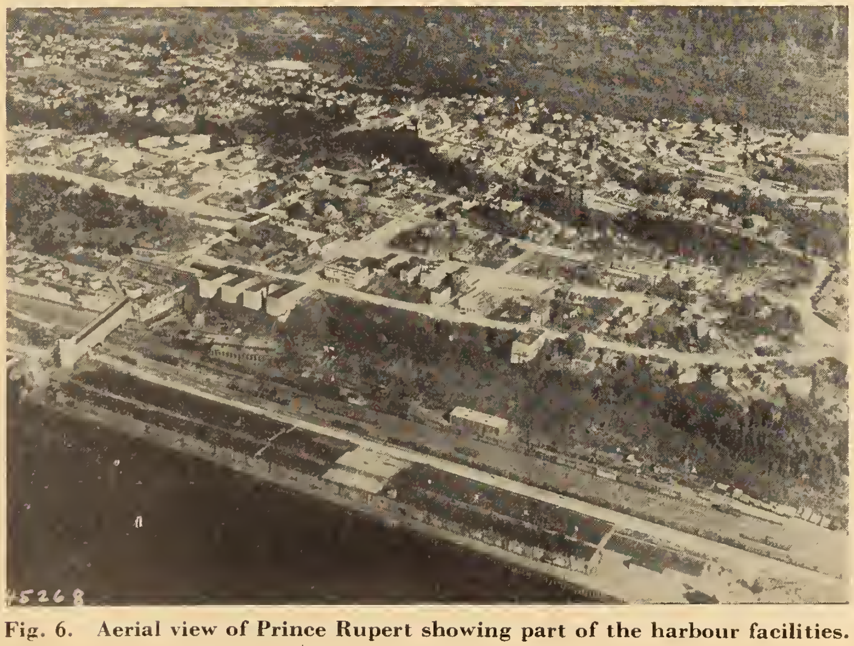

Fig. 6. Aerial view of Prince Rupert showing part of the harbour facilities.

in ocean-going ship tonnage required to move a given volume, and hence the hazard and resultant loss incidental to the movement of that volume. The saving in ocean sailing time to Oriental ports from Prince Rupert as compared with, say San Francisco, is 2½ days. The saving in ton days and, finally, in ship lifetimes especially in war conditions can readily be visualized. These points were well exemplified, though little publicized, in the late world war, when the United States forces used Prince Rupert as a forwarding base for ordnance and supplies of the Aleutian Campaign.

Northwest Deserves More Attention

It was not my purpose in preparing this paper to put forward any proposals or suggestions for action in the field of either defence or international collaboration. My excuse for choosing the northwestern corner of the continent as a subject is only that I have spent considerable time in parts of that country, and consequently have thought more about it than I have about some other things. I think it deserves a great deal more attention by North Americans of both nations, and especially in North American schools, than it has been receiving. Speaking in character, as a railway man mainly concerned with matters bearing on the development of our territory I can, however, with knowledge and confidence set out the following conclusion:

The northern Pacific coast of Canada, with its great harbour and port at the gateway to southeastern Alaska and facing to the Orient, has potentialities of national and continental significance which have been obscured, partly by events and partly by lack of popular understanding. Late developments in industry, in world affairs and in international relations, point to the increasing advantages that have come from the establishment of Prince Rupert as a Pacific Ocean terminal on the only harbour north of the Vancouver locality reached by the continental rail systems: advantages from a viewpoint of continental defence, as a factor in international relations in its situation at the gateway to Alaska and as a prime centre of industry on the north Pacific coast of British Columbia.

Cold Weather Construction

The crusher and mill buildings of Johns-Manville's new Munroe asbestos mine in northern Ontario were built during the winter months last year when temperatures were as low as —56°F on an exposed thermometer. The two five-storey steel frame buildings comprising 83,500 sq. ft. of floor space were erected in 190 working days using mainly unskilled labour, recruited locally and working under extreme winter weather conditions.

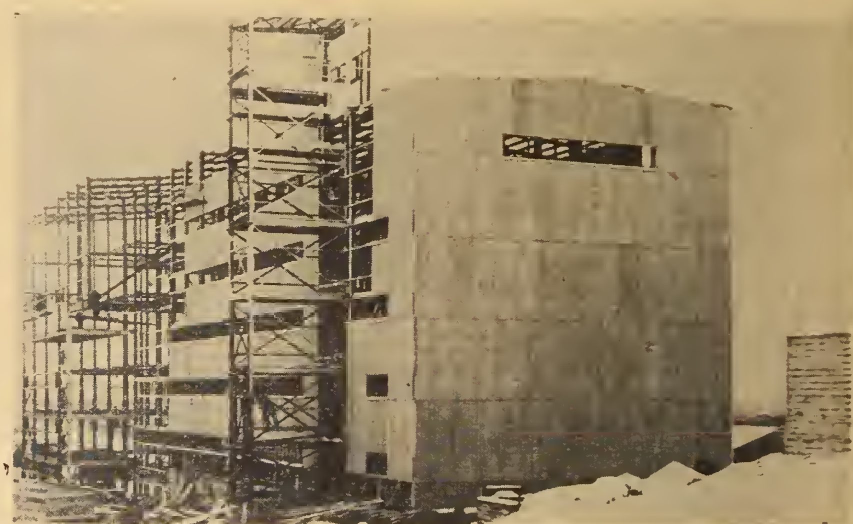

Fig. 1. First group of bays with exterior walls of corrugated Transite applied.

This performance was due mainly to the extreme simplicity of the wall construction used for the buildings. The steel structure was completed in units of 8 to 12 bays, the steel for each bay being carried to the full height before starting the next bay. After a group of bays was framed, the girts that support the wall were placed and the walls were built working from the outside in.

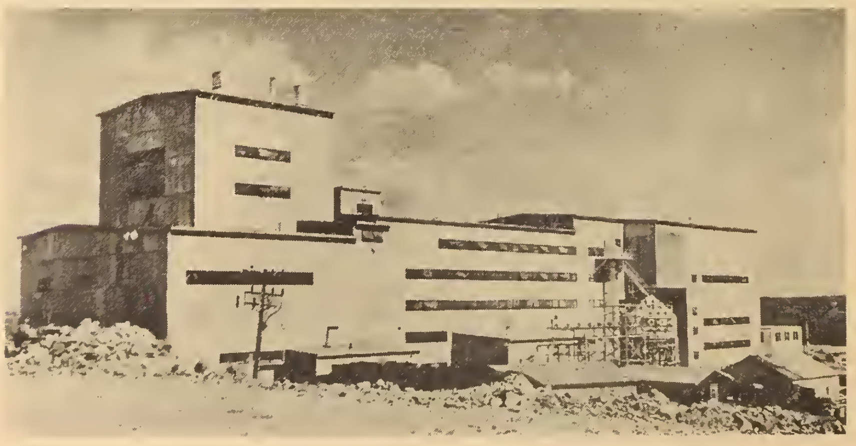

Fig. 2. Exterior of completed crusher and mill buildings.

Sheets of corrugated asbestoboard lapped horizontally and vertically, were stud welded to the steel transite. As soon as one group of bays were enclosed by these exterior sheets, a tarpaulin was dropped over the open end to permit heating and pouring of the five floors of concrete. Rock wool batts were then stacked against the inside surfaces of the corrugated Transite and covered with a vapour barrier paper. The wall was completed by stud welding an interior wall of corrugated Transite.

The finished wall is only 5½ in. thick and weighs only 15 lb. per sq. in. but it has an insulating value equal to a 10 ft. thickness of brick masonry.

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For the Year

1950

Together with Committee and Branch Reports

During the past year, the Institute has continued the expansion of membership and activity that has characterized the years since the beginning of the Second World War. This expansion is general in national engineering bodies throughout the world.

The years of preparation for, and waging of, the Second World War were times of emphasis on pure and applied science, and incalculable scientific and engineering progress was made. The engineer population has increased tremendously and the Engineering Institute of Canada has become an organization to be considered and consulted in the conduct of the country's affairs, and such consideration and consultation has, in fact, come to comprise a good deal of the work of the Council and the directing and executive officers. Agenda of Council meetings commonly include correspondence with the senior ministers and department heads in Ottawa.

New Branches

During 1950 the Sudbury branch was officially inaugurated and has been most active on behalf of the profession in northern Ontario. In December, a long-standing need was met by the inauguration of the branch in Belleville, Ontario.

Annual Meeting

The 1950 Annual Meeting was a new departure from established procedure in that it was held in conjunction with the Annual Summer Convention of the American Society of Civil Engineers. About a thousand American and Canadian engineers attended and all agreed that the experiment resulted in an excellent exchange of views and technical information.

The branch officers' and students' conferences and other events identified with the Annual Meetings of the Institute were held as in the past but technical sessions, entertainment, plant visits, and most luncheon and dinner functions were held jointly with A.S.C.E. The combined efforts of both societies resulted in a particularly comprehensive technical programme comprising 57 technical papers.

Council and Committees

Council met 11 times during the year with 6 of these meetings being held at points outside Montreal. Standing and special committees have been active and it seems unnecessary to report again details which have been reported throughout the year in the pages of the *Journal*.

Engineers Council for Professional Development

The Institute, has, during 1950, continued its active support of this influential international group. The appointment of Lt.-Col. L. F. Grant, past-president and field secretary of the Institute to be vice-chairman of E.C.P.D. was in some measure a tribute to the contribution of the Institute, but it was also a further recognition of the personal support Col. Grant has himself extended in the various posts he has occupied on behalf of the Institute.

The activities of E.C.P.D. were considered in some detail in the report of the annual meeting of that organization which appeared in the November *Journal* (P. 988).

Premises

The expansion of the Institute activity has aggravated the congestion of the Headquarters building. The House Committee has continued to study the situation and certain minor changes have been made. After the installation of oil heating, the basement space was cleaned and painted and has now been put to use largely to provide additional accommodation for the library. During the past year, certain necessary repairs were made to the front mansard roof but there are indications that further extensive repairs will be necessary during the coming year.

Presidential Visits

During 1950, Presidents J. E. Armstrong and J. A. Vance continued the custom of visiting all, or as many as possible of the branches. With the complete co-operation of the Canadian Pacific Railway Mr. Armstrong was able to visit every branch and Mr. Vance has, at the time of writing, covered the maritime and western branches.

Commonwealth Conference

In accord with the desire of Council to maintain close relations with the World's major engineering bodies, Mr. Vance and the general secretary attended the second meeting of the Conference of Commonwealth Engineering Institutions in Johannesburg, S.A., in April and May of last year. The proceedings and resolutions of the conference have been published in the *Journal* (July p. 616) and are further covered in this issue (p. 107).

Field Secretary

In October the Toronto office of the Institute was moved from 350 Bay St., to the new building of the Ontario Association of Professional Engineers at 236 Avenue Road. This arrangement is expected to facilitate full co-operation between the Institute and the Association. In his capacity as field secretary, Col. L. F. Grant has already visited many of the branches and has particularly concentrated on the problem of keeping the Institute in touch with members not resident in branch centres.

Membership

The membership in all classifications now totals 14,317. New names added for the year amounted to 2,019, but deaths, resignations, and removals reduced the net increase to 1,751. Most of Canada's senior engineers in responsible executive positions are members and many lend their active support to the extent of real sacrifice in time and personal resources. The Council and the membership of the Institute are deeply indebted for these contributions which are in large measure responsible for the place the Institute occupies on the national scene. These engineers must be constantly succeeded, however, and it is fortunate that the Institute has always commanded the support of the most outstanding and aggressive younger engineers whose procession through branch and Council responsibility in the Institute so often parallels their rise to executive rank in industry.

The following figures indicate great promise for future years, however. Student members in the 1950 elections comprised 1,629 which would indicate that the rising generation is recognizing these obligations early. There were in addition 232 Members, 124 Juniors, and 4 affiliates elected during the year. There were 30 reinstatements and 46 members were honoured with the classification of life member.

141 Juniors and Students transferred to Member and 1,266 Students transferred to Junior. Seventy-six Members, 77 Juniors, 35 Students and 7 affiliates resigned or were removed from the list for non-payment of fees.

Deceased Members

During the year 1950 the deaths of 73 members, including one Honorary Member, have been reported as follows:

Honorary Member

Doherty, Robert Ernest

Members

Amos, Arthur
Astels, Fletcher
Atkinson, Marshall Brodie
Barnes, Howard T.
Bates, Harry Eli
Birkett, Leonard Harris
Buckle, Charles Wilfrid
Cann, William N.
Carpenter, Henry Stanley
Chalmers, John
Chisholm, Donald Alex.
Chisholm, William Ronald
Connor, Arthur William
Creasor, John Alfred
Cropper, William Charles McDonald
Dibblee, Harry Miles
Dixon, Leon Snell
Duffy, David Auriel
Dunn, Guy Campbell
Elwood, Michael M.
Ericson, Charles Gotthhard
Evans, D. Arthur
Farrow, Richard Charles
Fawkes, Arthur Walter Ellson
Fowler, Charles Allison DeWitt
Goldman, Hyman A.
Grandmont, Bruno
Gregory, Alex Watson
Hill, E. S.
Hill, Stanley Clayton
Holden, John Chiene
Houston, Gavin N.
James, Harold H.
Keith, Homer Pasha
Legris, Charles Ernest
Lembcke, Robert E.
Lumb, William Ewart
Lyman, Stephen M.
Marshall, Joseph Atholstan Pembroke
Middleton, John
Mitchell, William Gordon
Morrison, Hugh Archibald
Munson, Arthur Hale
Macdonald, Archibald J.
MacDonald, Charles Donald
Macdonald, John Butler
McGrail, Thomas Ernest
Macnab, John J.
MacRostie, Norman Barry
O'Leary, H. Gordon
Porcheron, Alphonse D.
Roland, John Wilson
Russell, Allan Hugh
Sears, John Joseph
Sherrin, Philip William
Sherwood, Luman
Simard, Joseph W.
Smith, Robert Melville
Snyder, Horace H.
Thorne, Edward Lefferts
Treloar, George Edward
Walker, Alfred Paverley
Wellwood, Henry
Woollcombe, Edward Mickle
Worsfold Cuthbert Coleman
Wright, Archibald E.

Juniors

Chalmers, Hugh McL.
Dohan, John Timmins
Stark, James Currie

Students

Collis, Bruce John
Derome, Paul Louis
Kaiser, Joseph John

Total Membership

The membership of the Institute as at December 31, 1950 totalled 14,317, divided in the following classes (1949 figures are included for comparison):

	1949	1950
Honorary Members	21	20
Members	5,410	5,663
Juniors	2,558	3,740
Students	4,498	4,818
Affiliates	79	76
	12,566	14,317

Respectively submitted on behalf of the Council.

James A. Vance, M.E.I.C.,
President.

L. Austin Wright, M.E.I.C.,
General Secretary.

Legislation Committee

The Committee was organized during the late autumn and according to the terms of reference, no legislation affecting engineers has been passed. Therefore, the Committee has nothing particular to report.

L. A. Duchastel, M.E.I.C.,
Chairman

Committee on Employment Conditions

As chairman of the above mentioned committee for the Institute, I wish to report no specific activities for the past year. It appears that the present employment situation in Canada and abroad does not warrant the intervention of the Institute in any individual case that may develop.

As for the last few years, this Committee has not been called for any active work.

G. N. Martin, M.E.I.C.,
Chairman

Employment Service

Demand for engineers exceeds the supply. That is the general trend noted by the employment service during 1950 and with the high industrial activity this trend is expected to continue throughout the current year.

For the first half of last year the demand was average, but in the later part the number of openings and requests for candidates from various firms has risen sharply. The increased pace of industry, caused apparently by the unsettled international situation, has not only opened many new doors for members of the engineering profession but has greatly expanded the contacts of the service.

Known placements of engineers through this office in 1950 were 121; 595 persons were interviewed and a large volume of correspondence was handled. While it is valuable for the record to know when the efforts of this service are successful through acknowledgement of employers and candidates, the routine matter of formal acknowledgment is frequently overlooked or forgotten. It is safe to assume that many more placements are obtained as a result of our contact work. Many placements were also made during the summer months with students seeking employment. They proved to be highly successful not only from the view point of students registered but also with many employers.

Junior engineers are very much in demand and the large graduating class of 1950 has been well absorbed into industry. Actually, vacancies for recent graduates are becoming difficult to fill, since almost all seem to be satisfactorily employed. Despite the normally lower demand for seniors, the service is able to report many highly successful placements. The heavy flow of immigration from the United Kingdom and Europe has supplied many skilled candidates and many of these too have been placed. Several firms seem to have filled their quotas for other than native Canadian engineers but there are still professional men arriving in Canada who are available.

A total of 360 vacancies were registered with the department in 1950 and the details showed great variety of needs. Several firms, not previously associated with the engineering field, sought our assistance in obtaining personnel. Sales work, requiring technical background, was prominently offered and found many applicants. A large publishing house employed juniors for magazine production work, a comparatively new outlet for engineering knowledge and skill. With the broader scope, it is not difficult to place engineers with general technical ability.

It is interesting to note in correspondence that long established businesses in the United Kingdom also seek Canadian representatives to handle its large export business to Canada. The volume of letters from all parts of our own country from coast to coast indicates the high prestige enjoyed by The Institute and its services.

The department is appreciative of the many gracious acknowledgments and thanks for services rendered. They provide encouragement and, perhaps more practically, keep our records more exact and valuable. For this reason alone, we would ask, as in previous years, that members co-operate in letting us know the results of interviews or contacts arranged by the employment service. A successful placement when recorded, enables us to clear our files and move on to spend the time on those still to be served.

At the end of the year, there were 94 applications on the available list. In some instances, these may represent men seeking specific types of jobs or certain locations of employment and again other special circumstances may prevail.

In its fourth year of publication, now well established, The Employment Bulletin, of which 1,000 copies are distributed each month, has been most helpful to members as a ready and quick summary of the employment picture.

The Employment Service wishes to assure applicants and employers alike that, during 1951, it will continue to serve them with all its energy, seeking out prospects to fill vacancies and exploring the widening employment field.

(Miss) A. Summers,
Employment Service

Publication Committee

During 1950, 171,910 copies of *The Engineering Journal* — an average of 14,325 per month — were printed. The cost of production was 53c per copy, or $6.36 per subscriber for the year. 811 pages of technical and news material were published. The committee extends the thanks of the Institute to the contributors of papers and branch secretaries and others who supplied news items and reports.

In 1947, the last year in which the advertising interests of *The Engineering Journal* were handled by an outside agency, the loss to the Institute in publishing the *Journal* amounted to some $8,000. In January, 1948, a new contract was signed which placed the advertising operations in the hands of the present publication manager whose office is in the Headquarters building and who, in addition to acting as the *Journal's* advertising agent, lends his extensive experience to the make-up of the editorial section of the publication.

Under this arrangement the *Journal* has shown a steadily improving financial position up to the report for 1950 which indicates that the *Journal* has been able to contribute a modest sum to the other publishing activities of the Institute—and particularly the publication of separate technical papers.

As reported a year ago, the *Journal* has come to serve as the general news vehicle of the profession in Canada and your committee believes it meets a real need in this respect. Certainly the committee encounters evidence that the membership generally favours the present form of the *Journal*. Council has made available, funds for the separate publication of highly specialized technical papers and it is entirely reasonable that modest surpluses which the *Journal* may be able to achieve should contribute also to this important publishing activity.

Your committee desires to emphasize again that this fund is available and it is prepared to receive, in fact it earnestly solicits, manuscripts covering original work of Canadian engineers. It is an obligation of the Institute to provide these publishing facilities for its membership and it is likewise an obligation of Canadian engineers to set down their technical accomplishments for the reference of future engineers.

Because of increased costs of all services and the constantly increasing circulation of the *Journal*, the publication manager found it necessary to recommend that the *Journal's* advertising rates should be increased effective January 1, 1951. Although the increase is approximately 25 per cent, the *Journal's* rates are still considerably less than the national average for contemporary technical publications.

I. R. Tait, M.E.I.C.,
Chairman.

Library and House Committee

One meeting of the committee was held in 1950. The need of additional room at headquarters has of course been discussed, but the question of additional office space is not now so pressing due to the fact that the reading room on the second floor has been taken over for administrative purposes. However, headquarters' activities are still expanding and the need for additional space, undoubtedly, will arise before long. It should be pointed out that the main difficulty in supplying additional space at headquarters is in obtaining sufficient money to do a job that will be satisfactory for many years to come. The amount required for this work is substantial and exactly how this money can be obtained is not readily apparent. It is understood that a grant is being made to a building fund every year, so that in time sufficient capital will be available.

In the meantime, this committee feels that present facilities have been expanded practically to the limit, but under present conditions where materials, etc., are difficult to obtain, this is not the time, perhaps, for proceeding with a complete new building.

During the early part of the summer, repairs were effected to the front part of the roof at headquarters' building, but further work in this direction will be required next summer.

Also during this last summer, the basement has been cleaned and painted throughout and is now used for the storage of books from the library. This move has been made possible because of the change last year from coal heating to an automatic oil system.

H. F. Finnemore, M.E.I.C.,
Chairman

Library Report

During 1950, the only change in the library, outside of staff, has been the addition of about 500 feet of shelving space in the stack room which should provide for about four more years of expansion. Provision is also now almost completed for extra reading and study space in this stack room.

Under the instructions of the general secretary, the librarian spent a week at the Engineering Societies Library in New York last October, working on the Universal Decimal System of Classification. This week proved most interesting and instructive. Work has already started at the Institute on the completion of the classifying of all the books in the library. All members of the staff are keen on this work. As it progresses, the increased knowledge of the books and their contents enables the librarians to render better service to the members, and, of still more importance, the members are better able to serve themselves in finding detailed information on any subject in which they may be interested.

Enquiries for information by telephone, letter and in person, show an increase of 21 per cent over any previous year, and circulation and reading room use of books, pamphlets and reference books has increased 15 per cent.

The attention of members is drawn to the library film service. At the present time, the library has in its collection eleven films, but Institute membership in the Canadian Film Institute gives the members access to all film information obtainable from Ottawa. Enquiries are invited.

The following statistics will be of interest to members:

Additions to the Library—	1950	1949
Books	364	259
Reports, Standards, etc.	771	766
Total	1135	1025
Increase — 8 per cent.		
Circulation—		
Books	2156	2089
Journals	2640	2036
Pamphlets	813	677
Films	6	8
Total	5615	4810
Increase — 15 per cent		
Enquiries Received—		
By telephone	4194	2978
In person—day	2129	2013
In person—evening	191	202
By letter	2060	1578
Total	8574	6771
Increase — 21 per cent		

The value of material received for review purposes and on exchange, totalled $2,886, an increase of 5 per cent over 1949.

Appreciation is expressed to all publishers who have co-operated in providing these books and reviews. It is hoped that the publicity has proved of advantage to all concerned.

Emily Keeley,
Chief Librarian

Membership Committee

The programme recommended by this Committee, of soliciting desirable prospects to become members of the Institute, is being initiated through the efforts of the Field Secretary's office. The results are not yet available.

The great increase in membership in the Institute has been through recruitment in the Universities and the subsequent transference of these student members to juniors and in turn the graduation of a large number of juniors to full membership. At the moment approximately half the membership of the Institute is junior and student.

The inauguration of several new Branches has provided facilities that have resulted in a number of desirable prospects joining as corporate members in these Branches.

In all the Branches there are numbers of desirable prospects who should be invited to join the Institute. It is hoped that some programme can be devised that will assure that these prospects are invited to become members.

H. R. Sills, M.E.I.C.,
Chairman

Board of Examiners

In September of last year Prof. R. DeL. French who had served as chairman of the Board of Examiners since February, 1945 relinquished these responsibilities and the writer desires to record the Board's appreciation of his outstanding contributions to its activities during this considerable period. The movement to Canada in the post-war period of large numbers of British and foreign engineers and the necessary appraisals of their engineering education and experience have resulted in a good deal of work for the Board. It is considered that the Institute is greatly indebted to Prof. French for his extensive contribution to this work.

To avoid duplicating the legally prescribed functions of the licensing bodies, it has been the policy of Council whenever possible to recommend to applicants that they should seek registration if their engineering education is not obviously equivalent to that offered by the Canadian universities. Because of particular circumstances in some of the provinces however, this policy cannot always be applied and the Board is then required to prescribe such examinations as it considers necessary.

Throughout the past year the Board has considered a number of such cases and has in each case recommended such examination as seemed called for. The Board has also co-operated with headquarters in the conduct of examinations.

Toward the close of the year the Board completed inquiries which indicated that the national universities of the Baltic States of Esthonia, Latvia and Lithuania were of equivalent status. Previously only the University of Latvia at Riga had been approved but, on the recommendation of the Board, the three universities are now considered equally acceptable.

C. A. Robb, M.E.I.C.,
Chairman

Treasurer's Report

The audited statements appearing below indicate that the Institute continued to operate on a sound financial basis during the year 1950.

Income from membership fees totalled $109,720.05, an increase of $7,215.02 or approximately 7.0 per cent over 1949.

Revenue from publications totalled $127,659.81, an increase of $23,409.93 or 22.4 per cent over the previous year. Expenses of publications totalled $126,877.17, an increase of $25,881.28 or 25.6 per cent over 1949.

After transferring $3,000 to the Building Fund, surplus for the year amounted to $458.60.

Securities in the Institute's investment accounts amounted to $56,728.75, representing a slight increase realized through conversion of certain holdings. The approximate market value as of 31st December, 1950, of all our securities stands at $56,716.00.

Comparative Statement of Revenue and Expenditure

For the Year Ended 31st December 1950

REVENUE

	1950	1949
MEMBERSHIP FEES:		
Arrears	$ 3,467.36	$ 3,816.43
Current*	102,126.86	94,641.65
Advance	1,354.63	1,634.78
Entrance	2,771.20	2,412.17
	$109,720.05	$102,505.03
PUBLICATIONS:		
Journal sales	$ 60.25	$ 186.75
Journal advertising	127,599.56	104,063.13
	$127,659.81	$104,249.88
INCOME FROM INVESTMENTS	$ 1,190.16	$ 1,203.49
REFUND OF HALL EXPENSE	1,000.00	1,025.00
SUNDRY REVENUE AND PROFIT ON SALE OF SECURITIES	603.15	644.85
	$240,173.17	$209,628.25

* Membership fees including journal and directory.

EXPENDITURE

	1950	1949
BUILDING EXPENSE:		
Property and water taxes	$ 1,385.82	$ 1,367.82
Fuel	726.27	172.06
Insurance	463.36	297.44
Light, gas and power	826.73	741.81
Caretaker's wages and services	1,488.00	1,403.00
House expense and repairs	2,570.23	2,002.98
	$ 7,460.41	$ 5,985.11
PUBLICATIONS:		
Salaries	$ 11,287.84	$ 8,663.63
Printing and sundry expense	83,893.82	66,574.8[illegible]
Advertising and management	31,695.51	25,757.46
	$126,877.17	$100,995.89
OFFICE EXPENSE:		
Salaries	$ 46,243.00	$ 40,375.16
Telegrams, postage and excise	2,596.08	3,103.14
Telephones	1,108.73	1,082.50
Office supplies and stationery	6,900.67	7,519.35
Audit and legal fees	685.20	600.00
Messenger and express	148.40	78.37
Miscellaneous expense	1,704.82	682.32
Depreciation—furniture and fixtures	958.52	869.70
	$ 60,345.42	$ 54,310.54
GENERAL EXPENSE:		
Annual and professional meetings	....	$ 999.41
Students' conference	....	1,199.95
Meetings of council	$ 1,572.46	1,301.99
Travelling	4,806.85	3,774.27
Branch stationery	316.34	315.63
Institute prizes	455.60	577.12
Library salary and expense	9,987.01	5,821.45
Interest, discount and exchange	214.37	195.83
Committee expenses	400.20	210.87
Cost of membership in other societies	1,856.50	1,659.81
Sundry expense	736.26	558.80
Pension plan	745.27	3,009.74
Membership directory	4,269.90	4,592.44
	$ 25,360.76	$ 24,217.31
REBATES TO BRANCHES	$ 16,670.81	$ 14,245.87
TOTAL EXPENDITURE	$236,714.57	$199,754.72
TRANSFERRED TO BUILDING RESERVE	3,000.00	8,000.00
SURPLUS FOR YEAR	458.60	1,873.53
	$240,173.17	$209,628.25

Total Assets now stand at $126,970.71, n increase of $3,000 or 2.4 per cent over 949.

ALBERT DESCHAMPS, M.E.I.C.,
Treasurer.

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Finance Committee

During the year 1950 the revenue eached an all-time high of $240,173, due o continued expansion in membership, o transfers of students and juniors to igher grades and to increased volume f advertising in the *Journal.*

There was likewise a large increase in xpenditure due to higher building exense, to the larger number of Journals rinted and distributed, to necessary staff and salary adjustments including the operation of a field secretary's office in Toronto throughout the year for the first time, to the publication of a directory which proved more expensive than originally estimated, to changes and expansion in Library staff, including transfer to enlarged quarters and to the general increase in the cost of doing business experienced by all.

While the Institute has come through a year of intense activity with the *Journal,* due to excellent management, carrying itself with a small margin to spare, it is to be especially noted that the excess of revenue over expenditure of $3,458.60 amounts to less than 1½% of the gross income and to only $0.24 per member including students and juniors. An amount of $3,000 has been transferred to the building fund which now stands at $20,000 and $458.60 credited to surplus account.

Special reference is made to the "Voluntary Contribution" project which Council agreed to in 1950. The need for additional funds was so apparent to the committee and to Council that some method had to be devised quickly to meet the situation. Consideration was given to increasing the fees but this is a slow process closely restricted by the by-laws. Had such a method been followed a whole year would have been lost. It is hoped and believed that the voluntary method will produce substantial results.

The Finance Committee recommends strongly that in future the reserves account should be increased on the basis of not less than $1.00 per member per year, including students and juniors to

Comparative Statement of Assets and Liabilities

As at 31st December 1950

ASSETS

	1950	1949
CURRENT:		
Cash on hand and in banks	$ 5,376.77	$ 7,517.41
Accounts receivable—less reserve...	13,972.88	10,462.04
Arrears of fees—estimated	3,500.00	3,500.00
	$ 22,849.65	$ 21,479.45
INVESTMENTS AT COST:		
(Approximate market value as at 31st December 1950—$56,716.00)..	56,728.75	56,434.92
SUNDRY ADVANCES	116.50	350.00
DEPOSIT WITH POSTMASTER	400.00	175.00
PREPAID INSURANCE	756.00	170.00
GOLD MEDAL	45.00	45.00
LIBRARY	1,448.13	1,448.13
FURNITURE AND FIXTURES—at cost less depreciation	8,626.68	7,827.35
LAND AND BUILDINGS—assessed valuation	36,000.00	36,000.00
	$126,970.71	$123,929.85

LIABILITIES

		1950	1949
CURRENT:			
Accounts payable		$ 9,803.53	$ 7,637.22
		$ 9,803.53	$ 7,637.22
SPECIAL FUNDS:			
As per statement attached		18,687.31	18,348.00
RESERVES:			
Building fund		20,000.00	17,000.00
Building maintenance		2,000.00	2,000.00
Contingent reserve		5,000.00	5,000.00
Pension fund reserve		5,366.50	8,000.00
Technical publications fund		1,095.35	1,385.21
SURPLUS ACCOUNT:			
Balance as at 31st December 1949	$64,559.42		
Add: Excess of revenue over expenditure for year as per statement attached	458.60		
		65,018.02	64,559.42
		$126,970.71	$123,929.85

AUDITORS' CERTIFICATE

We have audited the books and vouchers of The Engineering Institute of Canada for the year ended 31st December 1950 and have received all the information we required. We have verified the cash in banks and the investment securities and the revenue therefrom. In our opinion, the statement of assets and liabilities and statement of revenue and expenditure for 1950, as attached, are properly drawn up so as to exhibit a true and correct view of the Institute's affairs as at 31st December 1950 and of its operations for the year ended that date, according to the best of our information and the explanations given to us and as shown by the books of the Institute.

RITCHIE, BROWN & CO.
Chartered Accountants.

MONTREAL, 12TH JANUARY 1951.

provide for necessary expansion and the uncertainties of the future.

The Finance Committee met twelve times during the year and reported to Council at each Council meeting.

The Finance Committee is in an excellent position to appreciate the work done by the Headquarters' organization. Under these circumstances it is a pleasure to record the Committee's appreciation of the excellent service rendered by the general secretary and his entire staff.

R. E. Heartz, m.e.i.c.,
Chairman

Committee on Professional Interests

To assist the reader of this report to secure a clear understanding of this Committee's objectives, it would appear useful to have these objectives restated.

Originally organized to assist in the advancement of co-operative agreements between the Provincial Associations and the Institute which promoted their incorporation in the first instance, this Committee, while still carrying on its original work, has acquired, usually by direction of Council, the duty of assisting in the promotion of new branches, the encouragement of co-operative agreements with sister engineering societies and certain other special work not specifically coming within the scope of other standing or special committees.

With the foregoing in mind, we believe that the past year, from this Committee's standpoint, has been one of unusual progress. There have been many indications of substantial growth and of consolidation of the many gains made by the Institute in the five post-war years.

Chiefly to be recorded are:

(1) The eminently successful work being done by Colonel L. F. Grant as field secretary, whose activities will undoubtedly be recorded elsewhere but whose influence on the work of this Committee is of such a nature that this report would be incomplete were this assistance not gratefully acknowledged. This Committee regards the field secretary's work to date, and the potential accomplishments of that position, as being, as was expected, of the greatest importance.

(2) The overwhelming vote in favour of an agreement between the Manitoba Association and the Winnipeg Branch of the Institute is another step towards complete co-operation.

(3) Discussions are being held which are confidently expected to lead to the formation of a Branch in Prince Edward Island.

(4) The visit of the president and general secretary to Britain and South Africa, reported elsewhere, forges another link in Commonwealth co-operation.

(5) The Joint Annual Meeting with the American Society of Civil Engineers and the Engineering Institute in July, 1950 did much to cement the friendly relations between the two societies and in many ways offered the membership of both opportunities for interchange of ideas that occurs only too rarely.

(6) The inauguration of the branch at Belleville, Ontario, brought our

Statement of Special Funds

As at 31st December 1950

Leonard Medal Fund:		
Balance as at 31st December 1949	$ 619.65	
Add: 3% interest	18.19	
	$ 637.84	
Less: Cost of prizes	42.00	
		$ 595.84
Plummer Medal Fund:		
Balance as at 31st December 1949	$ 839.58	
Add: 3% interest	23.55	
	$ 863.13	
Less: Cost of prizes	54.50	
		$ 808.63
Past Presidents' Prize Fund:		
Balance as at 31st December 1949	$ 8,499.68	
Add: 3% interest	255.00	
	$ 8,754.68	
Less: Cost of prizes	....	
		$ 8,754.68
Duggan Medal Fund:		
Balance as at 31st December 1949	$ 3,016.29	
Add: 3% interest	87.00	
	$ 3,103.29	
Less: Cost of prizes	107.00	
		$ 2,996.29
Julian C. Smith Memorial Fund:		
Balance as at 31st December 1949	$ 968.78	
Add: 3% interest	28.68	
	$ 997.46	
Less: Cost of prize	12.00	
		$ 985.46
Fund in Aid of Members' Families:		
Balance as at 31st December 1949	$ 3,910.34	
Add: 3% interest	117.30	
		$ 4,027.64
Pioneers of Science Prize Fund:		
Balance as at 31st December 1949	$ 238.60	
Add: 3% interest	7.14	
		$ 245.74
Life Members' Donation Fund:		
Balance as at 31st December 1949	$ 255.08	
Donation for 1950	10.00	
Add: 3% interest	7.95	
		$ 273.03
		$18,687.31

Harry F. Bennett Educational Fund

Statement of Receipts and Disbursements

For the year ended 31st December 1950

Balance as at 31st December 1949		$26,206.35
Interest on loans repaid		33.00
Interest on investments		607.89
		$26,847.24
Deduct: Sundry bank charges	$ 1.00	
Sundry printing, etc.	54.41	
Expenses — students' conferences, etc.	3,310.74	
		3,366.15
Balance as at 31st December 1950		$23,481.09
Investments at cost	$16,920.00	
Loans outstanding (see list)	7,495.00	
	$24,415.00	
Less: Bank overdraft	933.91	
		$23,481.09

Investments — *At cost:*

$10,000.00	Dominion of Canada Bonds 3% Sept. 1, 1966	$10,037.50
7,000.00	Province of Ontario Bonds 3% April 15, 1965	6,882.50
		$16,920.00

Auditors' Certificate

We have audited the books of the Harry F. Bennett Educational Fund of The Engineering Institute of Canada for the year ended 31st December 1950 and have obtained all the information and explanations we have required. The accounts record interest received on fully repaid loans only, no charge having been made for accrued interest on outstanding loans. In our opinion, the above statement of receipts and disbursements is properly drawn up so as to exhibit a true and correct view of the affairs of the Fund as at 31st December 1950 and for the year ended that date according to the best of our information and the explanations given to us and as shown by the books of the Fund.

Ritchie, Brown & Co.
Chartered Accountants.

Montreal, 12th January 1951.

total number of branches to thirty-three (33).

Implementing a decision by Council, ie vice-presidents of the various zones, sually in company with some senior embers, visited the branches of their one. Reports by both branch members nd the vice-presidents concerned indiated that this decision was a sound one lready the practice has resulted in iscussions bringing benefits to both ranches and headquarters.

This committee views with satisfacon the conferring by universities and ster societies, of honours and awards pon some of our distinguished members -events which were previously record-l in *The Engineering Journal*.

The increasing frequency of visits by minent engineers from Britain and the nited States and the visits of our members to the headquarters and ranches of our sister societies are nanifestations of growing unity in the rofession and such reciprocal visits hould receive the encouragement of ll members.

J. B. Stirling, M.E.I.C.,
Chairman

Nominating Committee

Chairman: G. R. Henderson, M.E.I.C., Sarnia, Ont.

Branch	*Representative*
Belleville	J. E. Buchan
Border Cities	F. J. Ryder
Calgary	H. R. Younger
Cape Breton	S. G. Naish
Central B.C.	W. Ramsay
Cornwall	John Hawkes
Edmonton	J. W. Porteous
Halifax	C. D. Martin
Hamilton	W. A. T. Gilmour
Kingston	R. D. Bennett
Kitchener	A. J. Girdwood
Kootenay	A. C. Ridgers
Lakehead	H. M Olsson
Lethbridge	James Haimes
London	G. N. Scroggie
Moncton	W. C. Baggs
Montreal	J. A. Beauchemin
Newfoundland	H. Forbes-Roberts
Niagara Peninsula	C. G. Cline
Ottawa	G. R. Turner
Peterborough	A. L. Killaly
Quebec	C. H. Boisvert
Saguenay	W. F. Campbell
Saint John	A. R. Bonnell
St. Maurice Valley	J. S. Whyte
Sarnia	J. E. Harris
Saskatchewan	A. H. Douglas
Sault Ste. Marie	R. A. Campbell
Sudbury	W. B. Ibbotson
Toronto	W. E. Bonn
Vancouver	Sidney Hogg
Victoria	P. E. Doncaster
Winnipeg	C. V. Antenbring

Admissions Committee

The work of this committee followed he usual pattern with recommendations resented at each meeting of Council on applications pending at the time. However, the recent revision of the by-aws has placed additional responsibility on this committee since opinions are not now received from the Councillors, and the sponsors are contacted only on specific request from the Admissions Committee.

Admissions or transfers were recommended for 376 members in addition to 138 automatic admissions and transfers under co-operative agreements, and 1,234 automatic transfers from Student to Junior. 1,629 students were admitted.

As noted in last year's report, work on the manual was suspended pending revision of the by-laws. The resulting simplified procedure in processing applications at Headquarters has now been established and the first draft of the Manual should be issued in the early part of 1951.

J. M. Crawford, M.E.I.C.,
Chairman

Ontario Division

The activities of the Ontario Division for the year 1950 have been limited in extent, and related entirely to projects initiated previously.

1. Shoreline Erosion

The committee on Shoreline Erosion, under the chairmanship of Mr. P. Buss, M.E.I.C., has studied in detail the report of Dr. G. B. Langford on this subject. Prompted by recent severe losses incurred at the western end of Lake Ontario, the Committee has taken steps to bring the problem before Federal authorities, through National engineering organizations.

2. Co-operation with the Ontario Association of Professional Engineers

The officers of the Division have continued discussions with officers of the Association, and a very satisfactory relationship, indicative of the fullest desire to further co-operation, has been maintained. Through the initiative of several Ontario Branches, and with the active co-operation of the Association, members of the Association have been encouraged, successfully, to participate in Branch and Institute activities.

3. St. Lawrence Waterway

The committee dealing with this subject has, under the chairmanship of Mr. E. A. Cross, M.E.I.C., completed an extensive study of Mr. J. G. G. Kerry's paper, and of related literature. Further investigation has been considered to be undesirable in the light of present advanced state of International discussions on this subject.

Officers for the forthcoming year are as follows:

Executive Committee: chairman, W. L. Saunders, Owen Sound; vice-chairman, W. A. T. Gilmour, Hamilton; secretary, L. C. Sentance, Hamilton; treasurer, G. R. Turner, Ottawa.

Board of Management: W. L. Saunders, Owen Sound; W. A. T. Gilmour, Hamilton; L. C. Sentance, Hamilton; G. R. Turner, Ottawa; E. A. Cross, Toronto; F. R. Pope, Peterborough; C. P. Warkentin, Sarnia.

A copy of the duly audited financial statement follows, prepared by the Treasurer, Major-General G. R. Turner.

Financial Statement

Receipts	
Balance as at December 31, 1949	$141.78
Bank interest	.68
	$142.46
Expenditures	
Nil	....
Balance as at December 31, 1950	$142.46
	$142.46

L. C. Sentance, M.E.I.C.,
Secretary.

Canadian Standards Association

As your representative on the Main Committee of the Canadian Standards Association, it is my privilege to furnish another annual report on the activities of this important and rapidly growing body.

The year 1950 has been a very busy one in all branches of the Association's activity, but the outstanding feature has been the transfer of the Approvals Division to new quarters at 71-77 Florence St., Toronto, and its consolidation as an operating unit in the C.S.A., severed entirely from the Hydro-Electric Power Commission of Ontario. This change is of outstanding importance and has involved a great deal of careful study and concentrated effort, but during a visit to the new quarters in November, the writer was impressed with the value of the new development and the splendid facilities now available to the large staff which has been transferred from various separated offices and plants to these new laboratories.

The Canadian Welding Bureau, another important division of the C.S.A., has also been very active in the promotion of good welding practice, including the education and control of operators. Since the establishment of this Bureau a few years ago, the confidence of engineers, architects, building officials and fabricators has increased to the point where welding is accepted for bridge and building structures by many municipalities and government departments throughout Canada. Further developments are in prospect in order to smooth out some of the difficulties and misunderstandings that still exist and a very active and important future is visualized for this division.

During the year, 47 new C.S.A. publications were issued comprising 34 new standards and 13 revised editions of existing standards. Twenty existing standards were reaffirmed as representing current practice, while minor revisions to 15 other standards were accomplished by the issue and insertion of revision slips. Many other projects are under investigation, some in an advanced stage and some in a preliminary stage, and to the construction industry, some of the more important accomplishments are the preparation of 19 specifications dealing with gypsum and lime products and also the consolidation of the specifications dealing with timber products under the newly organized Sectional Committee. Furthermore, the Sectional Committee on Civil Engineering has been divided to make possible the formation of Sectional Committees on such matters as concrete and building materials, etc.

Among the 47 standards published or republished during 1950, are a series under G-40 for structural steel, the new S-1 covering steel railway bridges, this being the 4th edition, a 3rd edition of B-12 covering galvanized steel wire strand, a 2nd edition of B-33.1 governing cap screws, set screws, studs and nuts and new additions of 015.1 and 015.2 governing cedar poles.

In conclusion, it may be noted that membership in the C.S.A. is increasing both in numbers and in representation and that industry in general is appreciating the fact that this Association provides a real service to both producer and consumer. There are still many problems to which standardization might be applied and the Association is willing and anxious to offer its services in every case where there is evidence of a potential usage for standard specifications.

P. L. Pratley, M.E.I.C.,
Representative of the Institute.

BRANCHES	Belleville	Border Cities	Calgary	Cape Breton	Central British Columbia	Cornwall	Edmonton	Halifax	Hamilton	Kingston	Kitchener	Kootenay	Lakehead	Lethbridge	London
MEMBERSHIP															
Resident															
Hon. Members	..	..	..	..	1	..	..	..	..	..	..	..	..	..	
Members	36	69	162	38	19	21	160	204	99	43	20	22	46	24	53
Juniors	14	34	41	25	9	7	80	34	67	26	15	11	20	6	50
Students	7	59	90	22	19	16	234	174	106	73	30	21	41	12	34
Affiliates	2	1	1	1	..	2	2	1	..	..	2	..	6	.	3
Total	59	163	294	86	48	46	476	413	272	142	67	54	113	42	140
Non-Resident															
Hon. Members	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Members	..	15	11	9	1	7	23	83	36	4	..	11	12	15	22
Juniors	..	11	8	3	2	1	18	24	20	2	..	7	10	3	19
Students	..	18	27	14	1	4	35	72	18	4	..	26	11	18	19
Affiliates	..	..	..	..	1	..	..	..	..	..	..	..	..	..	.
Total	..	44	46	26	5	12	76	179	74	10	..	44	33	36	60
Grand Total Dec. 31st, 1950	59	207	340	112	53	58	552	592	346	152	67	98	146	78	20[illegible]
" Dec. 31st, 1949	..	161	297	77	43	44	450	481	286	173	44	70	139	62	13[illegible]
Branch Affiliates, Dec. 31st, 1950	9	..	49	..	3	10	2	..	14	..	2	1	6	32	.
FINANCIAL STATEMENT															
Balance as of December 31st, 1949	..	876.58	211.48	391.96	15.57	198.74	393.23	468.05	32.24	184.57	151.84	183.44	325.46	135.82	320[illegible]
Income															
Rebates from E.I.C. Hq	..	421.20	150.40	92.40	94.20	133.20	232.80	156.20	534.50	267.90	120.00	170.70	289.20	35.40	356.[illegible]
Payments by Prof. Assns	..	..	504.89	151.55	..	..	522.90	735.60	..	..	..	..	..	106.67	..
Branch Affiliate Dues	72.00	7.00	179.00	30.00	11.75	32.00	..	..	82.00	..	20.00	..	35.00	93.00	10[illegible]
Interest	..	11.43	31.95	..	..	..	..	3.71	25.77	..	..	..	3.00	..	3.0[illegible]
Miscellaneous	456.85	1,117.03	939.77	560.55	..	142.00	803.32	721.89	787.34	24.00	3.50	53.30	2.35	68.05	450.3[illegible]
Total Income	528.85	1,556.66	1,806.01	834.50	105.95	307.20	1,559.02	1,617.40	1,429.61	291.90	143.50	224.00	329.55	303.12	819.4[illegible]
Disbursements															
Printing, Notices, Postage①	12.89	83.11	263.52	17.74	20.69	30.08	186.51	333.43	317.97	45.24	60.58	79.28	93.38	51.98	83.6[illegible]
General Meeting Expense②	..	10.00	193.04	13.50	66.13	20.87	380.07	68.75	47.75	145.69	80.63	20.00	..	44.44	174.4[illegible]
Special Meeting Expense③	372.00	1,293.55	1,133.34	803.99	..	314.50	140.53	1,007.44	719.67	44.98	26.54	228.36	300.90	138.97	307.9[illegible]
Honorarium for Secretary	..	..	23.40	..	..	..	100.00	100.00	..	..	..	..	8.15	25.00	..
Stenographic Services	..	21.25	..	23.00	5.00	..	..	114.40	50.00	..	..	..	..	..	5.0[illegible]
Travelling Expenses④	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Subs. to other organizations	..	..	..	..	..	2.00	..	..	..	..	..	5.18	..	..	
Subs. to *The Journal*	..	2.00	38.15	..	4.30	..	..	..	8.00	..	..	21.5	10.15	6.30	
Special Expenses	..	5.00	..	5.00	..	..	521.21	85.75	150.00	..	17.61	..	1.25	58.00	21.5[illegible]
Miscellaneous	..	.35	10.75	4.20	.54	9.65	15.42	27.41	150.92	49.39	..	7.94	..	5.18	.4[illegible]
Total Disbursements	384.89	1,415.26	1,662.20	867.43	96.66	377.10	1,343.74	1.737.18	1,444.31	285.30	185.36	342.91	413.83	329.87	592.4[illegible]
Surplus or *Deficit*	143.96	141.40	143.81	*32.93*	9.29	*69.90*	215.28	*119.78*	*14.70*	6.60	*41.86*	*118.91*	*84.28*	*26.75*	226.95
Balance as of December 31st, 1950	143.96	1,017.98	355.29	359.03	24.86	128.84	608.51	348.27	17.54	191.17	109.98	64.53	241.18	109.07	547.15

①Includes general printing, meeting notices, postage, telegraph, telephone and stationery.

②Includes rental of rooms, lanterns, operators, lantern slides and other expenses.

③Includes dinners, entertainments, social functions, and so forth. ④Includes speakers, councillors or branch officers.

Branches as at December 31, 1950

Montreal	Newfoundland	Niagara Peninsula	Ottawa	Peterborough	Quebec	Saguenay	Saint John	St. Maurice Valley	Sarnia	Saskatchewan	Sault Ste. Marie	Sudbury	Toronto	Vancouver	Victoria	Winnipeg
2	..	..	2	..	..	.	..	..	..	..	..	..	..	..	..	..
1,428	17	101	327	44	133	71	67	78	50	167	23	15	494	255	66	201
816	12	49	88	21	73	30	13	58	37	49	5	10	245	91	19	66
1,284	26	61	259	34	82†	22	21	55	29	183	14	20	387	531	52	324
21	1	2	4	2	2	1	2	1	.	.	..	2	6	5	..	3
3,551	56	213	680	101	290	124	103	192	116	399	42	47	1,132	882	137	594
..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..
97	16	4	58	33	15	11	70	8	4	58	28	16	26	19	17	21
80	2	..	26	13	14	7	16	8	2	13	27	8	12	19	8	17
81	21	..	43	24	17	4	89	8	1	..	38	10	35	63	25	51
..	..	..	.		1	..	..	..	..	..	..	1	..	1	..	..
258	39	4	127	70	47	22	175	24	7	71	93	35	73	102	50	89
3,809*	95	217	807	171	337†	146	278	216	123	470	135	82	1,205	984	187	683
3,184	48	206	664	146	448	131	314	190	95	480	173	..	1,048	875	150	635
10	..	2	16	11	.	..	17	1	..	..	..	..	..	..	1	22

For voting purposes only, there should be added to Montreal Branch, an additional 508 members, 317 resident in the United States, 117 in British possessions and 74 in foreign
es. †Does not include students at Laval University.

	Montreal	Newfoundland	Niagara Peninsula	Ottawa	Peterborough	Quebec	Saguenay	Saint John	St. Maurice Valley	Sarnia	Saskatchewan	Sault Ste. Marie	Sudbury	Toronto	Vancouver	Victoria	Winnipeg
1	5.208.02	72.70	535.75	841.34	249.92	686.40	469.04	428.02	228.26	220.64	90.86	935.14	..	1,833.87	550.92	111.15	1,878.45
0	5,103.80	150.90	476.70	1,017.40	408.00	532.75	431.40	207.25	439.20	269.10	34.25	249..00	153.60	1,854.00	976.00	257.70	857.00
0	..	8.40	..	..	..	..	..	260.00	..	..	606.12	..	..	..	..	..	..
0	64.00	..	..	45.00	30.00	..	21.00	102.00	6.50	..	..	36.00	36.00	..	..	3.00	100.00
3	90.00	..	18.66	54.95	.99	..	..	..	.	..	..	9.00	.36	31.37	11.96	..	36.00
0	1,990.00	215.00	..	529.29	50.85	384.32	167.50	..	.	567.54	..	165.00	150.00	457.29	395.25	113.00	302.26
3	7,247.80	374.30	495.36	1,646.64	489.84	917.07	619.90	569.25	445.70	836.64	640.37	459.00	339.96	2,342.66	1,383.21	373.70	1,295.26
8	2,990.90	42.14	121.31	428.21	133.99	55.37	51.40	101.76	102.35	44.30	120.28	83.75	30.95	626.79	405.30	101.51	663.35
0	282.20	35.00	129.59	52.00	95.70	49.70	40.87	.	52.05	785.01	254.30	392.40	76.75	371.59	75.00	67.53	.75
4	2.628.20	205.50	75.01	1,274.44	182.10	678.06	407.08	227.13	159.25	.	.	..		196.42	669.07	165.51	350.15
0	540.00	..	75.03	..	..	175.00	40.00	60.00	.	.	120.00	25.00	.	100.00	50.00	35.00	100.00
0	240.00	..	20.03	100.15	..	25.00	.	15.00	5.00		.	5.00	4.90	6.00	20.00	.	9.00
	292.38	..	..	.	..	..	..	..	.	.	97.07	..	..	..	..	..	25.00
	..	..	..	.	..	..	..	..	..	.	.	..	.	..	..	..	3.00
.5	14.00	..	..		6.00	..	6.00	34.00	2.15	.	..	12.00	6.00	..	..	..	44.00
	207.64	50.00	9.48	291.50	..	.	..	..	50.00	..	..	136.60	.	377.00	77.85	12.45	30.00
25	177.28	5.15	8.42	38.69	13.73	29.13	..	13.20	.70	70.60	14.47	55.30	..	454.40	30.78	..	33.93
52	7,372.60	337.79	438.87	2,184.99	431.52	1,012.26	545.35	451.09	371.50	899.91	606.12	710.05	118.60	2,132.20	1,328.00	382.00	1,259.18
11	*124.80*	36.51	56.49	*538.35*	58.32	*95.19*	74.55	118.16	74.20	*63.27*	34.25	*251.05*	221.36	210.46	55.21	*8.30*	36.08
32	5,677.22	109.21	592.24	302.89	308.24	591.21	543.59	546.18	302.46	157.37	125.11	684.09	221.36	2,044.33	606.13	102.85	1,914.53

Prairie Water Problems Committee

Your Committee on Prairie Water Problems was not particularly active during the past year. The individual members were, however, very interested in the hearings of the International Joint Commission which held sessions in connection with the application of the Reclamation Service of the United States for a share of the water of the Belly and Waterton rivers. Some members of the committee gave evidence before the Commission, and participated in the discussion.

Your Committee wishes to go on record as being pleased with the appointment of General A. G. L. McNaughton, M.E.I.C., as Chairman of the Canadian Section of the International Joint Commission, and Jean A. L. Dansereau, M.E.I.C., as a Member of the Canadian Section.

While no problems have arisen, your Committee is very pleased to note the progress in the building of additional irrigation and power works that will make good use of considerable additional water, and increase both agricultural and industrial production. The Federal Government spent over four million dollars, and the Alberta Government over two million in the development of the St. Mary and Milk Rivers project in 1950. This year's construction brought about 6,000 acres additional land under irrigation, but eventually a total of about 340,000 acres will be reclaimed. This will, it is estimated, increase the population of Southern Alberta by about 30,000 persons, and increase the agricultural production by millions.

Calgary Power Ltd. made good progress in the construction of the Spray project, which will soon be put into operation, adding 210,000 acre feet of storage in the Bow River basin, and 90,000 H.P. to the company's power production.

The Prairie Water Board, set up by the Federal Government, and the governments of the provinces of Alberta, Saskatchewan and Manitoba, is functioning and making a thorough check up on the use and waste of water in the prairie Provinces. Its work should result in more economical use of the streams that originate in the East slope of the Rocky Mountains.

G. A. Gaherty, M.E.I.C.,
Chairman.

Committee on Atmospheric Pollution in Canada

This Committee was appointed early in 1949 to study the general question of atmospheric pollution in the various parts of Canada and to recommend a standard by-law or ordinance that could be adopted, with such local modifications as might be necessary, for use in any of the provinces.

The Committee was a joint one representing a number of different public and professional bodies, and since October 12th, 1949, eight formal meetings of the Committees have been held. At each meeting appropriate sub-committees were formed to study various individual aspects of the problem, and the reports of these sub-committees were dealt with at the main Committee meetings.

The full report, including the form of ordinance suggested, is now ready in draft form and will be considered at the next meeting of the Committee on January 17th, 1951. If it is then approved, after the necessary amendments have been made, it will be referred back to the parent organizations for approval or criticism. Thereafter, if the report is approved as it stands, it will be printed and published, but if further amendments of a serious nature are required, the Committee will reconsider the matter and will then, presumably, issue a new report.

E. A. Allcut, M.E.I.C.,
Chairman

Canadian Chamber of Commerce

The Canadian Chamber of Commerce celebrated its 25th Anniversary in 1950. During that period of phenomenal industrial expansion it has given leadership in the solution of many problems affecting the social and economic health of the country. This has been done not only in the national field but also, through the constituent local Boards of Trade and Chambers of Commerce, at the community level. "In fact, it is here that the most effective Chamber of Commerce work is done. It is through these community organizations, devoted to the promotion of the civic, commercial, agricultural and industrial progress of the community, that building for the future is taking place."

The basic soundness of the Canadian economy was shown by its ability to meet the unprecedented demands of the last war and by the facility with which it changed from war-time to peace-time conditions. However, in the words of the Annual Report of the Chamber "we are again faced with the need for greater defence expenditures. There is the prospect that continuing and heavier requirements for our actual survival will defer any further transition to a more normal peace-time basis for business generally.

"It would be difficult to superimpose even a moderate preparedness programme on our present industrial structure without limiting to some degree the freedom of producers to produce and of consumers to consume. Moreover, the burden on the national budget of substantially larger defence expenditures and larger social and public works expenditures could become dangerously onerous. All of our foreshadowed security legislation and spending, therefore, should be reexamined in the light of our defence situation.

"Nevertheless, both government and business are confronted with the problem of building sufficient bulwarks against communist aggression without undermining the very foundation on which our progressive democracy rests. Some sacrifices are inevitable, but a practical compromise must be effected between satisfactory defences and improving standards of living for our people. At the same time, any business boom brought on by the threat of war does not add to the country's basic economic health and strength. A democracy cannot turn its armaments into a profit.

"It is against this background that business leadership will be called upon to face a challenging year ahead. The Canadian Chamber is effectively organized to play its part in meeting that challenge."

This is a problem in which engineers, individually and as members of the Engineering Institute of Canada, should be vitally interested and in which they should take an active part.

J. A. McCrory, M.E.I.C.,
Representative of the Institute.

National Construction Council

Four meetings of the Council were held during the past year to consider certain proposals and requests from Organizations affiliated with the Council.

Perhaps the most important matter was the growing tendency of private and public bodies to engage engineers and contractors from the United States to plan and design their plants and buildings. This practice has created considerable dissatisfaction among Canadian engineers inasmuch as it reflects on their ability and professional qualifications. The situation was also aggravated by the change made a few years ago in the customs' regulations, whereby engineers' plans, drawings, and blueprints were admitted into Canada duty free.

In order to draw public attention to this situation, the Council felt it necessary to emphasize:

1. The cost of educating architects and engineers.
2. The loss of many of our talented youth who emigrate to the United States where they usually find little difficulty in obtaining lucrative positions.
3. The unfairness of tariff item No. 180e which permits engineers' plans to be brought into Canada duty free.
4. The conservation of American dollars.

With the assistance of the Engineering Institute of Canada and the Royal Architectural Institute of Canada, a survey was undertaken of the Canadian universities to ascertain the number of students taking courses in engineering and architecture, the number of graduates in these professions, the average cost of their education and the absorptive capacities of the engineering and architectural fields to take up the respective graduates.

The results of the survey indicated that there were 10,715 engineering students and 783 architectural students at Canadian universities in 1949-1950, of which, it was estimated, 3,591 would graduate in engineering and 99 in architecture during the year 1950. It was further learned, as a result of the survey, that the approximate average cost of an engineer's education, including tuition fees, text books, equipment, and living expenses, based on a four-year course, was approximately \$4,500.00 and that of an architect, \$4,240.00. To these amounts should be added the pro-rata cost of providing the necessary facilities and staff at the universities which is estimated at \$3,000.00. It was also learned that the absorptive capacities of the engineering and architectural fields were approximately 100 per cent for the engineers and 87 per cent for the architects.

While the free entry into Canada of engineering plans has been the subject of much discussion at meetings of the Engineering Institute of Canada, the Canadian Construction Association, and other bodies, the National Construction Council, because of the strong feeling that engineering services were being purchased in the United States when equal or better services were available in Canada, wrote to the Minister of Finance, drawing his attention to the fact that customs tariff item No. 180e, originally intended to apply only to engineering services not available in Canada, was, as at present worded, open to abuse. The Council believes that certain advantages have been taken which were never intended and this was causing a great deal of dissatisfaction among engineers and architects. The Council therefore urged the Minister of Finance to either amend or repeal the item in question and it was gratified to learn that he had agreed to refer the matter to the Tariff Board for investigation and report.

Another matter to come before the Council was the request of the Canadian Lumberman's Association to lend support to their resolution urging government action in the protection of Canada's forest resources. In view of the importance to the construction industry of the preservation of our timber resources, the Council wrote to the Prime Minister expressing wholehearted approval of this resolution. The Council was gratified to learn from the Prime Minister that the Government was also very much concerned with the tremendous loss of our forest resources through fire and disease and that legislation had been submitted to Parliament providing "for entering into agreement with the provinces for the protection, development, and utilization of Canada's forest resources, including protection from fire, insects, and diseases". This legislation, known as Bill No. 62, was subsequently passed, following which the Council sent its congratulations to the Prime Minister who expressed his appreciation for its kind words of commendation.

Among other matters to come before the Council during the past year, was the licensing of United States engineers to practise in the Province of Ontario. This enabled them to carry out a number of building projects which could not be carried out by American architects because they were not allowed to practise in Ontario under the existing Architects' Act. This matter is now under joint consideration by the Ontario Association of Architects and the Professional Engineers of Ontario and it is hoped that some satisfactory solution can be found to the problem.

Other matters considered included the Canadian International Trade Fair, on one of the Committees of which representation was requested from the Council; a draft code for dwelling construction in connection with which the National Research Council requested comments and suggestions; and the Combines Investigation Act, which the Council felt did not come within its jurisdiction, but was rather a matter for the individual consideration of its affiliated organizations.

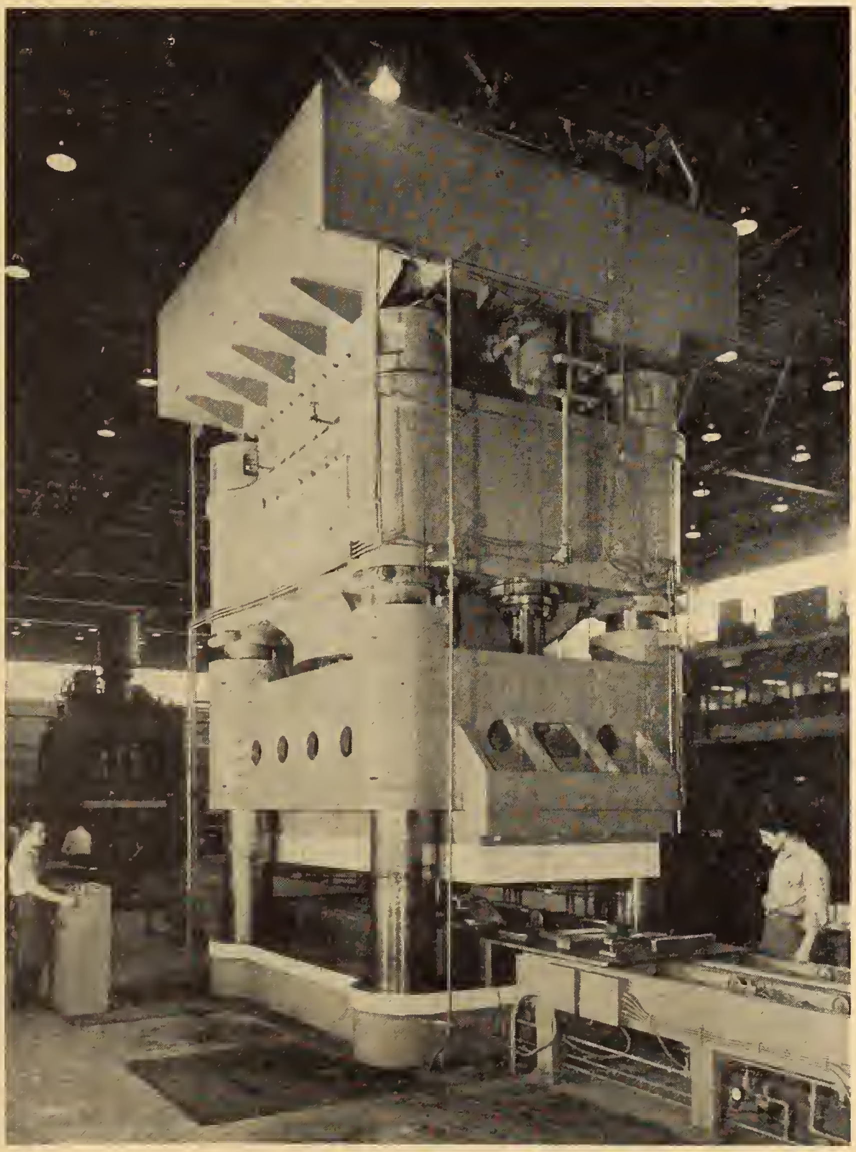
W. E. Bonn, M.E.I.C.,
Representative of the E.I.C.

Giant Forming Press for Aircraft Parts

This 5,000-ton hydraulic forming press, one of the largest ever manufactured in Canada, has just been built by Canadian Vickers, Limited, for Canadair, Limited, for the manufacture of aircraft parts.

A forming press of this type is economical because only a male die is needed. A block of special rubber in the lower part of the moving platen flows under pressure and bends the metal around the die. The rubber block in this press is the largest piece of rubber yet made in Canada. It is 12 inches thick, four feet wide and 12 feet long and weighs 3,702 pounds; it was made by the Dominion Rubber Co. Limited.

Built to Watson-Stillman designs, this press is not only one of the largest in the country but embodies the latest design features. It was completely manufactured in Canada, with the exception, of some of the hydraulic pump equipment which was unobtainable here. The top platen weighs 40 tons, the bottom weighs 35 tons, while the moving platen in the centre weighs 70 tons. The bottom platen is of welded construction. The rubber pad holder, made of seven-inch steel plate, has complete penetration welds. Holes for the four corner guide posts, each 18 inches in diameter, were bored simultaneously in the three platens. The press operates with a single ram, 62 inches in diameter; fluid pressure is 3,000 p.s.i.



FROM MONTH TO MONTH

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

Hydro Electric Progress in Canada 1950

The annual review of Canadian Water Power Development, recently issued by the Water Resources Division, Department of Resources and Development, Ottawa, reports a new record for 1951 of 1,037,275 hp. of new hydro-electric capacity installed during the year. This brings total installed capacity to 12,654,835 hp., or 23 per cent of total resources. New plants and extensions under active construction will add a further million hp., while those definitely planned amount to another $1\frac{1}{2}$ million hp. Increased demand for energy was reflected in an 8-per cent increase over 1949 in the consumption of primary power.

In British Columbia, the B.C. Power Commission is undertaking two projects in the interior, totalling 37,000 hp. A 140-mile power line to Vernon was completed and another from Campbell River to Duncan is under construction. The B.C. Electric Railway Co. has installed a third 47,000-hp. unit at Ruskin, and will modernize the Lake Buntzen plant, increasing its capacity by 42,000 hp. Storage capacity has been increased on the Bridge River plant. Several substations have been built, as well as a power line from Nanaimo to Victoria. Northern B.C. Power Co. is installing 2,700 hp. in 3 diesel units. The Aluminum Co. of Canada will give further study in 1951 to their proposed 1,600,000-hp., development at Kitimat. In the Yukon, construction started on a 3,000-hp. plant at Mayo by the N.W. territories Power Commission.

In Alberta, Calgary Power Co. has developed 62,000 hp. at Spray Lakes, and 39,000 further hp. will be completed at three others of its plants in 1951. The transmission system is being extended. 2,500 additional farms were supplied with power service. Northern municipalities are installing two small plants and investigating a third. Edmonton has converted two more boilers to gas firing.

The Saskatchewan Power Commission is adding 15,800 hp. at Kindersley and Estevan, and built 350 miles of transmission lines during the year. Consolidated Smelters has reopened its 3,300-hp. hydro-electric plant at Wellington Lake, closed since 1942.

In Manitoba, Winnipeg Electric has added one more unit at Seven Sisters, and has built a double circuit power line to its new substation at Transcona. 38,000 hp. of the ultimate 114,000 hp. now being developed by the Winnipeg Hydro at Pine Falls, will be completed in 1951, as well as a first of two steam power units for the City of Winnipeg. Sherritt Gordon Mines is developing 7,000 hp. on the Laurie River for their Lynn Lake Mine. The Manitoba Power Commission has added 278 miles of transmission lines and 3,363 miles of farm lines during 1950, and increased substation capacity by 16,300 kva.

In Ontario, the H.E.P.C. accelerated their development programme on the Ottawa River due to rapid increase in demand for power. Seven 60,000-hp. units were placed in service at Des Joachims, leaving one for completion in 1951. At Chenaux, two 20,000-hp. units went into service late in 1950, leaving 6 more for completion in 1951. At La Cave, construction of a plant with ultimate capacity of 192,000 hp. is actively proceeding and 72,000 hp. will be ready during 1951. A 56,000-hp. plant was placed in service at Thessalon in July, while at Pine Portage two 40,000-hp. units are now in service.

Two steam-generating stations

Cover Picture

In his paper on page 76, J. B. Bryce, M.E.I.C., describes the extensive model tests from which was evolved the design of the spillway at the Stewartville Power Development of the Hydro-Electric Power Commission of Ontario.

This month's cover photo is a general view of the development in which the spillway shows very clearly at the left of the dam.

are under construction at Windsor and Toronto; the former with initial capacity of 132,000 kw.; the latter with initial capacity of 188,000 kw., both to be completed in 1951. Ultimate combined capacity will be 600,000 hp. Five temporary steam plants with combined capacity of 61,000 hp. were placed in service in 1950. Planning is proceeding on the Niagara River development authorized last year by treaty, with its proposed six 100,000-hp. units, scheduled for completion in 1954.

The Commission during the year built 1,870 miles of transmission lines and 2,100 miles of rural lines. 33,000 new rural customers were added. Good progress was made in converting from 25 to 60 cycles, and the programme is scheduled for completion by 1958 or 1959. Besides the H.E.P.C. programmes, 21,000 hp. have been added by two paper companies and one municipality during the year.

In Quebec, units totalling 241,800 hp. were brought into operation, and more than half a million hp. is scheduled for 1951 completion. Quebec Hydro installed another 110,000 hp. at Beauharnois, and 220,000 more hp. will be completed in 1951. Shawinigan has placed two 65,000-hp. units in service at their Trenche plant on the St. Maurice and will install a further 3 units in 1951. Northern Quebec Power Co. are adding a fifth 34,500-hp. unit on the Quinze River, to be completed in March 1951. The Aluminum Co. of Canada has commenced work on a 200,000-hp. development on the Peribonka River, for completion in 1952, and is planning a second development of similar size on the same river. A total of 81,000 hp. at five sites is actively under construction by various companies and municipalities for early completion, while other smaller developments totalling some 21,000 hp. are planned for commencement at early dates. Four hundred miles of transmission line and 615 miles of rural lines were completed during 1950 by Quebec Hydro, Shawinigan, and other companies.

In the Atlantic provinces, the Nova Scotia Power Commission installed 12,800 hp. on the Mersey River in 1950; 28,000 additional steam and hydro capacity is under construction. The N.S. Light & Power Co. completed a 5,000-hp. plant in 1951. The Company will add 3,000 hp. of hydro power in 1951 and will add two 20,000-kw. steam units in Halifax during 1951 and 1953. The New Brunswick Power Commission is building a 27,000-hp. plant on the Tobique River, and is enlarging its Grand Lake steam plant by 12,500 kw. in 1951 and by 15,000 kw. in 1952. The Newfoundland Light & Power Co. added 13,000 hp. in 1950, and is adding 3,300 hp. at Tors Cove in 1951. Other plants nearing completion are: Seaboard Power Co., Sydney, 15,000 kw.; and Maritime Electric, P.E.I., 7,500 kw. In the four Atlantic provinces, 200 miles of new transmission lines were completed in 1950, with a further 60 miles to come in 1951, while in Nova Scotia alone 350 miles of rural lines were built in 1950.

Ontario Association Annual Meeting

The Ontario Association of Professional Engineers' Annual Meeting was held on January 26 and 27 at the Royal York Hotel, Toronto.

A highlight of the meeting was the banquet on Saturday evening at which the speaker was General A. G. L. McNaughton, chairman of the Canadian Section of the International Joint Commission.

The banquet also marked the introduction of the new executive of the Association for 1951, headed by president W. H. M. Laughlin, M.E.I.C., of the consulting firm of Proctor, Redfern, and Laughlin of Toronto. Mr. Laughlin succeeded E. V. Buchanan, M.E.I.C, general manager of the London Public Utilities Commission.

A graduate with honours from the University of Toronto the new president first joined the Dominion Bridge Company in Toronto. In 1946 he left the position of chief engineer of the Company's Ontario Division to become a partner in the firm of Proctor & Redfern at which time the partnership assumed its present name.

Other members of the 1951 Association executive are: vice-presidents, O. D. Johnston, M.E.I.C., and J. H. Smith of Toronto; R. C. McMordie, M.E.I.C., W. L. Sagar, M.E.I.C., R. M. P. Hamilton, A. M. Doyle, A. W. Murdock, G. Ross Lord, M.E.I.C., and J. R. Montague, M.E.I.C., all of Toronto; J. L. Lang, M.E.I.C., Sault Ste. Marie; C. K. Fraser, Peterborough; D. S. Simmons, M.E.I.C., Sarnia; O. W. Titus, M.E.I.C., Leaside; L. C. Sentance, M.E.I.C., Hamilton; J. W. Baker, Virginiatown; A. E. Cave, Geraldton; M. W. Hotchkin, Kirkland Lake.

W. H. M. Laughlin, M.E.I.C.

C.C.A. Meets in Quebec City

The 33rd annual meeting of the Canadian Construction Association was held at Quebec City from January 21 to 24, 1951. More than 700 delegates attended. At the first general session, reports of standing and special committees and of representatives were read. Lorne Bain, chairman of the membership committee, announced that current membership stands at 810, a net increase over last year of 59.

Chairman W. J. Mackay of the publicity committee, reported that press and radio representatives are turning more and more to the C.C.A. for authoritative information on construction matters, and that releases enjoy wide acceptance. Chairman Drummond of the committee on materials called attention to a reversal in 1950 of conditions experienced in 1949, when a general balance between material supply and demand had been a main factor in stabilizing construction costs. Steel shortages, he believed, would continue for some time to come, in spite of the current expansion and modernization of Canadian mills. 1949 steel imports had dropped to an annual rate of 750,000 tons. There would be no production increase until late 1952. A further rise in production of brick is expected, while supplies of lumber are more favourable, and would exceed deliveries in 1950, particularly in the lower grades. He urged material manufacturers to expand production facilities, to keep pace with the appreciably larger construction volume that steel industry expansion will make possible.

Chairman F. G. Rutley of the equipment rentals committee asked approval for publication of a schedule of equipment rentals for use of governments, owners, and contractors, at a cost of $5,000, which would be largely refunded by sales of the schedules. Chairman G. E. Crain of the civil defence liaison committee, pointed out that his committee was an advisory group in connection with various engineering services required in the event of a major disaster. Groups had been formed in practically all areas, composed of competent men in their respective fields, many with former army experience, ready to assist authorities at all government levels. He felt that stress should be laid on organization and financial aspects, as well as on equipment available and type of work required.

E. S. Sargent, chairman of the legislation committee, called attention to the Essential Materials Act, of last September, which gave the Minister of Trade and Commerce standby powers to regulate production, distribution, and prices of essential materials. The two items most likely to be affected were steel and electrical energy. Enumerating several additions to, and changes in, federal and provincial legislation during 1950, he noted progress toward legislation to eliminate double assessment of employees for workmen's compensation when temporarily employed outside of their home province. Chairman Albert Deschamps of the taxation committee, pointed to the leadership given to industries by the C.C.A., in submitting its excellent brief last year to the Minister of Finance, as a result of which relief was afforded for the first time in the 1950 budget, to shareholders of closely held corporations in the event of the death of the head of the firm. H. P. Frid, chairman of the labour relations committee, stated that many labour leaders and employers have agreed that the time has arrived for the National Joint Conference Board to meet again, to agree on a labour formula that will make for the co-operation and peace so essential for defence construction.

More Apprentices Needed

J. M. Pigott reported as chairman of the apprenticeship committee, that present registration of active apprentices stood at 9,816 for Quebec, and 5,499 for all other provinces excepting P.E.I. and Newfoundland. Though this was an all time high, the latter figure should be doubled, due to the present acute shortage of mechanics. Furthermore, if the Quebec system is shown to produce satisfactory mechanics and if the apprentices stay in the industry, without too high a turnover, serious thought must be given, he warned, to adopting the Quebec system throughout Canada, abrogating the old apprenticeship agreement in effect in other provinces.

There was, he charged, serious lack of co-operation in the training of employees. He again begged the association to try and get a uniform response from employers. The scarcity of skilled mechanics, he pointed out created too-powerful unions, which could obtain advantages over other trades. It drove work from field to factory, and reacted unfavourably on design and craftsmanship. Not only were more mechanics needed, but better and more intelligent mechanics as well. The industry was also suffering from a lack of properly trained superintendents and foremen. Institutes for advanced technical training are being advocated, and some are coming into existence. Mr. Pigott asked that priority be given by the management committee to full consideration to the teaching of skilled construction trades to Canadian youth, to deal with the existing manpower shortage.

Defence Construction

R. G. Johnson, general manager of the Association, presently on loan to the Department of Trade and Commerce as president, Defence Construction Ltd., for the duration of the present emergency, thanked the membership for their many offers of co-operation. The best assistance they can give, he said, is to get their contracts completed quickly and economically. Defence Construction Ltd. is a Crown Company, set up to administer the construction programme for the national defence effort. Staffed by Central Mortgage and Housing personnel whose inspectors are located close to almost all D.C.L. job sites, it not only awards contracts, but carries out inspection, and is the paying agent as well. Five regional offices will call for and analyse tenders, awarding them in a matter of days. Only delays anticipated are when voted funds are inadequate. Some inspection will be done by National Defence, and some by engineering firms. As time goes on, engagement of the latter's services will increase.

The trend in defence construction will be towards permanent types of construction, requiring less maintenance. The target for speedy settlement with builders is three weeks after completion. All bidders will receive lists of all bids after award has been made. Contractors must first make an effort to get their own materials but if this fails, help will be given in procurement by the crown company, which also will have a material expediting division. A statement is forthcoming shortly regarding designations for priorities.

Bidders tendering firm prices, said Mr. Johnson, were at an advantage over those inserting escalator clauses. Each supplier and sub-contractor was in the best position to forecast trends and estimate firm prices.

President's Address

At the first day's luncheon, "Bob" Drummond of Toronto, the Association's president, presided. Following a welcome to the City by Armand Viau, Quebec's industrial commissioner, speaking on behalf of mayor Lucien Bourne, Mr. Drummond gave the president's annual address, in which he called attention to the record volume attained by the industry during 1950, the final D.B.S. figure for which would exceed $2½ billions. While government estimates of total work completed, including companies and individuals working on their own account, amount to $3.1 billions, 15 per cent greater than for 1949; half of this increase in dollar volume probably represents increase in physical volume. Reappearance of shortages and delays and wage increases were reflected in a 10 to 15 per cent increase in construction costs over a year ago. Yet costs are not out of line with the general trend.

The projected $1¼ billion defence programme, he said, plus shipbuilding, freight car building, and allied requirements, superimposed on record breaking civilian demand, foreshadows serious shortages and the imposition of certain controls. Controls and cutbacks are a negative approach. Emphasis should be placed on more effective use of our supplies, and expanded production and imports and the development of a larger labour force. He welcomed announcements by major steel producers of increases in capacity. Repetition of the postwar voluntary deferment of less essential projects was, he believed, just as possible today. Warning of the economic consequences of strikes, he recommended secret ballots on strike action and enforcement of penalties for illegal strikes.

Continuing, the president expressed the view that there is undue fear today of another depression. With a new spirit of courage, vision, and enterprise, he said, we have abandoned the lack of confidence which has so long frustrated our rate of progress. The course ahead is clear and gives no cause for fear. Self control can avoid a broad measure of government controls. Should world events grow more serious, general controls affecting production, prices, and pay envelopes may become unavoidable. One cannot be operated effectively without the other.

The guest speaker at the annual dinner was the Hon. Maurice Duplessis, Prime Minister of the Province of Quebec. Mr. Duplessis sounded a warning that we are today suffering from infirmity of will power. We see references to rationing and restrictions, when logic tells us the only reasonable and fair control is self control. This apathy and complacency, and not communism and subversive ideas, is the danger of the day. People forget that the money to support social security measures is their own money that they pay in taxes.

Resolutions

Resolutions under consideration by general contractors, sub-contracts, roadbuilders, and supply sections of the Association include recommendations for reciprocal agreements between provinces to avoid double assessment of workmen's compensation, a repeal of Customs Tariff 180 (e) which permits free importation of engineers' plans. Discontinuance of security deposits with tenders for privately owned projects, repeal of the existing Mechanics Lien Act; and a new act to protect only workmen; better inspection procedures for housing; changes in labour relations legislation to require secret ballots when trade unions vote on strike action; deferment of non-essential construction; resistence to escalator clauses and quotation of firm prices by the membership; encouragement and assistance to the Quebec-Ontario Joint Committee on apprenticeship.

Other resolutions up for discussion and approval call for training of immigrants in local methods, language, and customs, and attainment of citizenship; early completion of the Trans-Canada Highway; practical leadership by the Federal Government to provinces, cities, and municipalities in the matter of civil defence, and advice and direction in regard to costs; elimination of level grade crossings; and standardization of highway traffic signs.

Other Speakers

Other speakers on the Convention programme include Col. Willard Chevalier executive vice-president, McGraw Hill Publishing Co. Inc., New York; Max W. Mackenzie, C.M.G., Deputy Minister of Trade and Commerce, Ottawa; and J. M. Wardle, C.B.E., M.E.I.C., director of engineering, Water Resources Branch, Department of Resources and Development, Ottawa. The meeting closed with a dinner dance on Wednesday evening, January 24.

An Engineer Looks at Emigration

Sir Frank Whittle, HON. M.E.I.C., is better known as the inventor of the turbo-jet engine, than as an inventor or improver of emigration methods but today he is again coming into the public gaze because of some revolutionary ideas on emigration which he is advocating.

Not long ago Sir Frank was in Canada to sound out the officials at Ottawa on his proposals. They have not received much publicity, but he has sent the Institute a copy of a short article which gives a rather general outline of what is contemplated. Even a casual reading will disclose the immensity of the scheme, and only a few moments' contemplation will reveal it to be bold beyond anything ever conceived before. However, it is a positive proposal and deserves the serious consideration of everyone. Don't say it can't be done until you have given thought to the great advantages it offers. No proposal that holds such almost boundless possibilities for good, should be dismissed casually. It is indeed big business and big thinking.

Just recently Sir Frank has been elected chairman of the group, that is promoting the proposal; "the New Era of Emigration".

Here is the article:

"Operation Commonwealth"

Air Commodore Sir Frank Whittle, Hon.M.E.I.C.

A great deal is said about the numerical strength and technical quality of our fighting services, but far too little is said about aspects of the security of Great Britain and the Commonwealth which are even more vital to survival. However strong the fighting services may be, we shall remain dangerously vulnerable as long as we are 50,000,000 people living in a land which, even with its present highly developed internal communications, is not capable of feeding more than 30,000,000 from its own soil.

Even if the population were evenly distributed, the situation would be dangerous enough, but it is not. The great bulk of it is concentrated in a few small areas. The fact that one-sixth of the total population is concentrated in the 680 square miles or so of Greater London at least doubles our vulnerability due to over-population in itself. Added to this, all our main arteries radiate from London; dangerous bottlenecks in our overseas supply routes occur at such ports as London, Liverpool, Southampton, and Glasgow.

How many people stop to think what our situation would be if the railways, arterial roads, and major docks were put out of action overnight? They are the lungs and arteries of a highly organized community; without them it is probable that no more than 10,000,000 people could hope to survive. In other words, about four-fifths of the total population would be faced with death from starvation, because even though there might be food for three--fifths of the population, its distribution would become virtually impossible.

While a dislocation on this scale seems unlikely, it is not impossible. In these days of atom bombs, something approaching it is easily possible.

A highly organized community has many analogies with the human body. The individuals which compose it—like the cells of the body—are for the most part specialized to do certain limited functions. Apart from their own particular form of specialization, they are entirely dependent on other sections of the community for the means of life. The central government, telephone system, etc., are analagous to the brain and nervous system; the roads and railways fulfil similar functions to the veins and arteries, and so on, but like many complex mechanisms, while it may be very efficient while it is working, it is also very vulnerable — that is one of the great dangers of over-centralization. The better it works while it is working, the more liable it is to complete dislocation.

No country in the world is so vulnerable to the atom bomb as Great Britain. Five or six atom bombs at an equal number of vital points would cause complete chaos. They would not necessarily come from the air—what is to stop some innocent-looking tramp steamer from depositing atom bombs at critical points in the Thames and other major harbours, to be exploded at the will of the enemy? For all we know, they may be in position now. It would pay an enemy to use them in such a way that the maximum material damage is done while the loss of life is kept as low as possible. Collapse by starvation would then come all the sooner.

What are we going to do about it? Piecemeal emigration is useless. Nothing short of a very carefully planned large-scale migration will do. Whole communities must be moved to other parts of the Commonwealth in such a way that they can rapidly become virtually self-contained in their new home — with them must go their tools and, so far as possible, their living accommodation. The whole thing would have to be run like a large-scale military operation. The order in which people go would be most important. It is clear, for example, that the emphasis should be on the building trades in the initial phase. We could afford this because after about two million people had gone, the need for building further houses in this country would virtually disappear.

The movement of such enormous numbers of people and the vast quantities of equipment which would have to go with them is an immense task. It would, for example, require 100 voyages of a grossly over-crowded Queen Elizabeth to move one million people by sea. Nevertheless, colossal though the task is, it is vitally urgent that we face it.

Not only would we benefit from such a policy, but the seriously under-populated sections of the Commonwealth would benefit also. Ultimately the whole Commonwealth would benefit in standard of living because the man-power now absorbed in carrying food from where it is grown to where it is eaten would be released for more productive activity.

Large-scale migration is the most urgent need—after that, or associated with it, a number of other measures are necessary. Redistribution of the remaining population; decentralization of communications and distribution; an increase in the number of usable harbours and so on. Not until these things have been done shall we be safe from liability to a very swift knock-out, followed by mass starvation.

It must be remembered that if a situation developed in which the whole surviving population was engaged in a desperate struggle to escape starvation, civilization as we know it would disappear. In such a seething cauldron the scum would rise to the top; the average decent citizen would stand little chance against the desperate and unscrupulous criminal elements in the wild scramble for the means of life. Many of them would not shrink from cannibalism to keep their beastly selves in existence. These people are already a menace — they would become a very serious menace indeed in the circumstances visualized here.

Any potential aggressor must be fully aware of our dangerous situation. Twice in one generation we have been brought to the brink of disaster by submarine blockade and twice we have had just sufficient time and means to scrape through. Time is essential to deal with aggression successfully. The aggressor always has the initiative. He is able to choose when he will strike, where he will strike and how he will strike. In this atomic age, we may not be allowed the time that saved us last time.

I believe that a policy of large scale planned migration beginning at the earliest possible moment is a vital necessity if the British nation is to survive a third world war, but I also believe that the tremendous effort would not be wasted if we are fortunate enough to escape war. Planned migration is a policy which is equally necessary for security in war and for prosperity in peace.

These things must be self-evident to any intelligent and well-informed individual — a blinding glimpse of the obvious almost—yet it is a deplorable fact that neither the Conservative nor Labour party leaders have had the courage to say what it is their duty to say. Why? They should know by now that the British people give of their best when faced with a mighty task in which they believe.

Let 'Operation Commonwealth' begin.

Interesting Papers at Chemical Engineers Meeting

A number of interesting papers were delivered at the meeting of the American Institute of Chemical Engineers in early December at Columbus, Ohio.

New Rubber Production Process

It was reported that a continuous cold rubber process has been developed by the B. F. Goodrich Chemical Company, Cleveland, Ohio. Cold rubber, familiar to most motorists as a source of tire rubber superior to the synthetic rubber produced during the war, was until recently produced by a batch method involving a 16-hour mixing period. A Goodrich-operated R.F.C. plant at Port Neches, Texas, has been converted from batch operation to continuous process. The conversion has increased capacity by about 20 per cent, lowered costs, improved quality, and resulted in better process and plant control. Over 65 million pounds of cold rubber have been thus produced.

Radioactive Wastes

Another speaker dealt with decontamination techniques which are claimed to have successfully eliminated the possibility of atmospheric pollution by radioactive airborne wastes.

Two methods are used to eliminate radioactive wastes — filtration and absorption. The great majority of these wastes are present as fine dust, so filtration techniques have been developed which reduce radioactivity to the level normally occurring in the atmosphere. For those few radioisotopes which are true gases, more complex absorption procedures are required.

Radioactivity that is removed from the air, must be permanently stored as it will be years, in most cases, before the radioisotopes have decayed to their stable products. In some cases, however, where work with short-lived radioisotopes is carried out, storage for about one hundred days is all that is required.

Fuel Oil From Coal

The U.S. Bureau of Mines in a progress report on the liquid-phase hydrogenation of coal announced at the meeting that improvements in the process made it possible to produce a usable fuel oil at only 1500 pounds pressure, representing a three- to six-fold reduction from previous high-pressure processes. This lower pressure permits the use of welded equipment and more easily available piping materials rather than the heavy forgings, special piping and valves required for the present high-pressure process. Such simplification in equipment may make it feasible to produce fuel oil in regions where petroleum is scarce, but where coal is plentiful, relieving the stress on U.S. and Allied merchant shipping in time of emergency, in addition to providing a supply of oil during normal times for those localities.

Glass Developments

The development of glass that conducts electricity was reported at the meeting. The use of this conducting glass in windows of aeroplanes, locomotives and ships helps to keep the windows free of fog and ice. Very lightweight glass, full of tiny bubbles, is another unusual product, which is proving itself as a heat insulating material and as a buoyant core for life rafts. Glass blocks have invaded every type of construction, from residences to chemical plants. Glass is astoundingly versatile and practical as a construction material for chemical process equipment when suitable precautions are taken.

Solar Heating

Black glass can be used to heat houses by capturing radiation from the sun, which supplies the United States with energy equivalent to over 150 million tons of coal every day. It was contended by one of the speakers that most of this energy is now wasted, but could be captured for residential heating. The proposed heat collector consists of a group of partially blackened, overlapping glass plates, mounted on a house roof. The arrangement is similar to that of shingles, separated by small air spaces. A glass cover over the staggered plates is employed to keep out dirt. Because of the high transmissivity of glass for solar radiation and its low transmissivity for long-wave heat radiation, the glass surfaces in the unit become heated when exposed to sunlight, and the reradiated heat has no avenue of escape. Air passing between the plates is heated from the trapped heat of the sun and forced into the house. A roof-top solar heat installation can be designed to supply 60 per cent of the energy required for heating a home.

Trucks and Roads

The Highway Research Board and the U.S. Bureau of Public Roads are co-operating in an attempt to determine quantitatively the effects of heavy truck traffic on a concrete pavement, on behalf of the highway departments of 11 states and the District of Columbia. Seven makers are furnishing trucks, and gasoline, oil, and grease is being contributed by 14 companies.

The test road is a 1.1-mile section of U.S. Route 301 in Maryland. It consists of two 12-foot lanes of 9-7-9 inch cross section, reinforced with wire mesh. Expansion joints are 120 feet apart, with two construction joints equally spaced between them. All cross joints have ¾-inch dia. dowels 15 inches apart, and lanes are tied together by dowels four feet apart. Subgrade soil is reasonably uniform throughout the test section.

Four axle loadings are being used:

- 18,000 lb. on one axle
- 22,400 lb. on one axle
- 32,000 lb. on tandem axles
- 44,800 lb. on tandem axles

Although the tests have not progressed far enough yet to warrant final conclusions, they have already definitely shown the destructive effect of heavy axle loads, whether measured by the cracking of the slab or by the vertical displacement of joints. For example, the 44,800-lb. load produced about 11 times as much cracking and eight times as much joint displacement as the 32,000-lb. load, though the ratio of the load is only 1: 1.4; while the 22,400-lb. load produced six times as much cracking and 11 times as much joint depression as the 18,000-lb. load, although the load ratio is only 1:1.24.

These tentative results suggest that road damage increases much faster than the load causing it, perhaps about as the sixth to eleventh power. Definite conclusions must, of course, await the completion of the tests and the careful analysis of the results, but they have already shown how destructive to road surfaces heavy traffic can be, and add strength to the contentions of those who would limit the permissible weight of vehicles using the public highways.

News of Other Societies

The **Royal Architectural Institute of Canada** (1323 Bay St., Toronto, 5) announces that the annual meeting in 1951 will be held at the Chateau Frontenac, Quebec City, March 1, 2, and 3.

The 1951 convention of the **Canadian Section of the American Water Works Association** is planned to take place from May 21 to 23, at the Royal Alexandra Hotel, Winnipeg.

The annual dinner meeting of the **Engineers' Alumni Association** (Central Ontario Branch) of the University of Manitoba will be held in the Royal York Hotel in Toronto, on February 24, 1951, commencing at 5.30 p.m.

The Wire Association will hold its Canadian regional meeting on April 19 and 20, 1951, at the Royal Connaught Hotel, Hamilton, Ontario. Chairman of the main committee for this meeting is Mr. James W. Galloway, of B. Greening Wire Co. Ltd., Hamilton.

Concurrently with the National Materials Handling Exposition at the International Amphitheatre, Chicago, April 30 to May 4, there will take place the Materials Handling Conference sponsored by the American Material Handling Society. Information may be obtained from Clapp & Poliak, Inc., 341 Madison Avenue, New York 17, N.Y.

Toronto, Canada, will be host to the 1951 summer general meeting of the **American Institute of Electrical Engineers,** which is scheduled for June 24 to 29, at the Royal York Hotel.

O. W. Titus, M.E.I.C., of Canada Wire and Cable Company, Toronto, is chairman of the general committee.

The Institution of Engineers, Australia, (Science House, Gloucester and Essex Streets, Sydney, N.I.W.) will hold its annual conference for 1951 in Brisbane from April 2 to 7, 1951. Members of The Engineering Institute of Canada residing in Australia or visiting Australia during this period are invited to attend the Conference under the same conditions as members of the Institution, and both the Council of The Institution and the Committee of the Brisbane Division assure them of a warm welcome.

A regional meeting of the **American Institute of Chemical Engineers,** (120 East 41st Street, New York 17, N.Y.) will take place March 11 to 14, 1951, at the Greenbrier Hotel, White Sulphur Springs, Va.

A comprehensive **Building Research Congress** planned for September 11 to 20, 1951, in London, England, will be the first of its kind ever to be held. The Congress will review the progress made in research in relation to architecture, building, and the associated branches in civil engineering, and it has been arranged because of a widespread interest in the subjects in many countries.

Dates of the Congress are September 11 to 20, 1951. It will be centred in the Institution of Civil Engineers, London.

Plans are proceeding for the **Third World Petroleum Congress** at The Hague, Holland, May 28 to June 6, 1951.

National Committees have been formed in many countries. Enquiries regarding the Canadian Committee and Canadian participation in the Congress should be addressed to Dr. R. K. Stratford, Imperial Oil Ltd., Sarnia, Ont.

New Role for Canadian Good Roads Association

The recent reorganization of the Canadian Good Roads Association, with wider objectives, an executive committee, and a headquarters at Ottawa under the direction of managing director C. W. Gilchrist, promises to focus the public's attention on Canada's need for more and better highways.

Canada is far behind the United States in the education of public opinion as to the need for better roads. There, national and state associations have long been active in directing all highway-user interest toward that end. When these associations speak, it is with authority, and politicians do listen. As a result the federal Public Roads Administration matches all state highway expenditures dollar for dollar.

In Canada the first step in this direction was taken a year ago by the signing of an agreement between the Federal Government and most of the provinces for sharing the cost of completing the Trans-Canada Highway. Not only is federal help in building other highways conspicuously lacking, but federal sales and excise taxes collected on gasoline and motor vehicles are never directly applied to

R. M. Hardy, M.E.I.C.

helping with highway improvement, while provincial gasoline taxes and license fees are often applied to many other purposes.

At the Association's Winnipeg convention last September, Past-President Willis warned that Canadians were facing a national traffic jam. During the past two decades, he pointed out, motor vehicle production has increased 90 per cent, while highway expenditures have only increased by 45 per cent. We have only some 22,300 miles of paved roads for our 2,500,000 registered motor vehicles. Adding the normal summer tourist vehicles to our own total would give about 360 vehicles for every mile of Canada's paved highways.

The Association is a national, non political, non profit organization, whose interest is the development of economical, efficient, and safe highway transportation in the public interest. It represents both road builders and road users. Its objectives are to ensure sound highway planning, financing, construction and management; reduction of the highway death and accident toll; application of taxes derived from highway users solely to road construction; more federal aid; safeguard of provincial rights; uniform and tighter licensing laws; standardization of traffic signs; sound regulations for vehicle sizes, weights and loads; and more uniformity in motor vehicle laws, including those relating to insurance.

The Association has also announced plans for establishing a national highway research institute, to contribute to improvement in the fields of highway engineering, construction, traffic control and highway safety. Robert M. Hardy, M.E.I.C., dean of engineering of the University of Alberta, one of Canada's leading research engineers in the field of soil mechanics, will head the institute, assisted by a committee of experts; engineers, traffic authorities, economists, and others. Even the medical aspects will receive attention, such as psychiatry as it relates to driver behaviour and accident prevention.

This Committee's terms of reference include problems relating to road location and design for safe and efficient flow of traffic and lower operating costs for vehicles. They also include determination of means for reducing construction and maintenance costs through the use of suitable materials and methods; community planning as it affects parking problems; vehicle design; accident proneness and driver behaviour; the effect of weather on winter driving conditions; and promotion of driver training and instruction in high schools.

This institute will be in full operation within a year, and generous support is assured for the continuance of its work. Services will be available to all levels of government as well as to other groups and individuals who may require information and guidance.

Conference of Engineering Institutions of the British Commonwealth

Johannesburg: April, 1950

REPORT OF THE CONFERENCE

At the invitation of the South African Engineering Institutions, extended at the first meeting held in London in September, 1946, the second meeting of the Conference of Engineering Institutions of the British Commonwealth was held in Johannesburg from the 11th to the 20th April, 1950. The following Institutions were represented:

AUSTRALIA

The Institution of Engineers, Australia

Delegates: W. D. Chapman, M.C.E., D. Eng., M.I.C.E., M.I.E.Aust., Past-President; C. H. D. Harper, M.C., A.M.I.E.Aust., M.A.S.M.E., Secretary.

CANADA

The Engineering Institute of Canada

Delegates: James A. Vance, M.E.I.C., President-Elect; Dr. L. Austin Wright, B.A.Sc., A.M.I.C.E., M.E.I.C., Secretary.

NEW ZEALAND

The New Zealand Institution of Engineers

Delegate: S. G. Scoular, M.N.Z.I.E., President.

SOUTH AFRICA

The South African Institute of Civil Engineers

Delegates: A. F. Bruyns-Haylett, B.Sc. M.I.C.E., M.Inst.T., President; J. P. Leslie, B.Sc., M.I.C.E., Vice-President.

The South African Institute of Electrical Engineers

Delegates: J. A. F. Michell, O.B.E., B.Sc.(Eng.), M.I.E.E., President; A. W. Lineker, B.Sc., M.I.E.E., Mem.A.I.E.E., A.M.I.C.E., A.M.I.Mech.E., Vice-President.

The South African Institution of Engineers

Delegates: S. F. Ginkey, M.Sc. (Eng.), M.I.Mech.E., President; G. Bradford, M.Eng., M.I.Mech.E., M.I.E.E., Vice-President.

[At each session one delegate from each of the South African Institutions was present, with Mr. A. J. Adams (Secretary, Associated Scientific and Technical Societies of South Africa).]

UNITED KINGDOM

The Institution of Civil Engineers

Delegates: V. A. M. Robertson, C.B.E., M.C., M.I.C.E., M.I.E.E., President; E. Graham Clark, C.B.E., M.C., B.Sc., M.I.C.E., Secretary.

The Institution of Mechanical Engineers

Delegates: Dr. S. F. Dorey, C.B.E., M.I.Mech.E., F.R.S., President; Sir Henry Guy, C.B.E., D.Sc., M.I.Mech.E., F.R.S., Secretary.

The Institution of Electrical Engineers

Delegates: Professor E. B. Moullin, M.A., Sc.D., M.I.E.E., President; W. K. Brasher, M.A., M.I.E.E., Secretary.

The Conference held nine sessions, and the results of its labours, expressed in the form of Recommendations and Resolutions, have since been adopted and endorsed by the Councils of each of the foregoing Institutions, the New Zealand Institution of Engineers preferring neither to confirm nor to reject one Recommendation, as noted below.

Though the Institution of Engineers (India) was not represented, the Council of that body have adopted and endorsed, with two exceptions noted later, all the Recommendations and Resolutions of the Conference.

It was proposed at the outset, and agreed, that the chair at the sessions of the Conference should be taken in rotation by the Presidents of the three Engineering Institutions of the United Kingdom; this procedure was accordingly followed throughout the Conference.

The deliberations began with a review of the operation of the Recommendations of the first meeting of the Conference, which had been convened in September, 1946, on the invitation of The Institution of Civil Engineers. The Institution of Mechanical Engineers and The Institution of Electrical Engineers in London. From reports given by the representatives of each Constituent Institution, it was clear that considerable progress had been made, through increasingly intimate collaboration and through the interchange of facilities and the exchange of information, in more effectively accomplishing the purposes for which the individual Institutions were founded.

As a result of this review a number of Recommendations to the Councils of the Constituent Institutions were drawn up, as follows:

1. That the Councils of the Constituent Institutions shall, when requested, send to each other as soon as they become available lists of papers which are to be published, giving the dates of publication or reading, so that any Institution can inform the initiating body that it is interested in a particular paper.

Note. This represents an emendation of Resolution II of the 1946 Conference.

2. That mutual arrangements be made between the Constituent Institutions whereby all members accredited by a letter of introduction signed by the Secretary be granted facilities as "visiting members" for a period not exceeding six months.

Note. This represents an emendation of Resolution VI of the 1946 Conference.

3. That the principles laid down in Resolutions IX, X and XI be reaffirmed and that they be pursued in the further development of the education policies of the Constituent Institutions.

Note. Resolutions IX, X and XI of the 1946 Conference read as follows:

Resolution IX.

That a common standard of general education for those entering the profession should be required by all the Constituent Institutions, ensuring that engineers have received a liberal education of a character providing a general foundation of culture and that for this the Councils of the Constituent Institutions should adopt a standard not less than that of the Common Preliminary Examination adopted by the Home Institutions for admission to their Student membership.

Resolution X.

That it being considered desirable to work towards a uniform standard of examination each Constituent Institution be recommended to model any examinations it holds, accepts, or influences, on the general pattern worked out by the three Home Institutions as a test of knowledge of:

(i) the basic principles of applied science,
(ii) the application of engineering science to one or other of its main branches, and
(iii) the practice of a particular branch of engineering.

Reciprocal recognition must lie always between the Institutions concerned and must depend upon the degree to which a common standard is reached.

Resolution XI.

That the Conference affirms the opinion that a professional engineer should include in his training a reasonable period of ordered practical training in or on engineering works. Having regard to the different conditions and practices within the Commonwealth, the Conference does not find itself in a position to make a definite proposal for the period and character of such training. But, in spite of the differences which now exist, it is recognized as desirable to work towards a uniform standard.

4. That, except in very special circumstances, the Constituent Institutions should aim at requiring a test by examination for Associate Membership.

Note. This resolution represents an emendation of Resolution XIII of the 1946 Conference.

5. The Conference having reconsidered Resolution XVI and reviewed the present position in each of the countries represented, together with the experience of registration of engineers where it is in force or has been experienced, recommends to the Councils of Constituent Institutions in those countries where the registration of engineers is not in force that the public and the profession are best protected from the practice of unqualified persons by maintaining a high standard of admission to the National Institutions and not by such registration.

Notes.

(i) Resolution XVI of the 1946 Conference reads as follows:
That, having regard to the different practices in different parts of the Commonwealth, some of which have registration whilst others have not, it would be impracticable to define any common line of action, but the Conference expresses the hope that each Constituent Institution will be alert to take such action as is open to it to protect the public and the engineering profession from practice by unqualified persons.

(ii) Having only limited knowledge of conditions in countries where the registration of engineers is not in force the Council of the New Zealand Institution of Engineers does not feel competent to confirm or to reject this Recommendation.

After this review the Conference discussed a number of matters which had been brought forward by the various Constituent Institutions, considering, among other things, the form of constitution that should be recommended for adoption by the Councils of the Constituent Institutions.

The Conference also considered methods by which liaison might be established with the Conference of the Engineering Societies of Western Europe and the United States of America, and recommended that the principles which they feel should underlie such liaison should be brought to the attention of the Engineering Societies participating in the latter Conference.*

Close attention was paid to the attitude which should be adopted by the Conference and its Constituent Institutions in their relations with UNESCO, and a recommendation in the following terms was adopted:*

(i) The Conference recommends that the Constituent Institutions inform their respective Governments and National Committees of UNESCO of the services which the present Conference performs in the field of engineering collaboration within the Commonwealth.

(ii) Furthermore, the Conference has taken note of the interest of UNESCO in fostering international collaboration among engineers, and recommends that when a Constituent Institution has occasion to advise UNESCO on matters relating to engineering, it should inform the Secretariat, it being understood that the Conference itself does not seek a defined relationship such as that known by UNESCO as "consultative status."

(iii) The Conference has been informed that UNESCO is proposing to undertake the formation of an organization to act in an advisory capacity in connection with International Special Congresses, to assist in preventing clashing of dates and overlapping of programmes and to advise UNESCO in respect of any grants of money for this purpose.
In view, however, of the constitution of this Conference and of a similar Conference of the Engineering Societies of Western Europe and the United States of America, and of the possible formation of a Conference of Engineering Societies of the Western Hemisphere, it is the opinion of this Conference that it is not necessary for UNESCO to concern itself with the affairs of the National Engineering Societies and their relations with each other, and indeed it would strongly deprecate any action which UNESCO might take to do so.

(iv) The Conference further recommends that the Councils of the Constituent Institutions take steps to ensure that appropriate representation of engineering opinion is secured by themselves on the National Consultative Committees of UNESCO in each of the countries of the Constituent Institutions.

In considering the better dissemination of scientific information among their members and otherwise, the Conference took note of the proceedings at the Scientific Information Conference, convened by the Royal Society in London in 1948, and gave particular attention to the Fair Copying Declaration of the Royal Society, making the following recommendation:

The Conference being informed that the Constituent Institutions have either subscribed to, or will favourably consider subscribing to, the Fair Copying Declaration of the Royal Society, recommends to the Councils of the Constituent Institutions that they publish a note in an appropriate part of their Proceedings stating that their Institution has subscribed to this declaration. The Conference also recommends that the Royal Society be advised of the desirability of this practice being adopted by all parties to the declaration.

Among other decisions, it was agreed that each Constituent Institution should be recommended to make available to the Secretariat full details of its activities, nature, organization and scope, so that this information could be conveniently grouped and published as a booklet. Arrangements were made by which the cost of this enterprise could be equitably shared, and it was further agreed that the information should be made available in this way to the Participating Societies of the Western European Conference and of any Conference of a like nature that might be formed in the Western hemisphere.

The Conference also agreed to interchange information on the titles and scope of the activities of the large number of specialist engineering societies and professional engineering protective associations which exist in the countries of the Constituent Institutions.

Much attention was given in the course of the deliberations to the important question of defining for the purposes of the Conference the meanings of the terms "professional engineer" and "technician," and, having learned of the setting up by the Western European Conference of a Working Party to study this matter, the Conference expressed the hope that while the Working Party were pursuing their deliberations they should inform the member Institutions of the Commonwealth Conference of their views before they were finalized. The representatives of the three British Engineering Institutions undertook to take the necessary steps in this regard.

Reverting to the important question of engineering documentation, the Conference discussed a report on the action taken by the Conference of Representatives of the Engineering Societies of Western Europe and the United States of America in setting up a Working Party to inquire into the needs of users of engineering abstracting services, and resolved to ask the members of the Western European Conference, through the Secretariat, that the proceedings of this Working Party be also made available to the Constituent Institutions, who would themselves inform the Working Party, through the Secretariat, of

* These Recommendations have not been accepted by the Council of the Institution of Engineers (India), which was not represented at the Johannesburg meetings of the Conference.

any needs peculiar to their own countries.

During intervals between the formal sessions the visiting delegates, in the course of tours in the vicinity of Johannesburg, were able to visit many places of engineering and scenic interest. They received much kind entertainment of a more personal character, and arrangements were also made for them to visit Eastern Transvaal and the Kruger National Park.

At the conclusion of the Conference, appreciation was expressed on behalf of the visiting delegates for the hospitality extended to them by the South African Institutions, and it was requested that the South African delegates should convey these expressions to their respective Councils. The Conference expressed its appreciation of the secretarial work which had been carried out by the permanent staff of the Associated Scientific and Technical Societies of South Africa.

Elections and Transfers

At the meeting of Council held at the Quinte Hotel, Belleville, Ontario, on Saturday, December 9th, 1950, a number of applications were presented for consideration and on the recommendation of the Admissions Committee the following elections and transfers were effected:

Members:

I. J. Adair, *Arvida, Que.*
R. A. Adams, *Hamilton, Ont.*
W. Boyd, *Toronto, Ont.*
R. J. Green, *Montreal, Que.*
W. K. Gwyer, Jr., *Trail, B.C.*
H. Hendry, *Toronto, Ont.*
J. T. Kelton, *Riverside, Ont.*
H. W. Luckett, *Toronto, Ont.*
S. M. MacIver, *Ottawa, Ont.*
T. A. McLaren, *Vancouver, B.C.*
A. Meletopoulos, *Montreal, Que.*
G. D. Morgan, *Campbellford, Ont.*
W. D. Proctor, *Hamilton, Ont.*
R. Rodaru, *Montreal, Que.*
E. W. Rudge, *Bradford-on-Avon, Eng.*
L. Schenker, *Lansing, Ont.*
A. F. D. Short, *Calgary, Alta.*
H. S. Stavang, *Copper Cliff, Ont.*
H. Stubley, *Montreal, Que.*
R. G. Walford, *Calgary, Alta.*

Juniors:

D. T. Austin, *Arvida, Que.*
D. E. Burnham, *Cornwall, Ont.*
R. M. Cuddy, *Ottawa, Ont.*
S. Jaugelis, *Montreal, Que.*
J. A. McRae, *Montreal, Que.*
A. A. Moncel, *Montreal, Que.*
S. Nowski, *Toronto, Ont.*
H. C. Palmer, *London, Ont.*
A. T. Ross, *Toronto, Ont.*
A. L. Whitehead, *Calgary, Alta.*
P. Wright, *Beachville, Ont.*

Transferred from the class of Junior to that of Member:

L. E. N. Carr, *Calgary, Alta.*
W. A. Ker, *Kelowna, B.C.*
D. G. Maclean, *Toronto, Ont.*
R. A. Muller, *Toronto, Ont.*
I. F. Ronalds, *Leaside, Ont.*
L. C. Turner, *Montreal, Que.*

Transferred from the class of Student to that of Member:

A. R. Edis
C. E. Howard

The following Students were admitted:

C. Allard
M. Asselin
E. A. Bastien
G. Beaulieu
P. G. Beaulieu
R. Begin
J. Belleau
P. Belleau
J. J. J. G. Blouin
H. Bonneau
R. Borduas
R. Bouchard
U. Bouchard
P. Bourassa
G. Brazeau
H. Brodeur
P. Brosseau
P. Labrecque
P. Laforest
R. Lafrance
M. Lafreniere
D. Lahaie
G. Lahaise
J. R. Lalancette
B. Lamarre
A. La Roche
W. J. Laskaris
J. M. Lawn
H. J. Lazarski
P. Leforte
R. G. Legare
R. Lepine
M. Leroux
M. Levesque
E. R. Bruce
G. E. Buteau
W. L. Canniff
L. Cesvet
J. P. Chamberland
J. A. Chant
N. Choquette
D. P. Clement
G. Cyr
A. Dada
R. Dagenais
J. A. Delaney
A. Denis
G. J. Desbiens
F. De Serres
M. De Vizio
F. Donato
J. E. Dooley
Y. Dube
A. Dupre
M. Dupuis
A. L. Eisenhauer
W. J. Elliott
G. Ethier
E. Freier
J. Gagnon
M. Gagnon
R. G. Gagnon
Y. Gariepy
F. Gascon
J. Gauvin
P. Gauvreau
A. Gelinas
J. A. Gilbert
N. H. Gillon
R. B. Graves
P. M. Greenwood
J. Guay
R. L. Hamel
M. Hetu
J. Hode Keyser
J. M. Holmboe
C. R. Houle
L. Juteau
J. F. Kannon
R. J. Kavanagh
R. P. L'Heureux
H. G. Likuski
N. Lindsay
L. Loiselle
J. Lord
M. F. Luft
J. A. McDonnell
H. W. MacKay
R. H. MacLeod
B. Marceau
J. Molaro
R. P. Newcombe
E. C. Orford
J. G. Paquette
J. G. Paradis
K. B. Parkinson
Y. Pelletier
I. Poissant
B. Poliquin
A. Poupard
G. Roberge
J. Rousseau
D. Roy
G. St. Martin
D. L. Servage
R. S. Shephard
R. Simon
J. A. Stewart
J. H. Strong
F. Talbot
G. Tellier
J. R. Theriault
C. A. Thibodeau
J. J. Tremblay
R. Tremblay
G. Trottier
A. Vaillancourt
J. C. Veillette
J. G. Vermette
W. J. Watson
W. A. Wesley
R. A. Wilson
G. Wolfe
D. H. Wyman
W. S. Zaruby

Applications through Associations

By virtue of the co-operative agreements between the Institute and the Associations of Professional Engineers, the following elections and transfers have become effective:

ALBERTA

Junior:

J. L. Pulford, *Edmonton, Alta.*

Junior to Member:

D. H. Pugsley, *Calgary, Alta.*

NOVA SCOTIA

Member:

A. L. Spackman, *Halifax, N.S.*

Junior to Member:

L. J. Payzant, *Halifax, N.S.*
T. A. Somerville, *Halifax, N.S.*

Coming Events:

Annual General and Professional Meeting

Montreal

May 9, 10, 11 - 1951

Personals

News of the Personal Activities of Members of the Institute

T. A. J. Leach, M.E.I.C., chief hydraulic engineer of the Water Rights Branch of the Department of Lands and Forests of British Columbia, has been elected chairman of the Victoria Branch of the Institute.

Mr. Leach is from Kamsack, Saskatchewan, a graduate of the University of Saskatchewan in civil engineering in 1938. He joined the Department of Lands and Forests in 1947, after service with the P.F.R.A., the Federal Department of Transport, the R.C.E., and the Saskatchewan Department of Highways and Transportation.

W. R. Godfrey, M.E.I.C., director of Public Works for the City of Saint John, N.B., has been elected chairman of the Saint John Branch of the Institute.

Mr. Godfrey is from Chatham, N.B., a graduate of University of New Brunswick, having received a B.Sc. degree in electrical engineering in 1935. For four years he was a cost accountant and assistant to the provincial district highway engineer in district No. 2 of New Brunswick. From 1940 to 1942 he was an instrumentman on airport construction with the Department of Transport, and from 1942 he was a water supply engineer for that Department on development of water supply for airports in Eastern Canada and Newfoundland. He went to his position in Saint John in 1946.

T. A. J. Leach, M.E.I.C.

A. R. Harrington, M.E.I.C., electrical engineer for the Nova Scotia Light and Power Co. Ltd., Halifax, N.S., has been elected chairman of the Halifax Branch of the Institute.

Mr. Harrington, who was born in Sydney, N.S., graduated from Nova Scotia Technical College in 1936 receiving a bachelor of engineering degree in electrical engineering. He joined the Nova Scotia Light & Power Co. Ltd. after graduation, as an engineer on design and supervision of canals, dams and hydraulic works.

H. D. Keil, M.E.I.C., is the new chairman of the Border Cities Branch of the Institute. Mr. Keil is with Canadian Industries Limited at Windsor, Ont.

He is from Brooks, Sask., and is a graduate of University of British Columbia, class of 1937. He was associated with Canadian Westinghouse Company at Hamilton, Ont., until 1940, after which he joined Canadian Industries Limited at the Windsor Plant as an electrical engineer. He was later appointed assistant maintenance supervisor and is now a planning and scheduling engineer for the Company.

F. H. MacKay, M.E.I.C., distribution superintendent, Great Lakes Power Co., Ltd., Sault Ste. Marie, Ont., is the new chairman of the Sault Ste. Marie Branch of the Institute.

A graduate in electrical engineering of University of Manitoba, he was born at Virden, Man. After graduation in 1936 he worked on hydro-electric maintenance and construction for the Great Lakes Power Company, being appointed in 1941 an assistant engineer on operation and construction. He received the appointment as distribution superintendent in 1947.

C. P. Sturdee, M.E.I.C., who was recently elected chairman of the Sarnia Branch of the Institute, is a mechanical design engineer with Imperial Oil Limited in Sarnia.

Mr. Sturdee received a bachelor of engineering degree from McGill University in 1934. That year he went to Imperial Oil Limited in Montreal as draughtsman and designer. From 1937 to 1941 he was sales manager for Gilbert & Barker Mfg. Co. Limited, in Toronto, Ont., after which he went to Sarnia, Ont., as a mechanical designer for Imperial Oil Limited in the general engineering department.

John E. Macdonald, M.E.I.C., superintendent of construction, in the engineering division of the B.C. Electric Railway Company, has been elected chairman of the Vancouver Branch of the Institute.

Mr. Macdonald was born in Vancouver and is a graduate in mechanical engineering from the University of British Columbia. He was associated with the West Kootenay Power and Light Company for eight and a half years before going to the B.C. Electric in 1939.

In 1940 he joined the R.C.A.F., on leave of absence. Overseas twice, he was engaged in aeronautical engineering and specialized in construction and

John Macdonald, M.E.I.C.

acceptance of Canadian-built Mosquito bombers. A squadron leader on discharge, he returned to the Company as a construction engineer and a year later was appointed superintendent of construction.

Geo. C. Davis, M.E.I.C., has recently been appointed president of the Winnipeg Central Heating Co. Ltd.

Mr. Davis graduated from the University of Manitoba in civil engineering in 1932 and started work with the Northern Public Service Corporation Limited and Winnipeg Heating Company Limited, the jointly managed residential entral heating companies that serve Winnipeg. Starting as an underground mechanic's assistant, he worked up through the service department, and then a substation operator to the sales and customers' relations department in 1935. In 1937 he was made vice-president and appointed to the board of directors of the two companies and was in charge

George C. Davis, M.E.I.C.

of customer relations, sales and utilization engineering.

In 1947 he was made vice-president and general manager of the companies, which just recently have merged. He is now president of the new company.

Mr. Davis is a member of the American Society of Heating and Ventilating Engineers, a past-president of the Manitoba Chapter. He is also a member of the Association of Professional Engineers of Manitoba.

G. C. McRostie, M.E.I.C., is continuing the consulting civil engineering practice formerly carried on at Ottawa under the name of MacRostie and McRostie.

F. T. Peacock, M.E.I.C., founder, chairman of the board, and former president of Peacock Brothers Limited, Montreal, has announced executive changes in the company.

W. P. Ferguson, M.E.I.C.

F. R. McDonald, M.E.I.C., has become vice-president and general manager of the company, succeeding as vice-president John Bryson, who has been appointed president and secretary-treasurer. **W. P. Ferguson,** M.E.I.C., was named general sales manager of Peacock Brothers, and F. A. Lucas is assistant general sales manager. All are directors of the company.

F. R. McDonald, M.E.I.C.

Mr. McDonald, a member of the publication committee of the *Engineering Journal*, is a mechanical engineering graduate of the University of Toronto, class of 1921. He has been a director of Peacock Brothers for several years. He joined the company in 1923.

Mr. Ferguson, who received the degree of B.Sc. from McGill University in 1924, has been with Peacock Brothers since that time. He was in charge of the Toronto and Sydney offices, and he was a director and western manager of the company in Vancouver, before coming to Montreal in 1947.

William J. Johnston, M.E.I.C., has been promoted to the position of superintending engineer at headquarters of the Department of Public Works of Canada.

After graduating from the University of New Brunswick in 1913, with the degree of B.Sc. in civil engineering, Mr. Johnston joined the Department as an assistant engineer in the Saint John District.

He enlisted in the Canadian Expeditionary Force (Siege Artillery) in 1917, and was on active service until 1919, when he returned to the St. John district staff. In 1936 he was promoted to the position of senior assistant engineer at Winnipeg, Man.

Mr. Johnston came to Ottawa in 1943, and in 1947 he was appointed district engineer in the Edmonton District, which had just been created. Due to the rapid post-war expansion of mining and other business activities in the Northwest Territories, and the resultant increase in the scope of public works in this area, the Department decided to establish a new district office at Edmonton, Alberta. Mr. Johnston organized the new district and carried out the huge construction programme, which extended into the Arctic Circle.

S. Stephenson, M.E.I.C., of Toronto, Ont., is the Canadian representative of Decca Navigator Company Limited and Decca Radar Limited.

Mr. Stephenson was demobilized from the British Army early in 1949, with the rank of lieutenant-colonel, returning to Canada, and has since represented the two Decca companies across Canada, including the supervision of service in Canada and the United States.

Educated in England, he worked in Canadian organizations from 1929 to 1939.

R. A. McLachlan, M.E.I.C., has been elected president of the Association of Professional Engineers of B.C.

Mr. McLachlan was born in Vancouver, and attended public and high schools there. He studied engineering at University of British Columbia, and at Massachusetts Institute of Technology, receiving the degree of bachelor of science from M.I.T. in 1926.

He joined Federal Drydock & Shipbuilding Company at Kearny, N.J., but returned in 1927 to Vancouver where he was with the Vulcan Iron Works, prior to joining the Dominion Bridge Company's Vancouver offices in 1929. He became chief draughtsman in 1937, and in 1947 structural mechanical engineer, and in 1950 chief engineer of the Pacific division.

R. A. McLachlan, M.E.I.C.

F. Krug, M.E.I.C., general manager of Montreal Engineering Company, Limited, consulting and operating engineers, Montreal, left at the end of January for Middle and South America. He will be away until mid-April and will visit Monterray and Mexico City, Mexico; San Salvador, El Salvador; Panama City, Rep. of Panama; Maracaibo and Caracas, Venezuela; and San Juan, Puerto Rico.

B. Wensley King, M.E.I.C., of Montreal has been named managing director of the Sperry Gyroscope Company of Canada, Ltd., newly formed subsidiary of The Sperry Corporation, U.S. manufacturer of precision aeronautical, marine and ordnance instruments.

A graduate of Royal Military College and Queen's University, Mr. King served from 1940 to 1945 as an engineering officer with the R.C.A.F. Thereafter he joined Canadair Limited where he has been purchasing agent.

The Canadian subsidiary will represent, in addition to the Sperry Gyroscope Company of Great Neck, New York, the Sperry Gyroscope Company Limited of Brentford, England.

B. Wensley King, M.E.I.C.

Herbert F. Schmelz, M.E.I.C., and **Wm. C. Viner,** M.E.I.C., have formed the engineering firm of Engineering Associates, Montreal, to work in design of production tooling, jigs and fixtures, single purpose machines, and moulds for rubber and plastics and associated rubber processing equipment.

Mr. Schmelz was formerly associated with Dominion Rubber Co. Ltd., Montreal, Que., as an engineer in charge of the equipment design and development division. He was educated at the Polytechnical Institute of Vienna, Austria, graduating in 1936.

Mr. Viner graduated from McGill

W. C. Viner, M.E.I.C.

University in 1941 with a bachelor of engineering degree in mechanical engineering. He served in the R.A.F. and the R.C.E.M.E. until 1946. He was associated with E. A. Robinson Oil Burners Ltd., M. Bernard & Son (Can.) Ltd. and Webster Industries Inc. of Montreal.

I. Kursbatt, M.E.I.C., consulting engineer, announces that he has set up in private practice in Montreal. He was employed by Dr. P. L. Pratley, M.E.I.C., during the past year on the design of the Canso Strait Bridge. Previously, he worked on the foundations and structures of the Columbia Cellulose Company's plant at Watson Island, B.C., for the Stadler Hurter Company. Formerly, he was bridge engineer to the Oxfordshire County Council in Britain where he was responsible for several long span rigid frame type bridges both in structural steel and reinforced concrete.

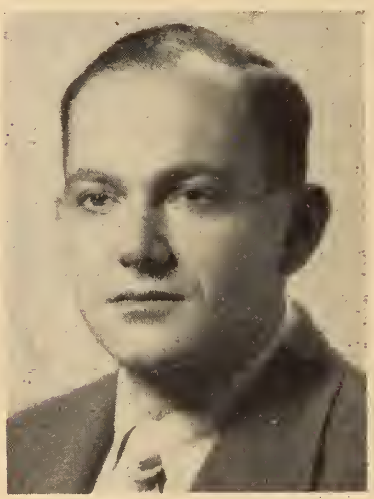
I. Kursbatt, M.E.I.C.

W. B. Boggs, M.E.I.C., is now employed with Canadair Limited, Montreal, Que.

Mr. Boggs graduated from McGill University in mechanical engineering in 1940. After several years with the R.C.A.F., he joined Trans-Canada Air Lines at Dorval, Que., where he was supervisor of maintenance until his recent appointment.

D. R. Fonger, Jr.E.I.C., is working for Benjamin Brothers Limited, Winnipeg, Man.

Mr. Fonger graduated from the University of New Brunswick in civil engi-



H. F. Schmelz, M.E.I.C.

neering in 1949. He was formerly structural detailer for Dominion Bridge Ltd., Winnipeg, Man.

H. B. Hall, Jr.E.I.C., is now working for Canadian Laboratory Supplies Ltd., Toronto, as an executive trainee.

Mr. Hall graduated from the University of Toronto in 1948 with a degree of B.A.Sc. in chemical engineering.

A. G. Eyles, S.E.I.C., has gone to Boston, Mass., to work for the firm of Jackson and Moreland, consulting engineers.

Mr. Eyles received a B.Eng. degree in civil engineering from McGill University in 1950.

W. D Munro, S.E.I.C., is now employed by the Shawinigan Engineering Company. He graduated from Nova Scotia Technical College in electrical engineering in 1950, receiving a degree of B.Eng. in electrical engineering.

S. J. Babin, S.E.I.C., who was a construction engineer with Central Mortgage and Housing Corporation Montreal, has accepted a position with Defence Construction Limited, Ottawa.

Mr. Babin graduated from the University of New Brunswick in 1949 in civil engineering.

E. D. Mackie, S.E.I.C., graduated from the University of Saskatchewan in the spring of 1950, and joined the Ferranti organization. Having completed a training course in the plant, he has now been assigned to the Ontario district sales division of Ferranti Electric Limited, serving both the meter and transformer divisions.

E. D. Mackie, M.E.I.C.

I. J. Vogwill, S.E.I.C., who graduated from the University of British Columbia in 1950 receiving a B.A.Sc. degree in mechanical engineering, is working for A. V. Roe. (Canada) at Malton, Ontario, as a junior design engineer.

Visitors to Headquarters

C. J. Mackenzie, Hon. M.E.I.C., Ottawa, Ont., December 28, 1950.

G. R. Turner, M.E.I.C., Ottawa, Ont., January 3, 1951.

E E. Goldsmith, Johannesburg, S.A., January 4.

E. D. Crawley, Middleton, N.S., January 5.

D. L. Rigsby, M.E.I.C., Kingston, Ont., January 8.

G. L. Dickson, M.E.I.C., Moncton, N.B., January 9.

Alexander Penman, Edinburg, Scotland, January 9.

J. N. Morens, St. Johns, Nfld., January 12.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

John J. Macnab, M.E.I.C., active for many years in Trenton, Ontario, as a civic administrator, died at his home in Trenton, Ont., on September 9, 1950.

Mr. Macnab was born at Bruce County, Ontario, in 1876. He was educated in Canadian public schools, graduating from Port Elgin High School and from McGill University in 1906 with the degree of bachelor of science. From 1906 to 1913 he was employed as engineer and superintendent of heavy construction, including railway shops, breakwater construction and hydro electric power plants, living in Moncton, N.B. and Cape Bauld, N.S., and Porcupine, Cobalt and Sudbury in Ontario. It was in 1913 that he moved to Trenton and was engaged in civil engineering and general contracting.

He joined the Institute in 1904 as a Student, transferring to Associate Member in 1907, and becoming a Member in 1940. He was a member of the Association of Professional Engineers of Ontario.

He was associated with community service throughout his life. He was a member of the Trenton Town Council for six years, and served on the Separate School Board and the Trenton Memorial Hospital Board. He was chairman of the Old Age Pension Board of Ontario.

D. A. Evans, M.E.I.C., who retired from the Powell River Paper Company at Powell River, B.C., in November, 1950, died on December 16th, at Powell River. Mr. Evans was a director of the Company and the vice-president in charge of industrial and personnel relations.

Mr. Evans was born in Wales in 1885. He received his diploma in mechanical engineering from the University of Wales in 1908. His first engineering work in Canada was in the shops of the Grand Trunk Railway at Montreal in 1908. He later became connected with the National Transcontinental Railway in the designing department and worked on draughting, installation of equipment and mechanical engineering with the Company until 1914. He served successively with the Canadian Pacific Railway, Canadian Explosives Limited, and the Canada Carbide Company at Shawinigan Falls, Que. In February, 1917 he was appointed manager of the St. Maurice River Boom and Driving Company, which position he held until 1924, when he became associated with the Newfoundland Power and Paper Utilities Corporation. He set up logging operations for the Cornerbrook Mill in Newfoundland, and also for the Dolbeau Mill north of Lake St. John in Quebec. He was managing the mill at Dolbeau before going to the Powell River Company as resident manager in 1936. He was elected a vice-president in 1947. On his retirement, he was retained in a consulting capacity on policy matters of the Company.

He joined the Institute in 1909 as a Student, transferring to Associate Member in 1914 and becoming a Member in 1920, and attaining life membership in 1949. He was an honorary life member of the technical section of the Pulp and Paper Association of Canada.

D. A. Evans, M.E.I.C.

News of the Branches

Activities of the Thirty-three Branches of the Institute and abstracts of papers presented at their meetings

Belleville

S. Sillitoe, M.E.I.C.,
Secretary-Treasurer

The second meeting of the Belleville Branch was held in the Rotary Room at the Quinte Hotel with sixty-five members in attendance. Mr. F. F. Fulton was in the chair and after a brief report by the secretary, the chairman called upon Mr. E. G. Gurnett to introduce the speaker of the evening, Dr. Huet Massue, engineer-economist, Shawinigan Water and Power Company, Montreal.

The subject of Dr. Massue's address was **Water Power in Canada.** He commenced with an interesting introduction of the subject by touching upon the developments in Europe and the economics of the situation in such developments as Loch Slay in Scotland where enormous engineering works involving miles of tunnels and aqueducts result in an increase in the catch basin area from six square miles to thirty-two square miles and a plant producing only 134,000 kw. He compared this to a project in Canada at Lake St. John costing only two and one-half million dollars for a dam which resulted in a storage basin of 600 square miles and the production of several million kw. of power. At the same time, the Scottish development, owing to intermittent, although heavy rain fall, has only a 10 per cent load factor as compared to a nearly 80 per cent load factor in Canadian developments.

Dr. Massue's presentation of a very extensive collection of data which had been thoroughly analyzed and organized for vivid presentation was delivered in conjunction with a large number of coloured slides. These slides included graphs and charts comparing many different factors related to the growth of power developments throughout the world and particularly in Canada in the

Provinces of Ontario and Quebec. Among the slides were such subjects as "Potential horsepower by continents of the world, compared to the actual power development; Potential and developed horsepower in Canada; Horsepower per capita for countries of the world; and Horsepower per capita for Canada and the Provinces". This chart shows the Province of Quebec far ahead of any other Province or state on the continent. Dr. Massue proceeded to explain that the reason for this lay in the character in the load of this province, where there are three heavy industries; pulp and paper, chemical, and aluminum, which account for large blocks of power. By comparison Ontario has a curve showing steady growth in many diversified industries, which would appear to be less subject to major changes in load.

Interesting comparisons between the revenue per dollar investment in power companies as compared with other industries were drawn. It was evident that power companies have a very heavy investment for the amount of revenue they derive.

Dr. Massue was able also to draw interesting pictures of the growth of population in relation to power development as well as numerous other interesting sidelights too numerous to be recorded here. The graphic presentation of the vast amount of statistics in such an interesting manner is indeed a worthy achievement for which Dr. Massue and the Shawinigan Power Company are to be greatly commended.

Mr. D. W. Bews expressed the thanks of the meeting for this most interesting address.

Border Cities

J. C. Aitkens, M.E.I.C.,
Secretary-Treasurer

C. J. Radford, Jr.E.I.C.,
Branch News Editor

On October 5, the members of the Border Cities Branch were privileged to hear an address by Mr. S. L. Fear, liaison engineer of the Ontario Hydro-Electric Power Commission. Approximately 80 members and friends were in attendance.

Mr. Fears' subject **Steam Power Plants** was very appropriate for this locality as the J. Clark Keith steam power station is being constructed on the outskirts of Windsor.

The two steam plants specifically referred to in the talk were the aforementioned, and the Richard L. Hearn Station in Toronto. In the absence of Chairman J. Hoba, the speaker was introduced by the Vice-Chairman, Doug Keil.

It was pointed out that the idea of using steam plants to produce electric power is not new; that in fact, Sir Adam Beck, founder of Hydro, had visualized this very thing many years previously. At the present time it is anticipated that these power plants will take care of extra power demands that occur at certain well defined periods but which are not a year round problem. Using especially prepared large scale graphs and charts, Mr. Fear demonstrated that steam plants when properly operated on a scientific basis are an economical means of augmenting our supply of "white coal" power. Line losses and line maintenance costs from Niagara to any large, distant power consuming community such as Windsor are heavy items of expense and point the way to production of power close to the location of power demand.

Slides were shown of the sites of the two plants as they were before construction started, following step by step the various stages of construction, to recent pictures of the projects as they are at the present time. Mr. Fear pointed out that both plants are scheduled to produce power in September, 1951, and are well on schedule. Pile foundations are being used in both cases, with a steel superstructure at Toronto, and reinforced concrete at the Windsor site, each being faced with brick. Toronto will produce 160,000 kw. as opposed to 120,000 kw. at Windsor.

Some of the engineering problems encountered and overcome in the various construction phases were recalled by the speaker. At the Richard L. Hearn site, railways were relocated to allow material and equipment to flow smoothly as required. An interesting point was the conveying of material excavated from the Toronto Rapid Transit System tunnel to the site, and its use as fill. The main problem at Windsor was the never ending battle with a very tricky clay soil condition necessitating much careful planning and study at all times when excavating in this material. At present a cofferdam has been completed for the intake and pouring of concrete for the open-cut channel is in operation.

The meeting was thrown open for questions and at the conclusion Mr. J. W. Southin, project manager for H. G. Acres & Company, consulting engineers at the J. Clark Keith Steam Plant, expressed to Mr. Fear the gratitude of the audience. Many members lingered to inspect more closely the variety of charts and curves on steam plant operation displayed by Mr. Fear.

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On November 10, a joint meeting of the E.I.C. Border Cities Branch and the local branch of the Association of Professional Engineers of Ontario was held at the Prince Edward Hotel, Windsor. The highlight of this meeting was the presence of Mr. E. V. Buchanan, president of the A.P.E.O. and the always-popular Colonel "Tom" Medland, executive director.

Mr. Jim Ronson commenced the meeting by announcing the results of the nominating committee ballot for the executive for 1951. Mr. Fred Ryder then introduced the first speaker, President Buchanan whose subject was **Security and the Professional Engineer.** The essence of the President's address was a challenge to the engineering profession to broaden the scope of their work, to dare and achieve new ideas with the same pioneering spirit so evident in our forbears in this new land, and to let security take care of itself. There are always those who would seek security he said. A few find it. Many do not. None add one iota to the sum total of knowledge, or increase our standard of living, the avowed aims of our professional societies.

The speaker expressed a high regard for trade unions, but expressed the belief that such an organization could not fit in, or should not fit in to Professional Associations. This, he said, is apparent in the very nature of our creed. The President then threw out another challenge and rebuttal—to those who would criticize engineers and claim we have merely applied old country techniques and changed them very slightly to meet the needs of a young and growing country and have done little towards pioneering new and distinct ideas. He cited James Watt as the first practical mechanical engineer who came to basic truths by experiment and would accept nothing that he could not prove. On a parallel to this he listed such contemporaries as Whittle—jet engines; Turnbull from New Brunswick — variable pitch propeller; engineers at Chalk River, who have made amazing progress in new atomic achievements; H.E.P.C. engineers who perfected the technique of pouring good concrete in sub-zero weather; engineers in our pulp and paper industry who built the first plant in the world capable of turning out newsprint at the rate of 2,000 ft. per minute, and others. This, he urged, is proof that no group of men has done more to invent and develop unique industrial methods and processes, or contributed more to a higher standard of life for all, in this and other countries, than have the professional engineers of Canada.

In conclusion he appealed to all young engineers to "dare to be foolish" to reject mass thinking and hackneyed "standard practices" and to try and better such practices in their own fields of work. To shed our "Ivory Tower" complex and learn not to shun publicity, to make the public conscious of the role of the professional engineer in our national life, he said is the duty and privilege of each member.

Mr. Joe Hoba, in the chair, introduced Colonel Medland and welcomed him to the meeting. His talk was entitled **A Beaver and an Ostrich.** He proceeded to bring the members of the Association up to date on current Association affairs, giving some interesting details on the manner in which applications for membership were handled, and the exhaustive research and office routine required. The "meat" of his talk was on account of what is being done to educate the public about the engineering profession. It was urged upon all present, as members, to take a keen and active interest in promoting the public relations programme now being conducted by the A.P.E.O. and to do all in their power to bring the professional achievements of Canadian engineers before the public.

Joe Hoba thanked the Colonel who then, with able assistance from President Buchanan, did a noble job of answering a barrage of questions relating to the evening's discussion. Refreshments followed.

Cape Breton

G. W. Ross, M.E.I.C.,
Secretary-Treasury

S. G. Naish, M.E.I.C.,
Branch New Editor

On January 16th Mr. J. C. Nicholson, retired general superintendent of Mines for the Dominion Coal Company gave a very interesting address on **The History of Coal Mining in Nova Scotia.**

Starting with the Duke of Kent, and the General Mining Association, Mr. Nicholson traced the various stages of the industry up to the present time. Having lived and worked all his life in Nova Scotia coalfields, Mr. Nicholson made the various pioneers and leaders of the industry live, as human beings, by instructive and amusing anecdotes.

He reminded his listeners of the early coal miners who got up at four in the morning to walk many miles to work, go underground at six, and not get back to the surface until after dark. He claimed that, even with modern mining machines, the output of these early miners had not been equalled. In concluding his talk, Mr. Nicholson paid tribute to these mining pioneers, who had created an industry for us under primitive conditions by hard work.

The meeting was under the chairmanship of Carl Gustafson, and the speaker was introduced by Louis Frost. A vote of thanks to the speaker was moved by Sydney Mifflen, who traced the early formation of the Cape Breton Branch. Anecdotes of early days were also told by W. S. McDonald and James Morrison.

A vote of sympathy was sent to Yorke Barrington, town engineer of Sydney Mines, on account of his illness. It was proposed by H. J. McCann, Jr., and seconded by S. G. Naish. A number of members testified to Mr. Barrington having been a most faithful attender of the Institute meetings. He was one of the very first members and has scarcely missed a meeting. All the members wished him a speedy recovery.

An invitation from the Halifax Branch to the Annual Banquet with the Professional Engineers on January 30th was read by Branch Chairman Cliff Murray.

Kingston

J. T. Provan, Jr.E.I.C.,
Secretary-Treasurer

S. H. Rochester, M.E.I.C.,
Assistant-Secretary

The regular monthly meeting of the Kingston Branch of the Institute, was held on Tuesday evening, December 12, 1950, in the Mackenzie Building, R.M.C. Mr. G. T. Andrews was in the chair. The business portion of the meeting introduced committee reports by Major A. L. MacLean (Papers Committee), Mr. D. L. Rigsby (Membership), Professor J. S. Campbell (Student Guidance), Professor A. Jackson (Public Relations). In addition, Mr. M. G. Saunders reported on the activities of the E.I.C. council meetings and the inauguration of a new Branch at Belleville. Mr. J. Provan gave the secretary-treasurer's report on the financial statement of the Branch.

The principal speakers for the evening, Mr. D. L. Rigsby, Aluminum Company of Canada, Ltd. and Mr. M. J. Waite, Aluminium Laboratories, were introduced by Professor Hugh Conn.

Mr. D. L. Rigsby gave a most interesting illustrated talk about his recent visit to Australia, and a brief survey of the industrial situation in the Dominion. He explained the equipment in use at the aluminum fabricating plant of the Australian Aluminium Company at Sydney. He pointed out the advantage to Canada in living next door to the huge industrial warehouse of the U.S.A. as against the comparative isolation of Australia which largely is dependent on its own resources and engineering "know-how".

Mr. Rigsby illustrated his air trip with an excellent set of pictures taken during his journey, commencing from Vancouver and proceeding to Australia via San Francisco, Honolulu, Fiji Islands, Sydney and Melbourne. The return journey was made via Singapore, Bombay, Cairo and Rome with a two week stop-over in England for a tour of aluminum fabricating plants there. Mr. Rigsby arrived in Montreal some eight weeks after departure.

Mr. M. J. Waite gave a most informative talk on the subject of welding. The speaker emphasized the importance of proper design of welded joints and particularly stressed the necessity of including full information on welding requirements in all working drawings. A poor welding design results in improper welding, bad appearance and high cost. However with careful attention of properly trained welding personnel to the preparation of parts, and careful selection of materials, a high strength joint with pleasing appearance can be made with remarkable economy.

Mr. Waite put forward his opinion that welding has now reached such a high level of importance in industry that universities and industries should take steps to ensure that detailed technical training in welding is given to young engineers and to the practical welder on the job. He felt that a higher standard of welding practice and very worthwhile economies could be achieved by making one man responsible for welding design and application in individual concerns. This would avoid indecision and lack of technique, and would provide a stimulated interest in the trade.

Mr. Waite displayed slides illustrating welded joints and structural welding work, and showing how failures may occur as result of incorrect procedures.

The meeting was adjourned for refreshments at the invitation of the R.M.C. Faculty Club.

Lethbridge

David Cramer, M.E.I.C.,
Secretary-Treasurer

J. T. Dokken, Jr.E.I.C.,
Branch News Editor

The Lethbridge Branch of the Institute held its monthly meeting at the Marquis Hotel on December 16, 1950. M. S. Mitchell, branch chairman, presided over the meeting.

J. Haimes, retiring city engineer, introduced Mr. J. Neufeld who will be Lethbridge's new city engineer. He welcomed Mr. Newfeld both to our branch of the Institute and to the city and joined with all those present in wishing him the best in his new position.

The Brown Musical Trio supplied the dinner music and R. S. Lawrence led in community singing. Vocal selections by Mrs. Janet McLeod and Mr. A. Branch, accompanied by Mrs. Katherine Brown, were thoroughly enjoyed.

Mr. Mitchell, the branch chairman, introduced Mr. P. M. Sauder, colonization manager for the St. Mary River Development, who showed three very enjoyable films depicting the scenery, people and industry of Alberta.

The first film, "Alberta Irrigation," dealt with the route of our water supply from its source in the mountains to its ultimate use in the irrigated fields. The various crops grown "under the ditch" and the numerous industries such as canning and sugar refining which have grown up in Southern Alberta due to irrigation were very interestingly portrayed as well as interesting views of the irrigation structures which can be seen in this part of the country.

The second film, "Alberta Vacation" was an interesting and refreshing travelogue of the scenic playgrounds and places of historic and geographic interest in Alberta.

"Songs of the West", a short film of western music, amid a mountain ranch setting, melodiously rounded out the evening's entertainment.

Mr. Mitchell, on behalf of the members present, gave Mr. Sauder a hearty vote of thanks for showing these films of interest and entertainment.

Peterborough

G. W. Herzog, Jr.E.I.C.,
Secretary-Treasurer

M. V. Powell, M.E.I.C.,
Branch News Editor

A well attended meeting of the Peterborough Branch on December 13th was addressed by Mr. R. M. McGee, sales representative of the Jones and Laughlin Steel Company, on the subject of **The Manufacture of Steel.** Mr. McGee was introduced by C. W. Holman and his address was entertaining and instructive, illustrated by a very fine film.

The production of steel was illustrated from the mining of the three main elements, through all the various steps in their handling and smelting to its making and final shaping. The speaker mentioned a fourth, and very important element, the human element. The workers' safety and health are now well guarded in modern steel plants.

The bulk of the Jones and Laughlin Company's iron ore comes from the Mesabi Range where it is dug out of open pits by power shovel and loaded directly into ore cars for transportation to Duluth. It is crushed, separated from impurities and loaded into the ore carriers by gravity in a most efficient and quick manner. Loading a ship with 14,000 tons of ore can be accomplished in about one hour, the trip down the lakes to Cleveland takes three and one half days, and unloading by a number of special cranes less than four hours. At the steel plant, the ore cars are lifted bodily from the rails, and dumped.

The mining and transportation of the other two elements, coal and limestone is accompanied in just as efficient a manner. The production of the necessary coke from the coal was illustrated, and the operation of the blast furnaces. In the Bessemer process of making steel an electric eye is used to control the operation and this is covered by a Jones and Laughlin patent. The operation of an open hearth furnace was clearly demonstrated. In the final rolling of steel shapes, the temperature is controlled largely with use of electric eyes.

Mr. M. V. Powell moved a vote of thanks to Mr. McGee. Mr. G. W. Herzog was Chairman of the meeting, and Mr. F. Pope gave a short account of the inaugural meeting of the new Belleville Branch which had its beginning with a meeting held June 1st by the Peterborough Branch at Belleville.

Saguenay

F. E. Hogg, M.E.I.C.,
Secretary-Treasurer

W. A. Armstrong, Jr.E.I.C.,
Branch News Editor

On December 11, 1950, Mr. D. Ross of the Pentagon Construction Company addressed a group of thirty members, describing the Ottawa River Power Development, with particular reference to the recently built Chenaux Development, on which he was assistant superintendent of construction.

Mr. Ross described the Chenaux as the fourth largest development on the main Ottawa River, on which the total developed power is approximately equal to that of the two Shipshaw plants. The developments are mainly low head, the maximum being one hundred and thirty feet, at Des Joachims. The power developed on the Ottawa is transmitted as far as five hundred miles, from the Quebec—Ontario border to Windsor, Ont., serving the industrial areas in southern and western Ontario.

Mr. Ross illustrated his description of the Chenaux construction with coloured slides. A particularly interesting feature was the use of a "pumpcrete" machine for pumping concrete to all parts of the structure, in both summer and winter conditions. The interesting discussion period which followed the showing of the slides indicated the keen interest which this type of construction holds in the Saguenay district.

The speaker was introduced by Mr. J. F. Braun, and Mr. F. E. Hogg voiced the appreciation of the audience.

Toronto

F. E. Wellwood, m.e.i.c.,
Secretary-Treasurer

I. S. Widdifield, m.e.i.c.,
Branch News Editor

The Toronto Branch of the Institute and the Ontario Section of the American Society of Mechanical Engineers held a joint meeting on November 9, 1950. Approximately 75 were present, in the McLennan Laboratory at the University of Toronto.

Mr. D. H. Thorburn, president of Gas Machinery Company (Canada) Limited, addressed the meeting on the effect of introducing natural gas into an industrial area presently served with manufactured gas.

Mr. Thorburn outlined in some detail the history and development of the natural gas industry, and stated that the conversion in Toronto would be more similar to conversions that had taken place in the United States rather than elsewhere in Canada.

The records show that the Chinese used natural gas before the Christian era. The first natural gas was discovered in North America near Charlestown, West Virginia, and was first used for house heating in 1821 near Verdonia, N.Y. In 1889, natural gas was first discovered in Canada in Essex County near Windsor.

The advance in use of natural gas in the last few years has been rapid, and there is presently installed 280,000 miles of gas pipe lines not including the multitude of city distribution systems. The present yearly use is six trillion cubic feet and the known gas reserves amount to one hundred and eighty trillion cubic feet.

Equipment which is normally used for burning manufactured gas will not be satisfactory without alteration when a change is made to natural gas. It is necessary that a survey be made and all equipment listed. This equipment is then engineered for natural gas consumption and the necessary parts ordered and installed. The main reason why equipment must be altered was due to the fact that B.T.U. Content of natural gas is practically double that of manufactured gas and also the combustion ratio between gas and air is different for efficient operation.

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Mr. S. L. Fear, liason engineer, steam stations, of the Hydro-Electric Power Commission of Ontario, addressed a regular meeting of the Toronto Branch on November 30th, in the Mining Building of the University of Toronto. Mr. Fear's subject was **Steam Stations for Hydro 1949-1953.**

Mr. Fear, who has been with the Hydro for many years on the study and design of steam stations, covered the development of the Richard L. Hearn Station at Toronto, and the J. Clark Keith Station at Windsor, as well as many smaller stations which the Commission has built and which are presently in operation throughout the Province.

The talk was well illustrated with drawings, graphs and lantern slides, and the various stages of development in the two major stations explained in detail.

Mr. Fear explained that at the present time the Commission was planning to use the stations only under peak load conditions and compared the cost of steam generated power to that developed hydraulically.

Approximately 125 members were present and all listened enthusiastically to Mr. Fear's remarks, as was evident by the number of questions which were asked at the conclusion of the address.

Victoria

W. A. Bowman, jr.e.i.c.,
Secretary-Treasurer

T. A. J. Leach, m.e.i.c.,
Branch News Editor

The regular monthly meeting of the Victoria Branch was held at Prince Robert House on December 15. During the business session the following officers were elected for the coming year: chairman, T. A. J. Leach; vice-chairman, A. F. G. Musgrave; secretary-treasurer, W. A. Bowman. Members of the executive are D. A. MacLean, G. W. C. Lake, J. A. W. Izard, A. W. Lash and W. G. MacIntosh. News-Editor will be G. Kidd.

Following the business meeting, A. B. Sanderson, chief designing engineer of the B.C. Department of Public Works gave an interesting address on **Highway Bridges in B.C.**

He pointed out that bridge building in B.C. dates back many years to the time when the Indian tribes in northwestern B.C. built spans of considerable length. One of the most famous of these is the Hagwellget Bridge which spans the Bulkley River north of Hazelton. This bridge with an overall length of between 150 and 170 feet and having a clear span of about 90 feet was made from local timber and abandoned telegraph wire. An old canard commonly told about this bridge is that, on its completion, the builders tested it by assembling a group of the fattest squaws in the village and sending them across. When they had crossed safely, the bridge is said to have been approved for public use.

While timber bridges are still used on secondary roads, steel and concrete bridges are being constructed on the main highways.

However, little reinforced concrete is being used as it requires special equipment and labour which in outlying districts is not easily available.

Of particular concern in B.C. is to find stable crossings in the wild rivers which flow through it. The most erratic rivers are those that are contained in glacial valleys such as the Capilano, Elk, and Similkameen, where continuous shifting of the water bed is taking place. Often by examining the cross section of the river bed its general stability can be determined for unequal cutting will be evident by a steeper slope on one side than on the other.

Generally foundation problems are not difficult in British Columbia except on the lower Fraser below Hope where deep deposits of silt require long piles to distribute the load. On the Stave River Bridge just recently constructed steel piles penetrate the mud to a depth of 70 feet. To avoid the dewatering of such a site prepakt concrete piers were built.

Methods of erection vary from place to place with the rocky canyon sites proving the most difficult. Under such conditions usually the cantelever or skyline method of erection must be used. In one particular case two triple-triple Bailey bridges were first placed across a gorge to act as falsework for the two bridge trusses.

The speaker pointed out that increasing road widths of today require wider bridges and at present the 12-foot lane is considered standard although in some places in the States they have gone up to 13 feet. Since bridges the same width as the road have the effect of slowing down traffic the tendency is to build bridges as wide as 30 feet to fit a 24-foot roadway. In B.C. where traffic is not a problem this is not so important and bridge widths run between 24 and 26 feet.

Loading for bridges was formerly based on so much a square foot. But now with bridges classified according to the number of lanes, generally the type of loading used on each lane, for calculation purposes, is an idealized truck with a trailer classified as an H-15-S-12 or an H-20-S-16 load. Trucks of 30 tons or more are permitted with the allowable axle load varying between 18,000 and 32,000 lb. depending upon its length.

In conclusion Mr. Sanderson pointed out that bridge design had advanced considerably in the last few years and such recent practices as pre-stressed concrete, welding and the use of aluminum in bridging by the Aluminum Company of Canada was producing economy both in weight and material.

After a very interesting question period the speaker was thanked by Mr. A. L. Carruthers on behalf of the Branch.

Winnipeg

G. W. Moule, m.e.i.c.,
Secretary-Treasurer

Electrical Section

K. Hallson, jr.e.i.c.,
Secretary-Treasurer

J. C. Pratt, m.e.i.c.,
Branch News Editor

Mr. J. Armstrong of the English Electric Co., Motor Division, St. Catharines, Ontario, recently addressed the Electrical Section of the Engineering Institute in Winnipeg. His subject was **Some Aspects of Synchronous Motor Characteristics and Appliances.**

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment.*

Situations Vacant

CHEMICAL

TWO CHEMICAL ENGINEERS 1948 or 1949 graduates to act as process engineers in the production units. Location Ontario. Salary open. Apply to File No. 2004-V.

CHEMICAL ENGINEER 1940 to 1945 graduate capable of geological evaluation of petroleum and gas producing areas and preferably with experience in refinery or chemical production. Location Ontario. Salary open. Apply to File No. 2004-V.

CHEMICAL ENGINEER 1949 or 1950 graduate required by chemical firm in Ontario. Applicant to act as administrative assistant to the works manager. Excellent opportunity for a junior engineer with clerical or administrative experience. Apply to File No. 2004-V.

CHEMICAL ENGINEER required by firm located in Montreal to act as sales engineer in Province of Quebec. Applicant should have sales experience and be between 28 to 31 years of age. Car provided. Apply to File No. 2010-V.

CIVIL

YOUNG CIVIL ENGINEER about 35 years of age with construction and administration ability. Applicant should be bilingual. Location Montreal. Excellent opportunity offered. Salary open. Apply to File No. 2009-V.

CIVIL ENGINEER required by large Canadian company with experience in structural steel design, preferably on hydro-electric structures such as gates and outdoor switching yards. Apply to File No. 2017-V.

CIVIL ENGINEER for design work on hydro-electric structures. Prefer at least four years' experience in this field. A knowledge of power house and dam foundations is desirable. Good opportunity with large Canadian company. File No. 137. Apply to File No. 2017-V.

ELECTRICAL

ELECTRICAL ENGINEER with a minimum of two years industrial experience on control devices and wiring, prefer test course training. Location Southern Ontario. Please quote File No. 13710. Apply to File No. 2005-V.

ELECTRICAL ENGINEER with two years industrial experience on circuit breakers, disconnect switches and metalclad switchgear, prefer test course background. Location Toronto. Quote File No. 13711. Apply to File No. 2005-V.

ELECTRICAL ENGINEER with a minimum of two years industrial experience on rotating electrical equipment, prefer test course background, duties include specification writing and general engineering work with large Canadian firm. Location Toronto. Refer to File No. 13712. Apply to File No. 2005-V.

ELECTRICAL ENGINEER required by large Canadian organization for its overseas operations to act as chief of system planning. Duties will include long range overall system planning of generating, transmission and receiver-station facilities in co-operation with operating companies; the direction of the activities of overhead and underground distribution, relay-protection, carrier-current, radio, special studies and standards and research departments, long range forecast of capital expenditures for the necessary transmission and distribution facilities and general engineering problems. Quote File No. 137. Apply to File No. 2005-V.

WELL QUALIFIED ELECTRICAL ENGINEER required by a large Canadian organization for its overseas operations to act as supervisor of relay protection. Duties will include preparation of plans for relay protection of transmission circuits, reservoirs and substations; review of relay maintenance procedures. Quote File No. 137. Apply to File No. 2005-V.

WELL QUALIFIED ELECTRICAL ENGINEER required by a large Canadian organization to act as supervisor of overhead distribution for its overseas operations. Duties will include long range planning of overhead distribution systems and allied substations; review of present overhead distribution practices with a view of improving and standardizing such practice and reducing operating costs. Quote File No. 137. Apply to File No. 2005-V.

YOUNG ELECTRICAL ENGINEER, 1949 or 1950 graduate required by consulting engineering firm in Montreal. Salary open. Apply to File No. 2008-V.

ELECTRONIC ENGINEERS required by large Montreal firm for development work on radio communication equipment and radar. Applicants should have three or more years of practical design experience in this field. Apply to File No. 2011-V.

THE PUBLIC SERVICE OF CANADA requires Electrical Engineers (electronics and communications). Appointments at Ottawa, Toronto and Montreal. Salaries up to $4,740.00 per annum. Details and application forms may be obtained by writing Civil Service Commission, Ottawa. Competition No. 50-158-B. Apply to File No. 2016-V.

ELECTRICAL ENGINEER required by large Canadian Company, with hydro electric operations in Brazil with several years experience with industry on public utility. Duties will include: specification writing, analyzing bids, checking manufacturer's drawings, inspection of heavy electrical equipment, supervision of freight tests and technical correspondence. Prefer a minimum of three years experience. Location Toronto. File No. 13741. Apply to File No. 2017-V.

ELECTRICAL ENGINEER required by university in Montreal. Duties include design and construction of electronic equipment and finally extensive research. Apply to File No. 2022-V.

ELECTRONIC ENGINEER required in Montreal with some experience with radar. Apply to File No. 2026-V.

MECHANICAL

MECHANICAL ENGINEER required by a large manufacturer in Montreal of heavy mechanical equipment. Applicant should have several years industrial experience which should include a background of welding knowledge. Apply to File No. 2001-V.

MECHANICAL ENGINEER required for the maintenance department of chemical manufacturer located in Province of Quebec. Applicant should have three to five years maintenance experience in chemical, refinery, brewing or some similar industry. Apply to File No. 2002-V.

TWO MECHANICAL ENGINEERS 1947, 1948 or 1949 graduates with design experience in the chemical or allied industries. Location Ontario. Apply to File No. 2004-V.

MECHANICAL ENGINEER 1947, 1948 or 1949 graduate to assist in plant construction inspection and supervisory work. This is a permanent position. Location Ontario. Salary open. Apply to File No. 2004-V.

MECHANICAL ENGINEER with several years experience on design and layout of mechanical equipment for hydro-electric construction, location Southern Ontario. When replying please quote File No. 137-8. Apply to File No. 2005-V.

MECHANICAL ENGINEERING GRADUATE or equivalent with three or more years experience in design and manufacture of light alloy structures required by large Montreal firm manufacturing radio communication equipment and radar. Apply to File No 2011-V.

MECHANICAL ENGINEER recent graduate up to three years employment interested in obtaining drawing office experience in plant production of heavy armament work. Forty minutes by tramways from Phillips Square, Montreal. Apply to File No. 2014-V.

MINING

TWO MINING ENGINEERS required by large firm in Province of Quebec to take charge of surveying work underground. Reply giving full details of experience and salary required. Apply to File No. 2015-V.

MISCELLANEOUS

TECHNICAL REPRESENTATIVE required in Montreal by Canadian Branch of British textile firm, manufacturing textile and cable machinery. Applicant must have executive ability as position offers exceptional opportunity. Apply to File No. 1706-V.

SCIENTIFIC OFFICERS wanted. Applicants should be Canadian citizens who are graduates in science, preferably with post graduate training. Research or general experience in some particular scientific field is desirable in certain positions. War service will be considered an additional qualification in some positions and a requirement in others. The main duties will pertain to the co-ordination, control and dissemination of scientific information in most of the major fields of science and technology. Salary $2,700.00-$3,800.00 depending upon qualifications and experience. Apply to Box 1274, Station B, Ottawa, Ontario. Apply to File No. 1707-V.

DESIGN ENGINEER approximately ten years experience in structural material handling and mechanical design. Boiler design experience an asset but not essential. Location Western Canada. Apply to File No. 2000-V.

CITY ENGINEER required in Western Canada. Applicants should state age, qualifications, salary required and details of previous experience. Preference will be given to applicants possessing municipal engineering experience. Apply to File No. 2003-V.

HYDRAULIC ENGINEER with several years' experience on reinforced concrete design and hydraulic structures, location Southern Ontario. Please quote File No. 13709. Apply to File No. 2005-V.

GRADUATE ENGINEER required by firm located in Western Canada, to handle all packaging equipment and installations throughout Canada, as well as all machines and equipment in plant. Headquarters in Winnipeg. Recent graduate required. Apply to File No. 2006-V.

RADIO TECHNICIANS required by small manufacturer located in the Maritimes, for aircraft electronic equipment maintenance. Applicants should have some experience. Apply to File No. 2007-V.

PRODUCTION MANAGER for small light engineering unit located in the Maritimes, employing approximately 60 people. Duties include production methods and layouts, produce own cost estimates on jobbing basis and be wholly responsible for operation of plant production facilities and personnel. Apply to File No. 2007-V.

CHIEF DRAUGHTSMAN required to establish small drawing office in electronics plant, located in the Maritimes. Mechanical design experience of electronic equipment, small mechanisms and structures. To be responsible for mechanical design, drawing system and draughting personnel. Mechanical draughtsmen also required. Apply to File No. 2007-V.

SENIOR ENGINEERS required by small manufacturer located in the Maritimes. Age 25 or over. University degree in engineering or physics. Three or more years experience in electronics in a senior capacity. Preferably with experience in radar problems. Salary $4000.00 to $6000.00. Junior Engineers also required with same type of background. Apply to File No. 2007-V.

FULLY QUALIFIED TEXTILE TECHNOLOGIST, graduate of textile institute, required in Montreal by industrial consultant. Applicant should have industrial engineering experience. Give full details as to experience and education to File No. 2012-V.

SALES ENGINEER, excellent opportunity for right man. Ontario sales and service for power house chemicals with established and growing firm. Degree in chemical engineering and knowledge of power plants and water treatment desirable but not essential. Prefer ages 25 to 35. Apply to File No. 2013-V.

MECHANICAL DRAUGHTSMEN, detailers, checkers, all grades from 2 years experience and up for plant in production of heavy armament work. Forty minutes by tramways from Phillips Square, Montreal. Apply to File No. 2014-V.

TWO INDUSTRIAL ENGINEERS graduates in mining required by large organization in Province of Quebec. Applicants should have some experience underground to do time study work, eventually leading to senior positions in methods and layout work. Reply giving full details of previous experience and salary desired. Apply to File No. 2015-V.

CIVIL OR MECHANICAL ENGINEER required by large mining organization in Province of Quebec for design and layout of buildings and equipment for asbestos milling operations. Reply giving full details of previous experience and salary desired. Apply to File No. 2015-V.

SUPERVISOR OF UNDERGROUND DISTRIBUTION. Large Canadian organization requires well qualified electrical engineer for its Brazilian operations, duties will include long range planning of all underground distribution systems and of allied substations, review of the present underground distribution practices and reducing operating cost, making such studies as required by the chief of system planning or the chief electrical engineer. Apply to File No. 2017-V.

ASSISTANT PRODUCTION SUPERINTENDENT required by large firm of long standing manufacturing men's shirts, pajamas etc. for plant near Three Rivers, Quebec. Experience in manufacturing these lines or similar necessary. Applicant would be required to plan for high production, improve methods, lower costs etc. Good position to right party. Apply to File No. 2018-V.

RESEARCH CHEMIST required by chemical firm in Ontario for laboratory research under supervision. Minimum age 23 years, bachelor's or master's degree in chemistry or chemical engineering. Two or three years technical experience or Ph.D. in lieu of experience. Apply to File No. 2019-V.

CHEMIST required by chemical firm in Ontario for the development of textile chemicals. Minimum age 27 years. Degree in chemistry or chemical engineering with 5-10 years technical (laboratory or production) and sales experience. Position requires both research and sales abilities combined with practical knowledge of textile industry. Apply to File No. 2019-V.

ASSISTANT WORKS MANAGER required by chemical firm in Ontario. Age 30 to 35 years. Degree in chemical, mechanical or civil engineering, minimum of 5 years experience in industry. Responsible for overall supervision of plant operations, capable of maintaining discipline and assuming responsibility. Apply to File No. 2019-V.

SALES ENGINEER, recent graduate, preferably mechanical or electrical required by well established supply house with nation wide representation. Experience in equipment sales, of value but not essential. Training period to be spent in Montreal. Good opportunity for advancement to party interested in making career of this work. Apply to File No. 2020-V.

ARCHITECTURAL DRAUGHTSMAN required by large pulp and paper manufacturer in Eastern Canada for general architectural designs covering building changes on existing buildings and new buildings, etc. Apply to File No. 2021-V.

ENGINEERING DRAUGHTSMAN required by paper industry located in Montreal. Must be fully qualified. Apply to File No. 2023-V.

THREE FULLY QUALIFIED ENGINEERS required by a firm of management consultants located in Montreal. Salary open. Apply to File No. 2024-V.

MECHANICAL OR CIVIL ENGINEER required by national beverage company to act as plant superintendent in plant situated outside of Montreal. Applicant should be between 25 to 35 years of age. Salary open. Apply to File No. 2025-V.

APPLICATIONS will be received by the City Engineer until 12 noon, February 15th, for the position of traffic engineer for the city of Calgary, Alberta. Applicant should be a graduate engineer and shall have not less than three years experience in the field of traffic engineering. Applicant shall state age, qualifications, experience and salary expected. References as to experience and character shall be submitted with application. Apply to File No. 2027-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

JUNIOR CHEMICAL ENGINEER required in Montreal, by organization importing industrial chemicals from abroad. Applicant would act as sales engineer. Apply to File No. 1637-V.

TWO JUNIOR OR INTERMEDIATE CHEMICAL ENGINEERS for the control department of pulp and paper industry in the Maritimes. Duties would be in connection with control and process work. Apply to File No. 1650-V.

CIVIL

CIVIL ENGINEERS wanted with experience in design and construction of municipal works. Salary $235.00 per month and up, based on experience and qualifications. Apply to File No. 1641-V.

CIVIL ENGINEER required by large firm in Ontario, with about 10 years structural experience. Applicant must be experienced and able to assume responsibility. Apply to File No. 1644-V.

CIVIL ENGINEER with some experience on structural design, preferably on transmission towers and switching yards. Duties include engineering calculations, design and investigations of structures and surveys. File No. 13466. Apply to File No. 1651-V.

YOUNG CIVIL ENGINEER required by conveying industry in Montreal. Applicant should have some experience in design and detail work on structural steel. Good opportunity for advancement offered. Apply to File No. 1663-V.

CIVIL DRAUGHTSMAN required by large well established Canadian Company. Minimum of 10 years experience in concrete. Location Toronto. Apply to File No. 1687-V.

CIVIL ENGINEER, English speaking, preferably some surveying experience on road or transmission line location or other topographic work. For training in photogrammetry and subsequent employment as ground surveyor and control engineer for aerial mapping. Apply in writing stating experience to File No. 1691-V.

CIVIL ENGINEER, French speaking for training as operator of photogrammetric plotting machines and subsequent employment as operator in Montreal office. Good long term prospects for right man with executive ability. Initial salary during probationary and training period $200.00 per month. Apply to File No. 1692-V.

ELECTRICAL

ENGINEER required by a firm of consulting engineers in Montreal with experience in mechanical equipment for building, for work on heating and plumbing. Apply to File No. 1549-V.

ELECTRICAL ENGINEER required. Good opportunity for one who has had two or more years experience on sales and contract work in an electrical manufacturing company. This position offers excellent opportunity for advancement with a growing concern. Apply to File No. 1558-V.

GRADUATE IN ELECTRICAL or radio engineering from a recognized university with a number of years experience with airborne radio and radar equipment. Previous experience with R.C.A.F. airborne equipment desirable. Apply to File No. 1642-V.

ELECTRICAL ENGINEER for position as relay engineer with foreign branch of Canadian company. Prefer several year's experience with an operating company. Appointment would be initially for three years. File No. 13510. Apply to File No. 1651-V.

YOUNG ELECTRICAL ENGINEER required in Montreal for inside sales work on transformers. Apply to File No. 1654-V.

FOUR ELECTRICAL ENGINEERS, recent graduates with some experience in power required by large firm in Montreal. Apply to File No. 1658-V.

ELECTRICAL ENGINEER required by company in Montreal, with a minimum of 2 years experience in design and layout work. Applicant should also have some knowledge of construction. Duties include design and repair of work in the field and office. Salary range $350.00. Apply to File No. 1664-V.

FOUR ELECTRICAL ENGINEERS with five years or more experience in design, specifications, estimates, layout, inspection and testing, etc., for distribution work. Location Toronto. Reply stating age, education and details of work actually carried out in previous positions to File No. 1696-V.

MECHANICAL

MECHANICAL, heating and ventilating engineer required by internationally known manufacturer of heating equipment to take over Eastern Ontario territory, out of Ottawa. The same territory for other prominent manufacturers' lines is open to the right man. Apply to File No. 1646-V.

MECHANICAL ENGINEER required in Province of Quebec with some plant experience. Duties include design and plant layout work. Apply to File No. 1648-V.

MECHANICAL ENGINEER required in Ontario. Applicant should be young and aggressive with B.Sc. Canadian university for position as service manager. Must be capable of dealing with public and of instructing men in overhaul and maintenance of diesel equipment. Apply by letter only, stating age, height, weight, marital status, military service, university, religion, business experience and enclose photograph. Apply to File No. 1652-V.

MECHANICAL ENGINEER with knowledge of industrial steam power plant design, heating system design and application of steam, air and hydraulics as applied to processes, required by large established company. 5 years or more experience desirable, location Montreal. Salary open. Apply to File No. 1655-V.

MECHANICAL ENGINEER required by large organization in Montreal. Applicant should be between 30 to 35 years. Duties include general machine shop work and planning. Apply to File No. 1673-V.

MECHANICAL ENGINEER required for small manufacturing plant in Niagara Peninsula. Duties will consists of general draughting and machine design, particularly valves. Some previous experience would be advantageous. Apply to File No. 1681-V.

TWO MECHANICAL ENGINEERS for mechanical inspection in the field. Experience necessary in Hydro-Electric projects. Location overseas. Apply to File No. 1687-V.

MECANICAL ENGINEER to act as sales engineer for large organization in Montreal. Salary range $5,000.00. Apply to File No. 1690-V.

MECHANICAL ENGINEER required by firm located in the Maritimes with some experience in steel design and construction. Apply to File No. 1695-V.

YOUNG MECHANICAL ENGINEER required as assistant superintendent by firm located in Montreal manufacturing spun nylon yarn and nylon wool. Apply to File No. 1700-V.

MECHANICAL ENGINEER to act as project engineer required by large organization in Montreal. Salary open. Apply to File No. 1701-V.

MISCELLANEOUS

SMALL WELL ESTABLISHED ELECTRICAL MAINTENANCE BUSINESS in Montreal for sale at moderate price. Excellent opportunities for expansion under progressive management. Thorough investigation invited. Apply to File No. 1635-V.

SALES MANAGER required by firm located in Montreal. Applicant should have sales experience and a thorough knowledge of the operation of steel plants. Apply to File No. 1637-V.

ELECTRICAL AND CIVIL ENGINEERS with about 1 year experience, required by large organization in Montreal. Apply to File No. 1639-V.

PUMP DESIGNER wanted by large pump manufacturing firm in Montreal district. Excellent opportunity with wide scope for someone with initiative. Apply to File No. 1643-V.

FIRM, PRESENTLY LOCATED IN GERMANY, founded in 1908 and specializing in the design and manufacture of water treatment plants for boiler as well as for industrial purposes, wishes to contact firm or individual in Canada interested in forming a company here to use their designs for the benefit of Canadian industry. Willing to train an engineer, expenses paid in Germany. Apply to File No. 1645-V.

RATE SPECIALIST for foreign branch of Canadian company. Prefer man experienced in rate setting and retired from a hydro public utility. Duties during 2 or 3 years appointment, would be to serve as a consultant during organization of a rate department. File No. 13513. Apply to File No. 1651-V.

SCIENTIST WANTED in Ottawa, with engineering degree or science, preferably with post-graduate training in aeronautical engineering. A wide knowledge and at least 5 years experience in aeronautics is essential. The applicant must have served in the R.C.A.F., preferably in a position of responsibility in aeronautical engineering in armament work. Experience in research and development work will be considered an additional qualification. Must have ability to work well with others. Canadian citizen. Apply to File No. 1656-V.

SALES ENGINEER, for a permanent position in Toronto office. Preferably one who has had some experience in fan application work such as heating and ventilating, mechanical draughting, etc. Salary open. Apply to File No. 1657-V.

FULLY QUALIFIED structural design engineer required by firm located in Toronto. Apply to File No. 1659-V.

HYDRAULIC AND STRUCTURAL DESIGN ENGINEERS required in Ottawa. Work assignments may have to do with the development of major waterworks. Salary up to $7,500.00 depending on qualifications. For further details, write to The Civil Service Commission, Ottawa and request information circular, 50-616. Apply to File No. 1660-V.

ENGINEER REQUIRED in Montreal full experience in the design and construction of filter plants and water reservoirs. Apply to File No. 1661-V.

MECHANICAL AND CHEMICAL ENGINEER required in paper mill located in Newfoundland Experience is not absolutely essential, but one or two years in industry, not necessarily the paper industry, would be preferred. The applicants must be single and starting salary would be $300.00 to $325.00 a month depending on qualifications. Apply to File No. 1667-V.

GRADUATE ENGINEER required in Ontario with experience in design, construction, service and application of internal combustion engines, particularly diesel engines. Apply to File No. 1670-V.

PURCHASING AGENT required by internationally known manufacturer of power equipment, presently establishing a new factory near Montreal. Applicant must be capable of organizing own purchasing department to handle the purchasing of factory equipment, raw materials and prefabricated parts for the production of large and small electric power equipment, and must be familiar with Canadian market. Attractive salary offered with security and opportunity. Apply to File No. 1671-V.

ASSISTANT FACTORY MANAGER required by internationally known manufacturer of power equipment, presently establishing a new factory near Montreal. Applicant must have good technical background and extensive experience (including several years management) in the mechanical or preferably the electrical engineering field, and be familiar with labour relations, employee training, cost estimating and accounting, factory organization and maintenance, modern production methods and equipment and be preferably bilingual. Please include photograph. Apply to File No. 1671-V.

RESIDENT ENGINEER

to act as owners representative for hydro electric project in Northern Quebec. Excellent salary for experienced man. Apply to File No. 2028-V.

TWO SALES ENGINEERS required to act as representatives in Montreal and Toronto by young progressive industry, interested in the sale of British made products. Knowledge of pulp and paper industry desired. Apply to File No. 1674-V.

SENIOR PETROLEUM ENGINEER required by independent Canadian Oil Company with headquarters in Calgary. Applicant should be particularly experienced in reservoir engineering and production practices. No one with less than 7 years experience in the industry need apply. Give synopsis of education, training and experience and supply recent photo. Apply to File No. 1675-V.

MECHANICAL OR ELECTRICAL ENGINEER for supply inspection department of a large organization in Toronto. Applicant should have at least 12 to 15 years extensive practical shop and office experience in the manufacture of heavy mechanical and electrical machinery and equipment. Reply stating age, education and details of experience to File No. 1678-V.

SENIOR BUYER with 7 to 10 years diversified purchasing experience. Electrical engineering or engineering training desirable; also administrative or supervisory ability. Location Toronto. Apply to File No. 1679-V.

TWO MECHANICAL OR ELECTRICAL ENGINEERS for the design and development of meters and clocks, required for large electrical organization in Quebec City. Apply to File No. 1682-V.

INSTRUMENT ENGINEER (electrical or mechanical preferred) required for large oil refinery in Montreal east. Applicant should have not less than three years experience as instrument engineer or not less than 5 years general electrical engineering experience. Would be expected to take charge of instrument department under general supervision of power engineer. Salary open. Applications will be treated confidentially and should include full particulars as to qualifications, together with recent photograph. Apply to File No. 1684-V.

RESIDENT ENGINEER wanted, for construction of proposed Granville bridge in Vancouver, B.C. Duration of work approximately two years, starting about March 1, 1951. Applications should be made by letter giving full details of experience, professional qualifications, age, etc., and salary expected. Apply to File No. 1685-V.

SALES ENGINEER or contact man required by a firm of inspection engineers in Montreal. Must have considerable experience and be between 30 and 40 years of age. Apply to File No. 1686-V.

RESIDENT ENGINEER required by large well established Canadian company minimum 10 years experience in Hydro Electric construction, competent in design, construction experience in field. Age approximately 40 years. Location overseas. Apply to File No. 1687-V.

BRITISH ADVERTISER seeks Canadian engineering firm with reputation, willing to join with long established English counterpart. Enquirer to provide capital, select tools and supervise projects directed to both government equipment and rearmament programs. Also industrial manufacturer of small engines, motrocycles, etc. Apply to File No. 1688-V.

MECHANICAL OR CIVIL ENGINEER required by large engineering firm for their Toronto sales office. Age about 26 or 27 years. Applicant must have definite sales ability and would be away 50% of time. He should also have some practical experience with heavy equipment for paper mills, mines or quarries. Territory Northern Ontario district. Apply to File No. 1689-V.

DESIGN ENGINEER preferably mechanical required by large organization in Montreal. Applicant must have administrative ability. Salary range $5,000.00. Age 30 to 40 years. Apply to File No. 1690-V.

GRADUATE ENGINEER for design work on buses, required by large organization in Montreal. Apply to File No. 1690-V.

GRADUATE ENGINEERS and draughtsmen, mechanical, civil, electrical required for projects in Ontario and Quebec. Preference to those with 3 years practical experience. Apply to File No. 1697-V.

RECENT GRADUATE required by manufacturer in Winnipeg. Applicant must be interested in production planning, time and motion study, etc. Work will be in connection with the setting up of a modern production program. Training period. Salary open. Apply to File No. 1698-V.

AIRCRAFT HYDRAULIC DESIGNER required by large Montreal aircraft manufacturing firm. Must have 4-5 years experience and sound overall knowledge of system layout, flow calculations and detail component design. Apply to File No. 1703-V.

MECHANICAL (practical) Production Engineer, with thorough knowledge of metal working machinery, plant lay-out, processing, tooling and die making, production control for Western Canada Manufacturer selling all across Canada to other manufacturers and to wholesalers. Prefer man of 40 or older. Permanent and good future for a good practical factory manager and producer. Apply to File No. 1704-V.

Situations Wanted

MECHANICAL ENGINEER S.E.I.C. 1950 graduate, University of Toronto. Age 24, single. Experience in machine shop and repair and maintenance work. Presently employed in structural steel, foundry and machine tool industry as plant layout and maintenance engineer. Interested in permanent position leading to responsibility. Willing to work and learn. Available on short notice. Apply to File No. 1505-W.

YOUNG REGISTERED CIVIL ENGINEER with ten years army, administrative and municipal experience desires spare time employment to help him gain additional technical experience. Available Lower B.C. Mainland approximately 20 hours per week, including limited time during weekdays. Draughting and surveying assistance can be arranged. Apply to File No. 2377-W.

GRADUATE MECHANICAL ENGINEER, M.E.I.C., P. Eng., (Ontario), age 31, married. Presently employed in Toronto. Desires responsible position with manufacturing firm. Nine years experience in mechanical and structural design, inspection, shop liaison, and sales and service. Apply to File No. 2586-W.

MECHANICAL ENGINEER, Jr. E.I.C. (McGill 1947). Age 25, married and family of two. Experience consists of four years of summer work as instrumentman on highway construction; several months as sales engineer in pumps and allied electrical equipment; one year including specialized training in fire inspection work for United States fire insurance company. For the past two years have been a full partner in a road building outfit in Western Canada. Desires permanent position where responsibility, organization and sales ability are important qualifications. Starting salary and location are secondary factors. Available immediately. Apply to File No. 2858-W.

MECHANICAL ENGINEER, M.E.I.C., Queens 1936, age 38, married. Currently engaged in research work, 2 years, desire to return to industrial or commercial field. Have had the following experience since graduation: about 10 years diversified work in plant engineering embracing — dust control, 2½ years, application of control to metallurgical processes (primary metal producers), 3 years, industrial ventilation and air-conditioning, 1 year, general plant maintenance, 3½ years; about 2 years steel forging experience in small plant covering purchase, installation, and operation of equipment. Would be available at one month's notice to present employer. Apply to File No. 2966-W.

GRADUATE DRAUGHTSMAN, designer, Jr. E.I.C., B.Eng. Desires a position in the structural design field, preferably reinforced concrete and design. Age 24, McGill (Civil) graduate 1948. Two years experience in structural steel and reinforced concrete detailing and design. Prefer employment in Montreal area, will consider good position elsewhere. Presently employed. Available on short notice. Apply to File No. 3026-W.

MECHANICAL ENGINEER, B.Sc. 1941, single, veteran of R.C.A.F. Experience in laboratory work, aircraft maintenance, design of heavy machinery with emphasis on welding and applied stress analysis. Desires work of research nature. Willing to work outside Canada. Apply to File No. 3058-W.

MECHANICAL ENGINEER, 1947, Jr.E.I.C., age 26, two years of experience in maintenance and one and one-half years of experience in design and installation in industrial plants. Desires quality control or industrial engineering work in Montreal. Apply to File No. 3208-W.

CIVIL ENGINEER, B.Sc. 1947, Jr. E.I.C., P.Eng. (Quebec), age 26, married, with car, 3½ years varied structural experience with architects, fabricators and contractors, covering design, detailing and estimating of structural steel and concrete as well as liaison work, desires position with responsibility. Must include outside work in design and supervision, and/or liaison work, or sales promotion. Available on one months' notice to present employer. Ontario or Alberta preferred. Apply to File No. 3340-W.

PROCESS ENGINEER, M.E.I.C., chemical and metallurgical. Extensive experience in metal-working industry in both production and development. Desires senior position in technical or administrative field. Apply to File No. 3374-W.

ELECTRICAL AND MECHANICAL ENGINEER, B.Sc., M.I. Mech. E., M.I.E.E., A.M.I.C.E., seeks employment in Canada as from May next. Aged 47, married, three children. Experience includes oilfield electrification, consulting engineering, Government inspection, operation and management of hydro-electric undertakings, valuation. Recently in India visiting all hydro-electric schemes on behalf of major oil company. Present annual salary equivalent to $9000.00 basic $12000.00 with allowances. Available near Halifax early May. Apply to File No. 3378-W.

METALLURGICAL ENGINEER, M.E.I.C., P.Eng. (Ontario) Age 35, married, located in Toronto, desires sales post leading to administrative position in metallurgical or allied field. Ten years experience in industry includes technical control, process and methods application in light manufacturing, production supervision and administration. Currently employed in consulting capacity contacting industry throughout Ontario. Available after reasonable notice to present employer. Apply to File No. 3381-W.

CIVIL ENGINEER (B.E.N.Z.), 32, married, ex-service pilot. Experience in railroad, hydro-electric, highway, and airdrome construction, water supply, sewage disposal work. Also some experience in structural design and mechanical workshops. Seeks employment with consulting or structural engineers construction company, or Federal or Provincial organization. Presently in charge of airport project, available in mid-January. West Coast location preferred, but go anywhere. 2½ years experience of Canadian conditions. Expect to obtain Canadian registration at early date. Apply to File No. 3382-W.

CIVIL ENGINEER (Toronto 1949), P.Eng. Age 30. Married. R.C.A.F. veteran. Experience in hydraulic, hydrologic and hydroelectric fields including soil and foundation exploration, power and economic studies, flood control, and specification writing. Desires position in similar field. One month notice required to present employer. Apply to File No. 3383-W.

CIVIL ENGINEER, S.E.I.C., B.A.Sc., Toronto University, 1949, married, age 25, at present employed in London, Ontario. Desire permanent employment with opportunity for advancement. Experience in surveying, light construction work, draughting and general engineering duties. Willing to work anywhere in Canada but continuous travelling not desirable. Apply to File No. 3384-W.

METALLURGICAL ENGINEER, S.E.I.C. Graduate of 1950, McGill. Age 26, veteran, single. One year of practical experience in steelmaking with electric furnaces. Desire position leading to responsibility. Quite willing to work outside of country if so desired. Available on short notice. Apply to File No. 3385-W.

GRADUATE ENGINEER, M.E.I.C., married. Approximately 14 years industrial plant and construction experience including positions as resident construction engineer and plant engineer. At present employed and would consider changing only if offered a similar or better position with suitable opportunity for advancement. Apply to File No. 3387-W.

SENIOR PRODUCTION ENGINEER, M.E.I.C., of internationally famous engineering concern would like to assist small or medium size engineering firm in Montreal area in quickly clearing up design, production, or estimating difficulties. Available Saturdays or evenings. Temporary assignments considered. 10 years wide experience, fully qualified. Apply to File No. 3392-W.

MECHANICAL ENGINEER, S.E.I.C. Graduated with honours from U.B.C. in May, 1950. Age 24, single and in good health. At present employed in non-technical work in Ontario receiving supervisory training. Would like design development on research work anywhere in Canada. Available on short notice. Apply to File No. 3395-W.

ELECTRICAL ENGINEER, honours degree, A.M.I.E.E., M.A.I.E.E. 10 years experience world famous electrical manufacturing company, wishes permanent position anywhere in Canada. Very adaptable having broad range of interests. At present in Great Britain. Available early 1951. Apply to File No. 3396-W.

ELECTRICAL ENGINEER, S.E.I.C. Graduated University of Alberta 1950. Veteran, age 29; married, no children, desires permanent position anywhere in Canada. Have Naval electrical experience and training (E.A. 3rd Class), also experienced in electrical servicing. Have good technical background and excellent personality records. Available immediately. Apply to File No. 3403-W.

CIVIL ENGINEER, Jr.E.I.C., 31 years, B.A.Sc. Toronto 43, 7 years experience in industrial and housing construction both in field engineering and job supervision. Desire position in Southern Ontario in construction or related industry. Apply to File No. 3404-W.

MECHANICAL ENGINEER, M.E.I.C., graduate McGill 1943, veteran, age 30, seeks position as project or plant engineer. Broad experience in plant layout, design, construction, alteration and maintenance work. Employed during past 3 years on design and construction of large mill now nearing completion. Would consider alternative position as executive assistant or sales engineer. Apply to File No. 3405-W.

CONSTRUCTION COST ENGINEER, Queen's 1948, R.C.A.F. Veteran, with experience in all phases of estimating, scheduling, cost control, material requisitioning and expediting, for both large and small industrial projects, desires an executive or supervisory position where hard work and initiative will lead to advancement. Other assets include wife, two children and own car. Location unimportant. Apply to File No. 3406-W.

GRADUATE CIVIL ENGINEER, M.E.I.C., P.Eng. (Ont.) Age 38, married, family 2. Experience includes 10 years mining and 6 years pulp and paper covering-construction plant engineering and design. Presently employed as assistant resident engineer. Ontario or Quebec province preferred. Available on reasonable notice. Apply to File No. 3409-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., age 25, five years experience in highway and bridge construction. Presently employed but desires position with more varied experience. Am interested in any type of engineering and will work anywhere. Available in three weeks. Apply to File No. 3411-W.

1950 GRADUATE University of Saskatchewan, distinction in Engineering Physics. 26 years, family of 2, currently mastering in physics. Have background as resident engineer on municipal engineering project; ex-navigation instructor in R.C.A.F. Desire work in applied reasearch or in general engineering. Available May, 1951. Apply to File No. 3414-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.Eng., B.Eng. McGill 1949. Age 28. Single. Good health. Experience: two summers as junior draughtsman in pulp and paper mill, two summers as helper in foundry and boiler shop of firm manufacturing heavy machinery, spring 1949 to date as engineer with major oil company. Desires to obtain plant engineering experience with a firm located in the Toronto area. Apply to File No. 3415-W.

TWO PROFESSIONAL ELECTRICAL ENGINEERS, Jr.E.I.C. Honours graduates of Canadian Universities, having completed two years training with a leading Canadian Electrical Manufacturer, seek to better their positions. Professional employment with any progressive Canadian company will be considered. Apply to File No. 3416-W.

ELECTRICAL ENGINEER, S.E.I.C., B.A.Sc. U.B.C. 1950. Age 27, single. Experience: Radar mechanic R.C.A.F. One summer each as coal mine car repairer, tipple machinery operator, and electricians' helper in coal mine. Will work anywhere. Available immediately. Apply to File No. 3417-W.

MECHANICAL ENGINEER, S.E.I.C. graduate, University of Saskatchewan 1950. Age 31, married. 4 years overseas with R.C.A.F. as wireless mechanic. Some boiler shop and pipe fitting experience. Would like to specialize in heating and air conditioning or in power house work. Willing to undertake any required training. Apply to File No. 3422-W.

ELECTRICAL ENGINEER, Jr.E.I.C., Assoc. A.I.E.E., B.Sc. University of New Brunswick 1949. Age 25, single. One year experience in the manufacture and design of polyphase and single phase motors. Seeks position in design or production engineering in power field preferably in Montreal area. Available immediately. Apply to File No. 3423-W.

CHEMICAL ENGINEER, Laval 1949, single, bilingual, with summer experience in shipbuilding, galvanizing of steel and making of aluminum. Nearly two years experience in food industry in Montreal. Desires a position in industrial, sales or plant engineering with opportunity for advancement. Available on short notice. Apply to File No. 3428-W.

MECHANICAL ENGINEER

(25-30 years of age)

required for manufacturer of spun synthetic textile yarns at Granby, Quebec. The Plant Superintendent is a Graduate Mechanical Engineer and the position now open is that of Assistant Superintendent. Duties will include Planning Production, the Maintenance of the Machines, Planning and Installation of new machinery and daily contact with all levels of the plant personnel. Salary will be dependent on the experience of the Successful Applicant but a minimum of $300.00 per month has been established. Please reply in detail to file No. 1700-V.

Mechanical Engineer Required

As assistant to chief inspector of large oil company in Montreal. Applicant should have at least three years' experience in plant maintenance, involving shop fabricating methods, and inspection. Knowledge of metallurgy and familiarity with corrosion problems an asset. Salary open. Apply to File No. 2052-V.

ATTENTION EMPLOYERS!

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EMPLOYMENT SERVICE

The Engineering Institute of Canada

2050 Mansfield St., Montreal 2, Que.

Mechanical Engineer Required

For engineering office of large oil company. Applicant should have minimum of two years' experience in design and layout of mechanical equipment. Working knowledge of pressure vessel design an asset. Location Montreal. Salary open. Apply to File No. 2052-V.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

SCIENTISTS AT WAR:

Wilfrid Eggleston. London, Oxford University Press, 1950. 291 pp., illus., cloth, $3.50.

Reviewed by Dr. E. P. Fetherstonhaugh, M.E.I.C.

Throughout the tragic years of World War II engineers and scientists were aware that a great deal of important war research was in progress at and under the direction of the National Research Council of Canada. But until the publication recently of Mr. Wilfrid Eggleston's book, "Scientists at War" no comprehensive report was available to the public on the nature and extent of the war researches that had been undertaken in this country.

In this most interesting and informative volume there may now be found the answers to many of the questions that puzzled Canadians during the progress of the war. Some of the researches must still be shrouded in secrecy, but many interesting developments are now removed from the secret list and described in language devoid of all unnecessary technicalities.

The book contains eleven chapters, two appendices and an index. It is well illustrated with numerous photographs. The first chapter gives a review of research in Canada and briefly introduces in general terms some of the aspects of war research. It is followed by four chapters dealing respectively with "Radar", "The Proximity Fuse", "New Explosives" and "Atomic Energy". The use of scientific equipment in war is covered in three intensely interesting chapters dealing with the war on land and sea and in the air. Separate chapters are devoted to "Materials and Food" and "The Medical Front". The story concludes with a discussion of "Science and the Future", in which the great importance of maintaining an adequate and active research organization for peace and war is strongly emphasized. Reference is also made to the creation in 1947 of the Defence Research Board and its important functions.

To the general public and especially to those who have an interest in scientific developments, this book is as readable as a fascinating novel. Having read it one is conscious of certain outstanding impressions. There is a feeling of confidence in the ability of Canada's young scientists to match their wits against those of any country, and there is a realization that at certain stages of the war and in some of its aspects the results might have been vastly different had the scientists and engineers not been ready with counter measures to block the effect of the enemy's ingenious inventions.

Everyone will agree with Mr. Eggleston's statement on the first page of his book that "no scientist would seek to claim any of the glory due to the front line forces". But on the other hand it is right that due acknowledgment should be made of the arduous and devoted labours of the scientists and engineers who, working always against time solved in a practical way so many of the intricate and urgent problems of the armed forces.

In concluding this brief review, reference must be made to the splendid leadership given to the National Research Council by two members of the Engineering Institute of Canada: General A. G. L. McNaughton, who was President in the years immediately preceding the war and whose military experience, scientific knowledge and foresight led him to lay the foundations well in advance for certain contingencies that were bound to arise if war were to come; and Dr. C. J. Mackenzie who assumed the duties of President when General McNaughton left to take the First Canadian Division overseas. Under Dr. Mackenzie's inspiring and competent leadership through the six war years a vast amount of valuable research was undertaken and brought to a successful conclusion so that in many instances the finished equipment was available to the armed serviced in an almost unbelieveably short space of time after their need had been foreseen.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Airplane Design Manual, 3d ed.:
F. K. Teichmann. New York, Pitman, 1950. 382 pp., illus., $7.50.

Chemical Formulary, Volume IX:
Chemical Pub. Co., Brooklyn, 1951. 649 pp. $7.00.

Circuit Analysis of A.C. Power Systems, Volume II:
Edith Clarke. New York, Wiley, 1950 396 pp., illus. $8.50.

Elementary Theory of Structures:
J. C. Grassie. Toronto, Longmans, Green, 1950. 392 pp., illus. $5.00.

Fundamentals of Quantum Mechanics:
Enrico Persico. New York, Prentice-Hall, 1950. 484 pp., $8.00.

Horizontal Diesel Engines:
R. A. Collacott. London, Temple Press, 1950. 122 pp., illus. 8/6.

Kinematics of Machines, 5th ed.:
G. L. Guillet and A. H. Church. New York, Wiley, 1950. 299 pp., illus. $4.00.

Laplace Transformation:
W. T. Thomson. New York, Prentice-Hall, 1950. 230 pp. $5.00.

Plumbers' Pocket Book of Roughing-in Dimensions for Plumbing Fixtures:
A consolidated service by Canadian Potteries Ltd., and other companies. 134 pp., illus., paper.

Power System Stability, Volume II:
H. W. Kimbark. New York, Wiley, 1950. 288 pp., illus. $8.00.

Public Health Engineering, Volume II:
E. B. Phelps. New York, Wiley, 1950. 213 pp., illus. $4.00.

Receiving Tube Substitution Guide-Book:
H. A. Middleton. New York, Rider, 1950. 215 pp., illus. $2.40.

Rudiments of Mathematical Physics:
James Bain, Montevideo, 1950. 92 pp., illus.

Small Plant Management:
American Society of Mechanical Engineers. Toronto, McGraw-Hill, 1950. 548 pp., illus. $7.80.

TV and Other Receiving Antennas (Theory and Practice):
Arnold B. Bailey. New York, Rider, 1950. 595 pp., illus. $3.00.

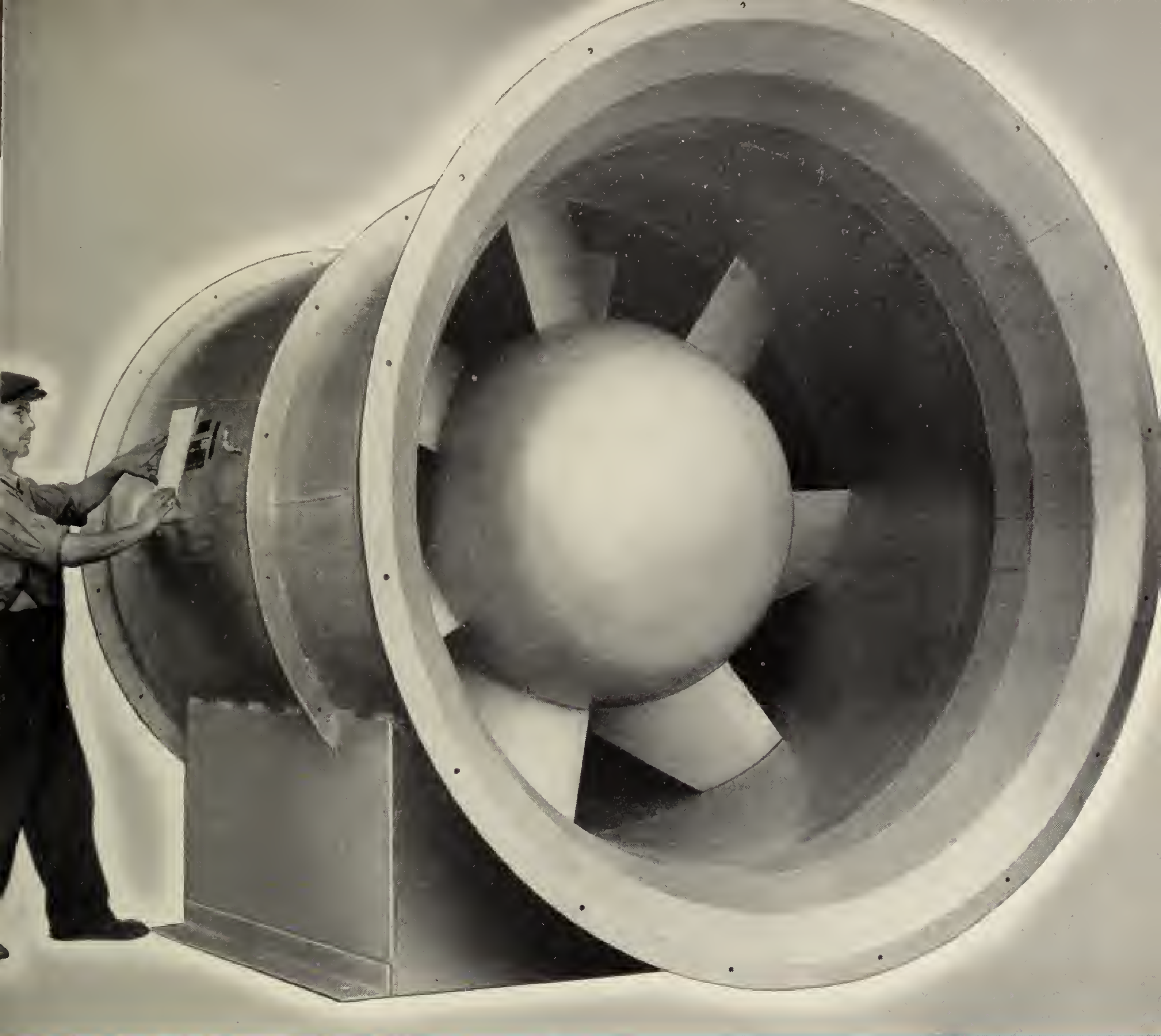
TECHNICAL BULLETINS, ETC.

American Society of Civil Engineers. Memoranda:
No. 321F, 1950—How to approach the business of getting a job, (for) senior civil engineering students and new graduates.

American Standards Association. Price Lists:
Price List, August 1950.

British Electrical and Allied Industries Research Association. Lists of Publications of The Electrical Research Association:
List, August 30th, 1950.

...Technical Reports:
No. L/T227: The crystallography and thermodynamics of order-disorder transitions in certain mixed ketones, by V. Daniel. No. L/T228: Tracking in solid insulating materials; consideration of replies to questionnaire, ed. by V. E. Yarsley. No. N/T57: Magnetization curves for polycrystalline ferromagnetics, by H. Lawton and K. H. Stewart. No. S/T58: Propagation of electromagnetic disturbances along a thin wire in a horizontally stratified medium, by B. L. Coleman. No. U/T115: A new oscillograph for the recording of very fast electrical transients, by R. E. Bauer and W. Nethercot.



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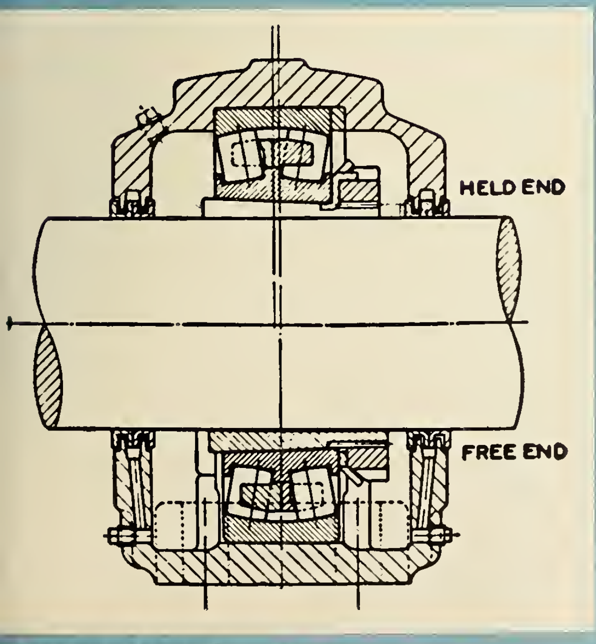

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Non-members may consult the library, but may not borrow material.

Canada. National Research Council. Additions to the Publications of National Research Council:

July-August 1950.

...Building Notes:

No. 7: Instruments for measurement of dynamic stresses (or strains) in temporary steel structures, by W. R. Schriever.

...Aeronautical Laboratories. Reports:

No. ME 1950 (3), being quarterly bulletin July 1 to September 30, 1950.

...Translations:

No. TT-64: The Swiss Federal Institute for snow and avalanche research on Weissfluhjoch near Davos at 8700 feet above sea level.

Canadian Manufacturers' Association Inc. Annual General Meeting Reports:

79th Annual general meeting, report of the general manager, J. T. Stirrett.

Engineering Societies Library. Bibliographies:

No. 5 — Bibliography on machinery foundations, design, construction, vibration elimination.

Georgia Institute of Technology, State Engineering Experiment Station. Circulars:

No. 28—The solvent extraction of oilseed, by E. P. Cofield.

Institute of Metals. Reprints from Journal of the Institute of Metals:

No. 1254—The jet-impingement apparatus for the assessment of corrosion by moving sea-water, by R. May and R. W. De Vere Stacpoole. No. 1255—Pitting corrosion in copper water pipes caused by films of carbonaceous material produced during manufacture, by Hector S. Campbell. No. 1256—The new continuous brass mill of the Scovill manufacturing company, Waterbury, Conn., U.S.A., by J. J. Hoben and J. F. Mulvey. No. 1257—The flow of zinc under constant stress, by A. H. Cottrell and V. Aytekin. No. 1258—Mechanism of primary creep in metals, by W. A. Wood and R. F. Scrutton. No. 1259—The mechanism of creep as revealed by X-Ray methods, by G. B. Greenough and Edna M. Smith. No. 1260—Some X-Ray observations on the nature of creep deformation in polychrystalline aluminium, E. A. Calnan and B. D. Burns. No. 1261—The Thermodynamics and Kinetics of precipitation in solid solutions, H. K. Hardy.

Institution of Structural Engineers. Reports:

Report on the structural use of aluminium alloys in buildings.

Society of Naval Architects and Marine Engineers. General Information Book:

General information book, edition of 1939.

...Advanced Copies of Papers to be Presented at Annual Meetings:

No. 1—An approximate theory of heavily loaded, free-running propellers in the optimum condition, by Hermann W. Lerbs. No. 3—Cooling effect of tube holes in thick shells of marine boilers, by J. F. Harvey. No. 4—The backing power of geared-turbine driven vessels, by E. F. Hewins and others. No. 5—Design-stage calculations of torsional, axial, and lateral vibrations of marine shafting, by Eugene Panagopulos. No. 6—Bearings and lubrication for marine turbines and reduction gears, by Frank C. Linn and John T. Burwell. No. 7—Standards for stability of ships in damaged condition, by Vito L. Russo and James B. Robertson. No. 8—Stateroom fire test, by Archibald H. McComb and Edwin E. Benzenberg. No. 9—Some aspects of ship bottom corrosion, by Paul Ffield.

U.S. Bureau of Mines. Information Circulars:

No. 7568—Methods of excavation and roof support used in some recently constructed tunnels, by S. P. Polack.

U.S. Geological Survey. Water Resources Review:

July 1950.

PAMPHLETS

Airport Design and the All-Weather Navigation Program:

Walter Prokosh. Presented at the annual meeting of The Airport Operators Council, Cleveland, 1950.

Anglo-Newfoundland Development Co., A Survey of:

Collier, Norris & Quinlan, Montreal, 1950.

Business Administration. Lecture Course:

L. Urwick. Institute of Industrial Administration.

Canadian City Growth, Problems of:

Albert Rose. Ottawa, Community Planning Association of Canada, 1950.

Canadian Government Specifications Board, An Outline of its Character and Function:

Ottawa, National Research Council, 1949.

Coal in Canada, Current Statistics on:

C. L. O'Brian. Presented at annual general meeting of The Canadian Institute of Mining and Metallurgy, Toronto, 1950.

Coals. The Briquetting of Alberta Coals:

W. A. Lang. Presented at the annual general meeting of The Canadian Institute of Mining and Metallurgy, Toronto, 1950.

Compaction of Soil:

F. H. P. Williams and D. J. Maclean. London, H.M.S.O., 1950.

Concrete Kerbs; Causes and Prevention of Failures:

J. A. Loe. London, H.M.S.O., 1950.

Condensation in the Home:

National Research Council, Division of Building Research. (Better Building Bulletin, June 1949.)

Corporation of Professional Engineers of Quebec. Proposed New Tariff of Fees and General Conditions:

The Corporation, 1949.

Dredging at DeCew Falls:

S. C. Cooper. Reprint from Engineering and Contract Record, Feb. 1947.

Education for Management. Management Subjects in Technical and Commercial Colleges:

Report of a special committee appointed by the Minister of Education. London, H.M.S.O., 1947.

Flood Control Works All-American Canal, Coachella Branch Boulder Canyon Project:

Willard R. Slater and others. Paper presented at Joint Summer Convention on the American Society of Civil Engineers and the Engineering Institute of Canada, Toronto, 1950.

Low Temperature Properties of Ferrous Materials:

New York, Society of Automotive Engineers.

Management's Debt to Engineering:

L. Urwick, Paper presented to the Birmingham Association of Mechanical Engineers, 1948.

Mines and Quarries in the Province of Quebec, List of the Principal Operators and Owners:

Quebec, Quebec Department of Mines, 1949.

North American Security:

A. G. L. McNaughton. Address delivered at the 79th annual general meeting of the Canadian Manufacturers' Association, 1950.

Point Four Program:

U.S. Dept. of State, Washington, 1949, 1950.

Psychology of Safety in Supervision:

J. L. Rosenstein. National Safety Council of U.S., 1950. Consists of 6 pamphlets: No. 1—You can't change human nature; No. 2—What is your U.Q.?; No. 3—Teaching safety on the job; No. 4—People act alike; No. 5—Safety takes teamwork; No. 6—You are human too.

Research in Learning:

Engineering College Research Council.

St. John's Newfoundland, Report on:

John Bland. St. John's Commission of Town Planning, 1946.

Sands for Plasters, Mortars and External Renderings:

A. D. Cowper. London, H.M.S.O., 1950.

Scotland, Manufacturing and Export Centre:

Edinburgh, Scottish Council, 1950.

Service for Management:

London, British Institute of Management, 1949.

Undeveloped Water-Powers in the Province of Quebec:

A. B. Normandin. Engineering Institute of Canada, 1949.

ANNUALS, YEARBOOKS, ETC.

American Concrete Institute:

20-year index (1929-1949) to the Journal of the American Concrete Institute.

Association of Architects of the Province of Quebec:

Register, 1950.

British Welding Research Association:

Annual report, 1949/1950.

Connecticut. Board of Registration for Professional Engineers and Land Surveyors:

Roster of registered professional engineers and land surveyors, January 31, 1950.

Crown Assets Disposal Corporation (Formerly War Assets Corporation):

Sixth annual report to the Minister of Trade and Commerce, April 1, 1949—March 31, 1950.

Ecole Polytechnique:

Liste des diplomés, May 1950.

Nova Scotia. Board of Commissioners of Public Utilities:

Report for the year ended December 31st, 1949.

BOOK NOTES

Prepared by the Library of The Engineering Institute of Canada

A.S.T.M. PUBLICATIONS:

American Society for Testing Materials, 1916 Race Street, Philadelphia, Pennsylvania:

Special technical publications:

No. 96—Papers on radiography. 95 pp., illus., $1.75.

In the present volume, three papers deal with the progress of electrostatic and betatron-type X-ray generators operating at potentials above the familiar one million volt range. Other papers deal with industrial and engineering applications of X-Ray machines.

No. 99—Symposium on use of pozzolanic materials in mortars and concretes. 203 pp., illus.

This symposium is the result of renewed interest in the subject of pozzolanic or blended cements. The paper starts with a definition and historical review of the early use of pozzolans, and continues with discussions on their use in mass concrete. Other aspects of the subject are also dealt with in detail.

No. 102—Symposium on high additive content oils. 63 pp., illus., $1.75.

The lubricating oils considered in this symposium are of an entirely new type and differ from the previous heavy-duty oils in that they contain from five to ten times as much additive. This is a well-rounded presentation from the standpoints of both the equipment and lubricants manufacturers.

No. 103—Symposium on application of statistics. 36 pp., $1.00.

This paper deals with the application of statistics to quality control in modern testing. Papers presented deal with: "The economic relationship between design and acceptance specifications", "Precision and accuracy of test methods", "Use of statistics to determine precision of test methods", "Modern quality control".

Standards:

Glass and Glass Products. Illus.

Products considered are divided in three groups: Glass and glass containers, glass insulators, glass textiles. In each case are given the methods of testing and the definitions of terms relating thereto. This is essentially a reprint of page 323-384 of 1949 Book of A.S.T.M. Standards, Part 3.

Procedures for testing soils. 418 pp., illus., $3.75.

These procedures are divided in five parts: soil explorations and sampling of soils; physical characteristics and identification of soils; physical and structural properties of soils; special and construction control tests for subgrades and base courses of highways and airports, and also for stabilization of soil with admixtures of soil, cement, bituminous and chemical materials for earth dams and embankments; bearing capacity tests of soil in place and dynamic properties of soils.

AMERICAN SOCIETY FOR ENGINEERING EDUCATION. ENGINEERING COLLEGE RESEARCH COUNCIL. PROCEEDINGS OF 1949 ANNUAL MEETING:

American Society for Engineering Education, Iowa City, 1950. 140 pp., paper, $2.00.

A symposium of 12 papers on instrumentation for engineering research highlights the proceedings of this 1949 annual meeting. Other papers in the publication describe federal military and non-military engineering research interests, as reported to the research council. The symposium on instrumentation contains descriptions of a number of new mechanical and electrical instrumentation devices developed in industrial and college laboratories.

CCH'S CONSOLIDATION CANADIAN INCOME TAX ACT, 16th ed., June, 1950:

CCH Canadian Ltd., Montreal, 1950. 328 pp., paper, $3.00.

This Consolidation reproduces the current law. Following each section in smaller two-column type is the full text of the section as it was prior to amendment, plus the full text of the analogous provision of the Income War Tax Act. A two-way cross reference table to the old and the new Act is an added feature. A 34-page index brings all points of reference to instant use.

CANADIAN SALES AND EXCISE TAX GUIDE:

CCH Canadian Ltd., Montreal, 1950. 194 pp., paper, $2.00.

This is the first authoritative statement on sales and excise taxes for popular use. It contains an alphabetical list of items exempted from tax. It also gives full information on the computation of the tax on goods produced in Canada, imported or for export, on samples, repairs, contracts, returned goods, ships' stores, custom work, containers and coverings, goods lost or damaged in transit, freight, etc.

CLASSIFIED HANDBOOK OF MEMBERS AND THEIR MANUFACTURES; 21st ed.:

British Engineers' Association, London, The Association, 1950. 655 pp., cloth.

This volume consists of reading matter and advertisements. A comprehensive classified list of manufacturers, which is distinctively printed on a different coloured paper, will be of great assistance to purchasers of engineering equipment. The foreword deals with progress in the engineering industry and pays tribute to the work of the research organizations which serve the industry.

HELICAL SPRINGS:

J. R. Finniecome. Manchester, Emmott, 1949. 60 pp., illus., paper, 2/6. (Mechanical World Monograph No. 56).

In this Monograph, particular attention is directed to a number of authoritative investigations on the closely coiled spring of circular cross section. The results of the analysis are presented by formulae, graphs, and charts. It is hoped that these may prove useful to those who are anxious to ascertain rapidly and accurately the desired design information.

INTERPLANETARY FLIGHT; AN INTRODUCTION TO ASTRONAUTICS:

Arthur C. Clarke. London, Temple Press, 1950. 164 pp., illus., cloth, 8/6.

This book is intended as a survey of the possibilities and problems of interplanetary flight, as far as they can be foreseen at the present day. The attempt has been made throughout this book to keep the treatment quantitative, and to give exact values and magnitudes rather than vague generalities. A great deal of the mathematics has been relegated to the appendix, and it is believed that the argument can be followed without undue difficulty by readers with only a general mathematical or scientific training. The approach is from the astronomical rather than the engineering point of view.

MACHINING AND MANIPULATION OF STAINLESS STEELS:

Walker, W. F. Manchester, Emmott, 1950. 78 pp., illus., paper, 3/6. (Mechanical World Monograph No. 57.)

The machining and other operations on stainless steels need not be regarded as troublesome, for with correctly designed tools and the early appreciation of the problems involved, first class and economic results can be obtained. It is the object of these pages to provide this information, the substance of which has been drawn from the author's experience as a production engineer.

A MANUAL OF PLASTICS AND RESINS IN ENCYCLOPEDIA FORM:

William Schack, ed. Brooklyn, Chemical Pub. Co., 1950. 547 pp., illus. $10.00.

Containing some 1500 subjects, arranged in alphabetical order for speedy reference, this volume is a compact but comprehen-

sive survey of the materials, processes, products and equipment of the plastics industry.

Both full length and short articles, on products, definitions and chemical terms are included, and also appendices, A, Trade names with their composition and manufacturer; B, Fabrication charts; C, Comparative prices of plastics.

PATTERN MAKING FOR ENGINEERS, 8th ed.:

J. G. Horner and Philip Gates. London, Technical Press, 1950. 390 pp., illus., cloth, 8/-.

The class of work dealt with in this book is believed to be sufficiently varied to prove instructive in the various branches of pattern-making. While the apprentice will certainly study it with advantage, it is hoped that the practical pattern-maker, the foundry man, the draughtsman, the designer, and those comprising the works executive will not peruse it in vain. To keep abreast of new developments, this eighth edition has been enriched by new illustrations.

RADIOACTIVITY AND NUCLEAR PHYSICS, 2nd ed.:

James M. Cork. New York, Van Nostrand, 1950. 415 pp., illus., cloth, $6.00.

This book is intended as a text for an introductory course in nuclear physics at the upper graduate or beginning graduate level. It is also hoped that it will be useful to research workers in this field. To this end, a revised Table of Isotopes with energies and significant references is included, as well as many other tables relating range, energy and momentum for various particles. For the student, there are problems at the end of each chapter, whose solution should aid to an understanding of the various topics.

STATE-CITY RELATIONSHIP IN HIGHWAY AFFAIRS:

Norman Hebden and W. S. Smith. New Haven, Yale University Press, 1950. 230 pp., $4.00.

Although the locale of this publication is limited to the U.S., the increasing importance of municipal, city and state or province division of responsibility for highway activities and financing has now become a major problem in most countries.

State laws, authority for rights of way, allocation of highway construction in cities state authority in city traffic control, traffic control devices and sources of highway revenue—those and a host of other pertinent questions are considered in this new book just published by Yale University Press. It should be of vital interest to all readers concerned either with road and highway construction, or in these forms of Engineering and Construction contracts with public organizations.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

BASIC ELECTRICAL MEASUREMENTS.

By M. B. Stout. Prentice-Hall, Inc., New York, 1950. 504 pp., illus., linen, $7.75.

This book is devoted to selected methods and instruments used most frequently to measure electrical phenomena. The principles, construction and use of galvanometers, potentiometers, a-c bridges and other measuring circuits and ancillary equipment are discussed. Two chapters deal with magnetic measurements and electrical indicating instruments. Introductory material covers such topics as electrical units, experimental procedures, and aids to computation. Selected references and problems are included at the end of most of the chapters.

CHEMICAL THERMODYNAMICS, Basic Theory and Methods.

By I. M. Klotz. Prentice-Hall, New York, 1950. 369 pp., illus., cloth, $6.00.

Designed primarily for chemists, this text presents the logical foundations and interrelationships of the theory of thermodynamics and expounds the methods by which theoretical principles may be applied to practical problems. The classical or phenomenological approach is used to the exclusion of the statistical viewpoint. Much attention is given to the mathematical tools needed in the application of theory. Exercises for student solution follow each chapter.

DESIGN OF ELECTRICAL APPARATUS.

By J. H. Kuhlmann. 3rd ed. John Wiley & Sons, New York, 1950. 512 pp., illus., cloth, $8.45 (Can.).

Practical methods are presented for the design of electrical apparatus, with explanations of the theory, procedure, and limits of design. Changes in this third edition include a revision of design constants and limits, the plotting of the characteristic curves of electrical sheet steels on semi-logarithmic paper, the enlargement of the copper tables to include new wire insulating materials, new values of insulation thickness, a review of multiplex windings, and many new methods for determining electrical and mechanical characteristics.

ELECTROMAGNETIC WAVES AND RADIATING SYSTEMS.

By E. C. Jordan, Prentice-Hall, New York, 1950. 710 pp., illus., linen, $10.50.

Intended for use by senior and graduate electrical engineers and physicists, this textbook considers the theory and applications of electromagnetic radiation and propagation. A review of fundamental theory is followed by the presentation of more advanced material on electromagnetic waves. Transmission lines, wave guides, and antennas are discussed as well as ground-wave and sky-wave propagation. A bibliography and problems follow most of the chapters.

ENGINEERING HYDRAULICS, Proceedings of the Fourth Hydraulics Conference, Iowa Institute of Hydrolic Research, June 12-15, 1949.

Edited by H. Rouse. John Wiley & Sons, New York, 1950. 1039 pp., linen, $15.00.

This comprehensive reference work, written by selected authorities, constitutes the official proceedings of the Fourth Hydraulics Conference, held in 1949. Fundamental principles are emphasized throughout the thirteen chapters that deal with the principles of flow, hydraulic similitude, flow measurement, hydrology, flow of underground water, steady and unsteady flow in closed and open systems, flood routing, wave motion, sediment transportation, and hydraulic machinery. The Appendix contains a list of symbols, dimensional considerations, and the properties of common fluids.

ILLUSTRATING FOR TOMORROW'S PRODUCTION:

By J. H. Farmer, A. J. Hoecker and F. F. Vavrin. Macmillan Company, Toronto, 1950. 203 pp., illus., linen, $5.75.

In a simple step-by-step treatment this text shows how to make a perspective drawing from an orthographic drawing, how to make true-scale exploded drawings, and how to make freehand drawings using mechanical construction principles. Isometric and oblique drawings are explained, the preparation of drawings for reproduction is described, and aircraft illustrating is briefly dealt with in a separate section.

IRRIGATION PRINCIPLES AND PRACTICES.

By O. W. Israelsen. 2nd ed. John Wiley & Sons, New York, 1950. 405 pp., illus., linen, $6.00.

Stressing irrigation principles, this book also describes modern methods and practices. Features of this second edition are a simplified treatment of the flow of water in soil, new material on drainage, a consideration of the consumptive use of water, a discussion of the social and administrative aspects of irrigation, and the addition of more than 300 selected references to recent publications on irrigation and drainage.

PROCESS HEAT TRANSFER.

By D. Q. Kern. McGraw-Hill Book Co., Toronto. 1950. 871 pp., illus., cloth, $9.70.

Combining both theory and modern practice, this text provides systematic instruction in the calculations, derivation and empirics of heat transfer, using the language and methods of industry. Each principle is developed within the actual equipment and flow patterns in which it occurs in the majority of industrial operations. All calculations are treated as interrelated occurrences between hot and cold agents through a single surface. Worked and unworked problems are included.

SNOW MELTING.

By T. N. Adlam. Industrial Press, New York, 1950. 224 pp., illus., linen, $4.50.

A comprehensive manual on all phases of the use of embedded hot water coils for melting snow on roads, driveways and sidewalks. It considers the different types of systems, the calculation of pipe sizes and spacing, and data on snowfall in the United States, Alaska and Canada. Design details, anti-freeze solutions, installation techniques, and installing and operating costs are also included.

TELEVISION, Volume V, 1947-1948, 461 pp.

TELEVISION, Volume VI, 1949-1950, 426 pp.

Edited by A. N. Goldsmith and Associates. RCA Review, Radio Corporation of America, RCA Laboratories Division, Princeton, New Jersey, August 1950. Illus., linen, $2.50 per vol., plus $.20 postage outside U.S.A.

The fifth and sixth volumes of this series cover the years 1947-1948 and 1949-June 1950. Like the previous volumes, they contain papers written by RCA authors which were published in various technical journals and magazines. Each volume is presented in six sections: pickup, transmission, reception, colour, UHF, and general. Some papers, because of space requirements, are presented in summary form only, whereas other papers are presented as previously published. In volume 6, as an appendix, some 506 technical papers on television and related subjects, written by RCA authors and published from 1929 to June 1950, are listed chronologically.

TELEVISION SERVICING, Theory and Practice.

By W. H. Buchsbaum. Prentice-Hall, New York, 1950. 340 pp., illus., linen, $5.35.

Part I of this practical manual covers the theory of television receivers, starting with the picture tube and progressing to the antenna. The installation practices outlined in Part II conform with the methods employed by a number of well-established service organizations. Part III is a trouble-shooting guide, arranged by symptoms.

TOOL ENGINEERING, Analysis and Procedure.

By L. E. Doyle. Prentice-Hall, New York, 1950. 499 pp., illus., linen, $6.35.

Beginning with a discussion of the nature and scope of tool engineering, this book covers the diverse aspects of the current duties, responsibilities, and procedures of the tool engineer. Economic principles, estimating, planning, manufacturing and dimensioning principles, process operations, layout, tool design and handling are covered in detail as major factors in the solution of problems that arise in tooling for efficient production. Practical examples and review questions are provided.

TRANSMISSION LINES AND FILTER NETWORKS.

By J. J. Karakash. Macmillan Co., New York, 1950. 413 pp., illus., cloth, $6.00.

In this exposition of elementary theory, consideration is given to pertinent conditions encountered in circuits dealing with frequencies extending from the voice range to the microwave range. The three main sections deal respectively with conventional steady-state transmission-line theory with emphasis on high-frequency applications, an introductory approach to network theory, and electric wave filters of various types. The application of Maxwell's electromagnetic field equations to wave guide transmission is discussed in an appendix.

ULTRA-HIGH FREQUENCY ENGINEERING.

By T. L. Martin, Jr. Prentice-Hall, New York, 1950. 456 pp., illus., linen, $8.00.

Intended for senior students majoring in electrical engineering or physics, this book contains a general study of the techniques associated with ultra-high frequency systems. It deals with the theory and technique of the component parts that make up complete systems, but not with the functioning of such systems as a whole. Six general areas covered are the generation and synchronization of special wave forms, the amplification of UHF systems, UHF transmission systems, circuit elements, oscillators, and the propagation of signals. Mathematics through calculus is assumed as well as introductory courses in electron tubes and circuits.

WAVE MECHANICS, Elementary Theory. 2nd ed., 312 pp., $3.50.

WAVE MECHANICS, Advanced General Theory. 524 pp., $5.00.

By J. Frenkel. Dover Publications, New York, 1950. Illus., linen.

This is the first American printing of a two-volume set published in England in 1934 and 1936. The first volume gives a general survey of wave mechanics and quantum statistics using only elementary mathematics. The second volume is devoted to the mathematical development of the general ideas underlying the subject and connects it with classical mechanics. Only the most essential elements of the theory are considered. References for each chapter are given at the end of the book.


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A Digest of Information

received by

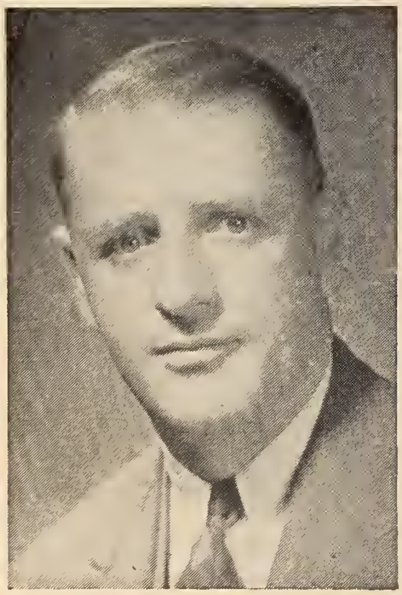
The Editor

Appointments and Transfers

E. J. Smith.—E. J. Smith has been named industrial locomotive specialist in Canadian General Electric's Transportation Division.

●

M. C. Lowe.—M. C. Lowe, formerly vice-president of Canadian Allis-Chalmers Ltd. has been appointed president of Canadian Allis-Chalmers (1951) Limited, a new wholly-owned subsidiary of the Allis-Chalmers Manufacturing Co., Milwaukee, Wisconsin.



M. C. Lowe

●

H. Dixon.—Harry Dixon of Montreal has been appointed assistant manager of western operations for Monsanto (Canada) Limited with headquarters at Vancouver, B.C.

●

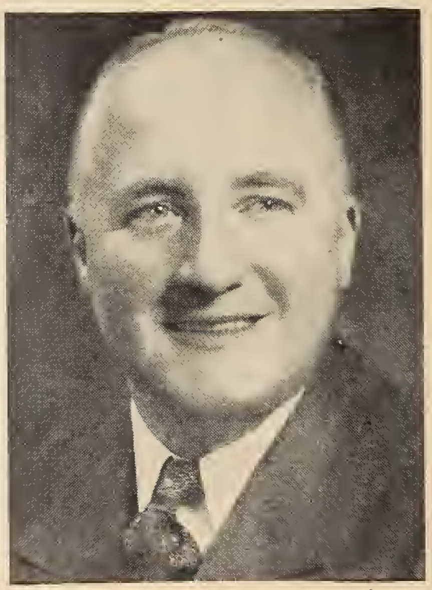
Canadian Standards Changes.—J. G. Morrow, chairman, Canadian Standards Association, has announced the following changes in the organization of the approvals division. These laboratories are located on Florence Street, Toronto.

Formerly the Division was operated by an administrative board which also had the responsibility of recommending approvals to the inter-provincial approvals council.

A new procedure gives Gerry Moes, recently appointed director, prescribed responsibilities There has also been created a technical advisory committee, one for each distinct branch of approvals work. The services of this technical committee will be available to the submittor and they include the adjudication of an appeal against the withholding of approval of any device.

It is believed that these changes will result in better and faster service.

●



C. A. Harrison

Charles A. Harrison.—Charles A. Harrison has been appointed district sales executive in charge of the Vancouver Sales Office and British Columbia territory of Jenkins Bros. Ltd. The appointment was announced by Herbert H. Gee, vice-president in charge of sales.

Mr. Harrison has occupied various positions with the Company. For the past eleven years he has been connected with the Jenkins Brothers sales office in Toronto.

●

Northern Electric Changes. — M. M Cockburn has been appointed Toronto manager of special sales for Northern Electric Company. R. R. Farrell, formerly of Timmins has been appointed to succeed Mr. Cockburn at Hamilton. R. A. Lee, formerly of the Kingston branch, has been named to the position of manager at Timmins.

●

C.G.E. Calgary District.—A. E. Ormsby has been appointed manager of Canadian General Electric Company's Calgary district. Mr. Ormsby is well known in the electrical industry throughout the west. For a number of years he has been manager of C.G.E. office in Edmonton.

●

Peacock Brothers Appointments. — John Bryson has been elected president and secretary treasurer of Peacock Brothers Limited. Previous to his appointment he was vice-president and secretary treasurer of the Company. Francis T. Peacock, founder of the Company, has been appointed chairman of the board. F. R. McDonald has succeeded Mr. Bryson as vice-president and

John Bryson

; also appointed general manager. W. P. 'erguson has been named general sales ıanager, and F. A. Lucas assistant genral sales manager *(See "Personals" in his issue.)*

●

Iinneapolis-Honeywell Appointments. —The Minneapolis-Honeywell Regulaor Co. Ltd. have announced the followıg appointments. John H. Fox is now ales manager, central region. He will ıake his headquarters in Toronto and is responsibilities include the superision of all sales offices and sales activties in Toronto, Hamilton and London. George E. Downie has been named naional sales manager for the heating ontrols division of the Company; W. '. E. Duncan is now national sales manger, commercial division; R. P. Hoover as been appointed sales supervisor of he industrial division, central region; 'lifford J. Paisley, is sales supervisor of he heating controls division, central egion, and John H. Cornwell is the ales supervisor of the commercial diviion, central region.

●

V. B. Thompson.—The Dominion Tar nd Chemical Co. Ltd., announce the ppointment of W. B. Thompson as ıanager of the development departıent. Mr. Thompson was formerly manging director and vice-president of the Nichols Chemical Company, Ltd.

●

'. C Clarke.—T. C. Clarke, formerly Alberta and British Columbia district ıanager of Northern Electric Co. has een appointed sales manager of the Company. C. E. Woolgar has succeeded Mr. Clarke in the western territory.

Mr. Clarke has served in all of Canda's western provinces during his long ssociation with the electrical industry. He joined Northern Electric at Vanouver as sales manager in 1920 and in 929 was named district sales manager t Winnipeg. Three years later he was ransferred back to Vancouver as district ales manager for Alberta and British Columbia. He was appointed district ıanager for the two provinces in 1933.

●

George Kent Agents. — George Kent Ltd., Luton, Bedfordshire, England, have leveloped a special domestic water neter for the Canadian market. It is nown as the Norlantic Major. It conains a straight-reading register, a frostrotection device, and meets the Amerian Waterworks Association specification or capacity, body length, and performnce. The basic design of the well known Kent M2 Rotary Piston meter has been etained. A long term plan provides for he assembly of the meter in Canada.

The following sales and service agents ave been appointed.

British Columbia:

Sealand Products, Ltd.,
2746 West Broadway,
Vancouver, B.C.

Alberta and Saskatchewan:

Gorman's Ltd.,
10238 — 104th Street,
Edmonton, Alta.

Manitoba and Northwest Ontario to line 90° with the addition of Fort William and Port Arthur:

D. G. Sutherland,
307 Niagara Street,
Winnipeg, Man.

Quebec and Ontario (West to line 90 excluding Fort William and Port Arthur):

J. W. Ellis Industries,
42 Lombard Street,
Toronto, Ont.

All these agents will carry stocks of spare parts to meet the needs of Norlantic Major users.

George Kent Ltd. have appointed a Canadian manager to co-ordinate all their activities in Canada. A further announcement on this appointment will be made.

●

Gutta Percha Offices.—Gutta Percha and Rubber Ltd., have announced the transfer of their general offices to their new building at 114 O'Hara Avenue, Toronto.

The offices had been located at 160 West Lodge Avenue for the past 19 years. In the new building very modern facilities for the comfort and convenience of the staff are provided.

Construction of the new building was under the supervision and direction of the Gutta Percha Engineering Service. The floor area is approximately 10,000 sq. feet.

●

Ingersoll-Rand Building. — Canadian Ingersoll-Rand Ltd. have announced the completion of their new building in Calgary and that the branch will be under the management of J. (Jack) E. Kolb who is well-known in oil circles. The building is at 611 11th Ave., W., in

> ## "Business & Industrial Briefs"
>
> **This section of the *Journal* is intended to keep readers informed on developments and changes in those business and industrial enterprises, and on new products, which affect the engineer.**
>
> **If you write with respect to any of the items in this, or other sections, please mention**
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downtown Calgary. The telephone number remains unchanged.

The building was designed and supervised by Norton A. Fellowes of Montreal and Rex A. Millar of Calgary. It was built by the Hurst Construction Company and is of contemporary styling and functional in every respect. Canadian Ingersoll-Rand Co. Ltd., have been manufacturers of gas and air compressors, pumps, mining, and industrial equipment and machinery for over 70 years.

●

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Protective Equipment.—A selection of approved protective equipment of interest to industries directly concerned with the atomic energy field, as well as the increasing number of industrial plants using radio-active isotopes, is presented in a new 8 page booklet published by Mine Safety Appliances Company. Described in the booklet are respiratory protective equipment, air sampling equipment, ventilation accessories, protective clothing, materials for contamination control, automatic artificial respiration instruments, and oxygen therapy equipment. Ask for booklet No. G-10. Address inquiries to Mine Safety Appliances Company of Canada Ltd., 500 MacPherson Ave., Toronto, Ont.

•

Underfloor Wiring.—A 19-page booklet on "G.E. Fibreduct Underfloor Wiring" is now available from any branch of Canadian General Electric Company. Of special interest to engineers and electrical contractors, the well-illustrated booklet shows the application of this nonmetallic underfloor raceway for commercial, industrial and institutional buildings. The contents of the booklet include layout design, installation methods and design and dimension diagrams for the smaller systems of Fibreduct raceways. The publication number is 4417-A.

•

Research Instrument Book.—"Instruments Accelerate Research" is the title of a new 84 page book recently published by the Minneapolis-Honeywell Regulator Company Ltd., Vanderhoof Ave., Leaside, Toronto 17, Ont.

This publication describes, for what is believed to be the first time, many types of equipment which, alone or in combination with other apparatus, are being used in research and analytical studies.

In addition to the importance of the publication as a reference and application guide for researchers and analysts, the book illustrates the great strides made in the instruments field since World War II. It also emphasizes how extensively industrial instruments are being used alone or in combination with others for technical, engineering and laboratory work.

The Company has given extensive mention to devices, made by many organizations, which are used in combination with its own instruments. A complimentary copy of this well produced publication will be sent to any *Journal* reader who is engaged in research work. When applying for a copy please do so on your official letterhead. Ask for bulletin No. 15-14.

•

New Film Available.—Canadian Westinghouse Company, Hamilton, Ont., offer for showing a film "Electrical Proving Ground". The film depicts the story of high-power laboratory testing.

It tells its story through narration, nusic, and approximately 200 scenes aken at manufacturing, testing and intallation locations. The picture was nade at the Westinghouse laboratories n East Pittsburgh. However, the quarer million tests carried out in the laoratory over the past 25 years are all vailable to the Canadian Westinghouse Company. The film takes 26 minutes o show—it is in full colour.

●

Liquids Control. — Precision Thermometer and Instrument Company, 1400 Brandywine Street, Philadelphia, offer a publication in which is described "Denitrol" equipment, designed for use in he control or the recording of blending, nixing, separation, dilution, and conentration of industrial process liquids. Ask for bulletin No. W.-2.

●

Precision Casting.—Microcast Division of Austenal Laboratories, Inc., 715 East 59th Place, Chicago 37, Illinois, offer a unique folder in which are described many precision casting applications. The folder is entitled "File on Microcasting Case Histories". Information is given on eight case histories of Microcast applications. The brochure is directed, primarily, at design engineers.

●

Scotch Boiler.—Dominion Bridge Co. Ltd., P.O. Box 280, Montreal, have recently released a folder in which is described their new low pressure Scotch Dry Back boiler. The copy in the publication points out that the new boiler s compact, inexpensive to install and requires a minimum of skilled labour for maintenance. Its unique construction, which assures a large steam output from a small unit occupying minimum space, s described. This new boiler has been designed particularly for oil firing but it can be used efficiently for gas firing and for some types of coal firing. It is built n ten sizes ranging from 30 to 200 hp. The folder is No. B-110.

●

Safety Gratings. — The Dominion Bridge Co., P.O. Box 280, Montreal, Que., announces that a new edition of its Catalogue is now available covering M-M. Safety Gratings, Fire Escapes, and Steel Trough Stairs. This 16-page publication is well illustrated and contains, amongst other data, manufacturing process details of grating treads, specifications and tables of safe distributed loads. The manufacturers state that M-M Safety Gratings are rigidly constructed and contain no rivets. They shed water and oil and have good nonslip properties. Ask for publication No. T-100.

●

Arc Welding. — A new booklet "Procedures and Equipment for Argon Metal Arc Welding, described the apparatus for this new welding method. The booklet can be obtained without charge from Dominion Oxygen Company Ltd., 159 Bay Street, Toronto 1, Ont.

●

Armco Publications.—Armco Drainage and Metal Products Inc. Guelph, Ontario, offer the following publications "An Economical Answer to Limited Headroom—Fast Runoff". It describes Armco Pipe-Arch and Multi-Plate Pipe-Arch and shows why they carry more water than round pipe. Test data and case histories also show the advantages of this type of piping. In addition the folder discusses erosion and corrosion problems. Tables are included which give recommended sizes and gauges.

"Armco Corrugated Metal Pipe—A type for Every Need". It lists the types of full-round pipe and pipe-arch available to meet specific requirements for various types of sewers, culverts, conduits, or irrigation systems. The booklet also contains reference data for assistance in selecting the most suitable structure. Photographs and case-histories show where plain galvanized, asphalt coated, Asbestos-Bonded and Paved-Invert Pipe and Pipe-Arch have given long service life under all types of conditions. Also included are details on fittings and instructions on the installation of Armco drainage structures.

The third publication offered is a small book entitled "Installation Manual-Armco Drainage Products". This is of pocket size and should be extremely valuable to those who are in charge of installation work.

●

Economiser Publications. — E. Green & Son Ltd., are represented in Canada by Peacock Brothers Ltd., P.O. Box 6070, Montreal. Green's are one of the world's oldest and best known manufacturers of Economisers and their Canadian representatives have available a complete range of descriptive literature. This literature is beautifully-produced and highly informative. When applying for copies please state whether you require details of the complete range of Green economisers or data on equipment designed for a specific need.

●

The Dominion Engineer.—No. 1 of volume 18 of the "Dominion Engineer," published by the Dominion Engineering Co. Ltd., Lachine, Que. contains a review of the Company's engineering manufacturing achievements during 1950. For copies of this and subsequent issues apply to the Company at Box 220 Montreal, Que.

●

Timber Booklet. — The B.C. Coast Woods Trade Extension Bureau, 837 West Hastings Street, Vancouver, B.C. offers a 4 page reprint of an article "Douglas Fir or Pacific Coast Hemlock" by W. Thornber, Timber Engineer.

●

Clarifiers.—A four-page bulletin No. 30-B has just been published by the Hardinge Company, Inc., 240 Arch Street, York, Pa. It covers the line of sand filter clarifiers made by the Company.

The equipment described is intended primarily for use in processes where a crystal-clear filtrate is desired. Numerous installations have been made for filtering gold solutions in cyanide mills, sodium chloride solutions in chlorine producing plants and other solutions in chemical plants. Copies are available.

●

Bepco Journal. — The January 1951 issue of the Bepco Journal contains an article on the Crompton Magnicon, a self-regulating alternator, by G. W. Jones. Another article featured in the issue is "Adjustable Speed D.C. Motor Drives" by E. A. Chandler, assistant chief engineer of the Company. To be placed on the mailing list for the Bepco Journal apply to Bepco Canada Ltd., 4018 St. Catherine St. West, Montreal, Que.

Gray Iron Coating.—Gray Iron Founder's Society Inc., 210 National City E. 6th Bldg., Cleveland 14 Ohio. offer a prospectus of their new manual "Metallic and Non-Metallic Coatings for Gray Iron". This manual, besides outlining process economies, indicates how industry can conserve essential alloys and still maintain normal production. The society, when forwarding the prospectus will be pleased to quote the purchase price of the manual.

Bristol Bulletin. — The Bristol Company of Canada Ltd., has just published a new edition of its thermocouple and pyrometer accessories bulletin. It lists many additional items and contains new data on the proper application and use of thermocouples. This 56-page publication contains a well illustrated catalogue of hundreds of pyrometer supply items, including assembled thermocouples, thermocouple wires, extension wires, protection tubes, insulators, and accessories for the full range of industrial pyrometer applications.

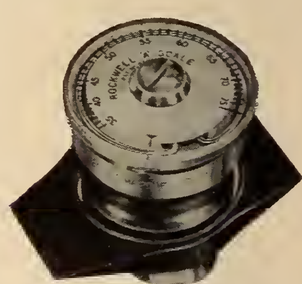
New technical information and installation sketches have been added to the "Users' Manual" section, which contains engineering data on modern practices in pyrometry. Also included are tables of calibration data for the commonly used base metal and rare metal thermocouples. The new edition is offered to *Journal* readers. Ask for No. P1238. The address of the Company is 71-79 Duchess Street, Toronto, Ont.

Gear Data. — Hamilton Gear and Machine Co. Ltd., 950-990 Dupont Street, Toronto 4, Ont. offer a technical data sheet "Flame-hardened Gear Teeth". This is one of a series of technical bulletins which are offered to *Journal* readers.

Aluminum Data. — The Aluminum Company of Canada Ltd., 1700 Sun Life Building, Montreal, have compiled a 60-page series of data sheets which are offered under the title of "Conductors". This release will be of particular value to engineers who are concerned with electricity. Recently the Company released a series of data sheets "Conductor Accessories". These too will be sent to interested readers. There is no charge for this service.

Fan Book.—The Canadian Fan Manufacturers' Association, P.O. Box 275. Windsor, Ont. has just published bulletin No. 102-C entitled "Standards, Definitions, Terms and Test Codes for Centrifugal, Axial, and Propeller Fans". The bulletin includes under one cover all information previously published in three separate bulletins. It also includes new tables on size standards for various types of fans and illustrations of revised fan arrangements. This publication will be of great interest to all users of fans. Copies are available without charge. Ask for bulletin No. 102-C.

Portable Hardness Tester. — Newage (Canada) Limited, 1178 Bay Street. Toronto, are Canadian distributors of a new type of hardness tester. It is a direct reading instrument designed for rapid inspection of production work. It weighs three pounds.



The tester has a spring-loaded, hardened-steel conical indicator and a two-inch diameter scale, which is normally marked for 100 to 440 Brinnell. Corresponding Rockwell, or diamond pyramid scale are fitted if required.

Complete details on this unique instrument are available. Write to the Company, at the address above asking for descriptive literature on the Ernst Hardness Tester.

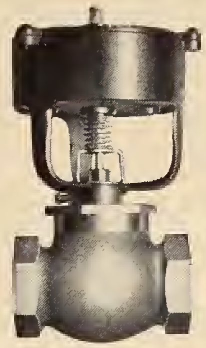
Welding Review.—No. 2 of volume 25 of the "Welding Review" contains a series of articles which will be of extreme interest to those in charge of welding operations. At the end of the publication there is a tear out section in which is described A. W. S. Electrode Classifications—(All position types and E6103 and flat position electrodes.) For copies of

(*Continued on page 156*)

FOR EVERY SERVICE

Solenoid Valve

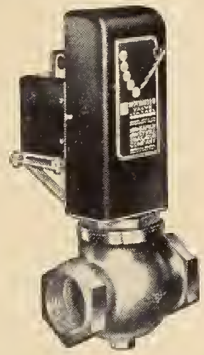
Diaphragm Gas Valve



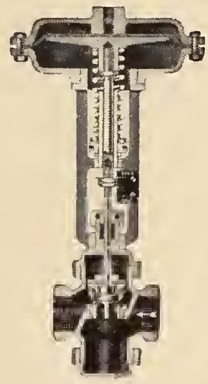
Pneumatic Diaphragm Valve

Gradutrol Valve

Slip Stem Globe Type Motorized Valve



Modutrol Motorized Valve



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HAMILTON

What new industry will use this yard?

New sets of rails branching from the trunk line—a sign that someone's plans for a new industry will soon become reality. This may be to mine ore found in the hills; but just as likely it will turn out some household article, previously imported—and make it cheaper and better if the plant design is right.

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OB 105

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 152*)

this and other numbers of the Welding Review apply to the Canadian Liquid Air Co. Ltd., 1111 Beaver Hall Hill, Montreal, Que.

●

Shaft Seals. — The Garlock Packing Company of Canada Limited, 620 Cathcart Street, Montreal, offer an interesting publication "Garlock Mechanical Seals for Rotary Shafts".

These seals are intended to provide leakless operation on a rotary shaft. It is claimed that there is no wear on the shaft when a Garlock seal is used. Sealing is effected by leakless and positive contact between carefully lapped metal-to-carbon or metal-to-metal mating surfaces. One of these elements rotates with the shaft and the other is stationary. The stationary element does not contact the shaft.

These precision-built seals are made in several standard designs and in a wide range of highest grade materials. Copies of this publication are available.

●

Asbestos Board.—Three new catalogues on asbestos cement building board have just come off the press. They deal with three outstanding products. Trafford Tile; Corrugated Board (4 in. Pitch); and Flat Board. Each material is thoroughly dealt with as to specifications and detailed construction data. All are well-illustrated with photographs of actual buildings with type lines explaining the reasons why the particular material was used. *Journal* readers will find these publications most informative. They may be obtained by writing to Atlas Asbestos Company, 5600 Hochelaga Street, Montreal.

●

Another Armco Publication.—How to use lightweight corrugated steel sheeting to effectively control movement of soil or water is described in a new illustrated 10 page booklet published by Armco Drainage and Metal Products Inc. Entitled "Armco Steel Sheeting for Trenches, Cofferdams, Cutoff Walls, Shore Protection", it points out where Armco interlocking and flange type sheeting can be used to advantage. For copies apply to the Company at Guelph, Ontario.

●

Nordberg Bulletin.—Nordberg Manufacturing Co., Milwaukee 7, Wis. offer a new 28-page 2-colour bulletin, in which are described the various types of machinery they manufacture. Fully illustrated with installation and product photographs, this bulletin gives design data on Nordberg two and four-cycle stationary and marine Diesel engines, gasoline marine engines, Symons Cone Crushers and Screens, mine hoists, machinery for the basic processing of ores and minerals, air and gas compressors and railway track maintenance equipment. Ask for bulletin No. 187.

●

Highway Construction Papers.—Highway construction problems were discussed during several sessions of the American Concrete Institute's 47th Annual Convention in San Francisco, Calif., Feb. 20-22, 1951.

A copy of the programme and copies of some of the papers presented may be obtained by applying to R. E. Wilde, American Concrete Institute, 18263 W. McNichols Road, Detroit 19, Michigan.

●

Acoustical Adhesive.—Tremstik Acoustical Adhesive, manufactured by the Tremco Manufacturing Company (Canada) Ltd. of Toronto, is now available to lumber yards and building supply dealers. Until very recently, the adhesive was distributed only through national distributors of acoustical tile and through large contractors.

For further details of this adhesive apply to the Tremco Manufacturing Co. (Canada) Ltd., 57 Bloor Street, Toronto, Ont.

New Equipment and Developments

Canadian Allis-Chalmers Purchased.—The purchase of all the physical assets of Canadian Allis-Chalmers Ltd., by a new wholly owned subsidiary of Canadian Allis-Chalmers Ltd. of Milwaukee, Wisconsin, was announced on February 1st.

The new subsidiary is known as Canadian Allis-Chalmers (1951) Ltd. The Canadian firm, which employs approximately 525 people, will continue the production of heavy machinery for the Canadian market. The main plant is located at Lachine, Quebec, and the principal products are hydraulic turbines, centrifugal pumps, texrope drives, mining machinery and equipment for the paper industry.

This is the second purchase of a Canadian plant by the Allis-Chalmers Manufacturing Co. in the past six months. In September, 1950, Allis-Chalmers Rumley Ltd., another Canadian subsidiary of the Company, purchased a plant at St. Thomas, Ontario.

In connection with the latest purchase, M. C. Lowe, president said "The wholly owned subsdiiary is now an integral part of the 103 year old Allis-Chalmers Manufacturing Co. which has a splendid history of production, research, engineering, and sales. With these resources at our command, we look forward to a steady growth of business in our Canadian market and the continuation of our cordial relations with both customers and suppliers."

•

Dominion Mobile Crane. — A mobile crane, with outriggers, with maximum capacity of 20 tons at 10 feet radius — is one of the latest machines to be produced by Dominion Hoist and Shovel Co. Ltd. It is known as the Dominion TM-20 Truck Crane.

The machine is built within highway width limitations and is particularly suited where frequent moves must be made between jobs. It is furnished with a butt splice quick connection boom to enable rapid changes in boom length to be made, and the basic short boom can be folded under for transport along the highway. The machine is fitted with worm driven precision boom hoist independently controlled. Tipping loads are carried from the revolving deck to the truck chassis by hook rollers engaging a double flanged roller path; the centre pivot thereby being relieved of all tipping strains. The chassis is specially built for crane service and includes front and rear outrigger boxes with sliding outrigger beams. The heavy tandem rear-drive axles are mounted on walking beams to allow operation on rough ground while maintaining full traction on all drive wheels. Air brakes are fitted on all wheels and an emergency transmission brake is manually operated to hold the machine while parked. Air brakes can be left on by latching the brake pedal during crane operation.

The cab is all-steel and weatherproof with ample ventilation and adequate safety glass windows allow operation in all weathers. The chassis is all-steel and is of the half width type to allow space for stowage of the boom while travelling. For reduced highway loads, the rear crane counterweight can be removed and transported separately. For shovel and pullshovel operation, the crane can be mounted in a rear position to ensure proper dipper operation over the back of the chassis frame. Clamshell and dragline attachments are also available.

•

Imperial Oil Refinery.—A major expansion and modernization programme for Imperial Oil's Sarnia refinery was announced on January 8th. When the programme is completed, probably by the end of 1952, Sarnia will have a plant of 71,000-barrel-a-day capacity. It is designed to process Alberta crude oil in equipment of the most up-to-date type.

Present capacity of the refinery is 55,500 barrels a day.

Preparation of the site for the new refinery units will start soon.

•

New Pavement Cutter.—Joy Manufacturing Co. (Canada) Ltd., Galt, Ontario, has announced the development of a new pavement cutter. This cutter has been designed to reduce to a minimum the inconvenience caused by necessary street openings for the repair of water mains or underground utility lines. Two large wheels, carrying Sulmet tungsten carbide tipped bits, saw parallel 2-inch slots in the pavement, 18 in. to 54 in. apart. The strip of paving between the slots can then be removed in chunks with a backhoe or similar equipment. Preliminary testing is said to have indicated that the pavement cutter will triple the speed and halve the cost of pavement removal. The machine is very silent in operation.

The cutter is mounted on four solid rubber tires and it is powered by a 75 hp. gasoline engine. It weighs 15 tons and travels from job to job at a speed of about 12 miles per hour.

•

Multiple Punching.—A new patented multiple hole punching system for unlimited hole punching patterns has been announced by Wales-Strippit of Canada Ltd., Hamilton, Ont. The new system provides "a simpler, faster, more convenient and economical method of punching holes in sheet metal parts by permitting the entire set-up to be made outside the stamping press or press brake." In addition, the Wales punch and die units are interchangeable permitting the same units to be used and reused in an infinite number of set-ups. This feature makes possible a minimum inventory of parts.

For complete details communicate with Wales-Strippit of Canada Ltd., 344 Sherman Ave. N., Hamilton, Ont.

●

Air Velocity Control.—A new, proportional action velocity controller, for controlling air velocities ranging from 50 to 250 feet per minute, has been developed by Johnson Temperature Regulating Co. of Canada, Ltd. While many applications of the new controller are possible, it is designed primarily to control the velocity of air through the doors of fume hoods, employed in working with radioactive materials, where a fixed velocity is required with variable door openings. It already is being used in atomic energy and cancer research projects.

Operation of the instrument is based on the fact that the velocity of air moving between two points, is proportional to the difference in pressure between those points. This extremely sensitive regulator responds to pressure variations of .0001 in. water gauge, and controls velocities within plus or minus 10 feet per minute. Control pressure increases in direct proportion to the increase in velocity. An increase of 10 feet per minute increases the control pressure 1 p.s.i.

The instrument consists of a very light, flexible diaphragm operating a pneumatic control mechanism. One side of the diaphragm is exposed to the pressure within the laboratory, and the other side is connected to an averaging pressure tip located within the fume hood. Thus, the diaphragm responds to the difference in pressure which causes flow through the hood door and automatically takes into account which of the two pressures is higher. For further information apply to the company at 3615 Danforth Avenue, Toronto 13, Ont.

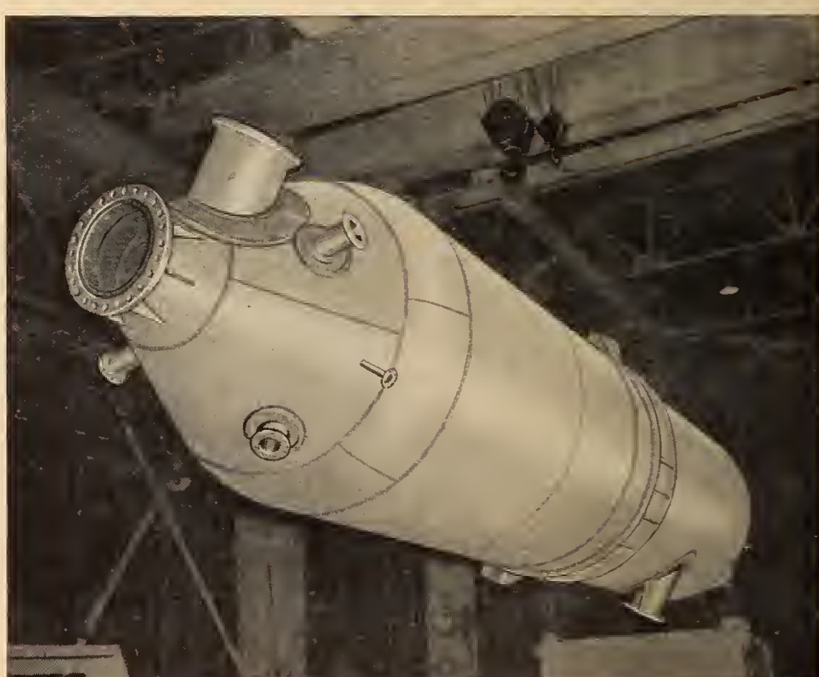
●

U.K. Steel Output.—United Kingdom steel production in 1950 reached a new record of 16,292,700 tons, nearly 300,000 tons above the target set at the beginning of the year and 740,000 tons above 1949.

●

New Control Instrument. — Taylor Instrument Companies of Canada Ltd., have announced the development of a force-balance, non-indicating controller, known as the TRANSET TRI-ACT Controller. It is designed for pneumatic transmission systems. It is claimed that this new controller incorporates all the basic process control responses of conventional controllers but it utilizes them in a different manner thereby giving improved performance. The new circuit contains two closed loops in series — the first containing fixed proportional response and adjustable rate action; the second, has adjustable proportional response and adjustable automatic reset. Such an arrangement gives the controller the ability to apply corrective action to the valve soon enough to prevent process conditions from overshooting or undershooting the set point.

It is also claimed that the new instrument will permit a faster reset rate and rate action than heretofore obtained. The composite effect of the three responses allows start-up and pneumatic setting with no overspeeding. The faster response settings allow the use of rate and reset response with stability on pro-



Steel Vessels — Inconel Lined.—To minimize risk of iron contamination in certain process industries, steel vessels lined with Inconel have been made in Canada. The lining is applied by an automatic spot welding machine developed by the manufacturers, John Inglis Co. Ltd., of Toronto. By this means the advantages of Inconel vessels are obtained at only a fraction of the cost of the solid vessels previously in use. In a recent order for these vessels 4 were constructed. Each weighed 29 tons empty and measured 9 ft. 2 in. diameter by 42 ft. 9 in. long. There were over 90,000 spot welds in each unit.

cesses where these effects were needed but could not be used.

A number of additional features are claimed. Complete details may be obtained from Taylor Instrument Companies of Canada Ltd., 10 Church Street, Toronto 1.

New Yukon Road.—A new 247-mile highway, connecting Whitehorse with Mayo, Y.T., was completed in 1950. The all-weather road was built by the Federal government to aid mining development in one of the largest lode-mining areas in Yukon Territory.

Electrical Power.—The total installed capacity of water power plants in Canada is currently listed at 12,654,835 hp. This represents a development of about 23 per cent of total resources.

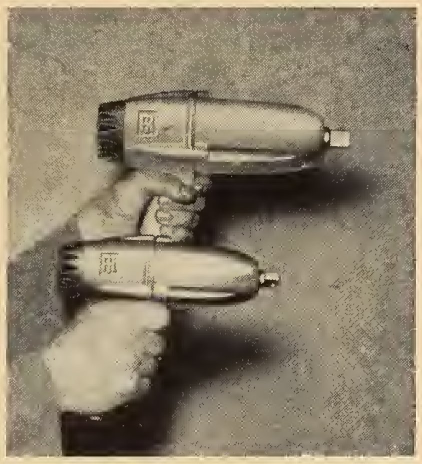
Wood Products Value.—The new value of Canadian wood products has been estimated at 1¼ billion dollars; approximately $92.00 for every Canadian citizen. Out of each $100.00 of the national income, about $20.00 is derived from trees.

Engineering Award. — The Rover Motor Company of Britain has been awarded the Dewar Challenge Trophy for "the year's most outstanding technical achievement" — the world's first gas turbine car which took 10 years to perfect.

Marine Meeting.—There will be an international conference of Naval Architects and Marine Engineers in London, England. The conference will open on June 26th and will remain in session for two weeks.

B.C. Flag Mast—Erection of a 108-ft. flag mast, given to the London County Council by British Columbia, has been completed at the Festival of Britain, South Bank, London, England.

New Ingersoll-Rand Tool.—Canadian Ingersoll-Rand Company Ltd., Birks



Building, Phillips Square, Montreal, announces two new air impactools, the size 504 for nut runing up to ⅜ in. bolt size, and the size 510 for nut running up to ¾ in. bolt size.

Similar to the Ingersoll-Rand Size 4U and 8U Electric Impactools in general appearance, both tools are streamlined and well balanced for ease of operation. The large, easy-to-grip reverse caps are deeply grooved so that tools may quickly be reversed even with greasy hands. Palm fitting pistol grip handles make these tools easy and comfortable to operate over long periods of time.

Special attention has been paid to the application of scientific muffling to lower operator fatigue and increase morale and safety. Ask Canadian Ingersoll-Rand Company Ltd. for their descriptive material on the complete range of impactools.

X-Ray Tanks.—A new line of stainless steel developing tanks for X-Ray department darkrooms is available from General Electric X-Ray Corporation Limited.

The steel used in the tanks is a special alloy designed to resist the corrosive action of photochemicals. The tanks are made in three standard sizes which can be arranged in multiples to suit the needs of darkrooms of various sizes and work loads. Address inquiries to General Electric X-Ray Corporation Ltd., 212 King St. West, Toronto 1.

British Industries Fair.—The British Industries Fair, which is held at Earls Court and Olympia, London, and East Bromwich, Birmingham, England, from April 30 to May 11, is designed expressly for the overseas industrialist and buyer. Every attempt is made to anticipate and satisfy their needs.

The service extended to the potential B.I.F. visitor begins in his home country. He is encouraged to call at his nearest British embassy, consulate, or other British government office, and to state his requirements so that they may receive individual attention. He will also be given advice on transportation and accommodation and given introductions to trade associations or government representatives in Britain.

●

Scottish Gold Miners. — Early this month 136 Scotsmen left Scotland for Timmins, Ontario, where they will be trained as gold miners. They were selected out of 900 applicants by a personnel officer of a Canadian gold-mining company during a visit to Scotland. The men have passed rigid medical and trade tests.

●

C.M. & S. Expansion.—The Consolidated Mining and Smelting Company of Canada, Limited, announced recently that, at a cost of over $3,000,000, it will add another 70 tons to the present 425-ton daily output of zinc from its plants at Trail, B.C. The new project is expected to provide permanent employment for about 50 men and will be completed in about two years. The expansion is being made to handle the increasing tonnage of zinc concentrates from British Columbia customs shippers and also the concentrates which will be coming from the Bluebell and other Cominco properties being prepared for production.

Work involved in the new project includes minor additions to the roasting and leaching plants, the installation of over 200 electrolytic cells, the provision of three 10,000-amp Mercury arc rectifiers and the installation of a new electric melting furnace.

●

Stelco Production. — The Steel Company of Canada Ltd. has almost tripled its yearly production of steel since 1939. During the past several years it has invested nearly $40,000,000 in the expansion of its mills for the production of plates, hot and cold rolled sheets and tin plate. This has made it possible to produce flat rolled forms (at a rate of over half a million tons a year). Other expenditures for the improvement of Stelco's plant and manufacturing facilities bring the Company's total investment during the past 10 years to a total of over $65,000,000.

●

Penetrometer Price Reduction. — A sharp reduction in price and great increase in accuracy are two main features of a new penetrometer available from General Electric X-Ray Corportion Ltd.

These penetrometers are designed to assist in the checking of the radiographic calibration of x-ray machines, to insure that they are operating properly, and also to test the performance of the machine under varying techniques. Complete information may be obtained from any C.G.E. office.

●

Plant Expansion.—Sir George Godfrey & Partners (Canada) Ltd., Lachine, Que., have announced the extension of their present plant.

The original plant, completed in October 1949, was primarily established for

the manufacture of cabin superchargers, essential to aircraft pressurization, and aircraft cooling units for air conditioning jet fighter cockpits and cabins of modern jet transport planes. In the industrial field, Godfrey produces several sizes of rotary positive displacement blowers and other equipment being manufactured includes several types of aircraft ground servicing equipment.

●

Sand-blasting.—The W. W. Sly Manufacturing Co. 4700 Train Avenue, Cleveland 2, Ohio, have just introduced a new sandblast cabinet designed for cleaning dies, tools, piston rings, valves, and other small parts. Its primary use is for cleaning small metal parts by the use of soft abrasives, such as ground corn cobs or ground nut shells. These will thoroughly remove all surface impurities without scoring the metal. It can also be used with sand or metal abrasives.

●

Atomic Power. — Monsanto Chemical Company has announced that it has informed the Atomic Energy Commission (U.S.) that it is ready to go ahead with a study of the feasibility of developing and operating nuclear reactors for the production of plutonium and with the ultimate goal of producing electric power.

●

Carborundum Coated Abrasives. — Canadian Carborundum Company Ltd will now service the Canadian market with a complete line of Carborundum Branch coated abrasives, it was announced by Leon A. Patt, general manager of the Company.

Mr. Patt said that the Company's distributors throughout Canada, many of whom have handled Carborundum products for over a quarter of a century, are being offered the opportunity to add the Company's coated abrasives to their present lines of Carborundum products, such as grinding wheels, sharpening stones, and abrasive grains.

●

Cluster Lights. — New, weatherproof cluster lights for outdoor protective lighting, factory yard lighting, boundary fence lighting, and other industrial area floodlighting applications are provided with the new Stonco Cluster Box No. 25 recently announced by Stone Manufacturing Company, Elizabeth 4, New Jersey.

Designed to conserve aluminum, the new unit combines tough aluminum alloys that are precision die-cast under tremendous pressure. A removable aluminum cover plate, sealed with a heavy cork gasket, provides quick, easy access to inside wiring. Each box has six holes tapped ½-in IPS to take from one to five standard lampholders for 150-watt, 200-watt or 300-watt outdoor weatherproof reflector bulbs which are available, as standard stock, from all major lamp bulb manufacturers. In recommending cluster lights for plant protective and anti-sabotage lighting, the manufacturer points out that burnout of a single floodlight normally results in total darkness whereas every light in a cluster would have to burn out before total darkness would result. Complete details may be obtained from the manufacturer.

●

Reminder...

The dates of the Annual General and Professional Meeting are May 9, 10, 11, 1951

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOLUME 34 | MONTREAL, MARCH 1951 | NUMBER 3

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★ ★ ★

CONTENTS

15,050 copies of this issue printed

Water and Sewerage Systems for Yellowknife

by

N. M. Hall, M.E.I.C.

Consulting Engineer and Chairman,
Department of Mechanical Engineering,
University of Manitoba, Winnipeg.

An address to be delivered to the Winnipeg Branch of The Engineering Institute of Canada.

As our settled area creeps steadily northward, there will be more and more communities to be supplied with municipal amenities, first probably water supply and sewerage systems. Conventional designs and methods must be modified to suit sub-arctic conditions. Mr. Hall's paper relates how the application of common sense problems, a solution which two years of operation have shown to be both successful and efficient.

The unusual features of this undertaking are due to its location on the west shore of Yellowknife Bay, a broadening of the Yellowknife River as it flows into Great Slave Lake from the north. The town is about 650 air miles north of Edmonton, 185 miles south of the Arctic Circle. It is within the area where permafrost exists a few inches deep under moss or muskeg 10 feet or more deep, in very sandy soils. There are many lakes, ponds and muskegs, with rocky knolls and ridges rarely more than 175 feet above Great Slave Lake. Vegetation is sparse and trees have little value except as firewood, though there is lumber available from sawmills on the south shore of the lake. Total annual precipitation rarely exceeds ten inches. Temperatures of —50° F. during the long winter, the prevailing northerly winds and the sparse snowfall introduce unusual problems into the operation of a water and sewerage system.

Transportation from Edmonton, the nearest distributing centre, is by air, rail and water, and recently, by the all-weather Mackenzie Highway from Peace River to the south shore of the Lake. Though some express and emergency shipments go by air, bulk freight is carried by the combination of rail and water routes from Edmonton. Freight rates are naturally high.

The existence of gold in the district has been known for many years. The Con Mine of the Consolidated Mining and Smelting Co., Ltd., about two and one-half miles from the old townsite, poured its first gold brick in 1938. The Negus Mine, half a mile beyond, came into production soon after. Following the war and with the increase in communication and transportation facilities, there was more active prospecting and development; in 1948 the Giant Yellowknife Mine, about four miles away, came into production and others are following.

Hydro-electric power from a single 4,500-hp. unit on the Yellowknife River about 35 miles distant from the town is distributed by the Yellowknife Power Co. Ltd. and this supply has recently been supplemented from an 8,350-hp. unit on the Snare River* about 95 miles away, installed by the Federal Government. The plants were synchronized in 1949.

Except for a limited amount of local firewood, the only fuel available is oil from Norman Wells on the lower Mackenzie River. This oil in three grades, light and medium diesel and Bunker C, is brought up the river by barge to the tank farm on Joliffe Island, or direct to the wharves of large consumers who have their own storage.

Old Townsite

The old town is located on a promontory joined to the north shore by an isthmus about one-quarter mile long. This site culminates in a rocky peak 100 feet high and is skirted by a one-way road with shipping facilities along the water front, and buildings back from the shore. A bridge connects it with Latham Island, where there are a few dwellings and an Indian settlement. Joliffe Island with its tank farm is further offshore. The population was difficult to estimate because of its floating element engaged in seasonal activities. Normally, the summer peak was about 2.500, and the town had already extended well beyond the rocky promontory. It had already been established as an administrative centre by various Government departments.

A summer water supply system, installed in 1939, served a number of street water points, and there was a small pumper for fire protection. The system consisted of exposed steel piping, a woodstave storage tank on the summit of the rock, a gasoline-driven pump

* See *The Engineering Journal,* Vol. 33, No. 3, March 1950.

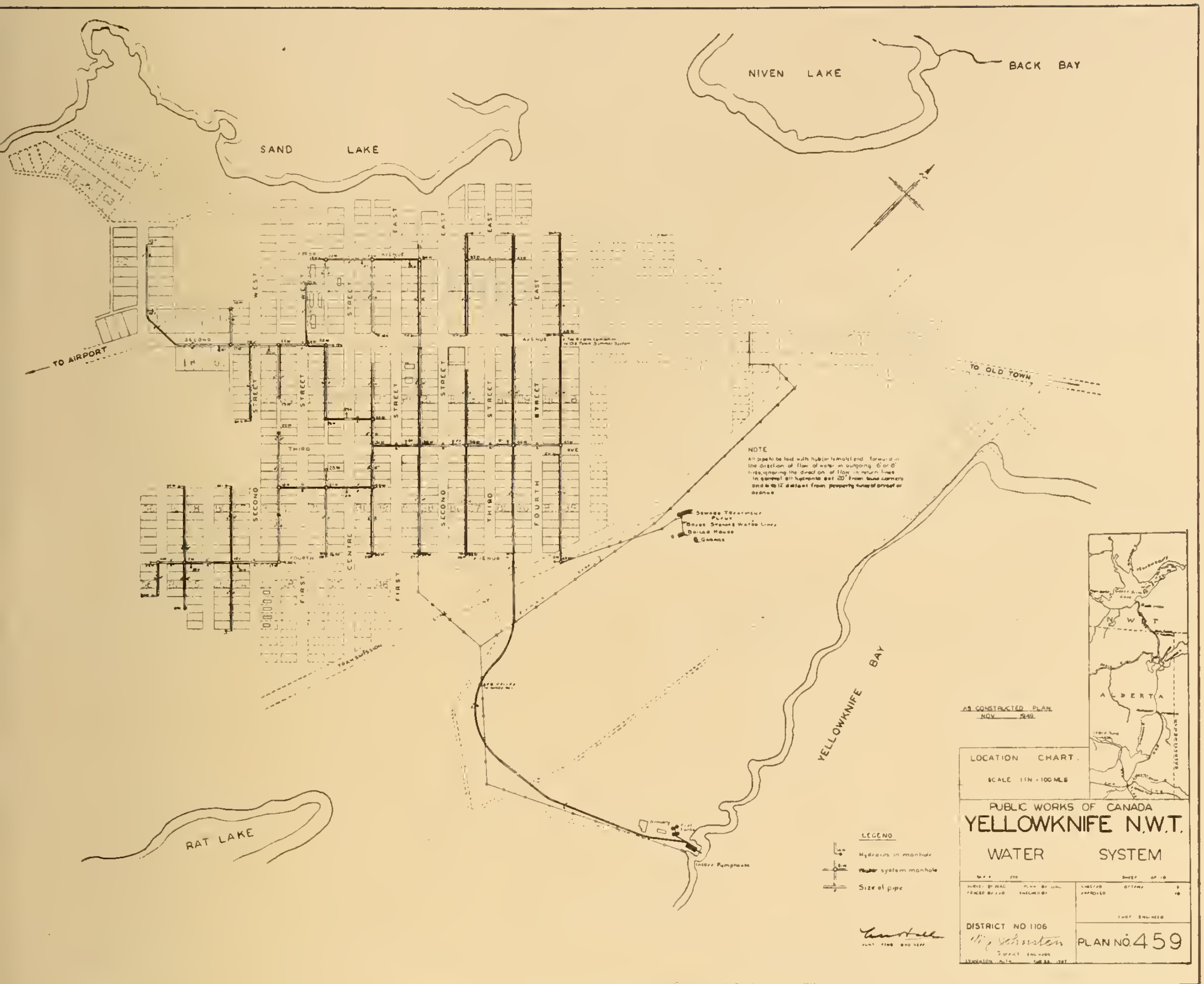

Fig. 1. Water system.

lrawing from the harbour, and an ITH chlorinator. It operated from arly June to freeze-up. A limited ire service and tank delivery was naintained in winter from supply ioles in the lake ice. Sanitary ser- rice was by motor truck and refuse ind garbage were burned. No ap- reciable extension or improve- nent to the existing system was egarded as practicable.

New Townsite

In 1945 the then Department of Mines and Resources selected a iew townsite to provide for an xpected increase in population, atisfactory location about a mile nland was subdivided into lots 50 y 100 ft. in blocks of 24, with 20-foot lanes. Rock outcrops, mus- keg pockets and reserved sites, educed the number of serviceable ots to about 450. The Depart- nent arranged with the Department of Public Works to investigate the feasibility of a water and sewer system for the new town.

Following an examination of the site and the results of a number of test borings, the writer recommended a conventional gravity sewer system and a circulating water system, with provision for heating as necessary, taking water from an intake in the Lake about a mile from the old town and about 3,000 feet from the south boundary of the new town. All pipe lines would be buried and insulated, using moss of excellent quality available in almost unlimited quantity in the neighbourhood. Supplying the summer service in the old town with a safe water instead of that from the questionable harbour intake was considered in the proposal. These recommendations were accepted and the design undertaken early in 1946. In 1947 a further nominal 175 lots were added to the original site; of this area, two low-lying portions, which would require sewage lifts, were left for future development.

The accompanying Figures 1 and 2 show the original site as extended. Second Avenue, later renamed Franklin Road, is the main thoroughfare leading from the old town to the airport. All other avenues and streets have lately been renamed to honour persons associated with the early history and development of the Northwest Territories. The site slopes gently northward from Second Avenue towards First Avenue and Sand (Frame) Lake, and gently southward towards Fourth Avenue. There are a few rock outcrops, and the average elevation is about 100 feet above the Lake. The northern half is sandy, with permafrost at various depths up to 10 feet or more, and the southern half is mostly overlaid with muskeg, with permafrost originally occurring at depths as little as a few inches. In order to avoid disturbing the permafrost under streets and to keep these clear for traffic, it was early decided to locate the water and sewer lines as far as possible in the lanes. Over two hundred test holes were put down to locate rock and permafrost levels. Clearing of trees and stripping to rock or permafrost was commenced early in 1946. A temporary summer water system of surface piping to street corner outlets in the new townsite was fed from the old town system by a small motor driven booster pump. The truck system of garbage and sewage disposal was extended to serve the new townsite.

Water System

As shown in Figure 1, the water system consists of an 8-in. header along Third Avenue fed from the pumphouse by about 3,500 feet of 8-in. pipe. From this header, 6-in. valved laterals run up and down the lanes. They are dead-ended. Paralleling these and in the same trenches is a return system consisting of a 6-in. header and a 6-in. intake return line, and valved 4-in. lines along the laterals. These, too, are not cross-connected. All piping is Universal cast iron with cast iron coupling bolts, laid with a minimum cover of 5 ft. 6-in.

A consumer's connection (Fig. 3) consists of a loop from a corporation cock on the 6 in. lateral into the basement, returning to a corporation cock in the 4 in. return. Inside the basement are cut-off valves, a tee leading to the meter, and on the return leg, a flat-faced union containing a copper disc with one or more small orifices to permit continuous circulation. All external piping is half-inch soft copper, with standard galvanized valves and fittings in the basement. For large consumers, the pressure leg only of the loop is larger.

Where there is neither a consumer connection nor a hydrant at the dead end of the lateral, an orificed half-inch copper "jumper" is installed in a four-foot manhole to ensure safe continuous circulation in the lateral. There are 38 six-inch hydrants, located at street intersections and at the dead ends of laterals. They have 6-in. valved runouts with half-inch copper orificed returns to the 4-in. lateral. In general, the runouts are 20 feet long, with hydrants six feet from property lines, set in rectangular concrete manholes, that may be drained by hand pump. Each hydrant has two $2\frac{1}{2}$-in. hose and one $4\frac{1}{2}$-in. pumper outlets. They are located so that no consumer is more than 300 feet from a hydrant.

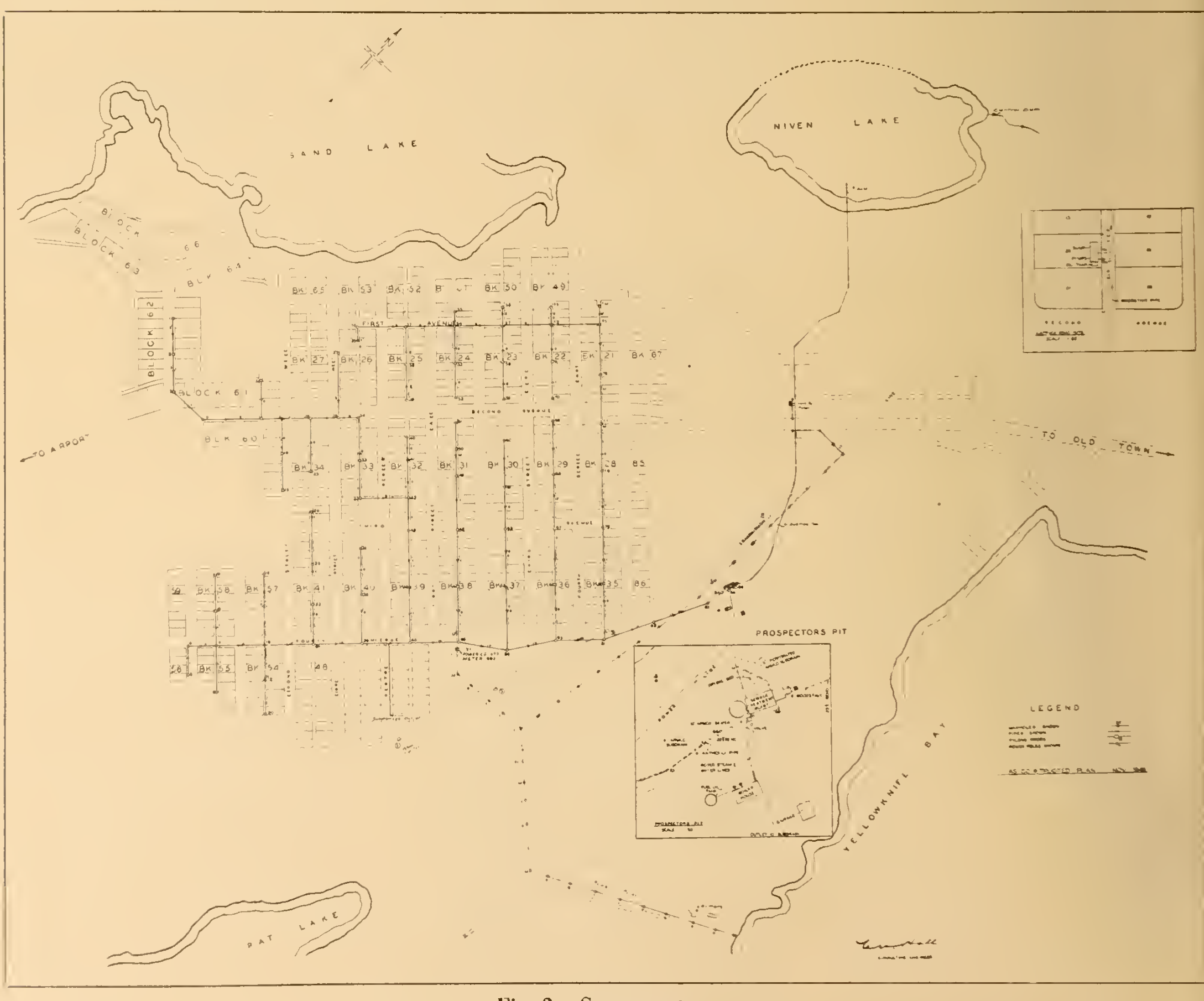

Fig. 2. Sewer system.

It will be noted that hydrants are fed from one direction only. This differs from conventional practice, but is unavoidable where a positive flow is essential.

The return flow from the orifice discs goes to a 500-U.S.-g.p.m. motor-driven circulation or secondary pump, in duplicate, which delivers it to the 8-in. pressure main. The difference between the delivery and return, representing consumption, is made up through a connection to a 6,000-gallon woodstave makeup tank in the pump house. In this connection there is an automatic chlorine feed which ensures the treatment of all makeup. The secondary pump has a delivery head of 215 feet, which provides for pipe friction, 100 feet of static head, and 85 feet pressure at street level. The pressure in the return line is throttled down to the makeup tank pressure by a hand-operated valve. The makeup tank is fed by a float-controlled 250-U.S.-g.p.m. motor-driven primary pump, also in duplicate, drawing from the intake well in the Lake. This pump has a foot valve and submerged delivery without a check valve to ensure being continually primed.

In the 6-in. return line is a shunt on the suction side of the secondary pumps containing a standard injector through which steam at 20 lb. gauge can be injected for heating. A two-pen graphic recording thermometer records the outgoing and return temperatures. Sufficient steam is injected to ensure that the return from the system is safely above 32 deg. F.

For fire protection, a 1,200-U.S.-g.p.m. gasoline driven pump draws from the intake well and discharges directly into the outgoing 8-in. line. At its rated head of 350 feet, it delivers at normal street pressure to the hydrants. Additional fire pressure is obtained from the pumper. A separate semi-automatic chlorinator feeds liquid chlorine to the suction to ensure that none but treated water can ever enter the system of the fire pump.

In the pump house are two 60-hp. and one 70-hp. return tubular boilers, with safety valves set at 30 lb. gauge, and fired by semi-automatic burners using Bunker C oil. On a nearby rock ledge at about 25 feet elevation are four 35,000-U.S.-gallon fuel oil tanks (Fig. 4) with heating coils surrounding the oil outlets. The connecting oil, steam and condensate lines are in a moss insulated box. The tanks are replenished directly from oil barges during the summer delivery season.

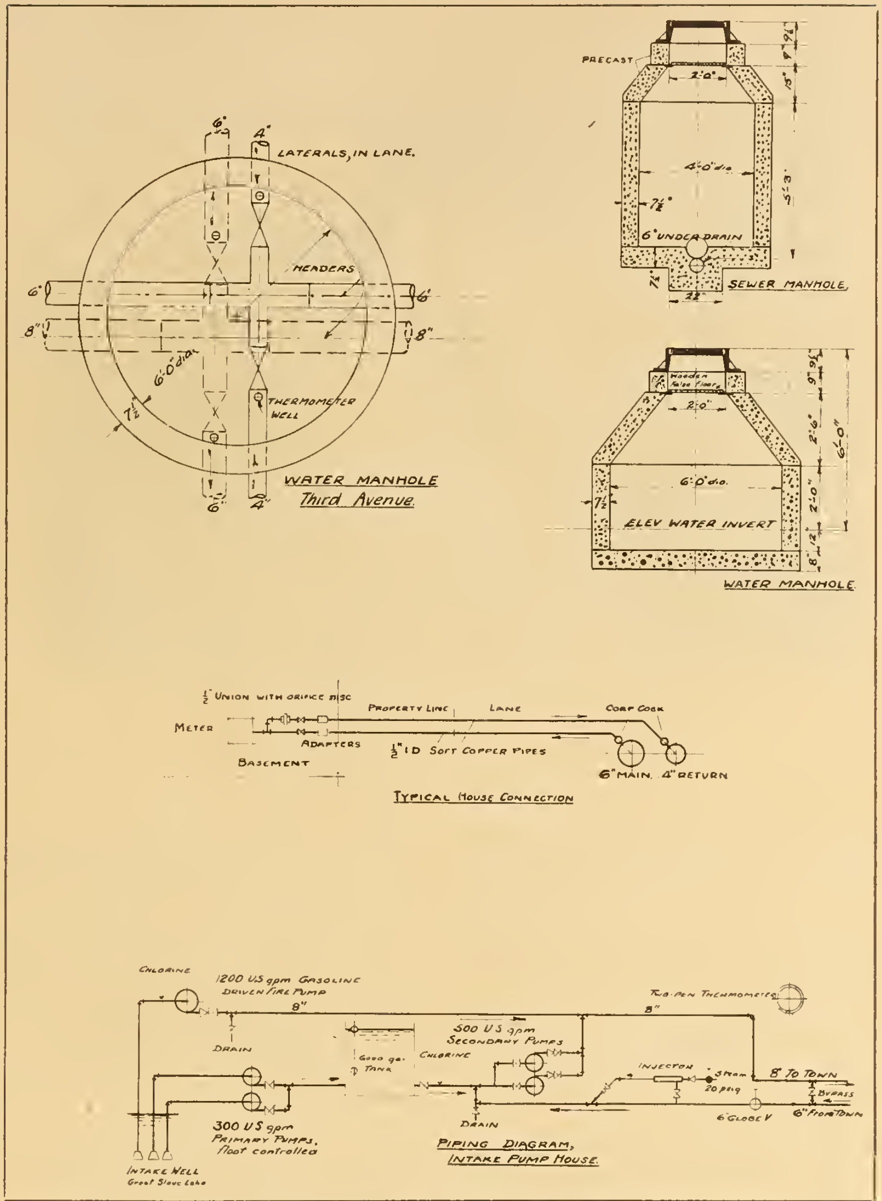

Fig. 3. Piping details for water system.

Electric power at 60 cycles and 2,300 volts is taken from the Yellowknife Power Company at a switching structure at Fourth Avenue. A three-phase circuit on wood pole-line leads to a two-throw switch in the pumphouse, thence to a bank of three 25 k.v.a. transformers just outside the building. From the transformers, 220 volt power re-enters the building for general use. The pole line also carries a 2,300-volt circuit for the sewage units.

To ensure uninterrupted service, a 125-k.v.a. 2,300-volt diesel-electric unit is installed in the pumphouse. By means of the two-throw knife switch, power is immediately available from this standby unit in the event of failure of hydro service.

Manholes

All laterals, both 6-in. outgoing and 4-in. return, at the Third Avenue headers and at other similar distributing points, are valved and provided with thermometer wells for checking temperatures. These are in four-foot and six-foot circular manholes as required. The cylindrical section of each manhole on a concrete base, was cast in place using collapsible plywood forms. Above this section is a precast frustum of a cone with a 45-deg. slope reducing to 24-in. diameter, which carries a conventional cast iron manhole ring and solid

Fig. 4. Fuel oil tanks at the intake pump house.

cover. Precast concrete rings were used where required to suit adjustments in lane and street grades. No reinforcement was used. The sewer manholes are all four feet diameter and of the same design.

Provision was made for supporting 24-in. diameter wooden false floors in the necks of the manholes to carry a moss insulating pad. This was found to be an unnecessary precaution. No ladder rungs are provided. Access is by a light wooden ladder carried in the maintenance truck. There are approximately 44 water manholes and 77 sewer manholes.

Pump House

This is 70 feet by 30 feet, of wood construction with rock wool insulation including the ceiling, and fire resistant sheathing on both walls and ceiling. It rests on a waste mine-rock fill extending outwards from the shore lines (Fig. 5). The intake well is 30 feet further into the lake, connected to the building by a covered insulated bridge carrying the suction pipelines. The well is four feet square inside and 10 by 10 feet outside, of hollow wall construction with walls of laminated 6 by 6-in. lumber. It rests on a mine-rock extension of the building base and is surmounted by a fully insulated and heated superstructure. Through each corner of the hollow wall is a wood pile and the hollow wall is rock filled. Extending further into the lake is a 10-in. corrugated steel pipe with bronze fish screen, well below ice cover which may be up to four feet thickness. The bronze screen is approximately 120 feet from the original shore line. The solid rock lake bottom carries 18 feet or more of very fine silt. The mine rock fill was sunk by assembling heavy surcharges and setting them by light dynamite charges which dislodged the silt. The fill was allowed to rest over the winter of 1947-48 before completing machine foundations in the following summer. No settlement has occurred.

The pump house proper is heated by steam unit heaters and the intake well and bridge by radiators. All condensate is returned to the boilers by a motor-driven pump. Steam injected into the town water must be replaced by makeup. The water is quite satisfactory for both boiler and town use, except for continuous slight bacteria count. Chlorination is continuous.

Sewerage System

This is of the conventional gravity type. It comprises a 10-in. interceptor along Fourth Avenue, extended to the disposal plant about 800 feet beyond the south-east corner of the townsite. The minimum cover is 7 ft. 6 in. and the minimum grade of 0.40 per cent was exceeded in a few cases only.

The sewer mains are two feet below, and six feet horizontally from the water mains. All pipe is corrugated steel, factory-dipped, with an extra float to smooth the invert. All service connections to the mains are 8 x 8 x 6 x 6-in. double 45° wyes, located approximately at the downstream boundary of every serviceable lot. The 6-in inlet branches are inclined upwards at 20°, with their inverts tangential to that of the main. Included with each is a 6-in. 45° ell, providing a compound bend for the convenience of the user and permitting the use of cast iron, tile or other piping. No house connections enter the 10-in. interceptor. At every intersection of sewer mains and at all changes of grade and alignment, is a four-foot concrete manhole. No provision was made for handling storm water; a by-law forbids the connection of eavetrough downspouts. This precaution was taken on account of the amount of dust deposited on roof. surfaces by summer winds.

Sewage Treatment Plant

This consists of a twin-cell primary sedimentation tank, an adjoining effluent sump, pumps in a dry well, sludge pumps in a similar dry well, a circular heated digestion tank and an oil fired steam heating plant, all located at what is locally referred to as the "Prospector's Pit".

The effluent is pumped through 1,200 feet of 6-in. woodstave force main in a shallow trench, over a rocky ridge to a second effluent tank with pumps in a dry pit. This site is alongside Franklin Road and is locally referred to as the "Garbage Road" site. From here it is pumped through 1,800 feet of 6-in. woodstave pipe over another rocky ridge and discharged through an insulated box on a trestle extending well beyond the shore line into an isolated shallow pond called "Niven Lake", with an area of about 13 acres (Fig. 6). All effluent pumps are in duplicate and with a capacity of 200 U.S. g.p.m. each, float operated at 220 volts, 3 phase from transformer banks tapped from the 2,300 volt line from the water intake plant and hence protected by the diesel-electric set. To avoid the possibility of the freezing of standing effluent between pumpings, there is at each plant a motor-operated spill valve that drains its force-main back to the sump when pumping ceases. Each sump has a nominal capacity of 10,000 gallons. Niven Lake normally loses its water by evaporation only, but has an old overflow into Back Bay, an arm of Yellowknife Bay. A low timber dam, with 8-in. tide gate, was thrown across the overflow. The effluent to date has caused very little discharge here. The incoming warm sewage maintains a clear opening through the ice at all temperatures. Should there ever be excessive overflow into Back Bay, it may be justifiable to add further treatment at the outfall.

The twin primary sedimentation tanks are 10 ft. by 26 ft. 6 in. and 8 feet deep from water level, with screen, grit-chamber, effluent-trough and suspended weir of conventional design. Motor-operated endless chain scrapers move the sludge into the suction pit of the sludge pumps, whence it is pumped into the 21-foot-diameter by 20-foot deep hopper bottom concrete digestion chamber. The digestor is heated by hot water in submerged copper coils. The same sludge pumps deliver digested sludge to open driving beds nearby.

At a distance of about 100 feet from the tanks is the 20 by 40 ft. boiler room with two 15 hp. boilers operating at 15 lb. gauge, oil fired with medium diesel fuel oil. Hot water is pumped from a heat exchanger to the digestor and steam radiators heat the building. All piping is in buried insulated boxes. A 4-in. line carrying town water in the same trench as the raw influent supplies clean water for boiler and wash-down purposes. No attempt is made to utilize sewage gas. The treatment plant meets the standards of the Federal Department of Health and Welfare.

Construction

During the 1946 season, the lanes were cleared and a considerable amount of stripping was done by light bulldozer to expose permafrost. Orders were placed for all water, sewer and woodstave pipe and fittings, and boilers, pumps, diesel generator, fuel tanks and other large pumphouse equipment, including the sewage effluent pumps. Each length of water pipe and each fitting was shop tested by hydraulic pressure before shipment and all sewer pipe was crated in sizes for handling by water transport.

During the winter of 1946-47, the contract for the installation was placed with the Northern Construction Company and J. W. Stewart, Ltd., of Vancouver, assuming a two-season period for completion. All tools and construction equipment were purchased or supplied by the Department of Public Works, and on the completion of the work, stored in Yellowknife for future work in the Territories. Active construction commenced late in April, 1947. Pipe trenches were opened by dragline, shovel and back-hoe. Due to the sandy nature of the soil, excavation by trenching machine was impracticable. The summers of 1947 and 1948 were both cold and wet and thawing of the permafrost was very slow, due, partly, to the heavy accumulation of ground water and to the extremely fine sand encountered.

The problem of dealing with the accumulated water became so acute that it was decided to lay a system of under drains under more than half of the townsite. This consisted of 13,000 feet of 6-in. corrugated and dipped steel pipe perforated along the invert and laid in a bed of moss to filter out the fine sand. It was laid so as to form an immediate support for the sewer lines, and cut off trenches drained the system at two points towards the main lake.

Although the ground water elevation was approximately that of the adjoining Sand (Frame) Lake, there was no evidence that seepage took place through the bank of the lake. Measurements showed a steady flow from the drainage system, except in winter, when all flow ceased. It is anticipated that the flow will gradually diminish in seasons to come.

With the removal of this ground water, trenching proceeded steadily. A considerable amount of rock, mainly as hummocks, undetected by the test bores, was encountered, but, fortunately, there were few buildings to interfere with blasting. No piping was laid in 1947. The entire season was devoted to stock piling moss, to drainage, to preparation of the trenches, and to intake pump house foundations. This building was completed sufficiently to serve as a storehouse for machinery.

Construction work ceased in October and was not resumed until June, 1948. This season was again cold and wet, but pipe laying was largely completed, except in outlying areas where heavy

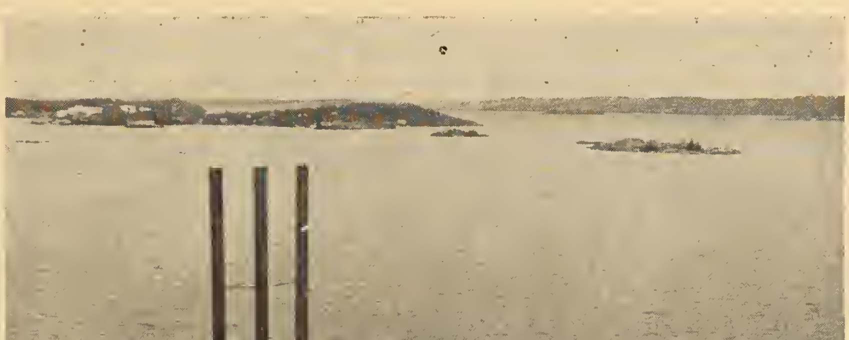

Fig. 5. Intake pump house for the water system on Great Slave Lake. The old townsite is in the far background.

rock work was required. Sections of water main were tested with compressed air before backfilling; and all mains were covered on the sides and top with enough moss so that there remained a thickness of about 10 in. after backfilling.

The arrival of cold weather prevented the erection of the sewage disposal plant, but the effluent pumps and sufficient sewerage system were completed to be put into operation. This gave service to the hotel, the hospital, the school and to centrally located buildings, a total of about 40 connections. Raw sewage was pumped into Niven Lake.

Preliminary operation was commenced late in November, with regular operation late in December, 1948. As a precautionary measure, outgoing water was held at 70 deg. F. for a month, and then gradually reduced to 40 deg. or 45 deg. F, depending on outdoor temperature and as required to ensure a return temperature safely above freezing.

A few breaks occurred in water lines, due mainly to difficult ground and back filling during severe weather. The operation of consumers' loops was entirely satisfactory. The sewage disposal plant and the remainder of the street system were completed in 1949 and their operation continued under the Department of Public Works until April 1, 1950, when the systems were formally handed over to the Department of Resources and Development.

Except for a few line leaks, the water system has been in normal and satisfactory operation over a period which includes two severe winters. The line failures were mainly in locations where the initial installation could be done only in freezing weather with frozen backfill. This demonstrates that a system can be designed to operate under sub-arctic temperatures and the restrictions and limitations of such a geographical location. This includes laying water and sewer mains and house connections at moderate depths that may be either above or below the boundary between seasonal and permafrost. Available records show that, within reasonable depths, the temperatures in permafrost are only a few degrees below 32 deg. F, with small annual fluctuations.

Because of the time lag between atmospheric and ground temperatures at pipe depths, water returned to the plant at higher than lake temperatures well into the winter and the period of water heating was from late December until June. The cost of fuel consumption has been lower than estimated, due, no doubt, to the effectiveness of the moss insulation and to the small number of consumers so far connected.

The sewerage system has operated without incident in spite of the small number of connections.

All water services are metered, and all the connections are entirely at the expense of the consumer, but to a standard set out by the Department.

The ultimate addition of a water tower was kept in mind, but it was decided to defer it until the system had been in operation for a time. A water tower would be a hazard to a circulating system in severe weather, but by restricting it to summer use, the system could be operated as a conventional system with a saving in labour and power that probably would carry the fixed charges added by the tower.

Personnel

This project was sponsored by and carried through to completion under the general approval of the Federal Department of Mines and Resources, now the Department of Resources and Development.

Initially, it was under the immediate supervision of Mr. P. E. Doncaster, M.E.I.C., district engineer of the Winnipeg office of the Department of Public Works. Later it was transferred to the newly organized Edmonton office, Mr. W. J. Johnston, M.E.I.C., district engineer. The resident engineer was Mr J. E. Kellett, M.E.I.C., assisted by Mr. E. Lundman, Jr.E.I.C., who has remained as operating manager following the transfer to the Department of Resources and Development in 1950. The contractor's superintendent was Mr. John McNeil of Vancouver. The writer was consulting engineer. √

Fig. 6. Sewage system effluent outfall into Niven Lake.

Engineers in Civil Defence

by

W. J. Scott, K.C.
Ontario Fire Marshal.

An address delivered before the Toronto Branch of The Engineering Institute of Canada, on February 1, 1951.

In this address I have been requested to discuss with you how engineers can fit into the civil defence picture. The necessity for civil defence is the ugly fact that faces Canadians today. When World War II ended, none of us then anticipated that in less than six years we would be girding ourselves for defence against the stupendous horrors of the atomic bomb. The film you have just seen, "The Tale of Two Cities", which was produced by the United States Army and recently declassified for public showing, gives you a much better idea of atomic warfare than any words can describe. My problem is to indicate to you some thoughts as to what you and I can do to safeguard our own lives and those of our families and fellow citizens, and to preserve our democratic way of life.

Civil defence is national life insurance in these perilous times. We, in our efforts and expenditures for civil defence, are just paying the premium on this life insurance. Our hopes are that civil defence will not be needed against war in our times. Here we are in the same position as the young husband who hopes that an early death will not cut him off from the support of his family. Just as, if he is a prudent man, he carries life insurance to provide against a possible disaster, so we in these days have to participate in civil defence. Or to take an example from the fire insurance field, it is probable that every man in this audience carries fire insurance on his home or property, even though the statistics for the Province show that only about one building in 25,000 suffers loss by fire in any year. In these days of communist aggression it would be a rare individual who would say that the possibility of war is not one out of 25,000. If we take the Canadian Prime Minister's figure as to the possibility of war being not more than one chance in 50, then civil defence today is 50 times as necessary as fire insurance.

In view of the wide interest in the subject of civil defence today, the *Journal* considers this paper important and timely. Engineers in all parts of Canada have an important part to play in civil defence. The references to other publications on the subject will be of help to those seeking wider information.

Atom Bomb Obliterates Area Five Square Miles

Those members of this audience who saw France in World War I, will vividly remember how a single shell would demolish a house or possibly even several houses. World War II brought its greater destructions through incendiary bombs and through its block-busters and then the V-1 and the V-2's. The characteristics of the V-2 are particularly appropriate for our study as to our possible future in atomic warfare. This missile travelled faster than sound, so that the public had no knowledge of its approach. The common expression was "If you hear a V-2, you are safe".

Similarly with an atomic bomb, if anyone takes evasive measures, or in other words "ducks" immediately, there is a good chance of survival even if he is out in the open when he sees and hears an atomic explosion. If he has advance warning of a few minutes to seek shelter, his chances are proportionately better. The V-2 demolished almost a whole city block. The single "nominal atomic bomb", as it is called in the U.S. textbook, virtually obliterates an area of five square miles and causes damage and secondary fires some two miles from ground zero for a total area of important damage of twelve to fifteen square miles.

This tremendous destruction from an atomic explosion is due to the great release of energy from the fission of uranium-235 or plutonium. On page 13 of the U.S. textbook "The Effects of Atomic Weapons" the energy equivalent of fission of one kilogram of U-235 is given as $2X10^{13}$ calories, $2.3X10^{7}$ kilowatt hours, or $8.4X10^{20}$ ergs. As engineers you will know that this energy release comes from the conversion of matter into energy when the mass equivalents of the resulting fission products are somewhat less than the mass equivalents of the original U-235. This is the energy from fission which is still in itself very much less than the energy that would be released

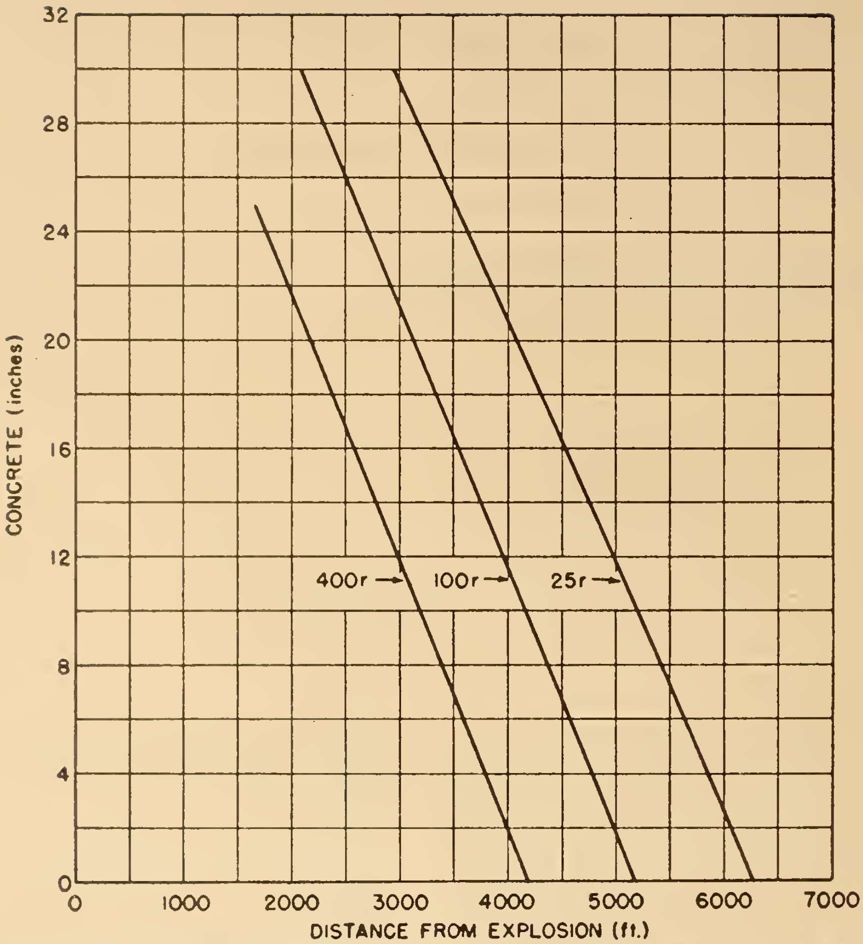

Fig. 1. Thicknesses of concrete required as function of distance from explosion to reduce initial gamma radiation to various amounts.

if the whole kilogram were converted into energy. That would be more than 1,000 times greater, for using the famous Einstein formula of $E=mc^2$ the release energy from the total destruction of one kilogram would be:

$$E = mc^2$$

$$\text{(in ergs)} = \text{(mass in grams)} \times \text{(speed of light in centimeters per second)}^2$$
$$= (1000) \times (3 \times 10^{10})^2$$
$$= 9 \times 10^{23} \text{ ergs.}$$

Where Engineers Can Help

In the past history of the world, whenever science has discovered a new weapon to use against mankind, defensive measures have always been developed. The Canadian textbook "Organization for Civil Defence" devotes Part V to "Methods of Civil Defence". Next I want to discuss with you briefly some of the lines of endeavour where it appears engineers can best give their most effective help to the people of Canada. In these comments I am not announcing policies for the Ontario Government, but speaking solely as an individual. Here I am drawing on my personal experience as a member of the Ontario Civilian Defence Committee during World War II, and of the new Ontario Civil Defence Committee. I speak from the background of the intensive study I have made of civil defence activities in both the United Kingdom and the United States during World War II and since.

In this Canadian Government publication the sub-headings and a few brief comments on them are:

Warning

This section provides for civil defence warning control centres in target areas. A recent press announcement from Ottawa gives the development of a new siren which can be heard over a radius of two miles. Engineers are certainly going to be needed where the differing power supplies available, even in individual locations in a single city, will provide the first complexity. I well remember the troubles we had in fitting the sirens delivered to single and three phase motors and 110 and 220 volt circuits. All phases of the warning system will require engineering skills for their maintenance and operation. Similar problems arise with general communications, which in the immediate area of an atomic explosion will probably be exclusively by radio. While civil defence services will have their own short wave radio systems, undoubtedly public broadcasting stations will be used for messages to the general populace. Indeed each householder is advised to have a battery-operated radio in his home, so that he and his family can continue to receive directions even though there be a general power failure.

Dispersion

This is largely a field for town planners and those who choose the locations for individual industries, which are followed inevitably by the communities of their workmen and those who provide service for them. Dispersion is the best counter-method against atomic attack, for an atom bomb is an expensive device in man hours and needs a substantial target to justify its expenditure, although the size of the target decreases as the Russians' stockpile of atom bombs grows. This is very much a long-term proposition, for obviously it is impossible to completely disperse our populations today without a complete disruption of production. But each factory which is built in some small town or on the outskirts of a metropolitan centre, instead of in the midst of a city, is another aid towards dispersion.

Construction

The paragraph in the Canadian manual says so much in a few lines that it is worth quoting in full:

"The inclusion in building codes and building practices of shock resisting features, fire prevention requirements and basements suitable for shelters, would greatly increase our defences at relatively little additional cost and reduce fire risk in peacetime."

Much research work is being done in this regard, and shortly formal recommendations will be issued from Ottawa. In the meantime we do have considerable information from the United States. I particularly draw your attention to the fifteen pages starting at age 372 of "The Effects of Atomic Veapons". Here the very reasonable principle is laid down, "It eems that a distance of about half mile from ground zero (the point lirectly under the bomb burst) vould be a reasonable compromise or the planning of general protecive measures". No one can foreast just where an atom bomb will go off, and it is just not economially feasible to try to build proective structures that will withtand a direct hit. There are facors entering into the Japanese experience which form the basis for his advice. The table on page 376 hows that the percentage mortalty did not drop to 90 per cent unil 2,000 feet from ground zero, vith the downward curve becoming harp only after 3,000 feet where he percentage mortality is 80 per ent.

The major reason for this loss of ife and the property destruction is he violence of the shock wave. The nost destructive point from which n atomic bomb can be used is an ir burst about 2,000 feet above he ground. The major destruction s within a radius of about 2,000 eet from ground zero, and thereafter decreases with the cube of the listance. To non-technical people his use of the figure 2,000 feet rom ground zero seems as if the scientists were being too definite about atomic explosions. But if you read the thirty-five pages devoted to the mach effects, starting on page 57 of "The Effects of Atomic Weapons", it will be seen that t is a simple matter of physics. The bouncing of shock waves from the earth and their reflection by the descending waves following, taking into account the intensity of these waves and their possible angle of incidence, gives the greatest mach effect at about 2,000 feet. There the combined intensities are about eight times as great as a single shock wave. Beyond that distance the angle of incidence is too great, and the intensity of the explosion decreases with the cube of the distance.

Another factor in determining this half mile is that in any atomic explosion there is a great release of neutrons which have a maximum range in air of about 2,100 feet. If the explosion is a low air burst so the ball of fire touches the ground, an hour after the explosion the radioactivity at ground zero is still 8,000 roentgens. The significance of this is that the laboratory

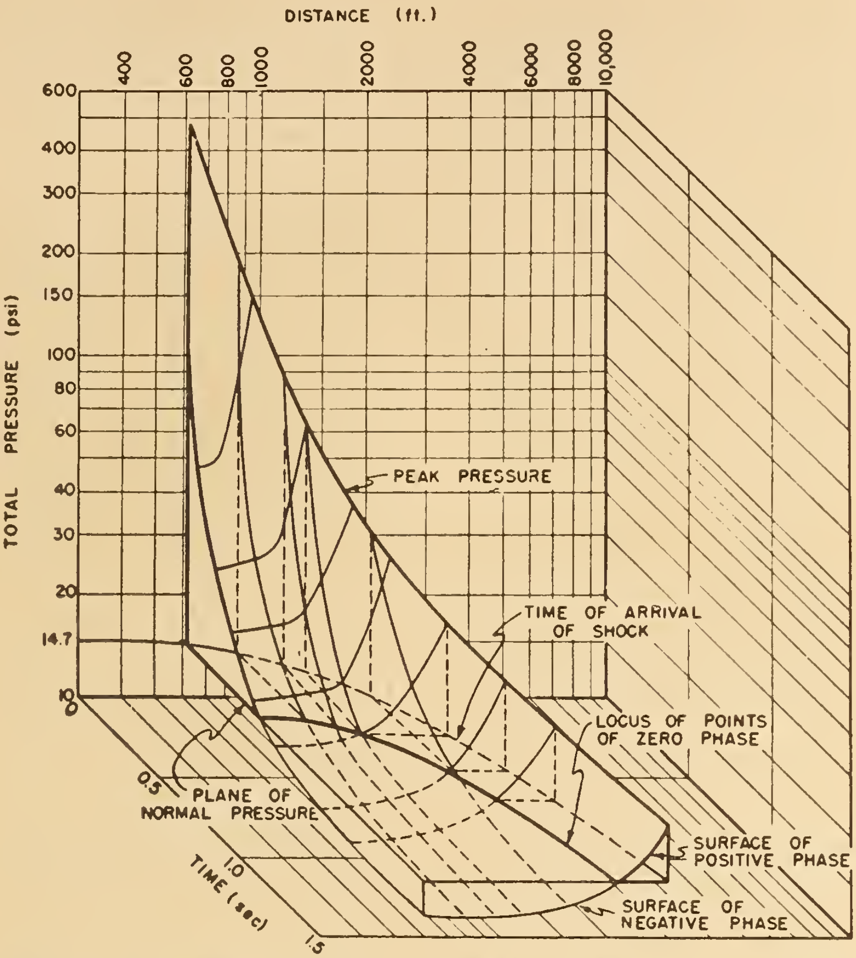

Fig. 2. Total pressure-time-distance diagram for shock wave in infinite homogeneous atmosphere.

tolerance for exposures is 0.3 roentgens per week and the text "The Effects of Atomic Weapons" at page 236 gives a dose of 400 roentgens received over the whole body in the course of a few minutes as the median lethal dose which would be fatal to about 50 per cent of human beings.

All radioactivity from an atomic burst decreases with the square of the distance, so that at just over 6,000 feet from ground zero there is no prompt gamma radiation of any kind, even for a person in the open without any protection. Those of this audience who are construction engineers will be interested in the graph* showing the thicknesses of concrete required as a function of distance from an atomic explosion, to reduce the initial gamma radiation to various amounts. This is on page 237 of the "The Effects". For example at 2,000 feet it requires 22 inches of concrete to reduce gamma radiation to an intensity of 400 roentgens, which is the 50 L.D. dosage, while 12 inches of concrete will do the same at 3,000 feet. The usual measure for civil protection is 100 roentgens to which radiation is reduced at 3,000 feet by 22 inches of concrete and at 5,000 feet by just two inches of concrete. The Jap experience was that only 15 per cent of the personal injuries were attributed to nuclear radiation.

The Japanese experience in the heat wave that accompanies an atomic explosion was that this was responsible for a high proportion of the physical damage, with total fire destruction being about 80 per cent of the building damage. It is hard to differentiate between the fires which were caused by thermal radiation and those which were secondary fires, arising from ordinary causes of buildings damaged by the blast. Burns, from these same two causes, accounted for about a third of the Jap casualties. The thermal radiation is caused by the high temperature of the atomic

* Reproduced as Fig. 1 of this paper on page 172.

explosion and the resulting "ball of fire", which reaches about 900 feet in diameter. The intensity of the thermal radiation is given at page 180 of "The Effects" as 6.7×10^{12} calories. At page 201 there is a table showing that this will give moderate burns on the unprotected human skin at a distance of 10,000 feet from an atomic explosion, will char white paper at 12,000 feet and char maple at 7,000 feet. It is possibly of some technical interest that while close up there is some ultra violet radiation, the most damaging effects at a distance are from radiation in the infrared range.

Fortunately the thermal radiation travels in straight lines, so that only direct exposure leads to harmful consequences. Shelter behind almost any object is effective except quite close to ground zero, and the ordinary building construction principles for better fire safety apply completely.

The U.S. textbook "The Effects of Atomic Weapons" states that for blast, thermal radiation and gamma radiation there is time for the individual to take evasive measures which can reduce the casualties by 50 per cent. On p. 125 it is pointed out the duration of the blast is in the order of one second and at p. 29 that its shock wave travels 12,000 ft. in 10 seconds. On p. 207 it is stated that only one-third of the thermal radiation is received in the first second after the explosion. Even for gamma radiation, the semi-log graph on p. 238 shows 18 per cent of the total dosage in the first one-tenth of a second, just under 50 per cent in the first second, and about 80 per cent in the first two minutes. These "ducking" times form the basis for the detailed advice to the public given in the U.S. pamphlet "Survival under Atomic Attack".

Blackout Precautions

The Canadian policy on blackout precautions is not decided as yet, and any instructions will come from the Department of National Defence. However, in view of the physical limitations against frequent air attacks on Canada, it would seem ridiculous to institute any system of blackouts such as were generally observed in the United Kingdom during World War II. It is also a question as to how effective any blackout is against the use of radar. There might have to be some type of black-out however in coastal cities, to avoid becoming too plain targets for guided missiles from submarines.

Shelters

The Canadian policy on shelters as given in the manual is: "The construction of heavy surface or special underground shelters would not be justified at present. Incidental shelters can be made at little cost in money or materials in many types of structures, particularly in basements. . . . Enforcement of suitable building codes incorporating shock and fire resisting features, and other safety requirements above and below ground would help provide protection from A-bomb effects."

In the U.S. textbook "The Effects of Atomic Weapons" there are fifteen pages starting at page 372 that give principles of proper construction in much more detail than is possible here. For example, the recommendation for multi-storey, reinforced-concrete or steel-frame buildings suggests the design should allow for a horizontal wind component of 90 pounds per square foot, with a vertical component of 70 pounds per square foot, to provide against structural collapse at a distance of half a mile from an atomic burst. For underground structures, the design for earthquake resistance is suggested.

There are just two points in building construction that should be mentioned further. One is that all load-bearing brick or concrete block walls have poor resistance to an atomic blast. Not only do they collapse, but the bricks and blocks become highly-dangerous missiles. Further, if we are to live in an age of possible atomic warfare, our engineers and architects will have to reverse the present trend towards the extensive use of glass. The Jap experience was that the casualties to personnel in reinforced concrete buildings were higher than in buildings of ordinary construction, due to injuries from glass splinters. This hazard from glass splinters from an atomic explosion is exceedingly severe, and extends over a much greater area than the danger zone for structural damage, heat radiation or gamma radiation.

For those who want to design structures to resist an atomic blast, there is a most instructive three-dimensional graph* on page 51 of "The Effects of Atomic Weapons". From this pressure-time-distance diagram of the shock wave, it will be seen that there is a peak over-pressure of about ten pounds per square inch at 2,000 feet which has a duration of 0.5 seconds. A lawyer like myself should probably hesitate to translate this to engineers. But for those who might be thinking of the family garage as a shelter, it may be mentioned that my slide rule shows this means on a garage wall 8 feet high and 15 feet long a total pressure of 86.4 tons for a duration of half a second.

Restoration of Public Utilities

The British and Japanese experience with bombings are not comparable to Canadian conditions, since our public utilities' services are usually buried much deeper in the ground in order to be below the frost line. Nevertheless these public utilities would present major problems after an atomic attack. The expectation is that except for an area close to ground zero, the mains for water, gas, sewers and any underground electric lines would not be damaged, although above-ground connections might be fractured. The very obvious pre-planning is for grid systems with frequent cut-offs. The making of complete and accurate maps of all public utilities is an obvious necessity, and it should be remembered that these should not be stored in the city halls which are usually in the centre of the target, but copies should be at various points in the perimeter of target areas.

What should the industrialists, business man and private householder do with respect to his public utilities in the event of a few minutes advance warning of an atomic attack? This is a debatable problem, on which the authorities so far have failed to agree. Just a week ago today I sat in on a civil defence meeting in New York City where many eminent engineers failed to reach unanimity in a three-hour discussion on such a question as to whether or not the householder should try to shut off his water, gas and electricity. The consensus of the U.S. experts seems to be that for both electricity and gas, only the appliances should be shut off. It was

* Reproduced as Fig. 2 of this paper on page 173.

elt that the hazards of pilot lights when the service is being turned on again would be greater than the danger of leaving the main valve open on gas mains.

For electricity it is deemed highly desirable to pull the switch on oil furnaces, but to leave the main switch for lighting services on for lighting, and also for the use of radios for directions from the civil defence authorities. For water mains it is felt these should be left untouched to provide an immediate water supply for firefighting, as well as to maintain sprinkler systems in operation. For those who might worry about sprinkler leakages, it is believed that at distances of about 3,000 feet or more a sprinkler-head would not open under even direct thermal radiation, although this is something on which there may be further information available shortly.

Civil Defence Engineering Section

On page 32 of the Canadian manual, further opportunities for engineers are given in the organization of Civil Defence Engineering Section to handle decontamination, salvage, building repair and pioneer groups to supply labour for general use in clearing debris, etc. These are all specialized trades in normal peacetime fields, where their very names denote the purposes.

What Ontario is Doing

All the above advice is not to be deemed as entirely comprehensive, but just designed to give to you members of the Engineering Institute of Canada some lines of thought to develop and expand. But all this advice raises questions as to what the Ontario Government may be doing about civil defence. Therefore I shall refer briefly to the progress we have made in this Province.

Our direct interest in civil defence for the present emergency goes away back to 1948. It was in that year that, as an unofficial Canadian observer, I sat in on the Washington meetings which drafted the famous U.S. publication known as the "Hopley Report". This textbook established basic principles for a very elaborate civil defence organization. That publication has now been replaced by the recent one referred to earlier, "United States Civil Defence" which contains the following chapters of real interest to engineers; 9. Air Raid Warning Service; 10. Shelter Protection; 18. Engineering Service; 19. Rescue Service; 20. Communications; 21. Transportation; 22. Plant Protection; and 23. Supply Service.

Later, since a Canadian Civil Defence Co-ordinator has been appointed at Ottawa, we in this Province have worked in very close co-operation with him and his staff. To obtain the most authoritative information possible on the new hazards of atomic warfare, the Ontario Government, through co-operation from Ottawa, sent me to take the U.S. Army's course in radiological defence, which I completed last May. Dr. R. G. Struthers of the Ontario Department of Health has also just returned from taking the medical radiological course at Washington, D.C.

Since last September, the Canadian Army have been running a series of three-week courses in atomic - bacteriological - chemical warfare at Camp Borden, where Ontario has filled every vacancy offered to us. For instance, the seventh member from my own staff goes up to the ABCW course opening next week. The first Civil Defence Forum to discuss national planning for training and operations opened at Hull, Quebec, on Monday of this week, and there are seven representatives from Ontario at this, including one from the Fire Marshal's Office. We will have another large delegation at the second national forum opening February 15.

Last year the Ontario Civil Defence Committee was formally organized, with Col. the Honourable G. Arthur Welsh, Provincial Secretary, as its Chairman. It is impossible to establish a full-scale civil defence system until the basic problem is settled of finances as between the federal-provincial-municipal governments. Nevertheless much progress has been made. The pattern for organization in this Province is that there are five semi-autonomous divisions of police, fire, health, welfare and civil defence divisions, all closely co-ordinated and working together.

The health and welfare organizations are already established on a county basis, and it is decided as a matter of provincial policy that fire departments for target areas should also be co-ordinated on a county basis. It is probable that the police will follow the same pattern. With the example of Toronto and York County in the action they took last week to establish a county basis, it may well be that the general civil defence activities throughout the Province will be co-ordinated on the county level like the four other services just mentioned.

Organizing Well Underway

Ottawa has designated certain areas in this Province as potential targets, where detailed surveys have been made or are underway as to existing hazards and protective facilities. In all instances, the municipalities concerned have been notified as to Ottawa's directions, but for obvious reasons these names cannot be made public. However, in all of them initial steps for organization have been taken. Dealing with my own sphere of the fire services, I can say that the organization which has been initiated is for the fire chief for the largest city in each county to be responsible for co-ordination and standardized training of all fire departments in his county.

These fire chiefs are now working on mutual aid running-cards which would provide immediate help to any target centre from all fire departments in an area of 50 to 100 miles away. All these fire departments are listed in detail in our own F.M.O. publication mentioned earlier, where in the latter pages these are all tabulated by counties throughout the Province. In the 43 aeroplanes owned by the Ontario Department of Lands and Forests we have a highly-mobile fire department, with small fire pumps in the hundreds and fire hose by the millions of feet, available for immediate dispatch to any point in central Canada or for mutual aid to the United States. For obvious reasons I cannot give details, but I can assure you that you would be surprised at the extent to which existing resources have been organized.

Similarly on the provincial level for other services, the Province through its short-wave radio networks of the Department of Lands and Forests and the Ontario Provincial Police can now blanket the entire Province, for the purpose of getting aid for any stricken area or calling for aid from any district able to help. Before starting any recruiting or training programme, it is obvious that instructors on both the provincial and local level must be provided first. This is one of the reasons mentioned for the attendance of people at the various Canadian and U.S. courses. In order to supplement this training of instructors, we have had very extensive distribution of educational literature. For instance, all the publications mentioned in the Bibliography have been sent to municipal fire departments throughout Ontario and to other municipal authorities and officials. There have been quite a number of others sent out too, including all available British manuals.

Further, Col. Welsh has specially authorized me to make two announcements which will be of special interest to this gathering. The first is that the importance of the engineering profession is recognized in the fact that he has arranged to include an official representative from the professional engineers of Ontario, among the Ontario delegation to the current national civil defence forums at Ottawa. Secondly, the first general distribution of educational literature is in the hands of the printers from whom deliveries will start in a few days of 280,000 copies of the U.S. pamphlet "Survival Under Atomic Attack", which will be distributed first throughout the high schools of this Province.

Incendiary Bombs Less Likely

In all these discussions you may have noted that my references have all been to "atomic attack". Under present world conditions, our only possible enemy is Russia and her satellites. Fortunately for us in Canada, these are all far removed from the settled portions of our country and particularly from the Province of Ontario. Unless or until the unlikely event happens of Russia capturing land bases on this continent or in Newfoundland, it is a physical impossibility to have saturation raids against us like the raids in Europe during World War II, and which Great Britain would undoubtedly suffer in any future war.

As to the type of attack we would most likely receive here, just look at the fact that it would take 2,000 Russian bombers with 10,000 aircrew reaching Toronto to drop high explosive and incendiary bombs, to give an equal effect to one "nominal atomic bomb." Consideration of the engineering tests of "efforts and results" readily show the type of attack for which we need to prepare. In any event, preparations against atomic attack would automatically take care of any lesser attacks by high explosives and incendiaries. But I need hardly reassure you, in conclusion, that all of us hope none of our civil defence efforts will ever be called upon for actual experience in war during our lifetimes. We are simply paying our life insurance premiums in this troubled world.

√

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Some Highlights of the

65th Annual General and Professional Meeting

MOUNT ROYAL HOTEL, MONTREAL

MAY 9, 10, 11 - 1951

- **Defence**
  Dr. O. M. Solandt, Defence Research Board, Ottawa; N. M. Brydon, Brydon Construction Co., Glasgow, Scotland; Maj.-Gen. G. B. Howard, Industrial Preparedness Association, Montreal.
- **The First Five Years of Professional Development**
  A. C. Montieth, J. C. McKeon, Westinghouse Electric Corp., Pittsburgh; H. K. Breckenridge, West Penn Power Co., Pittsburgh; K. B. McEachron, Jr., General Electric Co., Schenectady.
- **Quebec Titanium Developments**
  M. J. O'Shaughnessy, Quebec Iron & Titanium Co., Havre St. Pierre, Que.
- **British Electric Power Transmission**
  C. W. Marshall, British Electricity Authority, London, Eng.
- **Electro-thermal Aircraft De-icing**
  J. L. Orr, National Research Council, Ottawa.
- **Field Welded Digesters for Columbia Cellulose Corp.**
  P. E. Savage, Dominion Bridge Co., Montreal.
- **Air Sanitation**
  E. A. Allcut, University of Toronto.
- **The St. Lawrence Waterway**
  J. G. G. Kerry, Port Hope, Ont.
- **Instrumentation for Chemical Processes**
  J. A. Rice, Fischer & Porter, Toronto; J. V. Quinn. Canadian Industries Ltd., Montreal.
- **Ontario Hydro Steam Plants**
  R. L. Hearn, H.E.P.C., Toronto.
- **Oil and Gas Development in Alberta**
  J. R. Donald, J. T. Donald & Co., Montreal.

PLAN NOW TO ATTEND

Airborne Magnetometer

by

T. O'Malley

President

Canadian Aero Service Corporation, Ottawa.

An address presented to the Ottawa Branch of The Engineering Institute of Canada.

Magnetic measurements have been used in prospecting since the 17th century. Ground magnetometers are still used extensively to measure variations in the field of the earth, in search of oil and minerals, but the newest and most economical geophysical prospecting tool is the airborne magnetometer. This instrument brings a significant improvement to the quality of magnetic measurements, because it provides high sensitivity and stability, continuity of record, and escape from serious error due to daily magnetic variation. It avoids measuring near-surface accidentals which often obscure ground measurements, and finally the instrumentation and survey technique produce highly dependable records. The sum of these improvements is a new and economical exploratory tool for oil and minerals, particularly useful in large areas in those of difficult access. In the past four years the total miles of traverse covered with the airborne magnetometer alone exceed the traverses covered by all other methods of geophysical prospecting combined.

The high-sensitivity airborne magnetometer has an interesting history. It was developed and first flown by the Gulf Research & Development Co. in February, 1941. Then, since the instrument had possibilities as a submarine detector, it was further developed and modified for this use, during the recent war, then development reverted to its use as a geophysical prospecting tool. Its commercial history began in January, 1947, when the first commercial airborne magnetometer survey ever made in search of minerals was made in Canada.

Modern magnetometer aircraft are equipped with the continuously recording Gulf magnetometer, with the detector either towed below the aircraft on a cable or mounted in the tail of the aircraft, depending on the design of the plane and the accuracy of measurement required. The next piece of equipment is a stabilized continuous strip camera, the Sonne camera, to take continuous pictures 35 mm. wide, and incorporating a stabilized mirror to minimize side tilt and thus reduce movement, increasing photograph quality and position orientation. The third instrument used is a recording radio altimeter to give a continuous picture of ground clearance. Since the magnetic signals weaken as the airborne magnetometer is moved from the magnetic source, this altitude recorded is important. An optional piece of equipment is Shoran, used for flight guidance, depending on the circumstances of the survey.

Now that the instrumentation has been explained, an outline of the survey routine will show the importance of the mapping phase of airborne magnetometer surveys.

If suitable aerial maps exist they may be used, otherwise new ones must be made at 1 mile to the inch, with the photographic flight-lines running parallel to the magnetometer traverses. These traverses are now plotted on the aerial photographs as parallel lines a quarter-mile apart, or perhaps less, since this is a mineral survey. The pilot then flies along each of these quarter mile separated lines at an altitude of about 500 feet. Seven or eight days of this tedious flying makes a pilot wish he were on a "milk run" for T.C.A.

During the flight the magnetometer records variations in the earth's field as a profile on a ten-inch tape. The magnetometer operator also monitors the radar altimeter. At the same time the camera photographs the path the aircraft is flying. These three records — the magnetometer profile, the altimeter record and the photographic record—are marked and numbered simultaneously, so that all three are co-ordinated in time.

To control the effects of daily magnetic variation, which in Southern Canada is severe and can invalidate a survey, the following procedure is used. A series of overlapping closed loops, each taking less than 20 minutes, is flown around 30 by 50 mile sections of the area. In addition, tie lines are flown every six miles across the traverse lines. The traverse lines are anchored to these control loops and tie lines with the result that no magnetic reading is more than a minute and a half from a control point. This control pattern is used in oil surveys; mineral surveys require less control because the gradient is usually steep. One more precaution is observed: a magnetometer identical with the airborne unit operates on the ground to observe variations in the magnetic field directly. This information is

Fig. 1. The flight survey personnel check over the flight strip before take-off. The pilot follows the flight lines indicated on the strip of aerial photos. The survey plane is seen at the left.

radioed to the survey plane periodically. If the variations are not linear within a period of a few minutes the flight is stopped.

When the flight is completed, some five hours and 500 miles of recorded traverse later, the film is developed. The co-ordinating marks — "fiducials" — are spotted from the Sonne film back to the flight strip used by the pilot. Then these points are transferred from the flight strip to the base map used to compile the data for the survey. Following this, the magnetic profile is read in units called "gammas". These readings are plotted on the base map between the fiducials, which also appear on the magnetometer profile. This plotting procedure is repeated for each profile. Then the base map is contoured by drawing smooth lines between corresponding values. The result is a map, which reflects accurately all the subtle changes in gradient which are important to proper interpretation.

What information does this map provide to aid mineral prospecting? What are the general geologic problems to which the airborne magnetometer may be economically applied? Here are some; more may appear as the full use of its qualities begins to be made.

Fig. 2. The magnetometer with aircraft and crew.

Survey target magnetic

The fields of survey in which the magnetometer has been used so far are primarily those where the ore being sought is itself magnetic. Two obvious examples are magnetite and ilmenite. Successful surveys for both of these minerals have been made with the airborne magnetometer. Aside from areas still under investigation, commercial magnetite bodies have been found by the airborne magnetometer in Ontario. The world's largest known ilmenite bodies were delineated in Quebec with the airborne magnetometer.

Target non-magnetic, but in intimate association with magnetic material

Some mineralization processes produce or segregate magnetite along with the mineral being sought. Many placer deposits segregate magnetite with the economic minerals being sought. Hence, rutile, uranium, gold, and tin offer possible exploration targets in the placer category, and surveys for asbestos are possible because of the magnetite associated with the asbestos mineralization.

Target non-magnetic, but magnetic horizon associated

Some of the earliest surveys with the airborne magnetometer were made in northern Michigan, where the host rock is highly magnetic, but the mineralized areas are oxidized to hematite and hence are non-magnetic. At first glance it would appear that the heavy magnetic signals of the host rock and the small magnetic indications of the ore would make the magnetometer useless as an exploratory tool. However, convolutions of the beds are extremely well indicated on magnetic maps and can be traced by reference to related magnetic horizons, even though overlain by hundreds of feet of glacial drift.

Structural geologic indications

The ability to make maps of great precision opens up the possibility of using the airborne magnetometer in general structural problems which have heretofore not been explored by magnetic methods. It is obvious that a one-gamma map will show up dykes and intrusions however small. It is also obvious that if there are magnetic beds in the near-surface structures, they can be mapped with considerable confidence. Faults and folding will become obvious in the magnetic record.

Conclusive examination of a geologically favourable area

A good example of a survey used to find all possible ore bodies within a given domain is given by Dr. Weston Bourret in the *Journal of Economic Geology*, referring to the survey at Mingan, Quebec. Here the boundaries of the anorthosite were first established by widely spaced magnetic flights; then within the established boundaries, a precise and closely spaced survey was made, to locate all ilmenite deposits within the area. No other exploratory method would have given conclusive answers of this nature within a reasonable length of time.

So far this paper applies to a survey in which the pilot flew "contact". Over undifferentiated country or over water the use of the Sonne camera to record the flight path is impracticable. In such circumstances Shoran has been used to guide the aircraft. Recording Shoran co-ordinates continuously during the survey flights makes plotting the position of the aircraft a simple routine and provides the horizontal reference for the magnetic data.

In all magnetometer surveys it is necessary to evaluate the type of base map on which to plot the path that will serve most adequately and economically. In areas of low relief a carefully constructed photographic index will suffice for most mineral surveys, where only relative and not geographic orientations are needed. On the other hand, in oil prospecting surveys the areas covered are large and the anomalies broad, so the mapping must be of a higher order of accuracy.

This can be illustrated by describing the routine of producing an oil survey. A 16,000,000-acre area near Peace River, Alberta, will serve as an example. In this survey small inflections on the magnetometer profile are important. Inconsistent and erroneous horizontal positions can create spurious anomalies of the order of these small inflections.

In this survey the area was photographed at one mile to the inch from 34,000 feet altitude. A slotted template radial control plot of this photography was then prepared. On this plot the positions for each fiducial recorded by the Sonne Camera were plotted, and then the profiles were fitted into their approximate positions. Thereafter, the same routine as described for mineral surveys was followed.

The utility of such maps in oil prospecting can be described by quoting from L. L. Nettleton, who is a recognized authority in magnetic interpretation: "As a first look at broad areas, its most useful result may be in showing the general configuration of the basement, the location of synclinal axes and broad swells of the basement surface and the corresponding variations in the thickness of the sedimentary section. This, in turn, can indicate the probable drilling depth required to reach particular horizons in the section and possibly point to zones where pinch-outs, reefs or other irregularities may be more probable." Other useful information is also obtained.

Magnetometer surveys often promote the use of aerial photographs as an aid to prospecting and development. A by-product of these surveys may be a topographic map or a precise, controlled mosaic. Each serves the need for base maps for other work. Since the aerial magnetometer survey is not an end in itself, but rather a rapid reconnaissance tool, further ground exploration is always necessary, and by-product maps speed up such programmes.

Fig. 3. Airborne magnetometer in flight during a mining survey over the muskeg of eastern Canada. These surveys, which have helped to uncover important finds, are flown at an altitude of a few hundred feet. First such commercial survey ever made was flown in January, 1947, in the Province of Ontario, in spite of temperatures of 20 and 30 below.

An example of how the fields dovetail is the Allard Lake titanium survey, an ideal application of the airborne magnetometer. Since the results of the magnetic survey were positive, the aerial photographs taken incidental to the survey were also used to make a topographic map for a preliminary railway location. In another survey, the photographs for the magnetometer survey were compiled in precise, controlled mosaics on which were plotted the traverses and the stations for the subsequent gravity and seismic surveys. Thus the necessity of plane table work was eliminated. In addition, the photographs were used for photo-geologic interpretation.

Aerial mapping and this new geophysical exploration tool work hand in hand to speed the search for oil and mineral resources in the Dominion. More than 100,000 miles of traverse have been flown already, and the method is still growing in usefulness. √

Chemical Control of Vegetation

by

A. Brodie

A paper reprinted from the February 15, 1950, issue of "New Zealand Engineering".

Vegetation growth is a problem of major or minor concern to almost every engineer, and labour conditions have brought the problem into definition just when very effective and revolutionary means of chemical control have been discovered. This paper describes the latest developments and trends, in New Zealand. Costs given are, of course, for New Zealand; they would probably be lower in Canada.

Vegetable growth is to the local authority engineer an annoyance, to the railway engineer a problem, to the power authority engineer a hazard, and to the drainage engineer a nightmare. Soil conservation and forestry associations may be greatly embarrassed by the wrong kind of growth in the wrong place, and not even the harbour board engineer is altogether free of this worry, as endowed lands and undeveloped foreshores can and do breed noxious weeds.

The hoe, the axe, the sickle and the scythe now have limited value. High labour rates result in *rising* costs of $90 or so an acre for grubbing thick gorse, and the problem is then only partly solved, because regrowth is rapid and extensive. But 80 per cent to 100 per cent effective control of these pests can be obtained with a vast saving of manpower and at a *falling* overall cost of $25 to $35 an acre by chemical means.

Intermediate between hand and chemical treatment comes mechanical operation. Irrigation ditches are cleaned by a trenching machine, a drag-line or a grab, or by hauling a loop of heavy chain along the channel. In Australia two 120-hp. caterpillar tractors, joined by a 400 ft. steel cable, have been tearing swaths 250 ft. wide out of scrub. In the South Island, the New Zealand Railways use drags to work the ballast on the track and so smother the growth of vegetation. In Tanganyika a fleet of bulldozers, rooters and tractors is clearing the jungle itself.

An older method than these is that of fire, which is often efficacious but also hazardous. Science has developed a good system in the flamethrower whereby controlled burning can clean off the weeds between row crops for the farmer—or for the engineer, the growth on the railway permanent way and the vegetation on the banks of irrigation and drainage channels. In the main, however, the flame is a retardant only, and, if growth is rank, has to be used twice—the first time to dry off the vegetation, the second to burn off.

The danger from lush growth surrounding oil installations and the like is most effectively removed by yet another method, that of establishing lawns, or else pasture cropped by tethered sheep.

The chemical control of vegetation is by no means new. The Romans gave the final seal to the fate of Carthage by a simple and effective sterilization of the soil through sprinkling a liberal dose of common salt over the site. This would call for 4 to 8 tons of salt to the acre. The genesis of chemical control, however, really belongs to the year 1899, when Jones and Orton studied the application of sodium chloride, copper sulphate, several of the arsenicals, and other salts. Soon sodium arsenite was the standard weed-killer in Europe and America, particularly for railway work. The succeeding years showed unspectacular progress until the efficacy of sodium chlorate, borax and carbon bisulphide as plant-killers was discovered. Continued desultory development revealed a limited use for petroleum oils, coal-tar distillates and other products.

In the 1930's some research was under way in England and America on plant hormones. These are organic chemicals generated in very minute quantities in the plants themselves, and were first noted in 1905 by an English scientist, Starling. Their present name is derived from a Greek word meaning "that which stimulates". Before the last war some of the hormones were isolated, analysed and then synthesized. Later Britain and America pooled their knowledge, and the U.S.A. carried out intense research on hormones as another possible war weapon. It was known that the metabolism of plants could be disrupted by unbalanced dosages of these hormones in a way not dissimilar to the effects of erratic glandular secretions in the animal world, though scientists do not yet know precisely how these important chemicals operate in either flora or fauna. But the effects can be truly astonishing. The merest trace of one type of hormone will give an impetus to the growth of seeds, seedlings and cuttings. Another hormone will set fruit and give seedless tomatoes. Others prevent potatoes from shrivelling or sprouting, stop pre-harvest drop of tree fruits, or regulate the growth and ripening of pineapples at will so that the canning season can extend over six months instead of three. Hence the name "growth regulators" sometimes used. From chemical curiosities in 1944 these hormones had risen by 1948 to astounding fame and have given an impetus to biochemical research that will without doubt show spectacular results within the next few years.

The two plant hormones of interest to engineers are 2, 4-D (2, 4-dichlorophenoxyacetic acid) and 2, 4, 5-T (2, 4, 5-trichlorophenoxyacetic acid). These are less benevolent than those hormones mentioned above except when used with care and exactitude. For instance, one part in a million will kill a tomato plant in active growth. Herein lay their war potential. A sufficient dose at the right time is capable of dealing destruction to almost any crop, be it grain or vegetable, let alone most fruit and ornamental trees and flowers. Their common virtue lies in the fact that different species of plant life show varying degrees of susceptibility to these two hormones, and in the fact that extremely small quantities of liquid are needed for their application.

Most weeds, briars, scrub, bushes and many trees can be killed without detriment to the grasses, as the latter, owing to their thin, upright, waxy-surfaced leaves, are tolerant to these hormones to a fairly considerable degree. In this characteristic lies the supreme virtue to the highways engineers and the soil conservation engineer, but it is a drawback in the eyes of the railway maintenance staff, who specify a clean sweep of all vegetation on the permanent way.

Before discussing the many facets of these growth regulators, it is proposed to summarize briefly the whole useful range of chemical herbicides that have a place in the engineers' references. It should be noted that a combination of two or more of the following chemicals can be used, often with enhanced effect. The pattern of action suggests division into the following groups:

Soil sterilants.
Soil fumigants.
Contact herbicides.
Translocated herbicides: (a) Non-hormone-like; (b) hormone-like.

Soil Sterilants

Chlorates

The commonly-used sodium chlorate and certain proprietary products are similar in action, though the latter, owing to various additions, are slightly less inflammable. Both have been used extensively for the control of noxious perennial weeds, and they are good for small patches where quick and complete eradication is desired and where soil sterility for one to three years is not objectionable.

Chlorates are usually applied in spray mixtures containing 1 to 2 lb. per gallon of water at the rate of 500 to 800 gal./acre, depending upon the density of the vegetation. The cost of material from \$55 to \$110 per acre.

Enough should always be applied to wet the plant thoroughly at or after full bloom for perennials, or when annuals are 2 in. to 3 in. high. A fan jet, not a cone type, should be used. In some cases material may also be used in the dry form with a mechanical spreader, in the spring. Approximately 675 to 1,000 lb. per acre are used. Usually more than one, sometimes as many as three, applications are required before complete control of deep-rooted perennials is obtained.

Chlorate materials are corrosive to spraying equipment, and should be applied in large gallonages of water, at pressures ranging from 50 to 150 lb./sq. in. Chlorates form highly inflammable combinations with organic matter and are toxic to livestock. They are mainly a by-product from surplus electrical energy, so the world supply tends to fluctuate independent of market demand. Several tragedies of recent years have raised rather considerable transport difficulties.

Ammate

Ammate (ammonium sulphamate) is used to control small patches of some resistant weeds, and for quick elimination of woody shrubs. It is especially adapted to areas where toxic materials such as sodium chlorate are likely to endanger roots of nearby plants. Applied as a spray or dry at 3 to 8 cwt. per acre, the material costs \$70 to \$160 per acre.

Ammate, dissolved in water at the rate of 1 lb./gal., should be applied at pressures of 50 to 100 lb./sq. in. if possible, the undesirable growth being thoroughly wetted. Usually two applications are necessary before complete control is accomplished. As a foliage spray, it is recommended for control of woody plants that are not affected, by 2, 4-D or 2, 4, 5-T, or that are adjacent to sensitive crops.

The material has also proved successful for killing tree stumps and in the elimination of sprouts. It is sprayed or applied dry on freshly-cut stumps at the rate of approximately 1 oz. per inch of tree diameter. Used in this way, it inhibits the growth of sprouts and aids to some extent in rotting out the stumps.

It is showing some promise as a control for perennial grasses.

Ammate is corrosive, and, after using it, sprayers should be thoroughly washed. It is non-toxic and non-inflammable.

Borax

Borax is well adapted for the control of herbaceous weeds and grasses on areas round grain elevators, timberyards, oil installations, arsenals, warehouses, tele-

Fig. 1. A patho fc Californian thistle after spraying with hormone weedkiller. *D.S.I.R. Photo*

phone poles and in parking areas, tennis courts and driveways. The material is used mostly in the dry form, but can be sprayed. It is applied by a fertilizer spreader at the rate of 2,300 to 3,400 lb. per acre, costing $80 to $110 per acre for material.

Borax is recommended for the elimination of difficult perennials, but its use on crop land will be limited because the ground usually becomes sterile for some years after such heavy applications. On non-crop land, soil sterility may be desirable. It is not considered poisonous, is non-inflammable and is non-corrosive to ferrous metal.

Arsenicals

Those in most common use, sodium arsenite, arsenic trioxide and arsenic pentoxide, are water-soluble and are usually sprayed at the rate of 1,100 to 2,200 lb. of the chemical per acre, costing $90 to $180 per acre for material. The spray mixture is applied at 100 to 200 gal./acre. Leaching by rain removes soluble arsenic from the soil rather rapidly, so for maximum effect these chemicals should be applied during dry periods. Soil texture naturally affects the degree of leaching, so must also be considered in determining the dosage required. From one year to five years' sterility of the soil results, but, as they are highly toxic to man and beast, the use of arsenicals is very limited by safety considerations.

Coal-gas Tar Distillates

Coal-gas distillates and cut-back residues at 60 to 100 gal./acre can be very effective, but are costly, dirty, and constitute a fire risk on street walks and roadsides. A lighted match dropped on sprayed vegetation has been known to set off a blaze.

Soil Fumigants

The three main soil fumigants are (a) carbon bisulphide, (b) chloropicrin, (c) prochlor, which are used by placing 2 fluid oz. in holes 18 in. apart and 6 in. to 8 in. deep. At 1,100 lb. per acre, materials cost $90 to $225 per acre. They have been used for the control of deep-rooted weeds on land of high value and are mentioned in this paper merely as being indicative of an unusual direction of attack upon vegetable growth.

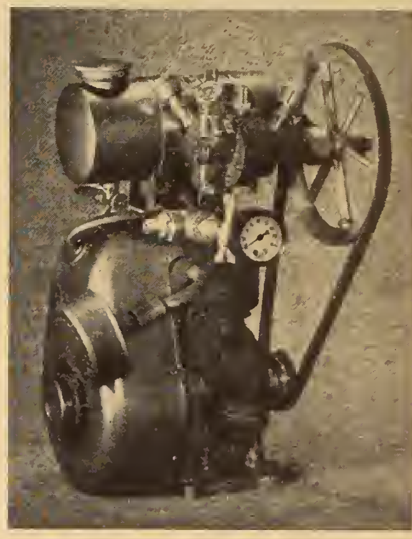


Fig. 2. Compact engine and pulp assembly. The pump has a built-in pressure relief valve.

Contact Herbicides

Dinitro Compounds

The most effective of these to date is ammonium dinitro-ortho-secondary-butylphenol when applied in oil or oil-and-water emulsion, using one or two gallons of the active ingredient per acre. The cost of materials ranges from $10 to $25 per acre. It is useful for the reduction of vegetation or "chemical mowing", so finds a place in giving quick temporary elimination of grassy and broad-leafed weed growth along highway ditches, railroads and fence rows where mechanical mowing is impractical. The chemicals can be poisonous to stock and to humans, and stain clothing and skin seriously, but are not corrosive to the usual metals.

Chlorinated Phenols

Pentachlorophenol and other chlorinated phenols are sprayed with an oil carrier at 20 to 40 lb. of the active ingredient per acre for destruction of above-ground growth. The total volume of spray liquid will usually be 50 to 150 gal./acre according to density of vegetation. As with all contact herbicides, any unwanted foliage must be covered completely, leaving no above-ground growing point to develop again. Cost of materials is $10 to $35 per acre. The phenols can be poisonous taken internally in quantity, can irritate eyes and skin, but are not corrosive.

Translocated Herbicides

(A) Non-Hormone-like

Trichloroacetic Acid (T.C.A.) — This is sprayed to control certain grasses and prickly pear cactus at a rate of 10 to 100 lb./acre, and costs about $25 up to $180 per acre for materials. The lesser dosage will retard or stop grass growth without killing, and is therefore used instead of mechanical or hand mowing to maintain vision of signs and guard rails on highways. Moist conditions are required to transmit it to the roots, and results vary according to the types of grasses. Soil sterility lasts 60 days or so, depending on rainfall. Cost of materials may be expected to fall on entering large-scale production. It is non-toxic and non-corrosive.

IPC.—This material, known chemically as isopropyl-n-phenyl carbamate, is one of the newer weed-killing chemicals which are promising but which are still in the experimental stages. It has given results in tests conducted for the control of perennial grasses, and at present should be used only for experimental treatments. It is sprayed at 4 to 10 lb. with 50 to 100 gal.

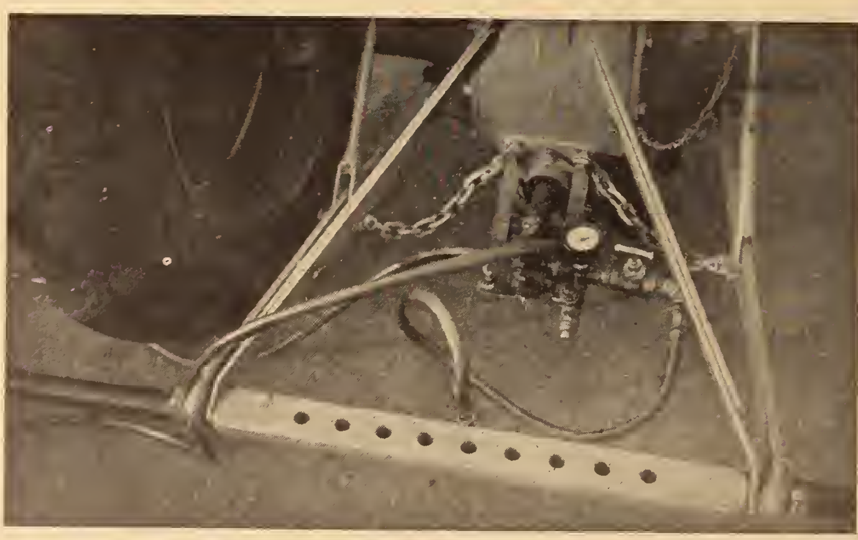


Fig. 3. Tractor power take-off unit.

of diesel oil to the acre. Cost of material is $35 to $70 per acre.

(B) *Hormones or Growth Regulators*

These products are now obtainable almost entirely from sterling sources and are neither poisonous, inflammable nor corrosive.

2-Methyl-4-Chlorophenoxyacetic Acid (M.C.P.A.).—This hormone is comparable with the sodium salt form of 2,4-D in its effect, and has its place in crop and pasture treatment. However, the engineer will be primarily interested in the esters of 2,4-D and 2,4,5-T discussed next. It has not yet proved possible to produce a workable formulation of an M.C.P.A. ester.

2,4-Dichlorophenoxyacetic Acid (2,4-D).—Spraying or dusting 2,4-D at 3 oz. to 4 lb. of acid per acre costs $1 to $4 per acre for materials.

If properly applied, the 2,4-D or its stimulus is translocated through the entire system of susceptible plants, thereby ensuring death of the complete specimens. There are three main groups commonly used.

(a) *Sodium Salts* (Powder forms).—The salt forms include the sodium salt of 2,4-D. This powder is easily transported and stored. Concentrations of 2,4-D acid up to 97 per cent are on the market. The mono-hydrate salt forms are completely water-soluble, mix with all types of water, but are not yet readily available in this country. These salts are excellent forms of 2,4-D for easy-to-kill weeds, especially for lawns, parks and cemeteries because of their stability. Consequently, they are the safest to use where desirable vegetation such as flowers and ornamentals are likely to be injured by spray fumes.

The main disadvantage of the 2,4-D sodium salts is that they are completely water-soluble, so that rain which falls within a short time following application tends to make them less effective. Judicious spraying with increased dosages and the addition of wetting agents make the salt forms more effective.

(b) *Amine Salts* (Liquids).—There are several forms of amine salts of 2,4-D. The basic acid is in this case dissolved in an organic alkali and makes a liquid concentrate. The amine salts of 2,4-D are water-soluble, making a clear solution. They are quite stable and are best for easy-to-kill weeds. Since these forms also are non-volatile, they are well adopted for spraying in lawns, parks, cemeteries, etc.

Occasionally when used in extremely hard water, especially in concentrated forms, some clogging of the nozzles can occur, owing to calcium and iron precipitates. The compounds are being improved by the addition of sequestring agents, so that this condition will not be troublesome in the future.

There are some disadvantages in the amine forms. They are not quite as effective on old or semi-resistant weeds as are the esters. On the other hand, they are not quite as harmful to the plants among which many weeds grow. Being water-soluble, they should be applied when spraying conditions are favourable, so that the material is not washed off by rain. In this respect they are less affected than are the sodium salts.

(c) *Esters* (Liquids).—The esters of 2,4-D, sometimes referred to as the oil-based forms of 2,4-D, will usually prove the most effective of these weapons for the engineer. The esters are made by combining 2,4-D acid with methyl, ethyl, isopropyl, butyl and amyl alcohol.

They are recommended specially for the control of weeds along roadsides, ditch banks, fence rows, railroad embankments and pastures where the primary under-cover is grass.

The esters have given better control than the other forms on deep-rooted perennial weeds, on harder-to-kill weeds, and on woody growth. Experimental work has not progressed far enough to show outstanding difference between the various esters.

Fig. 4. Spray machine and 17-ft. 10-in. articulated boom.

As a group, the ester forms are much more effective than are either the salt or amine forms in midsummer and midwinter. They make emulsions in combinations with water, or mix with oils and penetrate the leaves quickly, and so are not washed off to any great extent by rain. Since they are the most potent of the 2,4-D compounds, much smaller quantities are needed. This very often makes them one of the cheapest forms of 2, 4-D to use.

The chief disadvantage of the ester forms is that more damage will result from over-dosage than when either the amines or salts are used. Sometimes, when extensive or careless spraying is carried out, drifting fumes will injure desirable plants such as tomatoes and legumes of various kinds at some distance from the spraying site.

2,4,5-Trichlorophenoxyacetic Acid (2,4,5-T).—This acid is a very valuable adjunct to 2,4-D. It also is not harmful to grasses at moderate dosages, but will control some growth that is resistant to 2,4-D. It appears from recent tests that brambles, including blackberry, are susceptible and that 80 per cent to 100 per cent control can be obtained. In this case it is most important that the stems be treated rather than the leaves. Older bushes lend themselves best to attack either by high-pressure high-volume spray application to drive past the leaves on to the stems from above, or low-volume medium-pressure internal application by special appliances—*e.g.*, the blackberry spear. Up to 1 gallon of the concentrate per acre, at a cost of about $17, is needed. The 2,4,5-T should be mixed with water for high-volume and with dieselene for medium-volume treatment. The cost of the material may be expected to fall as the scale of production rises.

Another effective treatment method is to mow the brambles, leaving stumps about 9 in. above ground level, and then to spray the freshly-cut surfaces and the stems right to the ground.

The time to treat uncut bushes is summer and autumn; stump treatment, according to overseas experience, is effective at any time.

When to Spray with 2,4-D and 2,4,5-T.

Generally speaking, vegetation is most susceptible to 2,4-D when the plants are young and about 3 in. to 6 in. high. Late frost or a warm dry spring may harden off many young plants prematurely so that they are more difficult to kill with ordinary concentrations of 2,4-D.

If weeds in pasture, fence rows, ditchbanks and roadsides are sprayed when they are relatively young, considerable material can be conserved.

Perennial weeds should be sprayed not earlier than at the bud stage, and regrowth appearing from perennial roots should be sprayed again when rosettes are from 3 to 8 in. high. On annual weeds, one spraying is usually enough to kill all existing plants; on perennial weeds, several sprayings are usually required before complete control is accomplished. It has been proved that the most tenacious perennial can be exterminated by six-monthly spraying over a period of three years.

Brushwood should be allowed to leaf out completely before it is sprayed. If sprayed too soon, it is often merely defoliated and not killed.

Weeds and Their Reaction to 2,4-D and 2,4,5-T

The stage of growth at which weeds are sprayed is very important. Many weeds which are sensitive to 2,4-D in the seedling or early-growth stages become only moderately sensitive and some even semi-resistant as they become older. Older weeds, which have been hit by a late frost, weeds which have been growing under dry conditions, or weeds with a lot of dust on the leaves are usually harder to kill with 2,4-D than when they are growing fast and have plenty of moisture and nutrients available. Results may not be apparent even up to three months after treatment; the reaction can be very slow (particularly in winter), but none the less sure.

Application of 2,4-D and 2,4,5-T

For chlorates, arsenicals, ammate and others, high-gallonage application is still necessary—*i.e.*, 200 to 500 gal./acre. For 2,4-D as little as 2½ gal./acre can be used under most favourable conditions, though 8 gal./acre is a general recommended rate. In spraying, it is the 2,4-D which does the killing; the water is only the carrier. The same amount of 2,4-D in 100 gal. of water per acre or in 5 gal. will give equal results, but the concentrated spray saves water hauling, size of equipment and time. The acid equivalent or pounds of 2,4-D acid per gallon of mix is the measure of concentration both by manufacturers and users, whether of salts, amines or esters. It should be noted, however, that the relative effectiveness of these three forms of 2,4-D is roughly 100, 120, 160.

Application of 2,4-D can be made in two ways—as dust or as spray. There are many dust-spreading machines and hand appliances, but this form of treatment is not recommended except in back country because there is too much danger of material drifting to susceptible plants. Sprays will settle much more quickly, particularly the oil-based types.

Knapsack Sprayers

Knapsack sprayers are inexpensive, are easily handled and carried, and can be taken to inaccessible areas. They are excellent for small patches, and with concentrated sprays and low-volume nozzles, extensive areas can be covered with one fill of solution. With the low-volume nozzles, one disadvantage of an 8-gal. pressure-type sprayer, that of frequent re-pumping, is largely eliminated. There are sprayers on the market which can be carried and pumped at the same time, eliminating the need for putting down the sprayer to pump it up, but they are tiresome for continued use. The knapsack sprayer is inadequate for extensive areas, but it is useful for spot spraying, and for spraying in lawns, parks, cemeteries, along fence rows and round buildings.

Small Power Plants

Small power units, consisting of an engine and a pump, are easily made and transported. They can be carried in a pickup, sledge, trailer, tractor or truck along with the spray solution and booms or hand guns. Such units are relatively inexpensive and they save much time and labour in pumping.

The main disadvantage of the small portable unit is that a vehicle must be used for transportation while spraying. However, portable units are often more convenient than tractor-mounted units because they can very quickly be removed from the conveyance. These units can feed a number of hand appliances.

Tractor Attachment Units

The main advantage of a tractor attachment unit is that the tractor furnishes both power and transportation. Booms and hand guns are easily carried. With concentrated weed sprays such units—carrying from 50 to 100 gal. of solution on the tractor—are able to spray from 5 to 10 acres without refilling. For ease in moving, 15 to 20 ft. booms are usually best, although in level areas additional extensions to cover wider reaches may be advisable. Several hose lines with hand booms, wands or guns can be served from the pumps.

Turbine Blowers

Spray mix injected into the air stream from a turbo-blower gives a cloud of fine spray that can be directed into dense growth on public utility rights-of-way, on roadsides, on fire-breaks, or in forestry plantations. This is a quick and efficient method of application in locations clear of sensitive crops, shrubs and trees, but has the same drawback as dust applicators—*i.e.*, danger from wind drift.

Aircraft Units

Application by aircraft is a professional job to be done by experts, and has found favour in many areas because it saves so much time (60 to 100 acres treated per hour) and permits spraying when the ground cannot support heavy spray machines or the country is not readily accessible. Concentrated sprays are always used, preferably unified with oil.

Spraying must be done when air currents are relatively still. There is a great hazard to nearby crops, gardens, shrubs and trees because of drift and occasional failure of valves to cut off the spray mixture as the plane leaves the area. Application by aircraft should properly be restricted to locations where there is a minimum of sensitive crops in the vicinity, with ample allowance made for spray fumes and drift. Flag-men or smoke markers must be used to guide the plane when flying to and fro, and suitable landing places must be within handy reach of the working area. A helicopter is ideal for treating brushwood and willows, as the down draught from the propeller drives the spray in past the leaves.

Woody Growth

Second only to the control of annual and perennial weeds is the use of 2, 4-D and allied chemicals on woody growth. Extensive trials and fairly wide testing of the use of chemicals promise considerably lower costs as well as more permanent eradication than where scrub or tree growth is slashed or handled mechanically.

As with other plants, woody growth varies considerably in susceptibility to 2, 4-D. Most species of willows are very susceptible at all stages of growth. Poplar shows more resistance, especially as the tree increases in size; poplar saplings to a height of 4 ft., or thereabouts, are more susceptible than trees 12 to 20 ft. high. Most of the hardwoods—oak and ash especially — are classed as resistant; likewise some of the shrubs such as wild rose and brambles. These latter, however, succumb to 2, 4, 5-T.

While many excellent "kills" of willows, to a height of 20 to 40 ft., have been obtained with cover sprays, treatment at a much younger stage of growth is recommended. This holds especially for all less susceptible woody growth. Best results will follow treating woody growth up to three or four years of age. "Cut-over" land is best sprayed a year or two after cutting and while regrowth is still growing actively, and is sensitive to the action of the chemical. A solution of 2, 4-D ester (5 per cent or stronger) applied to the surfaces of stumps and canes will kill some trees and shrubs that are tolerant to foliage sprays.

Owing to the dense and large amount of leaf and stem surface to be covered when treating trees, considerably more water per acre is desirable than for ordinary weed spraying, and higher pressure facilitates penetration of dense foliage.

Three methods of applying sprays to woody growth are available. The boom sprayer, as used for flat lands, has not proved very satisfactory for woody growth, owing to limited coverage, varying heights of growth, the problem of obstructions met with along roads, etc. An adaptation of the boom rig, employing an extended flexible boom reaching well over the ditch or roadside, is in quite general use in Eastern Canada.

A power sprayer, employing two hose lines and equipped with four-nozzled hand booms, has given fairly satisfactory results on limited-sized jobs. For any considerable mileage this method will be found too slow and costly, as well as giving "patchy" results.

The turbine-type machine, using an air blast into which is fed the chemical solution, is particularly well adapted to treating roadways, ditches, power and telephone rights-of-way. A blast of spray can be directed upward, downward or parallel to the machine as desired, for a distance of 50 to 60 ft. The air blast will work away from or sideways to, but not directly into the wind.

When considering the turbine type of sprayer, two factors should not be overlooked — the rapidity with which the work can be covered and the cost of operation. Ten or more miles of roadway can be treated daily. Not including chemicals, the cost of application will be about $25 per day. It would seem advisable for two or more municipalities to co-operate in the purchase and operation of this type of machine. It is possible that contract sprayers may be ready to take on work of this kind, whereby a large overhead outlay could be avoided.

Approximately 1½ to 4 lb. of acid of 2, 4-D per acre are recommended for mixed woody growth. In the case of willows, satisfactory results have followed the use of lesser amounts. The addition of 5 per cent to 10 per cent diesel fuel oil to the spraying speeds the kill, and may result in more effective eradiction. The ester form of 2, 4-D is recommended. Preliminary trials indicate that the addition of equal parts of 2, 4-D and 2, 4, 5-T may be advisable where woody growth resistant to 2, 4-D is encountered. Gorse is a case in point. Trials show that, where leaves and foliage are completely covered with this spray, very good control may be expected. The problem of "old man" gorse is best handled by first burning off in the autumn, or, better still, felling and burning. The burning cracks the hard seed, which can remain fertile 50 years in the ground before germinating. The dense resultant regrowth in the following late summer is then readily treated. The cost of materials should not exceed $15 an acre. Adult standing gorse would require much greater quantities of liquid and it would be very difficult to ensure complete coverage of all stem and leaf surfaces. The dead stand of trunks would still have to be dealt with. If it were fired, the subsequent seedling growth would be intense.

Information on how late in the season woody growth can be treated is rather limited. In general, treatment may start any time after the trees and shrubs have leaved and while growth is rapid. Where it is desired to destroy weeds along with woody growth, it may be necessary to delay spraying until the weeds have started to grow.

Except under ideal conditions for treatment, complete coverage followed by 100 per cent "kills" can hardly be expected. Retreatment a year or two after initial application, whereby misses and re-growth are picked up, should assure nearly complete eradication of all growth susceptible to the chemical. Surface sowing of grass seed over treated areas will help to establish competition which will go far to prevent weed and tree re-establishment.

Not much information is available on cost of treating woody growth. The Manitoba Drainage Maintenance Board reported to the Second Western Canadian Weed Control Conference as follows:

"Woody plant growth in drainage channels and roadsides can be effectively and economically controlled by treatment with 2, 4-D formulations. Comparative costs of chemical and mechanical control are as follows: Chemical control, two applications, approximately $14 per acre — this includes cost of chemical. Mechanical control (men with brush hooks and axes) approximately $50 per acre. Chemical control, in addition to the saving in cost, is also more permanent, as it kills the roots of the plants."

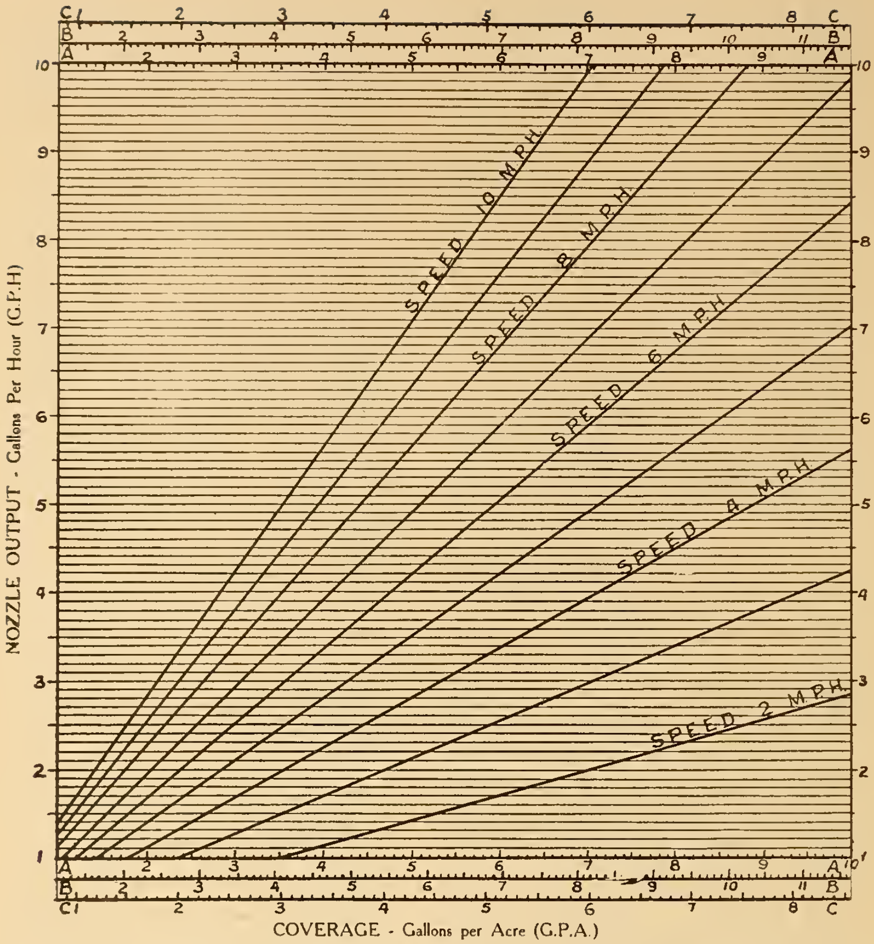


Fig. 5. Chart relating coverage and speed to nozzle output. Use scale A-A for 14-in. nozzle spacing, scale B-B for 12-in., and scale C-C for 16-in.

Engineering Applications

Engineers will find their own personal problem within one of the main categories given below. It should be remembered always that chemical weed control, particularly with the hormone-type products, is no slapdash simple operation. For best economy, careful experiments, research and records are vital and will pay handsome dividends. Concentrations, times of application and quantities of liquid should be varied, and the weather, temperature, humidity, soil type, rainfall before and after, and even time of day, should be noted. Not only the quantitative infestation of the dominant weed species and the results thereon, but also the same facts relating to incidental weeds, should be recorded. If such records are kept, in a year or two the engineer will have determined the minimum dosages and the best times and circumstances for optimum results under the particular conditions of soil and species in his own locality.

The Municipal Engineer

The chipping of grass and weeds along gutters, roadsides, kerbs and footpaths will soon be a thing of the past. The consequent loading and disposal of the spoil will no longer be needed and the dust nuisance will abate. T.C.A. and I.P.C. both hold promise of safe, economical control of grasses and weeds in the near future. At present, owing to the fire hazard allied to chlorates, the danger of arsenicals, and the staining of walls and apparel by tar products, the best solution is a mixture of 2, 4-D and pentachlorophenol in an aromatic oil base. This costs about $17 per acre for materials and will eliminate almost all low growth except some perennial grasses which are killed to the ground surface only. A spring and autumn application, however, will keep all growth well under control if applied at the rate of about 20 gal./acre. It should be applied to damp the whole surfaces of the growth, using a knapsack sprayer, a roller sprayer, or a power-operated hand wand.

A knapsack sprayer with low-volume nozzle wand will control fennel and hemlock, using 2, 4-D, gorse using a brushkiller of 2, 4, 5-T plus 2, 4-D, blackberry using 2, 4, 5-T alone.

Roadside embankments and cuttings should be trimmed of bushy growth in the autumn then sprayed with brushkiller in the following summer. Parks, cemeteries, golf courses and sports grounds can be cleaned of most weeds by spraying with the roller sprayer or a power rig in the spring. Hospital, school and institution grounds can be similarly treated.

County and Highway Engineers

Noxious weeds, such as ragwort, should be spot-sprayed with 2, 4-D through a knapsack sprayer. Weed and brush can be controlled with a tanker truck mounting an articulated boom on one side together with two long hose leads for reaching inaccessible places. A turbo blower may be used when clear of crop lands; a bushkiller mixture (2, 4-D plus 2, 4, 5-T) is used. Tests so far show it advisable to spray blackberry with 2, 4, 5-T alone for economy. Grasses are not affected by normal dosages of these hormones. Treated areas should be sown and fertilized if necessary to establish a strong turf which will inhibit seedling growth of weeds.

Railways

Right-of-way treatment is similar to that for highways. Track treatment, however, seeks elimination of all weeds, and has in the past been done with chlorates or arsenicals. North American practice now favours 2, 4-D fortified with pentachlorophenol in dieselene at the rate of 16 gal./acre. This cuts down all vegetation on the permanent way, but will not eliminate certain grasses, on which T.C.A. is used where necessary. For economic use of the chemicals, the hoe should be used on erratic "old man" growth.

Plant investment, maintenance and operating costs of chemical treatment as against hand or mechanical control on the permanent ways of the New Zealand Railways are approximately in the ratio of two to three. The figures refer to the use of chlorates in high gallonage spraying. The application plant consists of an A.B. engine, crew accommodation carriage, materials wagon, mixing wagon, 6,000 gal. tank wagon, and finally the pump and spray wagon. Using chlorates, the 6,000 gal. of spray mix covers about 20 miles at a speed of 25 m.p.h. The chlorate at 1 lb./gal. costs $28 per mile at the new dollar exchange rate.

Experiments using the 2, 4-D mix with this spray train have proved that the 6,000-gal. tank will serve for 200 miles of track at the same speed of 25 m.p.h. with equal control at a cost for materials of under $17 per mile. It is possible that this low-volume treatment will permit the use of small district equipment giving more flexibility of application in keeping with local requirements.

Public Utility Rights-of-way

Noxious weed treatment is similar to the county and highways remedy. The bigger problem is to keep ground growth from threatening overhead lines or smothering above-ground pipe-lines, and to keep the routes clear for inspection, maintenance and repair patrols. The 2, 4-D plus 2, 4, 5-T brushkiller is now widely used for this abroad at about 100 gal. of spray per acre. Truck or tractor-mounted units operate in easy country using turbo blowers, spray guns or hand wands. Rough country calls for knapsack or helicopter application.

Catchment Boards

Willow control is the prime concern in this case. The action of 2, 4-D in killing right to the roots is nowhere more important than in the elimination of resprouting of treated willows. Various species show differing degrees of susceptibility. Foliage spray is economic for growth up to 8 to 10 ft. high. Old growth may be dealt with by painting freshly-cut stumps or by frilling (*i.e.*, cutting and opening back the bark to expose the cambium layer all round) and pouring in 2, 4-D concentrate. Intermediate growth is often handled by spray painting 2, 4-D concentrate in a 2-ft. band around the trunk just above ground level. Drilling a hole in the trunk or stump and pouring in concentrate is variable in its results. Spraying from aircraft has of late given very satisfactory results abroad.

Influences peculiar to each district require that each catchment board conduct a wide range of experiments itself if best economy and effects are to result.

Drainage Boards

Irrigation channels and waterways are now threatened in parts of this country with the deadly water hyacinth, for which 2,4-D is possibly the only answer, and a very ready one. It is reported non-toxic to fish in concentrations far greater than likely to be encountered in water-wheel control. Chlorinated benzenes and special emulsions of solvent naphthas have been very successfully used for the control of submerged aquatic weeds, so allowing for freer flow in the channel. These materials, however, are slightly toxic to fish.

Forestry

Firebreaks must be kept clear of rank vegetation, scrubland cleared for planting, competitive growth eradicated from amongst standing timber. In some cases even grasses must be eliminated from firebreaks. 2,4-D and 2,4,5-T in oil provide the best answer to date.

Soil Conservation

2,4-D and 2,4,5-T enable the eradication of undesirable growth without detriment to the establishment of a protective grass cover. An abandoned field in Norfolk, U.S.A., with an eight-year-old brush cover of elder, birch, willow, aspen, blueberry, maple and spirea was cut over in the autumn and the largest stumps painted immediately with esters of 2,4-D and 2,4,5-T. Subsequent sprouting foliage was sprayed in the spring and the field converted to semi-natural grassland in twelve months. The quantity and duration of re-spraying will relate directly to the amount of hard-to-kill species that may have been present in the original cover.

Low-volume Nozzles

Were it not for the development of delicately precise low-volume nozzles, hormone-type weedkillers would have doubtful virtue over older chemical treatment methods.

The primary function of a nozzle is to deliver a uniform coverage with minimum fogging on a plane area when working at a constant pressure and travelling at a constant speed. To this end, where multiple nozzles are used, each nozzle of a specified size or output must rate exactly as the others over the whole range of working pressures. This is where some years of painstaking research and the evolution of expensive machinery have at last attained a measure of perfection.

The first efforts were directed at the solid and the hollow cone. It is obvious that in translatory motion neither of these jet shapes can give uniform coverage. The solid cone in travelling concentrates too much spray mix in the central area; the hollow cone too much towards the outer edges. This led naturally to the more difficult manufacturing proposition, the fan-shaped jet.

Three methods are adopted in the production of the fan-type jet:

(1) Two impinging circular jets as in the fishtail gas burners.
(2) A circular jet deflected from a dead smooth inclined surface.
(3) Partial penetration into the sharp angle of a V-cut by a conical hole from the rear. This gives a lemniscate orifice.

No. 1 is the principle of the Bray gas jet. The fine orifices are too easily blocked and difficult to clean. The "spread" is too uneven. No. 2 is adopted by the Kromer Co. in U.S.A. and is not unsatisfactory. No. 3 is the most favoured method by the bigger nozzle manufacturers in the U.S.A.—*e.g.*, Spray Systems Co., Spray Engineering Co., and the Monarch Engineering Co. Earlier efforts were partially frustrated by a thick outer edge to the spray jet from the lemniscate orifice, but the above firms have now overcome this problem to a greater or lesser extent. The disadvantages of the products of the two first companies are:

(a) The feather edge of the orifice; this results in wear and alteration of capacity after a period of use.
(b) A multiplicity of parts to the nozzle, leading to possible losses in the field when clearing blockages, etc.

The Monarch Engineering Co. claim that their orifice is a thickened edge product 12 times that of the edges of other brands. There is one invaluable feature, namely, the one nozzle housing (body and cap) will accommodate any one of a whole range of interchangeable tips (low-volume fan, hollow cone, solid cone, and high-volume fan). It is this nozzle that finds widespread use in New Zealand, as tips alone may be imported and the housings manufactured locally, thereby eking out dollars.

The range of these Monarch interchangeable tips runs from as low as 0.84 gal./hr. output up to as high as 300 gal./hr.

To relate nozzle size, speed of travel and coverage in gallons per acre there is a simple handy graph illustrated in Fig. 5, page 186.

There are three methods of mounting nozzles on the spray boom so as to reduce loss of spray mixture after shutting off. (N.B.—It is not wise to attempt to screw a nozzle directly into a boom. The wall thickness of tubing is not sufficient to give enough threads to prevent leakage.)

(1) Insert and weld the nozzle holder well up into the boom tube.

(2) Use an inverted U to draw off from the top of the boom.

These two methods trap any loose scale or grit in the boom but limit drip only partially. They are of little effect in the latter respect on sloping ground.

(3) The best safeguard is to use a ball check valve in combination with (1). It is inserted above the nozzle and comprises a spring-loaded valve that automatically closes when the fluid pressure drops to 10 lb./sq. in. Its use is essential for aircraft spraying to prevent spray falling on sensitive crops, etc., when the plane is manoeuvring between working runs.

The Low-volume Fan Tip is generally to be preferred for weed control spray booms. It gives better penetration and less fogging than the cone type.

The Low-volume Hollow Cone Tip is preferred on hand wands by many users. It gives better atomization than the others.

The Solid Cone Tip is useful for spot spraying and for applying oil sprays. It is best for drenching work with hand appliances.

The High-gallonage Tip is useful for all purposes requiring the application of larger volumes of liquid.

Always check nozzle output with the pressure gauge readings on the machine and do not rely on makers' rated capacities. Rated capacities are based on water spraying, and the output with oils, for instance, will be different. Again, all pressure gauges are not always accurate. Re-check output occasionally according to severity of use. In time, wear on nozzle tips will increase output.

The orifice of these tips has a delicate edge so *do not use a needle* to free blockages. A toothpick or toothbrush is suggested.

Before operating a new machine in the field with hormone sprays, run the liquid through the system for, say, half an hour, collecting the spray in containers under each nozzle. This will free any dirt, grit, filings, etc., that may be in the system and so will eliminate stoppages in the field itself.

Clean tips after each day's use by boiling for half an hour in "Basol 88" obtainable from most dairy supply companies. Dust and oil can build up round the orifice and deform the shape of the jet.

Never lay the boom on the ground; store it in a clean place.

For users having a "Holland" or "Dragon" knapsack sprayer there are available special nozzle housings designed with all the interchangeable tip features and for direct fitment to the wands of these sprayers.

It has been found that humidity and plant and ground moisture as well as plant physiology play a part in determining the effectiveness of hormone sprays. This accounts for a large proportion of the failures on some occasions when applying spray mix at 2½ to 5 gal./acre. The other prime factor is time of day. Operations before noon will generally be good; in the afternoon, less so, particularly towards evening. Hence the recommendation for the general user is now to spray at not less than 8 gal./acre.

Some recommended tip sizes for various purposes are given above. Expert operators know under what conditions the following liquid rates can safely be reduced.

	Rate (gal./acre)	Monarch Fan Tip No.
Crop and Pasture Weeds...	8	32
Ragwort, not less than....	20	46
Dinitro Products, not less than	30	59
Gorse (with water)	80	67
Gorse (with dieselene)	30	59
Blackberry (with dieselene)	30	59
Blackberry (with water)...	80	67

For blackberry work it is most important to spray the stems rather than the leaves. To facilitate this a special blackberry spear has been developed. A triple nozzle head sprays a 180° fan, highly atomized and of 3 ft. radius. It is hoped that working at 40 lb./sq. in. pressure or more, less liquid and less concentrate will give control equal to that obtained by the higher rates listed above.

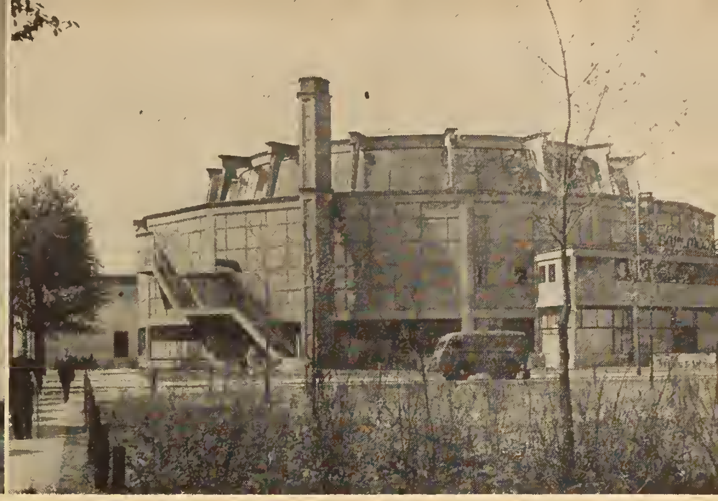
Finally, mention should be made of z.i.p., comprising a zinc organic complex in polyethylene polysulphide (p.e.p.s.), a new chemical which, applied to ground growth, or to trees, makes them repellant to destructive animals. Rabbits, opossums, deer or livestock will not touch grass, crops or trees so sprayed. The chemical is non-poisonous and the effect lasts up to three months, according to the rate of growth of the vegetation.

In conclusion, it must be remembered that these growth regulator compounds are not magic chemicals. There are still some shortcomings, disappointments and pleasant surprises in their behaviour. They are still very new and we really know very little about them. But they are in the process of revolutionizing the control of misplaced growth. Thanks to the chemist, the prophecy that man would ultimately succumb to the overpowering progress of weeds and insect pests is now confounded in the first as well as the second respect.

Contemporary Trends in Building Design in Europe

The headquarters library has recently received a number of illustrated brochures from the International Information Centre for the Building Industry (Bouwcentrum) at Rotterdam, Holland. A few representative examples have been reproduced on the facing page in response to suggestions that Canadian engineers are interested in what their contemporaries in other countries are doing.

The file which presently includes data sheets on 24 outstanding examples in European building practice may be obtained from the library under the usual loan conditions. For further information readers should write directly to Bouwcentrum, Diergaardesingel, Rotterdam, Holland.



European Building Design

Fig. 1. (Top, left) Van Nelle's tea and coffee factory, Rotterdam, Holland, completed in August, 1929.

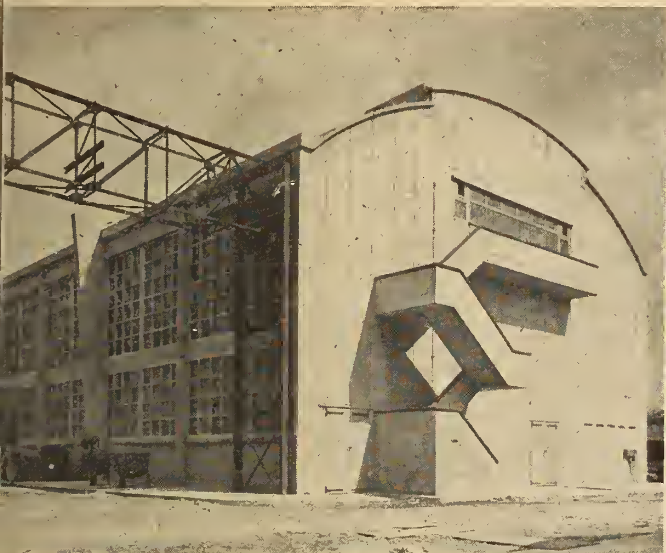
Fig. 2. (Top, right) Exhibition building and restaurant at the International Information Centre and permanent exhibition for the building industry in Rotterdam, completed December, 1948.

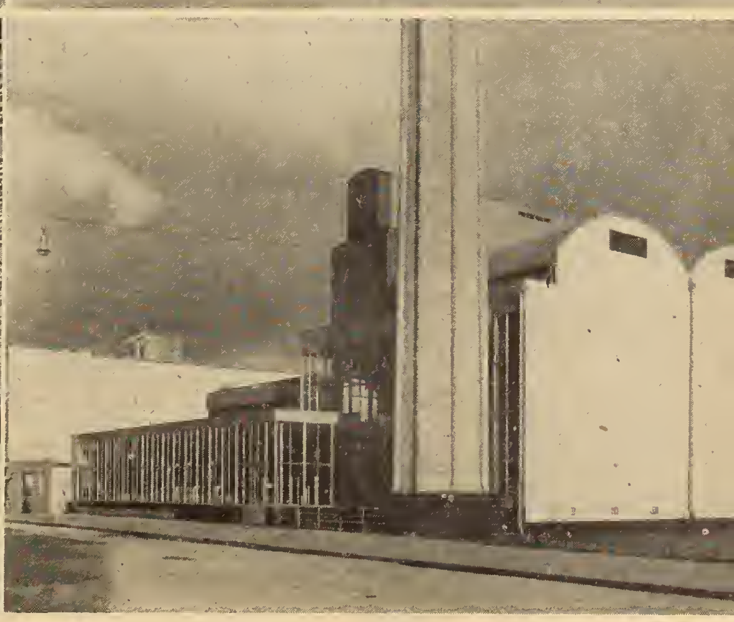
Fig. 3. (Centre, left) Chemical factory of Messrs. May and Baker, Dagenham, England, completed in July, 1948.

Fig. 4. (Centre, right) Shell-Nederland office building. The Hague, Holland, completed in October, 1941.

Fig. 5. (Bottom, left) Main hall of the stock exchange in Rotterdam, Holland, completed December, 1941.

Fig. 6. (Bottom, right) A powerhouse at Van Nelle's tea and coffee factory, Rotterdam, Holland.





FROM MONTH TO MONTH

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

Manpower Controls

The creation by the Federal Government of the National Advisory Council on Manpower will be of interest to all Canadians. The terms of reference as reported in the press are very general, but it may be that the Council itself or the officials of the Department of Labour have more specific ideas as to what has to be done and how it is to be done. According to press and radio the Council is "to advise the government on how to make the best use of Canada's available labour resources in the face of the developing shortage of manpower, created by defence production and military requirements".

The Council is made up of four representatives of labour and four of employers, two each from agriculture, women and the veterans. The balance of fourteen comes from the government services. The joint chairmen are Arthur McNamara, Deputy Minister of Labour and Norman Robertson, clerk of the Privy Council.

It is reasonable to expect that the word manpower includes the professions, but the specific representatives of the group, other than for agriculture, are all officers of trade unions. There is no reference to the professions or the universities but agriculture is singled out to have two representatives. Likewise the veterans have two representatives although they cannot possibly represent any specific division of labour as far as occupation is concerned.

It is to be hoped that the professions are not to be neglected or that their interests are not to be delegated to the trade unions. In the professional groups the engineers and the scientists are going to be important and early consideration as to their disposal or control is essential if in an emergency the waste that was experienced in the last world war is to be avoided.

One of the four members representing employers is Albert Deschamps of Montreal, an engineer of distinction who many times has served his government in their need. Members of the profession will be well pleased with his selection, and perhaps his presence on the Council can be taken as some representation for them. Incidentally Mr. Deschamps is the Treasurer of the Institute.

There are three more engineers on the Council representing government services. These are Marc Boyer, M.E.I.C., Deputy Minister of Mines and Technical Surveys, Hugh Young, Deputy Minister of Resources and Development, and E. L. M. Burns, Deputy Minister of Veterans Affairs. Although the selection of these four gentlemen has been made without regard to their professional status, it is of some comfort to know they are there.

In the writer's opinion it would have been a better arrangement if the advisory group had been selected entirely from persons outside of government service. With over 50% of the Council membership chosen from and at the deputy minister's level, it seems a bit inconsistent that the terms of reference should say the Council "is to advise the government". In other words, this is to say that the government is to advise itself. If it is advice that is wanted it should be sought outside of government circles. Civil servants, even at the deputy minister level, are not ordinarily thought of as advisers to the government. They are the administrators who should be seeking outside advice to add to the knowledge that is theirs by virtue of their ministerial duties.

Including the joint chairmen the

Cover Picture

This month's cover photo shows a crew pouring steel ingots at Sorel Industries Limited, Sorel, Quebec.

At left is a laboratory observer carrying an optical pyrometer. Such men are all graduate metallurgists and their job is to check and record accurately every step in the operation of making steel so that at no time can there be any departure from specific procedures.

ouncil consists of 30 members, 16 f whom are in the government ervice. It does seem like an unsual arrangement.

The Institute has expressed its nterest and concern in this matter y means of a letter addressed to he Hon. Milton F. Gregg, Minister f Labour. Mr. Gregg replied romptly by telephone and exressed appreciation of the Instiute's interest but did not indicate hat any change in the make-up of he Council was contemplated.

At the regional meeting of the ouncil of the Institute held on ebruary 17th at Shawinigan alls, it was agreed that further onsideration of this matter would e assigned to the Committee on Professional Interest with power o act.

Herewith is the letter to the Minister:

Montreal, Feb. 6, 1951

The Hon. M. F. Gregg, v.c.,
Minister of Labour,
House of Commons,
Ottawa, Ont.

Dear Mr. Gregg:

The newspaper announcement of the creation of a National Advisory Board on Manpower is of more than usual interest to the officers of the Institute. It seems like a move in the right direction.

However there appears to be one serious omission in the representation. We can find nothing relating to technical manpower. It may be that this is included in the Civil Service representation but we feel that like labour, employers, agriculture, women and veterans this form of representation should come from outside of the Civil Service or the departmental representation.

We are confident that no one appreciates more than you do the vitally important part which must be played in the ominous future by engineers and scientists. Perhaps it is the most essential group in the whole combination of helpful forces. It seems to us that the Advisory Council should have a clear representation for this group.

Personally I feel that an Advisory Council would be most effective if it were made up entirely of representatives outside of government, with representatives of certain governmental departments designated as assistants or aids to the Council.

It may not be possible at this late date to rearrange the Council even though favourable consideration were given to this proposal and therefore we urge that immediate attention be given to having adequate representation on the Council for engineers and scientists.

Yours sincerely,

(Signed) L. Austin Wright,
General Secretary

The Tariff on Engineers' Plans

Back in June, 1946, the Federal Government by means of Tariff Item 180e removed the tariff on several classifications of engineers' plans. In response to the urgent request of several members, the Institute protested this action both promptly and emphatically. There was a long exchange of telegrams and letters with the Minister of Finance but no real action took place until January 30th, 1951. On this date the Tariff Board held a public hearing at Ottawa to consider the method of valuing plans for customs purposes, and to hear argument for or against the 1946 changes.

The Institute's Committee on Professional Interests prepared a brief, and presented it at the hearing. It is impossible to know what the Board's recommendation will be, at least not for some weeks, and perhaps not then. However, the hearing was an interesting affair, and presented a good picture of democracy at work. It is too bad that it had not taken place before the tariff was removed in 1946.

On frequent occasions the *Journal* has reported on this matter. All the arguments in favour of at least a partial restoration have been given. It has been discussed with the executives of all the branches and talked over at great length with officers and members who had a particular interest in it. Therefore it is hardly necessary to review it in detail again, but it is believed by the committee that the brief itself should be presented to the membership—and so it appears herewith.

At the hearing certain points were raised, upon which the Institue was asked for an expression of opinion. These points were covered verbally before the Board and were confirmed later in writing. The letter covering these points also is presented herewith.

It is interesting to observe at this late date that the block of industry (at least 30 companies) which opposed the Institute's stand before the Board, seemed not to have a clear picture of what the Institute was asking for. Even after the brief had been presented, some company representatives failed to recognize that the Institute's plea was indeed reasonable, and not harmful to them.

It is the opinion of many who are familiar with it, that if the proposal had been discussed back in 1946 as it was in 1951 there would have been no difference of opinion at all. Industry has a good case and the Institute admits it, but 180e went too far—even beyond what certain industries had requested. All this would have come to light at that time and much misunderstanding been avoided, if the government had consulted the engineers as well as the industries concerned, back in 1946.

It is the Institute's hope, now that everything had been brought out in the open, that the interested industries will no longer think that the engineers were unreasonable or thoughtless of the welfare of Canada.

Another pleasing feature of the whole experience was that it afforded several engineering organizations an opportunity to demonstrate their ability to get together on a matter of common concern. The Institute was pleased to be so closely associated with the Corporation of Professional Engineers of Quebec and the Canadian Construction Association, and with other provincial associations which had taken an interest in the subject.

Herewith are the documents presented by the Institute to the Board:-

January 29, 1951.

The Tariff Board—Canada,
Connaught Building,
Ottawa, Ontario.

Reference No. 111

Gentlemen:-

The Engineering Institute of Canada appreciates this opportunity to present to the Tariff Board its views on tariff items 180 and

180e, by which last mentioned item the tariff on certain types of plans or designs produced by engineers, was removed in 1946.

In order to better understand the Institute's wide interest in this question, may we present the following information. The Institute was established in 1887. It operates through thirty-three branches spreading from St. John's, N'fld. to Victoria, B.C. Its membership of over 14,500 is made up of professional engineers and students of all branches of the profession such as mechanical, electrical, civil, chemical, mining and so on. It has a broad interest in the affairs of the profession and of Canada.

In asking for the restoration of this tariff in certain cases and a change in the basis of evaluation, the Institute is acting in the interests of the profession, but believes that the best interests of other groups as well, will be provided for, if the recommended changes are made. These groups include general contractors, manufacturers and architects. In studying the problem the Institute has been in close collaboration with the Canadian Construction Association and the provincial associations of professional engineers; particularly the Corporation of Professional Engineers of Quebec.

In the four and a half years during which the matter has been before the Council of the Institute, it has been discussed with every branch from coast to coast. There has been an unanimous support for the proposals which the Institute now proposes to make.

In order to have a further and final consultation with members, the Committee on Professional Interests to which Council has referred this matter called a meeting on Thursday, January 25th at the Headquarters of the Institute in Montreal to which were invited representatives from a wide variety of interests including consulting engineers, general contractors, industry, professional organizations and the Canadian Manufacturers Association. Tariff Item 180e was discussed in considerable detail and from many aspects. Eventually a completely unanimous conclusion was reached which conclusion forms the basis of the Institute's proposal with regard to this Item.

There are several strong arguments to support the proposal, but it is believed they can be better appreciated by the Board if the proposal itself is presented at this point. In this way there can be no confusion or ambiguity as to the purposes of the proposal or the logic of the arguments.

The Institute proposes—

> That Tariff Item 180e be revised by deleting the word "Plant" which is the 9th word in the first sentence, and substituting therefor the word "production", so that the sentence will read "Engineers' plans, drawings or blue-prints of machines and production equipment"; all words after "equipment" to be deleted.

The specific arguments to support this proposal are—

As presently written 180e includes on the free list many types of engineering work which are now a commonplace to Canadian engineers, such as "plant layouts, foundations, structural supports, dams, spillways and other hydro construction". The Institute feels there should be a tariff on drawings for such work, in order to suggest to Canadian organizations that Canadians are competent to do it, and to discourage the habit of going outside of Canada for such services.

The present wording is not clear. "Wiring piping, platforms, ladders, stairs, etc." seem too trival to be included separately in a tariff item. The Institute contends that normally such things may be associated with or attached to machines. In such cases they are actually a part of the machine or equipment and thus would be exempt from duty, as is the machine.

It is recognized that a tariff encourages foreign industry to erect plants in Canada for the Canadian market. Isn't it reasonable therefore to expect that similarly foreign engineering firms can be encouraged to establish their "plants" in Canada? The Institute argues not only that the tariff should be restored in many instances where it has been removed but that the rate should be high enough to make it worth while for a foreign engineering firm to open a designing office here. Therefore—

> The Institute proposes that the valuation of plans under Tariff Item 180 should be based on 3% of the cost instead of the present 1% as described in the Appraisers' Bulletin of June 20, 1939. This adjustment would make the tariff more effective and at the same time would eliminate the inconsistency of the present practice, whereby architects' plans are valued on the 3% basis and have been so valued for many years.

The Institute's interest in the tariff comes from the conviction that as far as possible Canadian work should be done by Canadian engineers. It is admitted that in some instances of a highly specialized nature it may be advantageous to consult firms outside of Canada, but in most cases Canadian firms are as competent or more competent than firms anywhere else in the world to do Canadian work. The Institute's study indicates that many orders are placed elsewhere, simply because some Canadians who employ such services are ignorant of Canadian engineers' competence and accomplishments. It seems unfair and unwise to encourage this unnecessary employment of foreign firms by making tariff concessions.

It is natural that American engineering firms should specify American made equipment (as they do) because they are familiar with it. For the same reason they are likely to use in their designs of structures to be built in Canada, materials, parts and standards not used, not suitable or not obtainable in Canada. This creates delays and unnecessary expense for the Canadian customer. Also there are noteworthy examples of American engineers designing types of equipment, plant layouts and foundations that are not suitable to Canadian weather, temperatures and other conditions.

In those instances where Canadian firms or government agencies feel that the specialized knowledge of some one foreign firm is essential to them, it is contended that such specialists should work through a Canadian associate. In this way a Canadian staff of engineers will be employed on the designing instead of Americans.

As an alternative it is contended that the American specialist should establish his own office in Canada to do Canadian work. Thus Canadians will become familiar with the highly specialized fields, without the necessity of moving across the border to do so. It seems only fair and reasonable that the money arned in Canada should in large ieasure be spent in Canada. The ffices referred to in this paragraph re much different from the sales ffices now being operated here by everal American firms.

Another evil that follows the invasion of the Canadian engineerng field by Americans is that freuently American contracting firms re given the contracts for the vork because—

a—They are subsidiaries or associated companies.

b—The engineering firm has established the "habit" of using a certain contracting firm or firms.

Canada is fortunate in having nany large and highly competent ontracting companies who can do practically all the work required in Canada. They should not be exluded from their own natural field by the employment of American ngineering firms to do the work of design.

There are many actual cases on ile with the Institute that prove he accuracy and the common sense of the agreements advanced in this presentation. Most of them have been submitted previously to the Minister of Finance but if the Board desires copies for its records he Institute will be pleased to upply them. They prove that in nost instances there was no need of employing foreign engineers, and hat in several instances better reults could have been obtained if Canadians had been engaged. Under these circumstances it is obvious there will be no hardship for Canadian users of engineering services, if a modest tariff is applied —or restored—to discourage the iabit of engaging the engineering irms of other countries.

The Institute urges that the proposed changes be instituted as quickly as possible, in order to bring to an end the injurious effects on the engineers of the present procedure.

All of which is submitted.

R. E. Heartz, M.E.I.C,,
Vice-President.

J. B. Stirling, M.E.I.C.,
Chairman of
Committee on Professional
Interests.

L. Austin Wright, M.E.I.C.,
General Secretary.

2050 Mansfield Street,
Montreal, January 29th, 1951.

February 9, 1951

The Tariff Board of Canada,
Ottawa, Ont.

Re: Item 180 and 180e

Gentlemen:-

May we have the privilege of placing before the Board in writing certain items which were discussed during the recent hearing, but which are not covered by our brief?

In the first place we would like to refer to the method of valuation for engineers' plans. You will recall that this was discussed in some detail before the Board last week. Our position is that we are satisfied with the present *system* as long as the *rate* is set at 3% instead of the present 1%.

Judging from the terms of reference, it appears that the Minister is interested in investigating the present method in order to determine if a better method can be devised. With this in mind we have proposed that the valuation of engineers' plans for customs purposes be based on the actual fair market value of the plans themselves rather than on the estimated cost of the finished structure, as is done at present.

To us this seems like a much simpler method inasmuch as it takes care of all the variables that enter into the present method. Also it would render unnecessary any checking of the finished structure which is necessary now, to compare the estimated cost with the actual cost.

From the observations of the Board members, made at the recent hearing, it appears that if Section 35 (1) of the Act is administered as it is written, the basis of valuation will be precisely that which we have proposed. In those cases (if there are any) in which the fair market value cannot be determined and section 35 (2 or 3) are resorted to, we request that the basis of valuation as described in the Appraisers Bulletin (Miscellaneous No. 6—Revised) be changed from 1% to 3%. This latter figure approximates the actual cost (the engineers' charges) much more closely than does the former.

Secondly, you will recall that representatives of Canadian Industries Limited asked that process layouts be added to the list of duty-free plans which we had described in our brief. To this we agree fully. Thus the final proposal of wording for duty-free plans would be:

"Engineers' plans, drawings or blue-prints of machines, production equipment and process layouts".

We are grateful to you for this opportunity to expand our previous presentation.

Yours sincerely,

L. Austin Wright, M.E.I.C.,
General Secretary.

Thanks, Dr. Cleveland

Members of the Institute who know or have heard of Past-President Dr. E. A. Cleveland of Vancouver will agree heartily with the sentiment of the following editorial which appeared in the Vancouver Province on February 2, 1951:-

"For years, whenever local municipalities have talked about amalgamating any of their activities, they have remarked on the outstanding success of one such merger—Greater Vancouver Water Board and Vancouver and District Sewerage and Drainage Board.

"Those boards are held up as models of what can be accomplished by municipal co-operation. And by common consent the credit is given to Dr. E. A. Cleveland, LL.D., M.E.I.C., chief commissioner of the Water Board and chairman of the Sewerage Board.

"This week Dr. Cleveland marks his 25th anniversary as chief commissioner of the Water Board. For 25 years his tact, diplomacy, integrity, force of character and engineering skill have served the cities and municipalities that belong to the board.

"It is no accident that during Dr. Cleveland's quarter-century the water services of those cities and municipalities have been administered with the minimum of friction and a maximum of efficiency. They have been directed by a firm hand.

"Dr. Cleveland has kept above politics and petty squabbles and has adroitly discouraged both on his boards. As an engineer, as an administrator and as a public servant he has set a great example of service.

"A self-sacrificing man, Dr. Cleveland has always preferred to remain in the background. After 25 years we Vancouverites want to record our appreciation and our thanks."

Engineers and Automobiles

It is interesting to note that an automobile insurance company doing business both in the United States and Canada recently released particulars of an extensive survey of its experience with all forms of automobile insurance.

The figures indicated that engineers stood seventh in order of excellence as automobile insurance risks.

In the list of sixty-four different categories of automobile users commissioned military personnel stood twenty-sixth, doctors thirty-second, and the legal profession fifty-first.

Pre-stressed Concrete Committee

The Institute is advised that the Institution of Civil Engineers has recently established a pre-stressed concrete development committee to co-ordinate research work leading to a basis of assessing the ultimate strength of pre-stressed concrete.

A rational approach to the assessment of ultimate strength has been put forward by Prof. A. L. L. Baker in the Institution of Civil Engineers Structural and Building Engineering paper No. 26 entitled "Recent Research in Reinforced Concrete and its Application to Design". The method is basically dependent on the knowledge of the stress-strain characteristics of the concrete and steel used and the limiting strains at failure of a beam. It is desirable that, in any future tests, measurements of strain should be made, so that the validity of Professor Baker's method may be checked.

The committee hopes to co-ordinate test work on beams and obtain the data required to verify Prof. Baker's method.

N.S. Association and Halifax Branch Hold Joint Annual Meeting

Some 300 engineers from Halifax and various centres in Nova Scotia attended the joint annual meeting of the Halifax Branch of the E.I.C. and Association of Professional Engineers of Nova Scotia on January 30th last. The meeting took the form of a banquet in the main ballroom of the Lord Nelson Hotel.

Joint chairmen were A. R. Harrington, chairman of the Halifax Branch and J. D. Fraser, president of the Association. The principal speaker was Air Vice-Marshal C. R. Slemon, Air Officer Commanding R.C.A.F. Training Command, Trenton, Ont.

Among the guests at head table were:- Mr. Harrington, Mr. Fraser, I. P. Macnab, president-elect of the Institute; Angus Macdonald, Premier, and Hon. J. A. D. McCurdy, Lieut.-Governor of Nova Scotia; Mayor G. S. Kinley of Halifax, Air Vice-Marshal Slemon; AV/M R. C. Gordon, A.O.C. Maritime Group R.C.A.F.; Dr. A. E. Cameron, president, Nova Scotia Technical College; Brigadier E. C. Plow, General Officer Commanding, Eastern Command.

The following new members of the Association executive were elected at the meeting: president, J. Douglas Fraser, M.E.I.C., Halifax; vice-president, Dr. D. J. MacNeil, M.E.I.C., Antigonish; councillors, Wm. A. Devereaux, M.E.I.C., Halifax; Dr. M. Roy Foran, M.E.I.C., Halifax; Clyde Cameron, M.E.I.C., New Glasgow; and R. P. Nicholson, M.E.I.C., Stellarton.

Ontario Association Honours General McNaughton

Highlights of the annual meeting of the Ontario Association of Professional Engineers were the address by General A. G. L. McNaughton on the work of the International Joint Commission, and the presentation of the Association's gold medal to the General by Lt. Col. L. F. Grant, past-president of The Engineering Institute.

The medal, for "outstanding accomplishment to the nation", has been awarded only twice before — to the Honourable C. D. Howe, Minister of Trade and Commerce and Dr. C. R. Young, dean emeritus of applied science at the University of Toronto.

The photograph above was taken after the presentation ceremony. It includes (l. to r.) E. V. Buchanan, retiring president of the Association, Gen. McNaughton, Col. Grant, and W. H. M. Laughlin, incoming president of the Association.

Further Honours to E. V. Buchanan

Last month the *Journal* reported on the recognition by Ontario Hydro of the outstanding contribution of E. V. Buchanan as general manager of the Public Utilities Commission of London, Ontario. It was a complete surprise to Mr. Buchanan to be invited to participate in the inauguration of Hydro's great new transformer and frequency changer station at Pond Mills and to find that the station was to be named the E. V. Buchanan Station.

The most recent honour was entirely premeditated and Mr. Buchanan was given warning that he was to be the honour guest at a banquet in Port Stanley which would commemorate his 40 years of service as general manager of the London and Port Stanley Railway. Highlight of the festivities was the conferring on Mr. Buchanan of an honorary citizenship of the Town of Port Stanley. The accompanying photo was taken at the Stork Club at Port Stanley.

At the testimonial dinner for E. V. Buchanan, left to right, Ven. Archdeacon W. A. Townshend; Mayor Allan J. Rush; J. Bevan Hay, vice-chairman of the P.U.C.; Dr. J. J. Tallman, chief librarian, U.W.O.; R. W. D. Lewis, K.C., chairman of P.U.C.; Mr. Buchanan; George D. Y. Leacock, president, Maloney Electric Co., Toronto, guest speaker; Elmo W. Curtis, past chairman of the P.U.C.; Alex G. Calder, commissioner, P.U.C.; Vern McKillop, secretary, P.U.C

Engineering — Profession or Trade

From *Engineering News Record*, September, 1950.

"New light is cast on the old question as to whether engineering is a profession or trade by the U.S. Supreme Court's decision in a case relating to fees schedules set up by real estate boards.

Because real estate operators—like engineers—sell services rather than commodities, the first question before the court was whether supplying such services constituted a trade, as that term is used in the prohibitions against restraints on trade in the Sherman Act.

The Supreme Court concluded that it did constitute a trade. And in stating why it did, the court made observations that may be applicable to engineering services.

This decision of the Supreme Court also is of importance to engineers because it related to schedules of minimum fees that are set up by local real estate boards and which members are required to observe. The court found that the system under which the Washington Real Estate Board issued its schedule constituted a violation of the Sherman Act.

Since the high court handed down its decision (May 8) the U.S. Department of Justice has announced that the decision will be used as the basis for action against organizations of architects and engineers that set up schedules of fees. The charge will be that the use of these schedules is also a violation of the Sherman Act (E.N.R., May 18, P. 23).

From a review of this decision and of preceding legal dictum, it appeared logical to conclude that, from the purely legal point of view, only a small part of what engineers do falls into the professional classification. When a consulting engineer is called in for the sole purpose of rendering an opinion based on his knowledge of engineering, the courts could be expected to hold that his work on that engagement is professional. But as soon as he undertakes to render a service, to prepare designs and specifications, his work would be considered a trade—in the eyes of the law.

The Supreme Court had before it an appeal from a decision of the United States District Court for the District of Columbia in THE UNITED STATES OF AMERICA V THE NATIONAL ASSOCIATION OF REAL ESTATE BOARDS ET AL. In the district court, the Department of Justice had charged the National Association of Real Estate Boards, its executive vice-president, the Washington Real Estate Board and 15 of its members with violation of the Sherman Act by conspiring to fix commission rates for the members. (The national association had in its code of ethics a provision that schedules of fees set by local boards should be observed, and the Washington board had a provision in its code stating that "brokers should maintain the standard rates of commissions adopted by the board, and no business should be solicited at lower rates.")

The national and local boards as well as the officers and members covered by the indictment were acquitted by the district court in both the criminal and civil action. Subsequently, the Department of Justice appealed the district court's decision in the civil suit to the Supreme Court. The high court concluded that there was not sufficient evidence against the national board and its executive officer to warrant conviction, so it let their acquittal stand; it concluded, however, that the case against the Washington board was sufficient to warrant conviction.

A basic question in this case was whether the business of a real estate agent is a "trade" within the meaning of the Sherman Act, or whether it is a type of service that is outside the provisions of that act.

On that point Justice Douglas, who delivered the opinion for the Supreme Court, said:

"Members of the Washington

board are entrepreneurs. Some are individual proprietors; others are banks or corporations. Some have no employees; others have large staffs. But each is in a business of his own. The fact that the business involves the sale of personal services rather than commodities does not take it out of the category of "trade" within the meaning of Sect. 3 of the act. The act was aimed at combinations organized and directed to control the market by suppression of competition "in the marketing of goods and services."

The Supreme Court's statement that members of the Washington real estate board are entrepreneurs, each with a business of his own, and its observation that "the fact that this business involves the sale of personal services rather than commodities does not take it out of the category of "trade" within the meaning of the act "would seem to indicate that the court would reach a similar conclusion concerning the practice of consulting engineers and architects, if and when the question is placed before it."

Athlone Fellowships

A recent visitor to Montreal was Dr. William Abbott of the British Ministry of Education who is visiting Canada to assist committees in examining candidates for the recently established Athlone Fellowships for engineering training in the United Kingdom.

On February 7th last Council, through Vice-President Heartz, arranged a luncheon for Dr. Abbott, at which the latter was able to outline the purposes and conditions for the award of the fellowships. Dr. Abbott stated that there are twenty-eight fellowships to be offered in group A—for undergraduates; and ten in group B for engineers in industry. At the time of the luncheon meeting committees had on hand some seventy applications.

The fellowships will provide for travelling costs to and from the United Kingdom and weekly allowance of £6-10 shillings, which is roughly equivalent to the wage of a skilled mechanic. Dr. Abbott admitted that while this income might seem low to Canadians, the Ministry of Education felt rather strongly that the Canadian candidates should not be treated any better than Britain's own apprentices or apprentices from other parts of the Commonwealth—there are said to be approximately a thousand of these visiting students every year from other countries of the Commonwealth.

Dr. Abbott accompanied by Mr. F. East of the United Kingdom High Commissioner's office in Ottawa, is to visit the universities in Canada.

Correspondence

Overseas Members

Maracaibo, Venezuela,
January 24, 1951.

Dear Mr. Editor:-

I have for acknowledgement your letter of the 31st October, 1950, and I would deem it a favour if you would convey to the Council my sincere appreciation of their confidence in having approved my transfer from Junior Member to Member of the Institute.

It is regrettable that distance prevents me from actively joining into activities of the Institute. You can rest assured, however, that those of us who are living down here are still very much interested in the affairs of the Institute and the strides in Canadian Engineering as evidenced by the *Journal*.

I hope that on my next trip to the States and Canada I may have the opportunity of personally visiting your Headquarters.

F. S. Idenden, M.E.I.C.

Bordeaux, France,
January 31, 1951.

Dear Mr. Editor:-

I very recently received the December Copy of the Engineering Journal and wish to take this opportunity to thank you for forwarding them to me in France. I find that the people here, particularly the Engineers, are interested in Canada, and the opportunities that it has to offer. I find the *Journal* most interesting, particularly from a technical point of view, and its contents enable me to more accurately discuss the present methods of construction employed at home and to confirm my statements that Canada is the ideal country to live in and the land of opportunity for all its citizens.

As mentioned in my previous letter, I expect to be back in Canada in July, 1951, and will then no doubt be in need of employment. The Institute Employment Service succeeded in finding suitable employment for me last year, and I would like to make use of its facilities again this year.

P. C. Barlow, S.E.I.C.

Civil Defence

Montreal, Que.,
January 29, 1951.

Circular Letter to Branch Secretaries of *The Engineering Institute* of Canada.

Gentlemen:-

For some time consideration has been given by the Council of the Institute to the subject of civil defence. Also there have been discussions between officers of the branches and officers of the Institute. I have been instructed to send a circular letter to the branches informing them of Council's policy.

More than a year ago the president of the Institute was invited to see General F. F. Worthington, Coordinator of Civil Defence, to discuss these matters. To the meeting was also invited Mr. Allan Ross who at that time was chairman of the Ottawa Branch of the Institute and president of the Canadian Construction Association. The general secretary and Major-General Guy Turner also were present.

The situation was discussed in considerable detail and the outcome was that in the opinion of all it appeared there was nothing that the Institute could or should do at the moment. General Worthington agreed to keep in touch with us and to advise us just as soon as the situation changed.

Recently some of the branches have been asking for information and the matter has been discussed further by Council. Acting under instructions from a recent meeting spoke again with General Worthington and in this conversation he explained that the situation as far as we were concerned was precisely as it had been at the time of the interview in Ottawa.

General Worthington believed that there was still nothing which we could do at the national level but he did point out that members of the Institute could be of great assistance in working with other groups at the local level. He recommended that they be urged to interest themselves in the matter from that point of view. He stated also that he would get in touch with us just as soon as there appeared to be anything that we could do as a national organization.

Under these circumstances Council has agreed that no action will be taken until instructions or requests are received from the government. However, Council desires to call attention to General Worthington's statement that members of the Institute could help at the local level. It is suggested that where local affiliations have not taken place already members of the branches get in touch with others who are interested in this subject and lend their assistance to any movement which may develop. In this way it is believed that the maximum assistance can be rendered.

If any branch has observations to make on this subject or suggestions which they think would be helpful please write Headquarters so the matter may be considered by Council.

Council would be interested in knowing of any activities in this field whether carried out by the branch or by individuals. Such information might well be reported through the columns of *The Engineering Journal.*

L. Austin Wright, M.E.I.C.,
General Secretary.

Colombo Plan

Ottawa, January 27, 1951
Room A133, No. 1 Building

Mr. L. Austin Wright, M.E.I.C.,
General Secretary

Canadian newspapers recently have given a generous amount of publicity to the "Colombo Plan", which is the Commonwealth's counterpart of the United States Point-Four Program, and the United Nations Technical Assistance Program. The Colombo Plan involves South and South-East Asia; the recipient countries at present being Ceylon, India and Pakistan, while the United Kingdom, Canada, Australia and New Zealand are the sources from which technical assistance will be sought.

The Technical Assistance Service, of the Department of Trade and Commerce, has been organized to administer Canada's part in the Plan. The main functions of this unit will be to secure Canadian technicians for long or short term periods of service abroad, and to place foreign trainees in Canadian industry. In view of the similarity of purpose and functions of the United Nations Technical Assistance Program and the Colombo Plan, this Division has been assigned the task of handling the Canadian end of the United Nations program.

The success of these programs in Canada will depend on the support and co-operation given by Canadians, particularly by Canadian industry and the associations and societies directly related to industry. In view of the present world situation, it is unnecessary to emphasize the importance of these technical assistance programs. It is realized that the provision of technicians for service abroad and the placement of trainees in our industry will entail certain sacrifices and expenditures, both by the Federal Government and by industry. This, however, should be regarded as part of Canada's effort to assist the Asiatic countries in their struggle to raise the standard of living of their respective peoples, and to eliminate outside influences that might destroy their freedoms.

Your Institute, through its wide membership, can be of very great value in promoting these programs. May we enlist your co-operation in drawing to the attention of your membership requests for technical assistance received by us, and in contacting certain industries we feel may hesitate to accept trainees from Ceylon, India and Pakistan.

There is a tremendous selling job to be done, and we believe you can help us to put the idea across to your members. This indirectly contributes to the national defence of Canada. The cost of such programs will be very small in comparison with that of an all-out war. Furthermore, the long term results to be achieved will be of mutual benefit.

Your comments on this subject will be much appreciated.

T. J. BROOK,
Director,
Technical Assistance Service,
Department of Trade and
Commerce, Canada.

Montreal,
February 8, 1951
(dict. Feb. 6)

Department of Trade
and Commerce,
Ottawa, Ont.

Attention: T. J. Brook, Esq.,

In your letter of January 27th you call our attention to the Technical Assistance Service of the department which has been organized to render assistance of a technical nature to the Asiatic countries. This matter has been brought to our attention before through the department and also through other officers of the government. However we're glad to have your further communication and in particular your suggestion that we can be of assistance.

I can assure you that the officers and members of The Engineering Institute of Canada have a deep interest in these problems which may well have an important bearing on the world situation. It is impossible to commit ourselves to any specific undertakings at the moment because the authority for such things lies with our Council. However until you have a specific proposal to put to us I can tell you that we are most interested and sympathetic.

Would it be helpful to you if we printed in *The Engineering Journal* the letter which you have just sent to us? The *Journal* goes to almost 16,000 people and many of them are just the type that you have in mind—both for services in the Asiatic countries and as prospective employers of the citizens coming from both countries for training in Canada.

If you could let me have word on this promptly we could have the letter in the March issue. I'm sure that it would interest many hundreds of our members. If you would like to make any change in the communication in the light of the fact that we might publish we'd be very glad to have you revise the communication.

If you have any specific ideas in mind please do not hesitate to send them to us. Our organization caters to engineers in all branches of the profession and it's made up of the most senior men in the profession and in industry as well as about 6,000 of the younger men—both students and junior engineers. Surely within this large company there would be some few that would be of particular value to you in the enterprises which you will be promoting.

L. AUSTIN WRIGHT, M.E.I.C.,
General Secretary.

Elections and Transfers

At the meeting of Council held at Headquarters in Montreal, Saturday, January 20th, 1951, a number of applications were presented for consideration and on the recommendation of the Admissions Committee the following elections and transfers were effected:

Members:

J. B. M. Armstrong, *Vancouver, B.C.*
F. A. Bain, *Montreal, Que.*
R. R. Buckley, *Ottawa, Ont.*
C. H. Conroy, *St. John's, Nfld.*
S. V. Donvito, *Arvida, Que.*
G. Perris, *Cornwall, Ont.*
I. Ingenohl, *Montreal, Que.*
W. S. Korwin-Lopuszanski, *Montreal, Que.*
P. R. McAdam, *Sudbury, Ont.*
A. Packevicius, *Ottawa, Ont.*
F. R. Ross, *Sudbury, Ont.*
R. Saarits, *Lethbridge, Alta.*
P. E. Semler, *Copper Cliff, Ont.*
J. W. Smith, *Sudbury, Ont.*
L. E. Tarandi, *Montreal, Que.*
L. C. A. Walford, *Montreal West, Que.*

Juniors:

S. Gaunt
R. S. Trussler

Transferred from the class of Junior to that of Member:

R. A. Begg, *Montreal, Que.*
N. W. Blakely, *Hamilton, Ont.*
J. T. Brennan, *Ste. Rose de Laval, Que.*
W. H. Craig, *Beauharnois, Que.*
C. Damecour, *Montreal, Que.*
D. L. Dickson, *Montreal, Que.*
P. E. Douville, *Acton Vale, Que.*
B. H. C. Downman, *Belleville, Ont.*
W. Hobson, *Lachine, Que.*
H. A. N. Holland, *Mount Royal, Que.*
G. B. MacCoy, *Sarnia, Ont.*
D. K. Macdougall, *Chatham, N.B.*
S. D. MacKinnon, *Calgary, Alta.*
G. R. McLean, *Edmonton, Alta.*
G. E. Ransom, *Beauharnois, Que.*
A. G. Rochon, *Sorel, Que.*
F. F. Woods, *Montreal, Que.*
J. M. Woods, *Campbellton, N.B.*

Transferred from the class of Student to that of Junior:

H. A. Templeton, *Guelph, Ont.*

The following Students were admitted:

B. W. Allen
E. E. Anderson
J. C. Apps
J. R. Arnold
N. Baker
F. Baril
J. L. R. Beaudet
J. R. G. Belanger
E. S. Bengston
C. W. Bermingham
A. Bertrand
I. J. Billington
P. M. Bilodeau
J. P. L. Bois
B. A. Bowen
M. Brassard
A. G. Breckenridge
M. J. Butler
D. D. Lambert
R. Lamontagne
N. J. Lapierre
P. LaRochelle
A. J. Lemoine
P. L. J. Limbert
E. T. Linney
E. J. Loen
D. G. Loomis
J. Malouin
L. J. Marcon
D. J. Matheson
M. K. Mathieson
C. E. Mercier
R. A. Miller
G. G. Monkman
J. L. Murray
R. R. Myers
C. D. Carter
J. K. Cavers
A. Chabot
J. A. J. L. Chollet
J. Coblenz
R. D. Connor
J. P. Cote
R. B. Cote
T. Covello
A. Crepin
F. G. Crofton
A. deC. de La Chevrotiere
J. L. R. R. Demers
J. M. Dessureault
A. W. Dewhurst
J. P. Dick
P. Y. Dionne
J. Dudra
A. Filion
P. H. Fillion
R. G. K. Findlay
J. I. Fisher
Y. Forgues
J. H. A. Forrester
D. D. Forsythe
J. G. Forth
J. E. G. Fortin
R. Fortin
K. W. Fraser
W. L. Fraser
Y. Fraser
M. Gauthier
J. N. L. Gauvin
J. P. Gauvreau
M. Gendron
R. Gilbert
J. C. Gilley
M. Glotman
J. W. Godin
L. Gosselin
R. Guerin
G. P. Harley
D. D. Haun
N. D. Heaslip
R. G. Heitshu
P. M. Hendrie
D. A. Hicks
D. R. Holbrook
H. Hornstein
L. A. J. Imbeau
A. E. Insley
G. F. Jacobs
J. K. Jamison
W. N. Jeffrey
W. A. R. Johnston
T. E. Jones
K. C. Kavanagh
J. S. Keeler
A. C. Kenny
K. W. Kolthammer
R. Labrie
J. A. L. Lachance
P. Lacourniere
B. M. Laliberte
J. W. McDearmid
J. D. McDougall
E. J. Macfarlane
W. G. McGaughey
E. G. MacInnis
J. R. M. McKay
J. K. McMillan
V. V. Neis
A. I. Newfeld
I. N. Nicholson
D. C. O'Donnell
C. F. Olive
A. Ouellet
D. F. Page
O. L. Pearce
W. Pellan
Y. Pelletier
S. W. E. Pepler
J. H. Perdue
B. J. Peters
J. G. Pike
H. G. Pinder
W. J. Plank
E. G. Poole
P. R. Poulin
A. Premont
G. A. Pritchard
D. E. Reid
E. S. Reid
M. E. Reid
T. J. Rhydderch
R. Roberge
L. D. Roberts
F. J. Robinson
S. M. Ross
K. A. Rutt
E. Ryll
J. M. Samson
G. Santerre
P. A. Savard
J. H. Scott
A. C. Schwenger
J. W. Shipman
H. O. Simola
G. D. Stephen
M. A. R. Stewart
R. K. Swartman
J. H. Taylor
R. P. H. Therrien
H. E. Thiessen
A. E. Thomson
W. C. Thomson
H. Toda
J. E. Umiker
R. Vincent
V. Visnevskis
M. S. Wakulchik
J. O. Ward
J. R. Waterston
A. G. White
R. A. White
R. S. Williams
J. I. B. Williamson
R. M. Withers
J. S. Wood
S. H. Woodend
F. C. Woodruff

Applications through Associations

By virtue of the co-operative agreements between the Institute and the Associations of Professional Engineers, the following elections and transfers have become effective:

ALBERTA

Juniors:

R. W. Edgecombe, *Edmonton, Alta.*
M. A. Jackson, *Edmonton, Alta.*

Junior to Member:

D. A. Bennett, *Medicine Hat, Alta.*

Student to Junior:

J. G. Hutcheon, *Calgary, Alta.*

SASKATCHEWAN

Member:

W. F. Gibbs, *Maple Creek, Sask.*

Juniors:

A. L. Court, *Regina, Sask.*
T. J. Manning, *Regina, Sask.*

Students:

J. F. Acton, *Saskatoon, Sask.*
D. A. Drew, *Saskatoon, Sask.*
T. A. Kajewski, *Saskatoon, Sask.*
E. W. Minogue, *Saskatoon, Sask.*

Junior to Member:

I. W. Twaddell, *Saskatoon, Sask.*

NOVA SCOTIA

Junior to Member:

C. W. Johnston, *Halifax, N.S.*
W. P. Kerr, *Rockingham, N.S.*

Student to Member:

J. H. Reeder, *Kentville, N.S.*

QUEBEC

Member:

J. A. Hayman, *Montreal, Que.*

At the meeting of Council held in Shawinigan Falls, Que., Saturday, February 17th, 1951, a number of applications were presented for consideration and on the recommendation of the Admissions Committee the following elections and transfers were effected:

Members:

R. P. Allsop, *Toronto, Ont.*
E. C. Brisco, *Chatham, Ont.*
J. E. Campbell, *Gatineau, Que.*
T. M. Carscadden, *Lethbridge, Alta.*
J. V. Daniliauskas, *Montreal, Que.*
G. B. Erlebach, *Vancouver, B.C.*
S. T. Reynolds, *Sarnia, Ont.*
A. R. Stanford, *Corner Brook, N'fld.*
A. S. Wright, *Corner Brook, N'fld.*

Juniors:

R. W. Brown, *Shawinigan Falls, Que.*
C. G. Fritz, *Winnipeg, Man.*
P. A. Gobeil, *Cap de la Madeleine, Que.*
D. L. Marr, *Sudbury, Ont.*
W. D. McDonald, *Toronto, Ont.*
U. Raabe, *Winnipeg, Man.*
A. D. Rae, *Sarnia, Ont.*
J. W. Waldron, *Kingston, Ont.*

Transferred from the class of Junior to that of Member:

J. M. Casault, *Edmonton, Alta.*
G. W. Clarke, *Edmonton, Alta.*
J. D. Cram, *Wallaceburg, Ont.*
H. L. Dahl, *Winnipeg, Man.*
P. S. Dewar, *Windsor, Ont.*
T. C. Elliott, *Calgary, Alta.*
G. G. Fisch, *Montreal, Que.*
C. M. Fung, *Trinidad, B.W.I.*
D. E. Guard, *Winnipeg, Man.*
G. S. Halter, *Fort William, Ont.*
R. A. Hemstock, *Devon, Alta.*
D. E. Hibbard, *Leamington, Ont.*
L. L. Langille, *Montreal, Que.*
G. B. Livingston, *Toronto, Ont.*
G. H. Loane, *Toronto, Ont.*
D. D. McLean, *Toronto, Ont.*
R. H. Morehouse, *Halifax, N.S.*
W. V. Morris, *Winnipeg, Man.*
L. F. Morrison, *No. Vancouver, B.C.*
H. A. Norton, *Shawinigan Falls, Que.*
D. D. Oldreive, *St. Thomas, Ont.*
P. A. Pasquet, *Niagara Falls, Ont.*
J. F. Pink, *Wilmington, Del., U.S.A.*
R. A. Ritchie, *Prince Rupert, B.C.*
J. S. L. Shales, *Toronto, Ont.*
J. E. Stanners, *Toronto, Ont.*
M. J. Warren, *Norwood, Man.*
R. S. Willmot, *St. Catharines, Ont.*
J. P. Woods, *Grand'Mere, Que.*

Transferred from the class of Student to that of Junior:

W. G. Dolman, *Selkirk, Man.*

The following Students were admitted:

J. Allan
E. W. Ankenman
R. O. Auger
H. D. Bagley
E. N. Baker
N. R. Baldwin
L. J. Bandiera
R. A. Batt
M. H. Bayne
J. S. Bean
J. G. Belyea
F. T. Booth
G. E. Bowie
J. H. Boyd
F. F. Braithwaite
B. W. Brooker
R. E. Brooks
M. R. Browning
G. R. Burns
J. M. Burrows
C. I. Cameron
A. J Campbell
D. S. Campbell
R. G. Canning
G. U. Cekich
A. J. Ceresino
J. R. Challis
R. D. Christie
J. R. Clarke
J. R. G. Cocking
M. G. Colvin
R. D. L. Connell
G. H. Cornish
E. J. Couchman
K. R. Crean
L. M. Cuddy
A. P. Cunningham
P. J. Dallien
J. M. Davidson
R. D. Davis
W. H. Davis
J. A. Dawn
F. J. Dells
F. De Maio
G. K. Dimock
J. W. Disher
O. Dodson
D. C. Doherty
R. A. Downing
R. C. Drinkwater
I. R. Dutton
C. L. Eckert
G. G. Else
N. M. Engelman
J. D. Fahey
K. R. Fahey
D. A. Fenwick
C. V. Flanagan
G. A. Flett
R. G. Foxall
A. Frame
R. H. Funk
A. Gater
F. Gill
A. Gladstone
R. A. Goodings
W. D. Goodings
G. A. Gorman
D. D. Graham
E. A. Greenberg
R. Greenhalgh
J. R. Gregory
A. M. Heisey
J. R. Hiley
J. R. Hodgson
E. E. J. Horney
W. K. Hughes
J. H. B. Hyde
W. N. Isberg
B. A. Jakowenko
R. W. Jarvi
C. E. Jay
J. E. Jensen
D. L. Johnson
I. Johnsson
N. J. Johnstone
F. S. Jones
A. Kagetsu
A. Kazdan
D. H. Keen
J. R. Kemp
D. J. L. Kennedy
H. Kitchen
H. Laks
W. A. Landon
F. Laronde
R. J. Long
D. C. Longman
T. G. Low
S. J. Lugos
T. W. Lumsden
R. B. N. McBurney
S. McClements
C. V. MacEachern
W. A. McIntosh
H. E. MacIntyre
W. R. McKay
R. M. McKee
L. J. MacKinnon
P. Marko
A. M. Marshall
D. K. Marshall
M. C. Matsubayashi
J. J. Maxted
G. A. Metcalfe
C. E. Miller
R. L. Montador
D. A. Moore
L. J. Moores
J. P. Morgan
J. C. Morris
S. E. Morton
K. J. Murphy
D. A. Murchie
F. A. Neary
L. A. M. Neil
R. J. Newton
M. C. Norris
M. J. Nugent
A. M. Parent
R. J. Patchell
A. W. Peterson
G. P. Phemister
E. L. Phillips
K. L. Philp
M. A. S. Pittman
J. J. Pomor
E. M. Powell
P. A. Primeau
R. J. Primeau
J. K. A. Quittner
J. T. J. Raleigh
H. D. Ramsay
J. G. Reynolds
J. Rezek
J. A. Rome
L. J. Rootham
T. T. Rose
L. J. Rubino
A. R. Ruggles
C. G. Ryan
H. C. Rynard
E. R. R. Saint
E. K. Sauer
J. J. Sebisty
L. C. Sevick
G. D. Sharon
D. R. Sherk
A. S. Simonsen
G. M. Sinclair
L. W. Smith
G. B. Sphikas
I. H. Stasiulis
A. R. Stienstra
B. C. Stonehill
S. Takahashi
J. R. Tanner
F. D. Thompson
S. Timoshek
J. H. Tims
H. G. Topliss
W. T. Tucker
D. K. Turner
G. M. Tuttle
G. N. Unsworth
P. C. Veinot
R. G. Vicary
W. L. Wagner
A. G. Westaway
R. G. White
D. A. Weigand
W. R. Williams
W. J. Willsie
H. L. Wood
C. M. Woodruff
P. P. Yeh
J. F. Yellowlees
S. J. D. Yeo
Z. Zalepa
V. Zvarich

Applications through Associations

By virtue of the co-operative agreements between the Institute and the Association of Professional Engineers, the following elections and transfers have become effective:

Alberta

Members:

H. Bear, *Edmonton, Alta.*
J. A. Dunlap, *Edmonton, Alta.*

Juniors:

N. G. Brown, *Edmonton, Alta.*
R. K. Dixon, *Calgary, Alta.*
K. C. Johnstone, *Edmonton, Alta.*

Junior to Member:

A. L. Berry, *Edmonton, Alta.*
W. M. Huddleston, *Medicine Hat, Alta.*
C. R. Neill, *Calgary, Alta.*

Student to Member:

R. H. Nicolson, *Edmonton, Alta.*

Saskatchewan

Junior:

E. Y. Carlson, *Regina, Sask.*

Students:

H. E. Dishaw, *Saskatoon, Sask.*
W. A. McLaughlin, *Saskatoon, Sask.*

Junior to Member:

G. S. Crawford, *Regina, Sask.*
W. C. Long, *Saskatoon, Sask.*
S. Ringheim, *Saskatoon, Sask.*

Student to Junior:

S. N. Bugaresti, *Regina, Sask.*
E. D. Ortloff, *Regina, Sask.*
T. C. Smith, *Regina, Sask.*
R. J. Tomlinson, *Regina, Sask*

Manitoba

Members:

C. L. Fisher, *Winnipeg, Man.*
C. S. Landon, *Winnipeg, Man.*

Nova Scotia

Members:

A. F. Copp, *Halifax, N.S.*
R. D. Fitzner, *Halifax, N.S.*

News of Other Societies

The **Society for Advancement of Management,** Montreal chapter (P.O. Box 164, Station B, Montreal) announces the second one-day Industrial Engineering Conference, March 30, 1951, at the Mount Royal Hotel.

W. B. Hewus of Dominion Rubber Company Ltd., Montreal, is secretary and co-ordinator of the conference, the general theme of which is "Engineering—a Profit Path".

The **Chemical Institute of Canada** (18 Rideau St., Ottawa, Ont.) will hold its 34th annual conference in Winnipeg, Man., June 18 to 20, 1951.

The **American Institute of Electrical Engineers** (33 West 39th Street, New York), schedules district meetings as follows—the southern district meeting April 11 to 13 at Miami Beach, Florida; north eastern district meeting, May 2 to 4, at Syracuse, N.Y.; the Great Lakes district meeting, May 17 to 19, at Madison, Wisconsin.

The three district meetings precede the Summer General Meeting of A.I.E.E., which will take place in Toronto, Canada, June 24 to 29, at the Royal York Hotel.

June 11 to 15, 1951, are the dates of the Toronto semi-annual meeting of the **American Society of Mechanical Engineers** (29 West 39th Street, New York 18). The Royal York Hotel will be headquarters.

The **American Society for Testing Materials** (1916 Race Street, Philadelphia 3, Pa.) announces that the annual meeting in 1951 will be at Atlantic City, N.J., Chalfonte-Haddon Hall, June 18 to 22.

The **British Standards Institution** (24/28 Victoria Street, Westminster, London, S.W.1.) announces the appointment of Mr. H. A. R. Binney, C.B., as the new director and secretary of the Institution.

He succeeds the late Mr. Percy Good, C.B.E.

The **Institution of Naval Architects** and the **Institute of Marine Engineers,** in Association with the **Institution of Engineers and Shipbuilders in Scotland** and the **North East Coast Institution of Engineers and Shipbuilders,** will hold the International Conference of Naval Architects and Marine Engineers during the Festival of Britain this year.

The dates for the international conference are:- London, June 25 to 30, 1951; Glasgow, July 2 to 4, 1951; Newcastle, July 4 to 6, 1951.

The secretary of the Conference is at 10 Upper Belgrave Street, London, S.W.I.

The 1951 annual conference of the **Institution of Engineers Australia** (Science House, Gloucester & Essex Streets, Sydney, N.S.W.) will be in session in Brisbane, April 2 to 7.

The International Welding Conference will meet in London and Oxford, England, from July 14 to 21, 1951. The congress will include the annual meeting of the **International Institute of Welding,** and its various commissions, and is being sponsored by the five

British member societies, namely, the Institute of Welding (2, Buckingham Palace Gardens, Buckingham Palace Road, London, S.W.I.), the British Welding Research Association, the British Acetylene Association, the Welding Sections of the British Electrical and Allied Manufacturers' Association and the Sheet and Strip Metal Users' Technical Association. The president of the Reception Committee is Sir William Larke, K.B.E.

The Measurements Section of the **Institution of Electrical Engineers** will hold a conference on electrical instrument design in London, England, from the 28th to the 30th of May this year. Members of the Engineering Institute of Canada are invited to attend.

Full details of the conference may be obtained from the secretary of the Institution, Savoy Place, London, W.C. 2.

At the annual meeting in January of the **Association of Professional Engineers of New Brunswick** at the Admiral Beattie Hotel in Saint John, N.B., Prof. J. Harry Moore, M.E.I.C., was elected president. He succeeds J. P. Mooney, M.E.I.C., of Saint John, who retains a seat on the council as past-president.

Other items on the agenda of the meeting were a presentation to R. A. Hughes of the first $200 scholarship of the Association; a report from Dr. A. F. Baird, the Association's representative on the E.I.C. Council; the setting up of a public relations committee; and a change in the Association's by-laws to permit the use of the designation of P. Eng., rather than R.P.E.N.B.

The principal speaker was J. M. H. Fraser, superintendent of the Saint John Dry Dock Co. Ltd.

On the occasion of the Festival of Britain, a **Joint Engineering Conference** will be held by the Institutions of Civil, Electrical, and Mechanical Engineers in London from June 4 to 15. The purpose is to record the contributions of Britain's engineers and scientists to the advance of civilization.

Members of the Institute are cordially invited to attend and participate in the discussions. Further details may be obtained from headquarters.

Personals

News of the Personal Activities of Members of the Institute

J. A. McCrory, M.E.I.C., former president of The Shawinigan Engineering Co. Ltd., has been elected chairman of the board. He is succeeded as president by **R. E. Heartz,** M.E.I.C., the former vice-president and chief engineer of the company; and **A. L. Patterson,** M.E.I.C., has been appointed chief engineer.

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

Mr. McCrory joined the Company in 1916. Subsequent appointments in the Company were as follows: office engineer, 1918; vice-president and chief engineer in 1935; and president in 1949.

In 1950 he was awarded The Julian C. Smith medal of the Engineering Institute for achievement in the development of Canada. The degree of D.Sc. was conferred upon him by McGill University, Montreal, in 1950.

Mr. McCrory was chairman of the Montreal Branch of the Institute in 1929; and represented that branch on the council in 1930-1936; and he was vice-president in 1937-38.

Mr. Heartz began his association with the Company in 1920. He was resident engineer on power developments at Shawinigan Falls, La Gabelle, St. Narcisse, and Paugan Falls, subsequently being transferred to the head office in Montreal. In 1935 he was appointed assistant chief engineer and since then has been associated with all phases of the numerous Shawinigan Engineering projects. Many innovations in methods and equipment, which have led to increased economies have been initiated by him.

R. E. Heartz, M.E.I.C.

In 1941 he was loaned by the Shawinigan Company to Wartime Merchant Shipping Limited where he acted in the capacity of general manager until 1942. This organization directed and coordinated the efforts of fourteen shipyards and their associated suppliers in carrying out the Canadian cargo vessel programme.

A. L. Patterson, M.E.I.C.

In January, 1947, Mr. Heartz was appointed vice-president and chief engineer and was made a director of The Shawinigan Engineering Company.

Mr. Heartz has been chairman of the Montreal Branch of the Institute; a councillor and a vice-president. He is chairman of the Finance Committee of the Institute.

Mr. Patterson, the new chief engineer, joined the Company as a junior engineer, subsequently becoming office engineer, and assistant chief engineer.

He graduated from McGill University in mechanical engineering in 1914. He was overseas from 1914 to 1919 with the R.C.A., and joined the Shawinigan organization on his return.

F. McCallum, M.E.I.C., regional engineer for P.F.R.A. Kamloops, B.C., has been elected chairman of Central B.C. Branch.

Mr. McCallum is from Saskatoon and is a graduate of the University of Saskatchewan, where he received a B.Sc. degree in civil engineering in 1938. He joined the Prairie Farm Rehabilitation Administration in Regina that year. He was appointed assistant engineer in Calgary in 1941 and went to Regina as assistant engineer a year later. He received the appointment as district engineer of P.F.R.A. at Regina in 1944. He was later district engineer at Saskatoon, and in 1948 went to his present position as regional engineer at Kamloops.

E. R. Smallhorn, M.E.I.C., general manager of Aerocrete Construction Co. Ltd., Montreal, has been elected chairman of the Montreal Branch of the Institute.

A Montrealer, he graduated from McGill University receiving a B.Sc. in civil engineering in 1923. On graduation he worked for the late H. G. Hunter, consulting engineer in Montreal, on water works and sewage work.

He left Mr. Hunter to accept a position as assistant to Mr. Willis Chipman, consulting engineer, Toronto, in connection with the design and construction of

E. R. Smallhorn, M.E.I.C.

a filter plant, reservoir and other additions to the water system of the City of Welland, Ont. On the completion of this job, he came back to Montreal to accept a position with the firm of R. S. and W. S. Lea for whom he acted as assistant engineer in connection with extensions to the water works systems at Windsor, Ont., and Brantford, Ont., and the power development on the Coaticook River for the Town of Coaticook, Que.

In 1931, he left Mr. Lea's employ to become associated with Aerocrete Montreal Limited. This firm later was absorbed or developed into the present Aerocrete Construction Company Limited of which he is now general manager.

F. McCallum, M.E.I.C.

George E. Humphies, M.E.I.C., has been elected chairman of the London Branch of the Institute.

Born at Wolverhampton, England, he was educated at Wolverhampton and Staffordshire Technical College, receiving a national certificate in mechanical engineering from the Institution of mechanical engineers in 1927. He had been associated with Foster Bros. Ltd., in England as a draughtsman. In Canada in 1928 he was with Hamilton Bridge Company, and in 1929 he did structural design for the Hydro-Electric Power Commission of Ontario, after which he worked for a time with McClintic Marshall Construction in Pittsburgh, Pa. He worked for the Department of Lands and Forests in 1932, and for several years after he was in the mining industry. From 1935 to 1940, for Canadian Comstock Co. Ltd., Toronto, he worked on design and construction of metallurgical and power plants in mines in Ontario.

He was overseas with the R.C.E. in the recent war. Since his return he has been in private practice, in partnership with M. M. Dillon & Company, consulting mechanical engineers in London, Ont.

H. W. Nickerson, M.E.I.C., chief engineer of Canadian Cottons Ltd., Cornwall, Ont., has been elected chairman of the Cornwall Branch of the Engineering Institute.

A graduate of the University of New Brunswick. Mr. Nickerson received a B.Sc. degree in electrical engineering in 1929 and in civil engineering in 1933. During 1929 and 1930 he was with the telephone engineering department of Northern Electric Company Ltd., in Montreal, and with the wire and cable sales department. He joined Canadian Cottons Ltd., at Milltown, N.B., in 1934, during the construction of a reinforced concrete dam. He was made assistant plant engineer of the Gibson Mill of Canadian Cottons in Marysville, N.B., in 1939. He was appointed plant engineer of the Canada Mill and the Dundas Mill of the Company in Cornwall, Ont., in 1943. He received his appointment as chief engineer of the Company in 1947.

F. F. Fulton, M.E.I.C., manager of the Belleville Plant of the Northern Electric Company, has been elected chairman of the Belleville Branch of the Institute.

Mr. Fulton has been with Northern Electric since his graduation from McGill University in 1928, and most of his service with the company has been in the field of electronics. He entered the active forces in 1939, as a lieutenant,

F. F. Fulton, M.E.I.C.

and attained the rank of brigadier early in 1945. He served overseas, and was awarded the O.B.E. in 1943 for his contribution to the technical services.

With Northern Electric he started as a sales engineer and after occupying a number of positions, became sales manager of special products in 1937. Following his return from active service in 1946, Mr. Fulton was made chief engineer of the electronics division and in 1949 was appointed manager of government contracts. He went to his present position in 1950.

C. D. Carruthers, M.E.I.C., of Wallace, Carruthers & Associates Ltd., Toronto, has been elected chairman of the Toronto Branch of the Institute.

Born at Millbrook, Ont., Mr. Carruthers studied at the University of Toronto receiving the degree of B.A.Sc. in 1927. After graduation he joined Gordon L. Wallace, M.E.I.C., consulting engineer, as designer and draughtsman.

He remained with Gordon L. Wallace, and received in 1931 an appointment as chief designer. He was consulting structural engineer for the firm prior to his appointment as associate and chief designer in 1947. The firm became known as Wallace, Carruthers & Associates Ltd., in 1951, and Mr. Carruthers is general manager and designing engineer.

E. T. W. Bailey, M.E.I.C., chief combustion engineer for the Steel Company of Canada, Ltd., at Hamilton, has been elected chairman of the Hamilton Branch of the Institute.

Mr. Bailey graduated from the University of Toronto with a B.A.Sc. degree in chemical engineering in 1926. In 1932 he received the professional degree of chemical engineer from the same institution. He worked with Aluminum Company of Canada Limited, Arvida, Quebec, for two years as assistant chief chemist, before joining the Steel Company of Canada at Hamilton, in 1928. He was later appointed head of the combustion engineering department.

Mr. Bailey was the winner of the Plummer Medal of the Engineering Institute in 1948. He is a director of the Association of Iron and Steel Engineers.

Julian Garrett, M.E.I.C., will discontinue temporarily his practice as a natural gas consultant in Edmonton, Alta., to accept a two year appointment by the Government of Barbados as public utilities commissioner and director of petroleum and natural gas. Before going into private practice in 1948 he was vice-president of Northwestern Utilities Limited, Edmonton.

T. R. McLagan, M.E.I.C., president and general manager of Canadian Vickers Ltd., Montreal, was elected to membership of the American Bureau of Shipping in New York, at the recent annual meeting.

The Bureau which sets and maintains shipbuilding standards, required extension of the foreign surveying staff, with exclusive surveyors being stationed in eight foreign ports including Halifax and Vancouver.

Richard A. Low, M.E.I.C., who was associate professor of civil engineering, resigned some months ago from the staff of Queen's University, Kingston, Ont., to become chief executive engineer for Trans-Canada Highway Division, Federal Department of Resources and Development.

Professor Low graduated from Queen's University in 1928 with a B.Sc. in civil engineering and joined the teaching staff of that institution in 1930, where he later became, successively, assistant professor of civil engineering and associate professor. He holds the degree of master of civil engineering from Cornell University.

Professor Low has worked on geodetic, railway and highway surveys, and on construction jobs. He made the final location of the Quebec Chibougamou Railway, and located the south section of the Isle Maligne-Quebec transmission line for the Shawinigan Water and Power Company. Shortly after the outbreak of the recent war he joined the gauge division, Department of Munitions and Supply, in Ottawa, and served during its period of organization, returning to Queen's in the autumn of 1942. He has long been interested in community planning, doing graduate work in this field and making several traffic surveys. He has been active in developing the work of the Kingston Town Planning Commission. He has served as chairman and secretary of the Kingston Branch and represented the branch on the Council of the Engineering Institute in 1945.

John T. Watson, M.E.I.C., has retired from the post of city manager of Lethbridge, Alta.

Mr. Watson came from Scotland to Canada in 1900. He was appointed, in 1906, assistant to the chief engineer of the City of Calgary power and light plant. From 1906 to 1916 he was superintendent of the Western Electric Company's plant at Red Deer, Alberta, and in the latter year was appointed chief engineer of the City of Lethbridge power and light and water plant. In 1929 he received the appointment as city manager of Lethbridge.

Commenting on his retirement, Lethbridge newspapers recalled J. T. Watson's able administration of the civic financial situation as well as his work in municipal utilities during his long service.

A. L. Mieville, M.E.I.C., has been appointed managing director of the associated companies throughout Asia of John Blackwood Hodge Limited. He will reside in Calcutta, India. Previously he was managing director of Bailimo Limited, London, England.

H. G. Michell, M.E.I.C., who was general manager of the Bolivian Power Co., Ltd., at La Paz, is now with the Montreal Engineering Co. Ltd., Montreal.

Mr. Michell went to the Bolivian Power Company in 1939 as manager of Oruro division. He was manager of the La Paz division in 1946 and 1947. He was then appointed general manager of the Company.

M. D. Stewart, M.E.I.C., who was formerly city engineer of Sudbury, Ont., is affiliated with the Kilborn Engineering Co. Limited, consulting engineers in Toronto. He is concerned with the design and supervision of various municipal engineering works.

R. J. Askin, M.E.I.C., has been appointed vice-president (manufacturing) of the Abitibi Power and Paper Company Limited, Toronto, Ont.

Mr. Askin started in the pulp and paper business with the Fort William Paper Company Limited in 1921. He was appointed manager of this mill in 1930 shortly after its merger with Abitibi operations and he was later appointed manager of the Thunder Bay Division. In 1942 he moved to Toronto as assistant manager of mills, becoming manager in 1943. He is a graduate in mechanical engineering of Queen's University. He is a past-councillor of the Engineering Institute of Canada, and a past-chairman of the technical section of the Canadian Pulp and Paper Association.

Fred H. Ballou, M.E.I.C., of Vancouver, has retired from the position of chief engineer of the British Columbia Sugar Refining Company, Limited. Mr. Ballou was eligible for retirement two years ago but postponed his departure from the sugar company's services until after the completion of the new beet sugar factory at Taber, Alta. He was in command of the engineering and construction of this large factory, and he also was in charge of establishing the company's factory at Picture Butte, Alta.

W. R. Craig, M.E.I.C., is the new chief engineer of the British Columbia Sugar Refining Company, Limited, Vancouver, B.C. and its subsidiary operations, including the Canadian Sugar Factories, Ltd., in Southern Alberta.

Mr. Craig graduated in 1933 as an electrical engineer from University of Alberta. He worked at various positions including a short period with the Lethbridge Northern Irrigation District, until he joined the engineering staff of Canadian Sugar Factories in 1935 as assistant construction engineer on the company's factory at Picture Butte. On completion of this project, Mr. Craig held various posts with the sugar Company there and at Raymond, Alta. For a short time he was master mechanic of the Picture Butte plant.

In 1940 he was transferred to Vancouver and has been at the sugar company's head offices ever since, except for two years' service with the R.C.E.M.E. On his discharge from the army with the rank of lieutenant he returned to the sugar company's engineering staff at Vancouver.

Henrik Mugaas, M.E.I.C., is associated with the firm Hill-Clark-Francis Ltd., New Liskeard, Ont.

Mr. Mugaas was with Lamaque Gold Mines Limited, Bourlamaque, Que. for many years, returning to his work there after service in the R.C.A.F. in the recent war. He was chief surveyor of the Company.

E. K. Lewis, M.E.I.C., of Imperial Oil Limited, has been transferred from Montreal to Winnipeg, where he is superintendent of the manufacturing department. Mr. Lewis has been with the Imperial Oil since 1934. He was at Dartmouth, N.S., for several years, and in the engineering and development section of the Company at Sarnia, Ont. He was production manager of the Polymer Corporation in 1946. He came to Montreal as superintendent of the Imperial Oil Refinery in 1948.

He graduated from N.S. Technical College in 1930.

W. J. McAdam, M.E.I.C., the former chief engineer of J. L. E. Price, Montreal, Que., is now with Wood and Langston, Montreal.

Mr. McAdam had joined J. L. E. Price in 1947 as assistant to the chief engineer with reference to the mechanical and electrical trades. He was chief engineer for Wartime Housing Ltd., Toronto, in 1946 and 1947.

Dr. K. R. Rybka, M.E.I.C., and **John H. Ross,** M.E.I.C., both of Toronto, have been appointed by the City of Toronto to a Committee to study the application for the increase in the price of gas made by the Consumers Gas Co. of Canada.

Ewart M. Haacke, M.E.I.C., Toronto, Ont., is now associated with J. A. Wilson Lighting & Display Ltd., in Montreal, Que.

Mr. Haacke was editor, for the past 6 years, of the Hugh C. MacLean publication "Electrical News and Engineering". He joined the publication as associate and technical editor in 1945 after service with the R.C.A.F. He graduated from Queen's University in electrical engineering in 1942.

A. O. Drysdale, M.E.I.C., has been appointed assistant superintendent of Plant No. 5 of Canada Cement Co. Ltd., Belleville, Ont. He has been assistant superintendent of the Company's plant in Montreal for several years.

E. L. Miners, M.E.I.C., is working in Ottawa, Ont., as estimator for the Defence Construction Co. Ltd.

Mr. Miners graduated from the University of Saskatchewan in civil engineering in 1936. He was for several years the assistant general manager of he C. M. Miners Construction Co. Ltd. n Saskatoon.

D. L. McGillivray, M.E.I.C., of Imperial Oil Ltd., has been transferred from Sarnia, Ont., to Toronto, Ont. During the recent war he was a technical advisor on petroleum products to the Royal Canadian Navy, with the rank of lieutenant commander in the R.C.N.V.R. He returned to his work with Imperial Oil in 1946.

James M. Courtright, M.E.I.C., of Shell Oil Co. of Canada Ltd., has been transferred from Vancouver, B.C., to Toronto, Ont., where he will be general manager of the purchasing and stores department.
Mr. Courtright, has been associated with the Company since his graduation from Queen's University in civil engineering in 1941.

E. H. Sinclair, M.E.I.C., who was branch manager of the Quebec Division of Canadian Ice Machine Company Limited, Montreal, is now associated with John Inglis Co. Ltd., refrigeration and air conditioning division and has been transferred to the British Columbia Branch.

Maj. I. M. McLaughlin, M.E.I.C., of the Department of National Defence, has returned to Ottawa following a course at the Military College of Science, Shrivenham, England.
Maj. McLaughlin went to England in 1948.

Gordon H. Mikkelborg, M.E.I.C., of the Ontario Paper Co. Ltd., has moved to Thorold, Ont., as materials handling and transportation engineer. He was, earlier, mechanical superintendent at Heron Bay South, Ont.

J. E. Thom, M.E.I.C., who has been assistant superintendent of construction, at the University of Toronto, is now associated with the firm of architects, Page & Steel, of Toronto.

G. P. Dewar, M.E.I.C., of Imperial Oil Ltd., has been transferred from Montreal to the manufacturing department of the Company in Winnipeg, Man.

B. D. McDermott, M.E.I.C., is a project engineer with Foundation Co. of Canada, Montreal. He was associated with J. L. E. Price Company in 1947-1950, and, earlier, with the Fraser-Brace Engineering Co. Ltd., at Montreal and in Shawinigan Falls.

John R. Michie, M.E.I.C., of Canadian Ice Machinery Co. Ltd., has been transferred from Ottawa to Vancouver, B.C.
Mr. Michie graduated from University of Toronto in mechanical engineering in 1940. He has since been associated with Canadian Ice Machinery Company as designer of refrigeration systems, sales engineer, assistant to the president on plant expansion, or contract engineer, and he was Ottawa Branch Manager before going to Vancouver. He served with the R.C.N.V.R. in the recent war.

J. L. Dery, M.E.I.C., is associated with Labrador Construction Co. Montreal. Previously he was vice-president of The Key Construction, Ltd., in Montreal, Que.
Mr. Dery graduated from the Royal Military College in 1934.
He worked in Montreal for the Federal Department of Public Works, before going overseas in the recent war with the R.C.A. He was a partner in the consulting engineering firm of Lapointe and Dery, in Montreal prior to joining the Key Construction Company in 1949.

B. E. U. Gagnon, M.E.I.C., is with Bathhurst Power & Paper Co. Ltd., Bathurst, N.B., as a senior designer. He was formerly with Stadler, Hurter & Co., Montreal.

Thomas J. Kew, M.E.I.C., is a design engineer with Ford Motor Co. of Canada, Windsor, Ont.
He graduated from Queen's University in 1948 receiving a B.Sc. degree in civil engineering, and was thereafter engineer in charge of testing materials at the Department of Public Works testing laboratory in Ottawa.

F. A. Hunt, M.E.I.C., who was assistant division engineer for the Canadian National Railways at Belleville, Ont., has been transferred to Capreol, Ont., as division engineer.
Mr. Hunt joined C.N.R. at Brantford, Ont., after graduating from Queen's University in 1940. He served overseas in the recent war as a lieutenant in the R.C.E. He has, since returning to C.N.R., been located at Toronto, at St. Catharines, and at Belleville.

Stuart S. Gilmour, M.E.I.C., has been appointed by the British Columbia Electric Company to the position of resident engineer on the reconstruction of the number one Hydro-Electric plant situated at Lake Buntzen near Vancouver, B.C.
Mr. Gilmour had been, for several years previously, chief field engineer for the Columbia Cellulose Co. Ltd., at Prince Rupert, B.C.

Kenneth R. Shipley, M.E.I.C., who is with Imperial Oil Limited, has been transferred from the Montreal East Refinery, to Winnipeg, Man.
Mr. Shipley was the supervisor of

Chairmen of E.I.C. Branches whose elections were announced in the February issue


W. R. Godfrey, M.E.I.C.
Saint John Branch


F. H. MacKay, M.E.I.C.
Sault Ste. Marie Branch


H. D. Keil, M.E.I.C.
Border Cities Branch


G. P. Sturdee, M.E.I.C.
Sarnia Branch

Plant No. 2, of Imperial Oil in Sarnia in 1944, and he was with the Tropical Oil Company in Columbia, S.A., as assistant refinery superintendent for several years, before returning to Imperial Oil in Montreal.

D. A. Welsh, JR.E.I.C., is district engineer at Prince George, B.C., for the British Columbia Department of Public Works.

Mr. Welsh graduated from University of British Columbia in civil engineering in 1949.

E. Ross Welsh, JR.E.I.C., has been appointed Quebec district engineer of Alchem Limited with headquarters in Montreal. His new territory will include all of Quebec except the northern mining regions.

Mr. Welsh graduated from the University of Saskatchewan with a B.Sc. degree in mechanical engineering. During World War II he served for three years with the Canadian Dental Corps and one year as an air gunner with the R.C.A.F. He joined Alchem Limited in 1948 and was in charge of the company's Calgary office for the past two years.

He is a member of the Canadian Institute of Mining and Metallurgy and of the Association of Professional Engineers of Alberta.

R. K. Nicholson, JR.E.I.C., formerly of Montreal is a sales engineer in the apparatus department with Canadian General Electric Co. Ltd., in Toronto, Ont.

Mr. Nicholson received a degree of B.Eng. in electrical engineering from McGill University in 1949.

Louis A. Zalkind, JR.E.I.C., is a design engineer for the Libby Air Conditioning Ltd., in Montreal Previously he was sales engineer for Sheldons Ltd., Galt., Ont.

W. V. Tobias, JR.E.I.C., is with Canadian Industries Limited. in the construction engineering department at Kingston, Ont. Formerly he was with Canadian Hydrographic Service at Ottawa, Ont.

J. M. Thomas, JR.E.I.C., is now employed by the Electrical Manufacturing Co. Ltd., at Montmagny, Que. He was previously with the Department of Colonization in Quebec City.

H. H. L. Pratley, JR.E.I.C., has gone to New Glasgow, N.S., to work for the Maritime Steel & Foundry. Previously he was designer with P. L. Pratley, M.E.I.C., consulting engineer, Montreal.

H. J. T. Patterson, JR.E.I.C., is working with the Dominion Structural Steel Limited, Montreal. He graduated from McGill University in civil engineering in 1948.

Previously he was employed by Shawinigan Engineering Co. Ltd., working on hydro-electric construction.

Guy Petit, JR.E.I.C., is with Fraser-Brace Engineering Co. Ltd., working at St. Joseph d'Alma, Que., as field engineer on dam construction.

Previously he was with The Shawinigan Engineering Co. Ltd., at Trenche, Que.

Mr. Petit graduated from Ecole Polytechnique in civil engineering in 1949.

Stan Nowski, JR.E.I.C., of Trenton, Ont., is an assistant construction engineer for Donald Inspection Ltd., Toronto, Ont.

He graduated from the University of Toronto in 1949 in civil engineering.

D. P. Howell, JR.E.I.C., who was previously with the Civil Service Commission, Department of Resources & Development at Banff, Alta., is now working at the Royal Canadian Mint, in Ottawa, Ont., as an assayer.

Mr. Howell graduated from the University of Alberta in 1949, receiving a B.Sc. in chemical engineering.

Andre Moncel, JR.E.I.C., who had been district development engineer with Canadian Liquid Air Co. Ltd. at Dorval, Que., is sales engineer with Watson Jack & Company Ltd., Montreal.

G. L. Lackman, JR.E.I.C., is a mechanical engineer with Canadair Ltd. He was previously employed as industrial design engineer, with Design Services Reg'd., Montreal.

Mr. Lackman graduated from Queen's University in mechanical engineering in 1948.

C. R. Eaton, JR.E.I.C., is employed in the design department for A. V. Roe (Canada) Ltd., at Malton, Ont. He graduated from University of Saskatchewan in mechanical engineering in 1949.

T. W. Dobson, JR.E.I.C., is assistant chemist at Donnacona Paper Co., Ltd., at Donnacona, Que. He was previously the assistant chemist for Price Bros & Company Ltd. at Kenogami, Que.

Mr. Dobson received a B.Sc. degree from Queen's University in 1948.

V. R. Cox, JR.E.I.C., is an instrumentman with Canadian National Railways, Edmonton, Alberta. He graduated from the University of Alberta obtaining a B.Sc. degree in 1949.

R. H. Carroll, JR.E.I.C., is now employed with Rotor Electric Company Limited, Toronto, Ont. He was previously working on design for Dominion Electrohome Industries Ltd., at Kitchener, Ont.

Mr. Carroll graduated from Queen's University in electrical engineering in 1946.

Paul Brissette, JR.E.I.C., is a plant engineer for Sorel Industries Ltd., at Sorel, Que.

After graduating in 1948 from Ecole Polytechnique, Montreal, he worked with Canadian Fairbanks Morse Company in Montreal.

J. G. Belzile, JR.E.I.C., is a mechanical assistant with Canada Packers Ltd., Montreal, Que. Previously he was chief draughtsman for E. J. Wright Utilities Ltd. at Strathroy, Ont.

R. G. Barbour, JR.E.I.C., of Fredericton, N.B., is in Montreal, working for Southern Canada Power Company. He is a 1949 graduate of the University of New Brunswick with a degree of B.Sc. in electrical engineering.

Lt. Albert J. Arcand, JR.E.I.C., who was at Chilliwack, B.C., with the R.C.S.M.E. is now stationed at the No. 4 Works Coy., R.C.E., in Montreal.

He graduated from University of Saskatchewan in agricultural engineering in 1949.

Bernard Abugov, JR.E.I.C., is an inspector of electricity and gas in Montreal for the Dominion Civil Service.

He graduated from McGill University in electrical engineering in 1949.

D. R. Abbey, JR.E.I.C., is field office manager, in the resident engineer's office at Senneterre, Que., for Surveyer, Nenniger and Chenevert, Montreal.

Mr. Abbey graduated from University of Saskatchewan in 1945, and did postgraduate work at McGill University.

D. I. Ourom, JR.E.I.C., of Ottawa, has left Canada for a period of two years during which time he will be associated with the Demerara Bauxite Co., MacKenzie, British Guiana.

W. A. Doherty, JR.E.I.C., is company engineer with the K. J. Beamish Construction Co. Ltd., Toronto. During 1950 he obtained the degree of M.A.Sc. from the University of Toronto.

F. S. Yano, S.E.I.C., (University of Manitoba, 1950, B.Sc., mechanical engineering) is on a training course with Massey Harris Co. Ltd. in Toronto, Ont.

R. C. Wannop, S.E.I.C., (U.B.C., 1950, B.A.Sc., civil engineering) is on the staff of Swan, Rhodes & Wooster, consulting engineers, Vancouver, B.C.

Harley Stewart, S.E.I.C., (University of Manitoba, 1950, B.Sc., mechanical engineering) is now in Windsor, Ont., working for the Ford Motor Co. of Canada Previously he was assistant supervisor in the forming department of Fiberglass Canada Ltd., Sarnia, Ont.

Joseph Norman Stevens, S.E.I.C., (University of Manitoba, 1950, B.Sc., civil engineering) is with the Department of Public Works of Canada in Winnipeg, Man.

C. W. Pidgeon, S.E.I.C., (Queen's University, 1948, B.Sc., mechanical engineering) who was doing post-graduate work at Queen's is now with the Capital Wire Cloth & Manufacturing Company, Ottawa, Ontario.

Michael C. Nadas, S.E.I.C., (University of Toronto, 1950, B.A.Sc., chemical engineering) is a paint chemist for Scarfe & Co. Ltd., Brantford, Ont.

M. W. McDermid, S.E.I.C., (McGill University, 1950, B.Eng., mechanical engineering) is in Quebec City with Anglo-Canadian Pulp & Paper Mills.

James S. MacDonald, S.E.I.C., (Nova Scotia Technical College, 1950, B.E., mechanical engineering) is with Canadian Vickers Ltd., Montreal, working as an industrial engineer.

C. A. Marteinson, S.E.I.C., (University of Manitoba, 1950, B.Sc., mechanical engineering) is now employed by Combustion Engineering Corporation in Montreal.

P. A. Lanigan, S.E.I.C., (McGill University, 1950, B.Eng., civil engineering) is with Southern Canada Power, in Montreal.

C. J. Kielland, S.E.I.C., (McGill University, 1950, B.Eng., civil engineering) has joined the staff of C. J. Jeffreys, consulting engineers, Montreal, as a structural engineer. He was previously in Lake St. John, Que., working for A. F. Byers Construction Co. Ltd.

A. Robert Jackson, S.E.I.C., (University of Manitoba, 1950, B.Sc., electrical engineer) is now an engineer-in-training with the Toronto Hydro-Electric System.

Charles H. Hood, S.E.I.C., (Nova Scotia Technical College, 1950, B.E., mechanical engineering) is a sales engineer with Austen Bros. Ltd., in Halifax, N.S. Previously he was a student engineer with the Nova Scotia Light and Power Co. Ltd., Halifax.

H. S. Hicklin, S.E.I.C., (University of Toronto, 1950, B.A.Sc., engineering physics) is working with Polymer Corporation, Sarnia, Ontario.

John W. Grainge, S.E.I.C., (University of Alberta, 1950, B.Sc., civil engineering) is a sanitary engineer for the Department of National Health and Welfare at Edmonton, Alta.

H. F. Gladish, S.E.I.C., (University of Toronto, 1950, B.A.Sc., mechanical engineering) is working as a junior engineer for E. B. Eddy, Company Ltd., Hull, Que.

C. Cameron Johnson, S.E.I.C., (University of New Brunswick, 1950, B.Sc., civil engineering) is with the Federal Department of Resources and Development as a park engineer in the national Parks Branch. He is stationed at the Fundy National Park at Alma, N.B.

Gerald J. Foley, S.E.I.C., (University of Saskatchewan, 1950, B.Eng., civil engineering) is employed by Central Housing & Mortgage at Ottawa, Ont., in the Defence Construction Branch working as a building estimator.

John S. Edwards, S.E.I.C., (University of British Columbia, B.A.Sc., mechanical engineering 1949, metallurgical engineering, 1950) is in the sales office of Dominion Oxygen Co. Ltd., in Winnipeg, Canada.

W. A. Corbett, S.E.I.C., (University of Manitoba, 1950, B.Sc., civil engineering) is working for Underwood & McLellan, consulting municipal engineers.

Edward Chow, S.E.I.C., (University of British Columbia, 1950, B.A.Sc. civil engineering) is with Swan, Rhodes & Wooster, consulting engineers, Vancouver, B.C., as a designing engineer.

Bruce Brown, S.E.I.C., (University of Manitoba, 1950, B.Sc., mechanical engineering) is with A. V. Roe Canada Ltd., at Malton, Ont.

L. M. Bluteau, S.E.I.C., (McGill University, 1950, B. Eng., mechanical engineering) is on a training course as a mechanical assistant with the Canadian Pacific Railway. Before starting the course he spent three months with the Royal Canadian Navy (Reserve).

J. Baumholz, S.E.I.C., is executive director of the Canadian Palestine Trading Co. Ltd. Previously he was secretary-treasurer and manager for Victory Equipment & Supply Co. Ltd., Montreal.

T. J. Anderson, S.E.I.C., (University of Saskatchewan, 1950, B.Eng., mechanical engineering) is engineering drawing instructor at the University of Toronto.

J. A. Aitken, S.E.I.C., (University of Manitoba, 1950, B.Sc., mechanical engineering) is a sales and service engineer with Combustion Engineering Corporation, Montreal, Que.

C. W. Dumka, S.E.I.C., of Edmonton, is working for Northern Electric Co. Ltd., in Montreal, as a design engineer.

J. F. Butterworth, S.E.I.C., (McGill University, 1950, B.Eng., metallurgical engineering) is employed with Light Alloys Limited, at Renfrew, Ontario.

H. F. Burns, S.E.I.C., (University of Manitoba, 1950, B.Sc., civil engineering) is in the engineering department of the City of Winnipeg.

Visitors to Headquarters

E. V. Buchanan, M.E.I.C., London, Ont., January 19, 1951.

J. G. G. Kerry, M.E.I.C., Port Hope, Ont., Jan. 23.

Drummond Giles, M.E.I.C., Cornwall, Ont., Jan. 25.

R. E. Kirkpatrick, M.E.I.C., Grand'Mere, Que., Jan. 25.

E. R. Eaton, M.E.I.C., Sudbury, Ont., Jan. 25.

V. C. Blackett, M.E.I.C., Moncton, N.B., Feb. 2.

Mrs. Blackett, Moncton, N.B., Feb. 2.

Viggo Jepsen, M.E.I.C., Grand'Mere, Que., Feb. 2.

Alan E. Cameron, M.E.I.C., Halifax, N.S., Feb. 6.

Allan Tubby, M.E.I.C., Saskatoon, Sask., Feb. 8.

G. R. McMeekin, M.E.I.C., Trail, B.C., Feb. 12.

T. C. Main, M.E.I.C., Edmonton, Alta., Feb. 12.

G. F. Bennett, M.E.I.C., Halifax, N.S., Feb. 12.

V. G. Kosnar, M.E.I.C., Ottawa, Ont., Feb. 23.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Guy C. Dunn, M.E.I.C., who was assistant to chief engineer for the Canadian National Railway lines, and a resident of Perth, Ont., died on December 31, 1950.

Mr. Dunn was born in Quebec City in 1862, and was educated in Lennoxville, Que. In 1881 he went to work for the Atlantic and Northwest Railway (now C.P.R.). He was chief engineer of the Ottawa, Northern and Western System of railways for eight years, and manager of construction. During this time he built the Royal Alexandra Bridge at Hull, Que., which went into use in 1901. In 1904 Mr. Dunn was appointed district engineer for the New Brunswick section of the National Transcontinental Railway. He resigned from that position in 1908 and was appointed a district engineer of Grand Trunk Pacific Railway in New Brunswick. From there he was transferred to Winnipeg as division engineer in charge of engineering work on main line and branches, and from there to Fort William, and to Edmonton.

In 1921 he was appointed assistant to chief engineer of Canadian National Railways, a position which he held until his retirement in 1928.

He joined the Institute as an Associate Member in 1887, transferring to Member 1897. He was associated also with the Professional Engineering Associations in Manitoba and Ontario.

Frederick R. Wilford, M.E.I.C., railway and government engineer and contractor, Lindsay, Ont., died on January 15, 1951.

A native of Cookshire, Que., Mr. Wilford was born in 1866. From 1886 to 1890 he was engaged on the survey and construction of the Cape Breton Railway under the Dominion Government, after which he worked on maintenance of way for the International Coal and Railway Company. He was with the Canadian Pacific Railways from 1892 to 1895 on survey and construction. From 1895 to 1897 he was engineer for the Royal Pulp and Paper Mills Co. of East Angus, Que., in charge of river improvement, sidings and yards, a system of waterworks. In 1897 he was appointed assistant engineer on the St. Lawrence Canals by the old department of railways and canals of the Dominion Government. In this work he was in charge of various works in connection with the enlargement and deepening of the Iroquois Section of the Galops Canal.

A resident of Lindsay, Ont., for the past 40 years, he formed the firm of F. R. Wilford and Company with his two sons.

He built power dams at Bobcaygeon, Lakefield and Young's Point, a power station at Lindsay, and part of the C.P.R. lines from Lindsay to Bethany, as well as schools and hospitals in Belleville and Lindsay.

The company ceased to operate two years ago.

Mr. Wilford joined the Institute as an Associate Member in 1894, becoming a Member in 1903.

John Chalmers, M.E.I.C., of Vancouver, pioneer engineer, who surveyed western territory in building one of Canada's main rail lines, died at Vancouver, B.C., on December 20, 1950. Mr. Chalmers had gone to Vancouver from Montreal on his retirement in 1937.

He was born in Scotland in 1867, but he was educated in Canada and graduated from University of Toronto in 1894. He did railway work in Ontario first, and municipal engineering at Guelph, Ontario. In 1896 he was resident engineer for the Toronto, Hamilton and Buffalo Railway. From 1899 to 1906 he did right of way surveys for track laying and bridging for Canadian Northern Railway in Western Canada. From 1906 to 1912 he was structural engineer for the Department of Public Works of the Province of Alberta, in charge of construction of buildings and bridges, during which time the Parliament Buildings in Edmonton were built. He then worked for the City of Edmonton for several years, and he was with the Imperial Munitions Board during the first World War, at Ottawa and Winnipeg. He then joined John Quinlan Company, contractors, in Montreal and he was engineer and manager of the firm until his retirement in 1937. He resided in Vancouver after his retirement, devoting his time to gardening and the making of fine furniture.

He joined the Institute in 1899 as an Associate Member, transferring to Member in 1910.

L. N. Jenssen, M.E.I.C., died on May 21, 1950, in Norway.

Mr. Jenssen was born in Hommelvick, Norway, in 1871. He graduated from the School of Technology, of Trondhjem, Norway in 1891, and took a postgraduate course in hydraulics and structural engineering at the Polytechnicum, Munich, Germany. He was employed for 10 years in Norway on survey and construction work principally dambuilding and mill-erections, and in 1902 he came to Canada to work for Price Bros. at Quebec City. He was occupied on railway construction for several years in Quebec, Ontario and British Columbia His later engineering work took him to Norway, to Brazil, and to the United States where he was associated with G. D. Jenssen and Company in New York City around 1920. He was resident engineer in 1922 for Alexander Potter of New York in connection with work in Warren, Idaho, for the Unity Goldmining Company. He was later a construction engineer with the Cherry River Paper Company at Richmond, West Virginia.

In 1925 he joined the staff of the Duke-Price Power Company at Isle Maligne, Que., as a designing engineer. He joined Fraser Brace Ltd., in Montreal in 1926.

Mr. Jenssen retired from engineering work in 1939 and returned to Norway, where he resided at the time of his death.

He joined the Institute as an Associate Member in 1904, becoming a Member in 1911, and a Life Member in 1947.

John B. Parham, M.E.I.C., who was inspecting engineer for B.C. Electric Railway Co., in Vancouver, B.C., died on January 4, 1951, at his home in Vancouver.

Mr. Parham was born at Valleyfield, Que., in 1882, and was a graduate of McGill University from which he received the degree of B.Sc. in 1908.

He had served with the 5th Royal Scots of Canada in 1900, and had gone to South Africa with the 4th Canadian Mounted Rifles.

After graduation he worked with the Interprovincial Pacific Railway at Moncton, N.B., and with the North Pacific Lumber Company. He was employed for twenty years by the Canadian Fairbanks-Morse Co. Ltd., in charge of the electric and hydraulic department. His work included pump installations at Copper Mountain and Coldstream, B.C.; installations at the Dominion Experimental Farm at Summerland, B.C.; at the Esquimalt dry dock. He also worked for Canadian Fairbanks-Morse, after leaving their regular employ on an installation at Premier Gold Mining Company. He was later associated with the Greater Vancouver Water Board; and with the Public Utilties Commission of Vancouver. He joined the Seaforth Highlanders of Canada in 1927, being appointed general staff officer with the rank of captain in 1940. Retiring from active service in 1944 he rejoined the Greater Vancouver Water Board. He later assisted the B.C. Electric Company in the installation of the high-head penstocks of the Bridge River Development, acting as representative for the Shawinigan Engineering Co. Ltd. He was an inspecting engineer for B.C. Electric Company during recent years.

On the reserve of the Seaforth Highlanders, he acted as staff officer in Vancouver and Victoria during the Second World War.

He joined the Institute as a Student in 1907, becoming an Associate Member in 1913, and transferring to Member in 1936. He was also a member of the Association of Professional Engineers of British Columbia.

D. M. Fraser, M.E.I.C., president and general manager of D. M. Fraser Limited, Toronto, died on January 20, 1951.

Mr. Fraser was born at Edinburgh, Scotland, in 1879. He studied electrical engineering at the Heriot Watt College, Edinburgh. From 1906 to May 1910 he worked in Scotland on electrification of steel and cotton mills.

In 1912 he came to Canadian General Electric Co., as an estimating engineer. For C.G.E. he was responsible for the design, layout and complete installation of the electrical plant at the shipyard of the Canadian Allis-Chalmers Company. He inspected electrical work at Halifax Shipyards. He also prepared complete electrical proposition for the Prince Rupert floating dry dock and was responsible for the complete electrical distribution system for Lauzon Dry Dock, Levis, Que.

He formed the Dominion Engineering Agency Limited, in 1922, and was president and managing director of the firm. In 1927 he founded the firm D. M. Fraser Limited, and was president and general manager of this firm of agents for industrial electrical equipment, until his death.

Mr. Fraser joined the Institute in 1920 as a Member, receiving Life Membership in 1951. He was a fellow of the American Institute of Electrical Engineers, and a member of the Association of Professional Engineers of Ontario and the Toronto Electrical Club.

John H. Dyer, M.E.I.C., electrical draughtsman for R. A. Hanright, consulting engineer in St. Catharines, Ont., died on January 8, 1951.

Mr. Dyer, was born in Halifax, Nova Scotia, in 1906. He graduated from Nova Scotia Technical College in 1928 receiving a B.Sc. degree in electrical engineering.

In 1928 and 1929 he followed the student apprentice course at Canadian Westinghouse Company at Hamilton, Ont., after which he was appointed a junior switchboard engineer. In 1933 he was in the testing laboratory of Imperial Oil Company at Dartmouth, N.S. He joined the staff of St. Mary's College, Halifax, N.S. in 1935 and was assistant professor of engineering for two years, working during vacations for the Milton Hersey Company, Sydney N.S. In 1937 he joined the English Electric Company of Canada Ltd., St. Catharines, Ont., working with the Company on switchgear design until 1945. That year he went to Sutcliffe Company, Limited, in New Liskeard, Ont. In 1949 he became associated with R. A. Hanright, consulting engineer in St. Catharines, Ont., as an electrical draughtsman.

He joined the Institute as a Student in 1928, becoming a Junior in 1937, and a member in 1942. He was also a member of the Association of Professional Engineers of Ontario.

Leon S. Dixon, M.E.I.C., of Bangor Maine, passed away in December, 1950.

Mr. Dixon was born in Medford Center, Maine, in 1886. He graduated from Higgins Classical Institute and from the University of Maine with bachelor of science and master of science degrees in mechanical engineering. For the past twenty-five years, Mr Dixon held executive engineering, production and construction assignments with firms in Canada and the United States.

His early engineering work in the New England States, consisted of construction work for Industrial General Contractors; engineering for Cape Cod Construction Company; survey engineering for G.N. Paper Company Bangor, Maine; design engineering for General Electric Company, Lynn, Mass.; and mechanical engineering for Eastern Mfg. Co., Bangor, Maine. He did work for the U.S. Army, in 1918, returning to Eastern Mfg. Co. as a mechanical engineer until 1920.

He worked in Canada in 1920-21 with the Riordon Company, Montreal, after which he was manager of engineering for the Eddy Paper Corporation, Three Rivers, Que., in 1923-24. As consulting engineer he was again associated with the Riordon Corporation for a time. He was general superintendent of operation, production and process revisions in 1924-25, for the Bogalusa Paper Co., in Louisiana, after which he returned to Canada as chief engineer and construction manager for Canadian International Paper Co., Montreal. He served as consulting engineer and construction manager for the Eddy Company, Ottawa, in 1931-32, and was associated with pulp and paper and allied industries and utilities and water supply as a consulting engineer from 1933 to 1945. He was the pulp and paper consultant for Stone and Webster Engineering Corp., Boston, Mass., from 1945 to 1948; and for two years after was a consultant with Newport News Shipbuilding and Drydock Company. In 1950 he was a consultant working with Madigan-Hyland, engineers, of New York City, on a proposed new pulp and paper mill in Labrador. His headquarters were in Toronto during that time.

He joined the Institute in 1921 as an Associate Member, transferring to Member in 1923. He held membership also in the American Society of Civil Engineers, American Society of Mechanical Engineers, the Royal Engineering Society, the American Military Engineers, and the Technical Association of the Pulp and Paper Industry.

Allan Kenneth Hayes, S.E.I.C., of Harvey Station, N.B., died in a motor accident in Chatham, N.B., January 4, 1951

Mr. Hayes was employed by Diamond Construction Company as a junior engineer after graduating from the University of New Brunswick as a civil engineer in 1950. He had worked with the company previously as an undergraduate. He had also done summer work during his first three years at the university, with the Department of Highways of N.B., as a chainman and instrumentman.

He was born in 1926 in Woodstock, N.B., where he received his high school education.

NEWS of the BRANCHES

Activities of the Thirty-three Branches of the Institute and abstracts of papers presented at their meetings

Belleville

S. Sillitoe, M.E.I.C.,
Secretary-Treasurer

The 3rd Meeting of the Engineering Institute of Canada, Belleville Branch, was held February 8th at the Kiwanis Center with 40 members in attendance. Mr. F. F. Fulton was in the chair. The Secretary read the minutes of the previous meeting and gave a short report of the membership status, showing that it had reached a total of 84, and explained that this was due in part to an increase in territory which is still subject to change. He reported that Mr. Fulton had attended the Toronto annual meeting and that Mr. F. C. Adsett had attended the Peterborough annual meeting, representing Belleville.

Mr. J. H. Legate introduced the speaker of the evening, Mr. I. I. Sylvester, who took as his subject **Diesel Electric Locomotives take their place in Canadian Railroading.**

Mr. Sylvester began his address with a brief outline of the development of the Diesel electric locomotive over a period of the last 25 years and touched upon early experiences with experimental cars produced by the C.N.R. for service on its newly acquired branch lines. He gave an interesting description of the operation of the Diesel engine and explained the principles with the aid of slides, showing the difference between 2 cycle and 4 cycle engines. He pointed out that an experimental Diesel electric car, which was run from coast to coast over the C.N.R. lines in 1927, still holds the speed record for the trip, and was instrumental in establishing the possibilities for the Diesel locomotive. The first practical applications were made in smaller units used as shunters and switchers. With improvement in the power plant and the development of higher powers, these engines have gradually become applicable to freight hauling.

With the aid of films he showed the improvements in construction of the Diesel electric locomotive from the early developments to the modern stream-liner in which the frame work has been changed from a platform type of construction to a truss structure in which the major strength of the unit is built into the side walls of the locomotive. This structure is then covered with a streamlined skin. The major improvements in the Diesel locomotive, as compared to its steam predecessor, stem from the fact that the controls are electrical and therefore smooth acting. The tractive effort is therefore smooth rather than pulsating, which results in very much less tendency towards driver slippage and makes it possible for a locomotive of the same weight to start and pull a very much heavier load than the equivalent steam locomotive. In addition the smoother power makes it possible to operate at higher speeds over the same track. The efficiency of the Diesel locomotive is double the efficiency of equivalent engines using gasoline or high petroleum derivatives as fuel and in comparison with steam the advantage is graphically represented by the fact that one tank car of fuel oil is equivalent to 12 car-loads of coal. It is thus possible for the Diesel locomotive to run much greater distances without servicing and provided the human element and scheduling of runs can be managed, a modern locomotive may be run as much as 900 miles a day. At the present time Diesel locomotives have not been applied extensively to passenger service because the greater financial return on investment can be derived by applying the efficient Diesel to freight and shunting operations. One problem remains in connection with passenger application, namely the development of boilers for heating with sufficient capacity to cope with the extremely cold winter weather encountered in the Prairies and in the mountains. Continual development is proceeding on this important phase of the work and at the present time locomotives with a power of 4,500 horse-power are equipped with a boiler for heating with a capacity of 4,000 lb. per hour and are used on some of the shorter passenger runs. Mr. Sylvester closed his talk with an interesting colour film entitled "Railroading on the Maybrook".

After an interesting discussion period the speaker was thanked by Mr. J. Buchan.

Cape Breton

G. W. Ross, M.E.I.C.,
Secretary-Treasurer

S. G. Naish, M.E.I.C.,
Branch News Editor

On February 20, the Cape Breton Branch heard an interesting address by Mr. Peter J. Power, superintendent of industrial relations for Dosco, on **Human Engineering.** The speaker pointed out that modern statistics showed that most prominent men owed their success to their knowledge of how to get on with other people, rather than to their technical skill. In particular, the need is great for those in executive positions to be able to secure co-operation from those around them.

The address was preceded by a colour film "No Man is an Island" showing the operations of the Consolidated Mining and Smelting Company, which the members considered outstanding. This film was obtained by courtesy of Prof. D. J. McNeil, Department of Geology, St. Francis Xavier University, to whom a vote of thanks was proposed by Bill McDonald, seconded by J. H. Fraser.

The speaker was introduced by Branch Chairman Cliff Murray, and congratulated by Mark W. Booth. A vote of thanks to the speaker was moved by Alec Miller and seconded by M. R. Chappell.

Central British Columbia

M. L. Zirul, M.E.I.C.,
Secretary-Treasurer

The regular general dinner and meeting was held at the Allison Hotel, at Vernon, on January 26. Notices had been sent to all members and to all others connected with engineering in the district. Twenty-seven were in attendance. The guest speaker was H. N. Macpherson, regional vice president of the Institute.

Mr. M. L. Zirul, secretary treasurer, took the chair temporarily, in place of Mr. M. L. Wade, who was to install the newly elected executive. The new officers were presented and A. F. Paget, vice-chairman, assumed the chair in place of Mr. F. McCallum, chairman, who was unable to attend.



President Vance

Counterclockwise around this page are photos of the president's western trip.

At top left. Enjoying the scenery near Kamloops are W. M. Ramsay, past chairman, and F. McCallum, chairman of the C.B.C. Branch; with Mrs. Vance and H. N. Macpherson of Vancouver, who accompanied the presidential party through most of the trip.

In the next two photos the president is shown as he presented certificates of student prizes to R. H. Assaly and A. Mohammed at the Universities of Saskatchewan and Manitoba.

A group of student engineers at Saskatoon were J. B. Motta. R. R. Carley, O. Sawula, L. E. Timlin, W. G. Kostyshn and M. E. Stadnyk.

Buffet luncheon at Prince Albert with R. R. Keith, Mrs. Vance and Mrs. W. Christie.

The Prince Albert section executive in session with the president. W. F. Hayes, R. R. Keith, J. Jonsson, R. T. Hollies (Calgary), W. Waters, E. R. Smith, Mr. Macpherson (Vancouver), W. D. Smith, Mr. Vance.

Others of the group who met the president in Prince Albert were Mrs. J. Jonsson, W. S. Paine, Maurice Pardoe and Mrs. W. D. Smith.

The C.B.C. Branch executive at Kamloops — back row, L. E. Willis, M. L. Wade, R. A. Barton, A. F. Paget, M. L. Zirul. Front row, W. M. Ramsay, Mr. Vance, Mr. Macpherson and F. McCallum.

The president was greatly impressed by the great St. Mary dam near Lethbridge. Pictured here are two of the senior engineers on the project — Ben Russell, M.E.I.C., Alberta, director of water resources, and W. L. Foss, resident engineer.

Wm. Jamieson (centre) was host to the presidential party at Powell River, B.C. With him are G. W. Allen. W. N. Kelly, H. N. Macpherson, all of Vancouver, and the president.



Visits the Branches

Clockwise on this page are further scenes from presidential visits throughout Canada.

At top left are Dean McLeod of the Faculty of Applied Science, University of British Columbia; J. P. Fraser, assistant chief engineer, B. C. Electric Company; with Mr. Vance at the Vancouver Branch meeting.

Mr. and Mrs. Vance, with Mrs. H. N. Macpherson in Stanley Park, Vancouver.

Past-president E. P. Fetherstonhaugh, the president, J. C. Trueman and H. N. Macpherson at Winnipeg.

Another group at the Saskatoon meeting included I. M. Fraser, V. Dallin, J. B. Mantle, A. Tubby and E. K. Phillips.

The next picture was taken during the luncheon meeting with the executive of the Winnipeg Branch. It includes (l. to r.) A. E. MacDonald, Mr. Vance, J. C. Trueman, G. W. Moule, S. H. Eggertson, L. A. Bateman, R. T. Harland. In the foreground is J. W. Greenlaw.

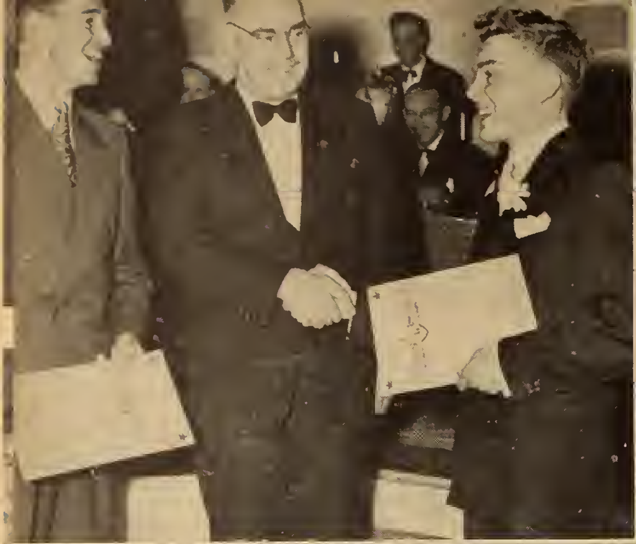
The head table at the Ottawa Branch luncheon meeting included, Mrs. D. B. Rees; R. S. Eadie (Montreal); Mrs. L. M. Christmas, past president, Ottawa Engineers' Wives Association; Dr. P. E. Gishler, chairman, Ottawa Branch, C.I.C.; Mrs. K. M. Cameron, Mr. Vance, and Branch Chairman Allan Ross.

Left to right. Norman Marr, D. M. Stephens (Winnipeg), B. B. Hogarth (Winnipeg), T. M. Patterson, at the Ottawa Branch luncheon.

Professors D. S. Nicol and M. L. Baker (foreground) and G. C. Reid and W. E. Jefferson (behind the table) listen intently to the president's message at Halifax. (The gentleman in the far background was not identified.)

The president and Mrs. Vance with Mr. and Mrs. Eric Hinton at Corner Brook, Nfld.

Presidents at Halifax. Left to right are president-elect I. P. Macnab, past-president J. B. Hayes, and president Vance.



Top left. A feature of the Hamilton Ball was the presentation of certificates for the best papers presented to the Branch by Students and Juniors. The winners R. B. Kerr and B. A. Warren are shown here receiving the president's congratulations.

Top right. The receiving line at the Engineers' Ball of the Hamilton Branch: Branch chairman L. C. Sentance, Mrs. Buchanan, Mr. Vance, Mrs. Vance, E. V. Buchanan, president at that time of the Ontario Association, and Mrs. Sentance.

Upper left. Back to the west again for this photo of Mr. Vance with the Lethbridge branch executive. They are (back row) W. L. Foss, R. D. Livingstone, R. S. Lawrence, P. E. Kirkpatrick, D. Cramer and (front row) A. L. H. Somerville, the president, M. S. Mitchell, A. G. Donaldson.

Lower left. When he visited the University of Alberta, Mr. Vance presented the certificate of the 1950 Student Prize to G. W. Jull.

Bottom left. During his visit to Ottawa Branch the president spoke to the students at Carlton College. He is shown here at the College with branch secretary W. R. Meredith, Air Vice-Marshal E. W. Stedman, assistant professor of engineering, and Branch Chairman A. C. Ross.

Bottom right. At the head table in Edmonton were: (l. to r.) R. E. Heartz (Montreal), T. W. Dalkin, Mr. Vance, Branch Chairman E. H. Wright, H. N. Macpherson (Vancouver) and Dean R. M. Hardy.


Top left. A reception was tendered the president in New York during the annual meeting of A.S.C.E. Some of those who attended were: R. J. G. Schofield, Mr. Vance, (unidentified), H. B. Oatley, R. E. Heartz, C. Davis, A. G. Christie, E. Vinet and C. E. Davies.

Top right. En route from Saskatoon to Prince Albert the president was a guest of J. L. Charles, M.E.I.C., chief engineer, Western Region, C.N.R. He is shown here with P. C. Perry, M.E.I.C., district engineer (left) and Mr. Charles, right, in the business car.

Upper right. During the annual meeting of the Military Engineers' Association, the president placed a wreath on the cenotaph at Chilliwack.

Lower right. Principals at the Military Engineers' meeting in Chilliwack: Maj.-Gen. McKenzie, Mr. Vance, Mr. T. Ingledow, Maj.-Gen. G. R. Turner, who was elected president of the Association.

Bottom left. The president was the principal speaker at the banquet of the Military Engineers' Association at Chilliwack. Here he is flanked by Lt.-Col. H. H. Minshall, Vancouver, and Maj.-Gen. Hertzburg.

Bottom right. This photo taken at the Hamilton Engineers Ball includes Branch secretary-treasurer G. L. Schneider, Mrs. Schneider, Mrs. J. B. Carruthers and Mr. Carruthers.

Mr. Macpherson, M.E.I.C., president and manager of Permanent Timber Products Ltd., Vancouver, was introduced by M. L. Zirul. In his **Comments on the Preservation of Timber Products,** he dealt with the history and development of wood preservation, the various types of rot and the treatments developed to combat them in the uses to which the timber is put. He described in detail the creosote treatments and the uses for which the treatments are suited.

Mr. Ramsay expressed the thanks of his audience to Mr. Macpherson.

A very interesting note was added to the meeting, by the presentation to Mr. A. G. Hatton, by members of the Water Rights Branch and by personal friends outside the Branch, some of whom were present, of a Hardy fly-fishing outfit to commemorate his retirement as district engineer from the Water Rights Branch.

Mr. Macpherson was called upon to lead a discussion on the possibility of forming a Central Branch of the British Columbia Engineering Association and of holding joint meetings of the E.I.C., and that body. A resolution was moved and seconded, and recorded and passed, that if such a branch of the Association is formed, its meetings would be held jointly with those of the C.B.C. Branch of the Institute. A committee consisting of Messrs. H. R. Hatfield, D. McMynn, and L. E. Willis, would give the matter further study.

Cornwall

John S. Sarjeant, Jr.E.I.C.
Secretary-Treasurer

A. A. B. McMath, M.E.I.C.
Branch News Editor

On January 26, the Cornwall branch met in Courtaulds' assembly room. This meeting was open to ladies and a total of 35 people attended.

The guest speaker on this occasion was Mr. Drummond Giles, president of Courtaulds (Canada) Limited. In his opening remarks, chairman G. G. M. Eastwood pointed out that besides being a local branch member, Mr. Giles was also a vice president of the Engineering Institute. Mr. Giles prefaced his address with a reference to Mr. Eastwood's impending departure to Kapuskasing. He expressed regret that the branch was losing a valued member who had rendered considerable service since the branch's inaugural in 1946 and wished him success in his new venture. Mr. Eastwood then handed over the branch charter to Mr. Giles, who passed it on to the new chairman, H. W. Nickerson.

Mr. Giles then described to his audience, some of the highlights of his recent visit to the Ottawa branch. After that, a 25 minute film was shown through the courtesy of Courtaulds. This film, "Threads of Science", told the story of rayon, in technicolour, from the time Robert Hooke first hoped in 1664 that such an artificial composition might some day be made. Georges Audemars' research in Switzerland in the 1850's and Count de Chardonnet's first rayon plant in France (1891) were mentioned. Courtaulds started operations in England in 1904. Their Cornwall plant opened in 1925 and produced the first rayon in Canada. After adding to this plant through the years, Courtaulds can now fabricate some 30,000,000 pounds of rayon annually.

The speaker was thanked by H. W. Nickerson. Then the latter called on Donald Ross-Ross to make a presentation to G. G. M. Eastwood on behalf of the members, in appreciation of his services to the branch.

Hamilton

G. L. Schneider, Jr.E.I.C.
Secretary-Treasurer

John H. Mitchell, M.E.I.C.
Branch News Editor

At the Annual Meeting of the Hamilton Branch of the Institute of Canada, Mr. L. C. Sentance presided at the head table of a luncheon at the Scottish Rite Club.

Mr. Sentance introduced the head table as follows:—E. R. Graydon, chairman, Toronto Branch, E.I.C.; Wm Stewart, chairman, Hamilton Branch, The Chemical Institute of Canada; E. T. W. Bailey, vice-chairman, Hamilton Branch E.I.C.; J. A. Vance, president, of the Engineering Institute; H. A. Cooch, chairman of the Board, Canadian Westinghouse; Dr. G. P. Gilmore, president, McMaster University; W. E. Brown, M.E.I.C. Councillar of the Institute; R. A. McLean, president, Hamilton Construction Assoc.; G. L. Schneider, secretary treasurer of the Hamilton Branch.

At the conclusion of the dinner, Chairman L. C. Sentance called the meeting to order and asked the secretary-treasurer to read the minutes of the last annual meeting. In his annual report, the secretary-treasurer stated that membership stood at 272 plus 64 non-resident members. Mr. Schneider read the nominating committee's proposed executive committee for 1951. This slate was put to the members and approved. The executives are as follows: chairman, E. T. W. Bailey; vice-chairman, W. L. Hutchison; secretary treasurer, G. L. Schneider; executive committee, F. J. McMulkin, J. H. Mitchell, M.E.I.C.; W. R. McColl, M.E.I.C.; H. H. Walker, Jr.E.I.C. The nominating committee for 1952 was nominated from the floor and included:—L. C. Sentance, H. A. Lumsden, A. Love, A. E. Tuck, G. L. T. Vollmer.

Mr. Neil Metcalf offered thanks to McMaster University through Dr. Gilmore for the thoughtful cooperation with Hamilton Branch in arranging the schedule of their lecture theatres for the monthly meetings.

Mr. H. A. Cooch introduced Mr. J. M. Breen, president of Canada Cement Ltd. Mr. Breen said "Engineering as a profession tries to help humanity and interests itself in all phases of civilization except those of art, literature and medicine". In solving many of life's problems an engineering background is a great help. Engineering is a man's job and does not attract "namby-pambies".

Today there is a great demand for engineers and those taking up the profession should obtain a broad education first and not specialize too early. Sometimes an engineer finds himself a specilist in a field for which there is no demand.

A four year course is not enough to make an engineer; graduation is not the end of the study but the beginning. Mr. Breen said "In the engineering curriculum greater attention should be given to two subjects, economics and public speaking." Of the first, sufficient is needed to give encouragement for study in later years. The second is important, as engineers generally are often unable to express their ideas in words.

The speaker was thanked by Mr. J. A. Brown.

The chairman introduced President J. A. Vance who said a few words of commendation for the work of the Branch over the past year.

The chairman reviewed the year's progress of the Branch, thanked the executive for their support, and handed the gavel to E. T. W. Bailey, chairman elect for the year 1951.

Mr. A. R. Hannaford thanked last year's executive for their fine service to the Branch.

Mr. Bailey stated that the next meeting would be at McMaster University Science Theater February 15 when Dean K. F. Tupper, University of Toronto, would speak on **"Heat Energy and Man;** then on March 22nd at Convocation Hall, McMaster University, the Hamilton Branch would invite all members of the Association of Professional Engineers, Chemical Institute, and outlying branches of the E.I.C. to hear Gen A. G. L. McNaughton, M.E.I.C.

The chairman adjourned the meeting.

Lethbridge

D. Cramer, M.E.I.C.
Secretary-Treasurer

J. T. Dokken, Jr.E.I.C.
Branch News Editor

The monthly dinner of the Lethbridge Branch was held on Saturday, January 20, in the Marquis Hotel with 75 members, guests and their wives attending. Chairman H. S. Mitchell presided.

Dinner music was supplied by the Browns' Musical Trio. Community singing led by R. S. Lawrence, a guitar duet by Jerry and Nick Devoss and a vocal selection by Miss Jackie Boyle accompanied by Mrs. Katherine Brown were enjoyed by all.

Mr. R. Hadlington of the Lethbridge Chamber of Commerce showed three fine films of varied geographic interest. "The Pearlers," a film showing a pearling ship off the coast of Northern Australia, depicted the method of obtaining mother-of-pearl, with emphasis on the work of the diver. The film stressed the high note of co-operation required between the diver and his "tender" on deck who is responsible for the diver's safety while under water.

The second film, "Across Ungava Peninsula", followed the journey of four scientists and four Indian guides across Northern Quebec's hitherto unexplored Ungava Peninsula. The party started by canoe on July 15th from the east coast of Hudson's Bay, moving upstream over a series of lakes with shallow rapids between each. This first part of the journey was barren of animal and bird life but 1500 new varieties of arctic flora were found and taken back. Twenty-seven water falls were encountered on this upstream trek indicating a great power potential. A new type of sextant was used on this trip for mapping.

After a four-day portage of over twenty miles through numerous lakes and rivers, the headwaters of the Payne River were reached on August 20th. Thick clouds of mosquitoes were encountered in this area against which high inds were the only defence. Permafrost was found to be 20 to 24 inches below ground surface. Bird, animal and fish life was very extensive over this part of the journey.

After a difficult journey of 325 miles the party arrived at Ungava Bay having collected a great deal of valuable data pertaining to this unexplored part of Canada.

The third film, "A Winter Carnival", showed the highlights of winter sports in Canada's various centres.

George Brown extended a hearty vote of thanks on behalf of the members and guests to Mr. Hadlington of the Chamber of Commerce for showing these interesting and educational films.

London

I. D. Patterson, M.E.I.C.,
Secretary-Treasurer

Robert G. Code, M.E.I.C.,
Branch News Editor

At the annual meeting of the London Branch of the Institute, Branch officers were elected as follows: G. E. Humphries, chairman; D. C. McGeachy, vice-chairman; I. D. Patterson, secretary-treasurer; Robert G. Code, D. N. Cooke, R. G. Newell, S. G. Chipman, and Donald Campbell. G. N. Scroggie is the past-chairman.

The guest speaker at the dinner was Mr. W. J. W. Reid of Hamilton, president of the Otis Elevator Company, Limited. Mr. Reid defined an engineer as one "who has been trained in engineering thinking".

Those so trained are becoming the main directing influences of modern life.

This shift of influence, said Mr. Reid, is not new and not novel. It has been occurring for some time. More and more engineers are receiving key positions in industry, business and finance. This trend will continue and increase, he predicted.

The shift in influence began when the world changed from an agricultural economy to an industrial economy . . . more and more pleople gravitated to industry for their livelihood. In turn the control of industry came more into the hands of the engineers who planned and built it.

Who then are influencing the majority of the people? If the majority are in industry, then one of the great influences in their lives is from industry—controlled by engineers.

For some time now, said Mr. Reid, we have been living in a 'materialistic world.' Not a world of materialistic ideology, but a world of actual materials. We want more cars, more highways, more plants, more power stations, he said, and these had been obtained by the 'engineering thinker'.

That the solution of the world's economic and social problems should become the work of engineers is natural, Mr. Reid said. As engineers are moving into all levels of finance and industry the social and economic problems are of necessity coming into their hands.

Their solution, he thinks, will be found as solution to production problems has been found. The 'engineering mind' is trained in logic and precision thinking. Once the problem has been analyzed the solution will not be long in coming.

However, he said, some engineers have adjustments to make in their new positions. Their precision-trained minds need some adjustment. Social problems aren't precise, he said, often they are intangibles. To this extent engineers must adjust themselves. Some have done so, others have yet to do so.

Members of the Military Engineers Association and the Association of Professional Engineers (Ontario) were invited to the meeting.

Montreal

R. B. Wotherspoon,
Secretary-Treasurer

There were over 100 present at the dance on February 2nd, at the Windsor Hotel, which was a great success and enjoyed by everyone. We were very

At the Montreal Branch Dance

Upper (clockwise around the table from left foreground) Tom Stafford, Mrs. Phaneuf, Leo Phaneuf, Mrs. Henne, Larry Henne, Mrs. Cholette, Pierre Cholette, Mrs. Mullins, George Ferrier, Harry Mullins, John Hillen, Mrs. Ferrier, Mrs. Perley, Allan Perley and Mrs. Stafford.

Centre (clockwise around the table from left) Unidentified, Mrs. Pragnell, Herb Pragnell, H. C. Link, Mrs. Link, K. R. Mills, Mrs. Mills, Mrs. Eldridge, T. Eldridge, Mrs. Hall, Per Hall and Miss J. Milne. Standing at right are Mr. and Mrs. E. G. Patterson.

Lower (left to right) Mrs. Croft, Archie Benjamin, Mrs. Fraser, Phil Croft, Mrs. Benjamin and E. G. Fraser.

sorry that the President and Mrs. Vance were unable to attend. Members and guests were received by Mr. and Mrs. R. E. Heartz, under whose patronage the dance was held, the Branch Chairman and Mrs. Smallhorn and the Vice-Chairman and Mrs. Lawton.

It can now be said that the Montreal Branch has five active Technical Sections with a sixth being organized. Meetings have been arranged by the Section Committees as follows: Civil Section, 6 meetings on Tuesday nights; Chemical Section, 3 meetings on Tuesday nights; Electrical Section, 5 meetings on Wednesday nights; Mechanical Section, 6 meetings on Monday nights; Transportation Section, 7 meetings on Tuesday nights.

The Mechanical Section is holding its meetings in the Ecole Polytechnique Auditorium and the Transportation Section meetings will take place in the Windsor Station.

We are pleased to report that Council has approved the use of the auditorium by the Branch on Monday to Thursday of every week, commencing 1st October, 1951. At this time it is expected that the Industrial Management Section will commence its activities.

Members not already registered with the Section or Sections of their choice, may do so in writing to the Secretary-Treasurer.

Members will have noticed that a high proportion of the expenses of the Branch has gone to printing of notices. In order to sustain the additional cost being incurred by the sections, your executive has decided to change the method of notifying members of meetings. In future two cards will be sent out each fortnight. One card will go to Members only and will give full details of 2 General (Thursday night) meetings with a list of section meetings, giving date, subject, speaker and place only. The other card will be sent to Juniors and Students with full details of a Junior Section meeting and listing with date, subject, speaker and place, the General and Section meetings of the Branch. Registered members of sections will receive notices of their section's activities.

Niagara Peninsula

J. J. Miller, M.E.I.C.,
Secretary-Treasurer

J. E. Kennedy, Jr.E.I.C.,
Branch News Editor

On Tuesday, January 16, the Niagara Peninsula Branch held a dinner meeting at the Esquire Hotel in St. Catharines. The speaker was Mr. W. J. W. Reid, M.E.I.C., President of Otis Elevator Co., and vice-president of the Engineering Institute of Canada. His subject **Modern High Speed Passenger Elevators,** illustrated with slides and motion pictures, was well received.

Mr. Reid traced the evolution of the elevator from the early models driven by steam engines and line shafts, through the age of hydraulic elevators to the modern traction drive units with the compact machinery in the penthouse and very complicated control systems. The complications increase roughly with the cube of the speed, and so does the cost of the installation. However, high speed elevators can handle more traffic and therefore fewer elevators are required, and Mr. Reid pointed out that in an office building of 8 stories, the rental income from the space saved by one less elevator shaft could amount to a half a million dollars over a period of forty years.

The modern "Autotronic" control systems, which in effect means automatic electronic, have gone a long way towards making the modern high speed elevators practical and foolproof. This "brain" of the elevator co-ordinates the movements of elevators in banks to give the most efficient service and can be set by the supervisor to handle the varying peaks that occur during a working day.

The next meeting was announced for February 15, 1951, at the Esquire Hotel in St. Catharines and will be a joint meeting with the Niagara International Section of the American Institute of Electrical Engineers, and the Engineering Department of the Canadian Comstock Company, Frequency Conversion Division. The speaker, arranged by the Engineering Department of Canadian Comstock Company, it was announced, would be Dr. Otto Holden, assistant general manager engineering of the Hydro-Electric Power Commission of Ontario, and his subject would be **The New Hydro Developments at Queenston and the Ottawa Valley Project.**

Peterborough

J. P. Watts, M.E.I.C.
Secretary-Treasurer

M. V. Powell, M.E.I.C.
Branch News Editor

The annual meeting of the Peterborough Branch was held at the Kawartha Golf and Country Club on January 30, 1951. A reception was held at 6:30 p.m. and the dinner with its traditional hams carved at the table then followed. The chairman, J. M. King presided at the business meeting and welcomed the visitors after expressing regret that our President, Mr. J. A. Vance, could not be present. The guests included Mr. Douglas Laird, assistant general secretary of the Institute, Mr. Jack Morris of Courtauld's Limited of Cornwall, and Mr. Fred C. Adsett of the Belleville Branch.

The business meeting was carried out in a lighter vein to relieve the tension under which many of the engineers have recently been working. All reports except that of the Secretary-Treasurer were verbal and decidedly humorous, the actual written reports, being filed for record. One item of the secretary-treasurer's report, the entertainment account came in for serious criticism by W. M. Cruthers who demanded an itemized accounting of the various expenditures. J. L. McKeever, the chairman of the Social and Entertainment Committee then stated in no uncertain terms that he would give no accounting. The guests and most of the members did not realize that this was part of the programme until about 2 ounces of liquid in a tiny bottle was passed over to Mr. Cruthers as his share of the entertainment. He then, was fully pacified after smelling, sipping and pouring it into his glass.

Mr. Adsett the representative of the infant Belleville Branch was wheeled in, dressed in baby clothes including bonnet, by Mr. Ross Dobbin, and conveyed greetings from his Branch. Mr. Douglas Laird gave a brief address on Institute affairs. Frank Pope introduced Mr. Jack Morris who outlined the "Trades Training Scheme" introduced in 1948 at Courtauld's Limited. The scheme is open to any employee from 20 to 40 years of age who is able to qualify.

The training period is two-and-a-half years and is broken up into six-month periods. In each period, the trainee learns a different phase of his chosen trade under a qualified workman who instructs eight trainees and receives extra remuneration. The trainees are also required to take night classes at the Cornwall Vocational School. Both speakers entertained the meeting with several superbly told stories.

The results of the election of Branch officers were as follows:—Chairman, A. J. Bonney, Quaker Oats Company; secretary-treasurer, J. P. Watts, C.G.E. Company; Members of executive, R. T. Bogle, G. S. Wade, J. L. McKeever, C. B. Muir, D. A. Drynan.

Saguenay

F. E. Hogg, M.E.I.C.
Secretary-Treasurer

W. A. Armstrong, Jr.E.I.C.
Branch News Editor

On Monday, January 22nd, 1951, a dinner meeting of the Saguenay Branch was addressed by Mr. J. F. Wickenden, vice-president of the Institute. Mr. F. G. Barker, presided, and the speaker was introduced by G. T. Malby, M.E.I.C.

Mr. Wickenden reviewed the affairs of the Institute and outlined a plan for a convention of the branches in his region. The lengthy question period which followed covered such topics as higher membership fees and procedure for obtaining membership for new Canadians.

Mr. E. Pare brought greetings from the Quebec Branch to the seventy-five guests present. Mr. Wickenden was welcomed to the district by Mr. L. C. Wellington of the Aluminum Company of Canada, and by Mr. N. F. McCaghey of Price Brothers.

Junior Section

R. H. Singleton, M.E.I.C.
Secretary

A technical meeting was held by the Junior Section of the Saguenay Branch, in the new Laboratories auditorium Tuesday evening February 6. Mr. E. H. Gavlas, of the Aluminum Company of Canada's Shipshaw Power House, presented a very interesting and instructive talk on **Principles of Design and Testing of Electrical Insulation.** The basic fundamentals of the behaviour of insulating materials when subjected to alternating voltages was first presented. This was followed by descriptions of the design of low and high tension power cables, of transformers, and of bushings (insulators at points where power cables enter transformers), particular stress being placed on insulating characteristics and subsequent power factor values. Finally, methods of testing insulation in the above equipment were described. This is done by applying an alternating voltage across the insulation and measuring the current and also the power that escapes across it. The contact positions for testing must be ingeniously chosen, particularly when checking the transformers.

The address was presented in an efficient and straightforward manner and so as to be understood by those less acquainted with electrical principles. The peaker was introduced by the chairman, Ir. H. V. Page and thanked by Mr. G. . Kinnear.

Sarnia

G. R. McMillin, M.E.I.C.
Secretary-Treasurer

R. Neil Payton, Jr.E.I.C.
Branch News Editor

On Tuesday, January 16, sixty members of the Sarnia Branch attended a inner meeting to hear an address by Ir. Brad Hooper of the Refractories Division, Babcock-Wilcox Company, New York. The speaker was introduced y P. C. Cochrane, and spoke on the opic **Refractories and Their Applications,** illustrating his address with oloured slides showing the manufacture f refractories in the company plant at Augusta, Ga.

Mr. Hooper described refractories under 4 major headings; scope of refractories made, general types, properties, and methods of control of properties. Refractories are defined as heat esisting materials and are made in standard brick shape, special shapes under 1,000 pounds, and refractory nortars. Refractories are necessary as a art of the "tooling-up" programme for many industries including the power, glass, iron and steel industries, the speaker explained. Before metals can be roduced there must be blast furnaces capable of resisting the particular temperature and atmosphere present in the rocess. Of the refractories made in the United States, silica and aluminous silica comprised 58 per cent, with lesser percentages of more costly magnesites, chromites and fused alumina. The later types may be used where resistance to basic or acidic slags are required, also for maximum resistance to abrasion. High thermal conductivity is a property common to these types. Much greater quantities of the intermediate grades of fireclay brick are used in steam boilers, open hearth and blast furnaces, which may require a million brick or more per furnace.

Other firebrick having special qualities include a heavy firebrick used for "backing-up" furnace walls and a lightweight insulating firebrick developed for the U.S. Navy. Weight of the latter brick is as low as one pound, containing 90 per cent air space and can withstand furnace temperatures up to 2400 deg. F. without serious loss of strength, shape or spalling. Thermal conductivity is approximately one-fifth that of average firebrick, making this type of firebrick of great promise in jet engine and atomic energy fields. Mr. G. Foucar on behalf of the local section thanked the speaker for his informative address.

Following the dinner, chairman of the new committees were introduced by President-elect C. P. Sturdee.

It was also announced that the President of the Institute would be guest of honour at the February and March meetings.

Sudbury

D. McKinty, M.E.I.C.,
Secretary-Treasurer

The Sudbury Branch of the Institute held a general dinner meeting on Friday, January 12, 1951. Fifty-eight attended, most of whom were members, with some from Sturgeon Falls and Espanola.

Mr. Rowatt, general sales manager of the S.K.F. Company, presented two films: "A Travelogue of Sweden's Industry" and "The Making of Bearings". The films were followed by a lively discussion period which showed the keen interest of the members in anti-friction bearings.

The application of the branch for membership in the Sudbury Chamber of Commerce has been approved and a branch member, P. R. McAdam, has been elected to the board of directors. The members have shown considerable interest in Branch membership in the Chamber and support of its functions should be quite active.

The next general meeting was announced as a dinner held jointly with the Professional Engineers, on February 9, 1951. Guest speakers would be E. V. Buchanan and Tom Medland.

Toronto

F. E. Wellwood, M.E.I.C.,
Secretary-Treasurer

I. S. Widdifield, M.E.I.C.,
Branch News Editor

Mr. C. D. Carruthers was installed as chairman of the Toronto Branch at the annual meeting held in the Albany Club on Tuesday, January 16, 1951. More than 100 members sat down to dinner and greeted President Vance on his presidential visit. President Vance discussed the engineering profession in Canada and expressed concern at the falling off of the enrolment of students in the engineering faculties of the Canadian Universities. He also felt that there was a definite need for greater cooperation between civilian and army engineers and suggested that army engineers in this military district be invited to take part in our Branch meetings. He thought it might be possible to have the army engineers address one of the meetings and tell the Branch members of their needs and problems. He outlined in some detail his trip across the Country and his visits to the various branches and closed by drawing attention to some of the problems facing the Institute in the near future.

The Leonard Medal was presented to Mr. Cavanaugh, of the Ontario Research Foundation, by President Vance.

The following societies were represented at the head table:

Class of 1951, University of Toronto.

Engineering Society of the Faculty of Applied Science.

Ontario Chapter A.S.M.E.

Toronto Branch A.I.E.E.

Toronto Builders Exchange.

Association of Professional Engineers of the Province of Ontario.

Toronto Chapter of the Ontario Architects.

Hamilton Branch E.I.C.

Belleville Branch E.I.C.

Past Presidents Dr. C. R. Young and Colonel Grant were also at the head table.

In addition to Chairman C. D. Carruthers, the following executive members were elected: W. H. Patterson, vice-chairman; F. E. Wellwood, secretary-treasurer; committee members, H. Cadario, McKenzie McMurray, Dean K. Tupper. The following committee members will carry on to complete their two year terms: R. Teagle, D. Beam, I. Widdifield.

Vancouver

Stuart S. Lefeaux, M.E.I.C.,
Secretary-Treasurer

H. T. Libby, M.E.I.C.,
Branch News Editor

The February meeting of the Vancouver Branch of the Institute was held in the Medical Dental Building Auditorium on February 16, with J. E. MacDonald in the chair and approximately 45 students and members present. The featured speakers were Dave Wood, Al Cronk and Emil Dubnie, whose papers had been selected as the three best in the competition recently conducted among the engineering students of the University of British Columbia. Don Jamieson, chairman of the student branch, was called upon to introduce the speakers.

The first paper, **Colour in Industry,** by Dave Wood dealt at some length with the benefits that can be derived by the careful study and application of colour in the factory and office. He showed how sound colour engineering tends to reduce fatigue and increase employee morale.

Al Cronk's paper on **Blanking Dies,** explained how the aircraft industry made cheap and effective blanking dies, suited more particularly for use on light guage and soft metals, at considerably less cost than conventional dies. He illustrated his paper with clear blackboard illustrations.

The final paper, **Copper Mountain Mine,** by Emil Dubnie, explained the geology of the area surrounding the Copper Mountain Mine near Princeton, B.C., and told of the high degree of mechanization and careful engineering planning required to make the removal of ore from this area economically feasible. Mr. Dubnie's paper was illustrated with a prepared map and much use was made of the blackboard during his talk.

The board of judges, comprised of W. Tindale, D. Denham and E. B. Webster, awarded the prizes to Emil Dubnie, Al Cronk and Dave Wood in that order. Dr. H. J. McLeod, dean of the Faculty of Applied Science of the University of British Columbia, in presenting the prizes, remarked that he was sure that the judges must have had great difficulty in selecting the best paper and thanked the Institute for the interest that it takes in the engineering students.

Mr. S. H. de Jong, chairman of the Programme Committee, outlined the tentative programme for the summer and fall season and stated that members would be formally notified as soon as the dates were established.

Mr. H. N. "Dutch" Macpherson reported on his recent visit to a Kamloops meeting and conveyed the best wishes of that group to the Vancouver Branch.

The regular monthly meeting of the Vancouver Branch of the Engineering Institute of Canada was held in the Auditorium of the Medical Dental Building at 8:00 p.m. on the evening of January 17th with members of the Vancouver Branch of the B.C. Engineering Society as guests. A record attendance of approximately 190 were present to hear a very fine talk by Mr. J. C. Oliver, Vancouver city engineer, on some of the problems of a city engineering department.

Mr. Oliver opened his address with a brief review of the services that were required in order that large cities could exist, such as sewers, water supplies, railway, interurban and urban transportation, airports, electric and gas services and communications such as telephones and telegraphs. He pointed out that, even though most of these services were carried on by private companies, the City plays an important part in the over-all planning.

In reviewing briefly the history of the City for the last 10 years he showed how during the war years a tremendous backlog of maintenance work was built up owing to the shortage of men and materials. By briefly reviewing, also, the tremendous growth in the population during the last decade he showed how a great expansion of existing facilities became necessary.

Mr. Oliver reviewed briefly the progress made todate. He explained that instead of the population remaining approximately static or even possibly declining after 1945, as had been anticipated, it has actually increased approximately 23 per cent. The City has also been affected by the rising costs of wages and materials so that the approved 50 million dollar 10-year programme has not been able to achieve what was expected of it. To-date 72 miles of streets have been paved or resurfaced, 55½ miles of sewers have been installed and 60 miles of water main laid. Besides this, 100 miles of gravel roads have been treated. All this, on top of the normal maintenance work that is required to the 1,000 miles of streets in Vancouver. The extent to which these repairs can go was emphasized by the fact that the cold spell of last winter cost the City $310,000 for snow clearing, sanding and extra maintenance on the light type of roads.

Mr. Oliver stated that traffic planning and traffic control was by no means the least important of the City's services. He mentioned the fact that the taxes paid by the ordinary domestic esablishment by no means pay for its share of the City's services. The difference is made up largely by the higher taxes paid by the down-town shopping area and by businesses and industries. He pointed out that in order to protect property values in the down-town area, and thereby maintain that source of revenue, it was necessary to provide for free flowing traffic in and out of the City and to encourage short-time parkers. He further explained that it would be virtually impossible to provide sufficient street capacity to permit everybody to use their private cars and drive into the heart of the City in the rush hours without some congestion, but as long as the transit system can operate freely by far the greatest majority of the people would be served.

Mr. Oliver touched briefly on traffic problems peculiar to Vancouver brought about by False Creek and mentioned the plans under consideration to overcome this difficulty. The first is, of course, the erection of the new Granville Street Span. In answer to a question Mr. Oliver replied that to the best of his present knowledge the bridge was going ahead as planned.

When questioned regarding the possibility of early completion of the Vancouver-New Westminster expressway, Mr. Oliver explained that it will be a very expensive project, costing at least $10 million per mile, and more in the cities. He said that at present the time lost and the volume of traffic does not merit such an expenditure although the time will undoubtedly come when it will. He explained that the stand that the City is taking is that the route should be established, building lines planned, the necessary properties purchased while they are comparatively cheap, rather than be faced at a later date with the problem of purchasing a route through fully built-up districts.

On behalf of the meeting Mr. R. A. McLachlan thanked the spreaker for an extremely informative and interesting talk, and mentioned that he was sure that many other civic-minded bodies would welcome such a talk.

Victoria

W. A. Bowman, jr.e.i.c.
Secretary-Treasurer

Gordon J. A. Kidd, s.e.i.c.
Branch News Editor

The annual meeting of the Victoria Branch was held in the Prince Rupert House on Friday evening, January 19, 1951. Chairman H. F. Bourne carried on the business meeting.

Mr. G. W. C. Lake, councillor, reported for the nominating committee and the following slate of branch officials were elected: chairman, T. A. J. Leach; vice-chairman, A. S. G. Musgrave; secretary-treasurer, W. A. Bowman; branch news editors, G. J. A. Kidd; executive committee, A. W. Lash and W. G. McIntosh; and D. A. MacLean, G. W. C. Lake and J. A. W. Izard, by virtue of their election for a two-year term at the last annual election.

D. A. MacLean, J. A. W. Izard, and G. Simmons, were nominated and elected to the programme committee. Colonel Sherwood was elected as auditor for the Branch.

Mr. Leach introduced Mr. G. F. Greene, light and power superintendent of the B.C. Electric Railway Company, who gave a most interesting address entitled, **Electronics Enter the Power Field.**

Mr. Green pointed out how the power engineer is accustomed to dealing with large things; huge dams, generators, thousands of amperes of current. His electronic brother engineer, as he juggles with vacuum tubes and tiny fractions of an ampere, which seem so puny by comparison, for years has been overlooked. However, it has gradually dawned upon the power engineer that the electronic engineer held the answer to problems that had gone unanswered for years. The electronic engineer has done much to keep the cost of electricity from rising when everything that goes into its operation and production has nearly doubled in the past few years. This has been done by reducing operation costs and much of this reduction has been brought about by use of electronic devices.

Mr. Greene then went on to explain some of these devices and how they are used. They are as follows: supervisory control by which the operation of numerous devices can be effected from a remote point over a single control channel; telemetering, where meter readings of temperature, water level, or any measurement that can be translated into electrical impulses can be transmitted over great distances; fault location for transmission lines which locates a fault in the line within a few hundred feet and eliminates costly patroling; space radio which is mostly useful for communication with mobile units; carrier current radio by means of which the same wire that carries the power can be used to carry intelligence; load control system, which is a combination of some of the above; automatic synchroscope which relieves the operator of the responsibility for bringing systems together at precisely the correct moment; microwave radio with its promise for increased transmission channels at less capital cost than telephone lines; the mercury arc rectifier which is important in the metallurgical fields; and the precise control of timing functions with the electronic timer.

As a result, during the short time that electronics have been in the power field, it has accomplished remarkable results with large savings in operating costs. Mr. Greene concluded his address by expressing the belief that electronics have been accepted as a very necessary part of an increasingly complex operation.

British Gas Turbine Developments

Most important news in this field during 1950 was the release of figures giving the power output of the Armstrong Siddeley "Sapphire" said to be the most powerful aircraft engine in the world. Static thrust is 7,200 -lb. which, at a speed of 600 miles an hour, is equivalent to over 10,000 horsepower—more than the whole power output of all four engines of a normal present-day airliner.

Another development witnessed during 1950 was the propulsion of a small passenger car by a gas turbine of 120 horsepower developed by the Rover Company in Britain. Two of these turbines were used to power a motor launch which was demonstrated on the River Thames.

Key to successful turbine practice is the metal of which turbine blades are made. This has been a major problem for designers throughout the world. In August, 1950, some details were released of the alloy known as "Nimonic 90", which has been in use on aircraft turbine engines for some time. It is claimed for it that, at 750 Degrees Centigrade, it is ten per cent better than the alloy used formerly (Nimonic 80 A) and that even at 870 degrees Centigrade it shows a high load-carrying capacity for long periods.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment.*

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER to act as economic analyst. Applicant should have post graduate training in finance and commerce or business administration with 2 years experience in chemical industry. Duties include market analysis and research. Location Ontario. Apply to File No. 2036-V.

TWO CHEMICAL ENGINEERS required in Central Ontario with about 2 to 5 years experience in the chemical industry, for processing work in rubber plant. Apply to File No. 2036-V.

YOUNG CHEMICAL ENGINEER required in plant located in Province of Quebec. Applicant would be obliged after completing training period to take charge of analytical laboratory and to co-ordinate production with control both in alcohol distillery and in magnesia insulation plants. Preferably under 30 years of age with 1 or more years industrial experience. Apply to File No. 2054-V.

CHEMICAL ENGINEERS with production ability, to operate chemical equipment such as filter presses, evaporators, vacuum jets, solvent recovery, etc. Location Valleyfield, Quebec. Excellent opportunity offered. Salary open. Apply to File No. 2053-V.

CHEMICAL ENGINEER 1949 or 1950 graduate required by large pulp and paper industry located in Province of Quebec. Apply to File No. 2059-V.

CIVIL

CIVIL ENGINEER required by large construction company in Montreal. Applicant should have 3 or 4 years experience in the design of reinforced concrete. Apply to File No. 2033-V.

CIVIL ENGINEERS required by large construction company in Montreal. Applicants should have 2 or 3 years experience in field and general construction. Apply to File No. 2034-V.

CIVIL, ELECTRICAL AND MECHANICAL ENGINEERS

Required by Vancouver, B.C., firm for office design on large hydro-electric development. Desire only working engineers with three or more years hydro or related experience.

Applications should include complete record of experience, salaries received, salary expected, and time required to make a transfer to Vancouver. Salaries commensurate with qualifications. Apply to File No. 2065-V.

YOUNG CIVIL ENGINEER with knowledge of reinforced concrete structures. Duties include supervision of concrete construction in Quebec, measurements on the work, drawings, reports and process estimates. Applicant must be bilingual. Reply in writing, giving full particulars as to experience, qualifications and salary expected to File No. 2060-V.

CIVIL ENGINEER required by engineering department of construction company. Duties include estimating, laying out construction work and engineering supervision. Salary dependent upon ability. Reply giving complete details of background and experience. Apply to File No. 2064-V.

ELECTRICAL

ELECTRICAL ENGINEER required by large power company in Eastern Canada. Some experience preferable but not essential. Good opportunity for advancement. Excellent working conditions. Apply to File No. 2031-V.

ELECTRICAL ENGINEER 1947 or 1948 graduate with broad experience in selection installation and maintenance of electrical equipment in either industrial plant or public utility. Location Ontario. Apply to File No. 2044-V.

ELECTRICAL ENGINEERS required by large public utility in Montreal. Applicants with or without experience desired. Apply to File No. 2046-V.

MECHANICAL

MECHANICAL ENGINEER wanted, with designing experience and mechanical ability, plus a desire to become sales engineer, by manufacturer of road building machinery located in the Province of Quebec. Good speaking knowledge of French is necessary. Apply to File No. 2037-V.

MECHANICAL ENGINEER with 3 to 5 years experience in maintenance engineering. An asset if bilingual but not necessary. Location: Valleyfield, Quebec. Excellent opportunity offered. Salary open. Apply to File No. 2053-V.

MECHANICAL ENGINEER, recent graduate, to act as plant superintendent in large bakery in Montreal. Apply to File No. 2055-V.

MECHANICAL ENGINEER of about 35 to 40 years of age to assist mechanical superintendent of plant located in Eastern Canada. Work will involve assisting supervision of construction, installation and maintenance of plant equipment including pumps, boilers, refrigeration air-conditioning equipment, etc. Salary about $5,000.00. Apply to File No. 2056-V.

MECHANICAL ENGINEER required for large construction quarry and concrete company. Must have some experience in layout and design of plants. Salary commensurate with ability. Reply giving complete details of background and experience. Apply to File No. 2064-V.

METALLURGICAL

METALLURGIST, recent graduate required for cast iron foundry located in Province of Quebec. Apply to File No. 2050-V.

MISCELLANEOUS

TOP FLIGHT MAN for methods and time study work on all operations incidental to manufacturing of light and heavy sheet metal products. Excellent opportunity for man of proven ability and experience to establish himself with a sound company employing 200 people. Salary open. Applicants to apply in writing giving complete facts on education, experience and personal history. Enclose recent photograph. Apply to File No. 2029-V.

HYDRAULICS ENGINEER for the water rights branch, department of lands, B.C. Provincial Government. Salaries; hydraulic engineer Victoria and assistant district engineer, Kamloops $3,696.00 to $4,296.00 assistant hydraulic engineer, Victoria $3,336.00 to $3,576.00. Positions permanent; superannuation plan. Candidates must be British subjects, preferably under 45 years of age; graduates in civil engineering or equivalent; eligible for full registration in Association of Professional Engineers of B.C. (in case of the last position, eligible for registration as engineer in training), knowledge of survey methods, photogrammetry hydraulics and hydrology of river discharge, dam design, soil mechanics and samplings; field and office experience on engineering work in hydro electricity, or irrigation and water supply or hydrology. Apply to File No. 2032-V.

ENGINEERING PHYSICIST required in Ontario for laboratory control work on routine analysis, calibration and development of testing and measuring equipment. Applicant should have about 1 year experience. Apply to File No. 2036-V.

HYDRAULIC ENGINEER fully qualified required by large industrial organization in Montreal. Applicant should be familiar with the design of hydro-electric power stations and water storage. Apply to File No. 2038-V.

PROFESSIONAL ENGINEERS of 2 to 15 years experience required for a large manufacturing firm in Southern Ontario. Reply giving education, experience, etc., to File No. 2040-V.

TWO SALES ENGINEERS required by firm in Montreal manufacturing welding and cutting apparatus. Applicants should be 1949 or 1950 graduates in engineering with definite sales ability. Apply to File No. 2041-V.

GRADUATE ENGINEER required in the development and engineering department of firm located in Montreal. Applicant must have a minimum of 4 years experience in a steel manufacturing plant. Position involves technical assistance to the steel industry in use of our products and work on problems related to this field. The territory will be mainly in Quebec and Ontario with headquarters in Montreal. This is an excellent opportunity along technico administrative lines for the suitable person. Apply to File No. 2042-V.

SALES ENGINEER, preferably mechanical, required by organization in Montreal. Applicants should be around 33 to 37 years. Duties would include designing and selling under supervision of specialty machinery used in pulp and paper mills for handling pulp wood and newsprint. Starting salary $4,000.00. Apply to File No. 2043-V.

CHEMICAL OR PETROLEUM ENGINEER 1940 to 1945 graduate capable of geological evaluation of petroleum and gas producing areas and preferably with experience in refinery or chemical production. Location Ontario. Apply to File No. 2044-V.

REPRESENTATIVE required by firm in Toronto manufacturing tarred felt and pitch used in roof construction, tar distillers, etc. Applicant would be obliged to call on architects, consulting engineers and general contractors. Apply to File No. 2047-V.

MECHANICAL AND STRUCTURAL ENGINEERS to act as project engineers to undertake the study and necessary design and drawing work in connection with a combination bar and strip mill located in Ontario. Salaries open. Apply to File No. 2048-V.

PROJECT ENGINEER graduate with at least ten years experience in design, construction and operation of petroleum chemical plants on petroleum refineries, required to supervise project division of company engaged in engineering and construction of gas processing plants located in Montreal, Canada. Salary commensurate with ability and experience. Apply to File No. 2051-V.

ENGINEER, age 35 to 45 years as maintenance superintendent and chief engineer for large Montreal property, approximately 750 rooms. Must be certified for large boiler plant, and be experienced in controlling cost of maintenance trades, including plumbers, carpenters, painters, etc. Bilingual preferred. Attractive opportunity to become established in permanent congenial situation. Apply to File No. 2057-V.

DESIGN AND DETAIL ENGINEERS required by a package handling conveyer concern located in Ontario. Promotion to responsible positions is offered to applicants having the necessary ability and qualifications .Apply to File No. 2058-V.

MECHANICAL OR CHEMICAL ENGINEER with two to three years' design experience in the chemical or petroleum industry located in Ontario. Excellent opportunity offered for advancement in a fast growing young company. Apply to File No. 2061-V.

DRAUGHTSMAN, Senior layout man, required for the engineering department of new plant in Western Ontario. Must be capable of making complicated layouts from specifications, drawings, sketches or notes furnished by engineers and have considerable knowledge of manufacturing processes and their limitations. Should be capable of doing some designing. Experience in structural work and piping. University degree would be helpful but not necessarily required. Apply to File No. 2062-V.

TWO RECENT GRADUATES required immediately for new Canadian plant of well known American Company. Prefer men with interest in industrial piping for chemical and other industries. Excellent opportunities for advancement. Salary commensurate with ability and experience. Company located in Hamilton. Apply to File No. 2063-V.

WE REQUIRE QUALIFIED ENGINEERS experienced in construction work on reinforced concrete, structural steel and frame buildings, as well as incidental services. Administrative ability and technical knowledge are essential. Employee benefits include three weeks annual vaction, sick leave allowance and a liberal plan for life insurance. hospitalization, and surgical benefits for the employee and his family. Replies are to contain details concerning education, experience, salary requirements, age, marital status and date available. Apply to File No. 2066-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

Situations Vacant

CIVIL

CIVIL DRAUGHTSMAN required by large well established Canadian company. Minimum of 10 years experience in concrete. Location Toronto. Apply to File No. 1687-V.

CIVIL ENGINEER, English speaking, preferably some surveying experience on road or transmission line location or other topographic work. For training in photogrammetry and subsequent emplyment as ground surveyor and control engineer for aerial mapping. Apply in writing stating experience to File No. 1691-V.

CIVIL ENGINEER, French speaking for training as operator of photogrammetric plotting machines and subsequent employment as operator in Montreal office. Good long term prospects for right man with executive ability. Initial salary during probationary and training period $200.00 per month. Apply to File No. 1692-V.

YOUNG CIVIL ENGINEER about 35 years of age with construction and administration ability. Applicant should be bilingual. Location Montreal. Excellent opportunity offered. Salary open. Apply to File No. 2009-V.

CIVIL ENGINEER required by large Canadian company with experience in structural steel design, preferably on hydro-electric structures such as gates and outdoor switching yards. Apply to File No. 2017-V.

CIVIL ENGINEER for design work on hydro-electric structures. Prefer at least four years' experience in this field. A knowledge of power house and dam foundations is desirable. Good opportunity with large Canadian company. File No. 137. Apply to File No. 2017-V.

ELECTRICAL

THE PUBLIC SERVICE OF CANADA requires Electrical Engineers (electronics and communications). Appointments at Ottawa. Toronto and Montreal. Salaries up to $4,740,000 per annum. Details and application forms may be obtained by writing Civil Service Commission, Ottawa. Competition No. 50-158-B. Apply to File No. 2016-V.

FULLY EXPERIENCED ELECTRICAL ENGINEER required by textile industry located outside Montreal. Applicant must have some real practical experience, about 15 years in a manufacturing plant, preferably textile mill. Excellent opportunity offered. Apply to File No. 1418-V.

FOUR ELECTRICAL ENGINEERS required by a large well established Canadian company. C or D class. Minimum 1-3 years experience, preferably in powerhouse electrical layout. Location Toronto. File No. 13651. Apply to File No. 1687-V.

FOUR ELECTRICAL ENGINEERS with five years or more experience in design, specifications, estimates, layout, inspection and testing, etc., for distribution work. Location Toronto. Reply stating age, education and details of work actually carried out in previous positions to File No. 1696-V.

ELETRICAL ENGINEER with a minimum of two years industrial experience on control devices and wiring, prefer test course training. Location Southern Ontario. Please quote File No. 13710. Apply to File No. 2005-V.

WELL QUALIFIED ELECTRICAL ENGINEER required by a large Canadian organization to act as supervisor of overhead distribution for its overseas operations. Duties will include long range planning of overhead distribution systems and allied substations; review of present overhead distribution practices with a view of improving and standardizing such practice and reducing operating costs. Quote File No. 137. Apply to File No. 2005-V.

ELECTRICAL ENGINEER required by large Canadian organization for its overseas operations to act as chief of system planning. Duties will include long range overall system planning of generating, transmission and receiver-station facilities in co-operation with operating companies; the direction of the activities of overhead and underground distribution, relay-protection, carrier-current, radio, special studies and standards and research departments. long range forecast of capital expenditures for the necessary transmission and distribution facilities and general engineering problems. Quote File No. 137. Apply to File No. 2005-V.

ELECTRICAL ENGINEER with two years industrial experience on circuit breakers, disconnect switches and metalclad switchgear, prefer test course background. Location Toronto. Quote File No. 13711. Apply to File No. 2005-V.

ELECTRICAL ENGINEER with a minimum of two years industrial experience on rotating electrical equipment, prefer test course background, duties include specification writing and general engineering work with large Canadian firm Location Toronto. Refer to File No. 13712. Apply to File No. 2005-V.

YOUNG ELECTRICAL ENGINEER, 1949 or 1950 gradaute required by consulting engineering firm in Montreal. Salary open. Apply to File No. 2008-V.

ELECTRONIC ENGINEERS required by large Montreal firm for development work on radio communication equipment and radar. Applicants should have three or more years of practical design experience in this field. Apply to File No. 2011-V.

ELECTRICAL ENGINEER required by university in Montreal. Duties include design and construction of electronic equipment and finally extensive research. Apply to File No. 2022-V.

ELECTRONIC ENGINEER required in Montreal with some experience with radar. Apply to File No. 2026-V.

MECHANICAL

MECHANICAL ENGINEER required by large organization in Montreal. Applicant should be between 30 to 35 years. Duties include general machine shop work and planning. Apply to File No. 1673-V.

MECHANICAL ENGINEER required for small manufacturing plant in Niagara Peninsula. Duties will consist of general draughting and machine design, particularly valves. Some previous experience would be advantageous. Apply to File No. 1681-V.

TWO MECHANICAL ENGINEERS for mechanical inspection in the field. Experience necessary in Hydro-Electric projects. Location overseas. Apply to File No. 1687-V.

MECHANICAL ENGINEER to act as sales engineer for large organization in Montreal. Salary range $5,000.00. Apply to File No. 1690-V.

MECHANICAL ENGINEER required by firm located in the Maritimes with some experience in steel design and construction. Apply to File No. 1695-V.

MECHANICAL ENGINEER required by a large manufacturer in Montreal of heavy mechanical equipment. Applicant should have several years industrial experience which should include a background of welding knowledge Apply to File No. 2001-V.

MECHANICAL ENGINEER with several years experience on design and layout of mechanical equipment for hydro-electric construction, location Southern Ontario. When replying please quote File No. 137-8. Apply to File No. 2005-V.

Managing Engineer

For Canadian owned company manufacturing electrical equipment in Toronto. Professional engineer with electrical-mechanical background required, preferably with experience in switch gear cubicle and street lighting design. This position requires both administrative and engineering ability. Age range—30 to 40. Excellent future, good salary, plus bonus and pension. Give full details of education and experience. Our employees know of this advertisement. All replies will be held in strictest confidence. Apply to File No. 2067-V.

ENGINEERS

for

Defence Construction Work

We require qualified engineers experienced in construction work on reinforced concrete, structurol steel and frames buildings, os well os incidental services. Administrotive ability ond technical knowledge are essentiol. Employee benefits include three weeks annuol vacation, sick leave allowance ond liberol plan for life insuronce, hospitalization, o n d surgicol benefits for the employee and his family. Replies ore to contoin detoils concerning education, experience, solory requirements, age, moritol stotus and dote ovoilable. Apply to File No. 2066-V.

MECHANICAL ENGINEERING GRADUATE or equivalent with three or more years experience in design and manufacture of light alloy structures required by large Montreal firm manufacturing radio communication equipment and radar. Apply to File No. 2011-V.

MECHANICAL ENGINEER recent graduate up to three years employment interested in obtaining drawing office experience in plant production of heavy armament work. Forty minutes by tramways from Phillips Square, Montreal. Apply to File No. 2014-V.

MINING

TWO MINING ENGINEERS required by large firm in Province of Quebec to take charge of surveying work underground. Reply giving full details of experience and salary required. Apply to File No. 2015-V.

MISCELLANEOUS

TWO SALES ENGINEERS required to act as representatives in Montreal and Toronto by young progressive industry, interested in the sale of British made products and having some experience in pulp and paper industry. Apply to File No. 1674-V.

SENIOR PETROLEUM ENGINEER required by independent Canadian Oil Company with headqaurters in Calgary. Applicant should be particularly experienced in reservoir engineering and production practices. No one with less than 7 years experience in the industry need apply. Give synopsis of education, training and experience and supply recent photo. Apply to File No. 1675-V.

MECHANICAL OR ELECTRICAL ENGINEER for supply inspection department of a large organization in Toronto. Applicant should have at least 12 to 15 years extensive practical shop and office experience in the manufacture of heavy mechanical and electrical machinery and equipment. Reply stating age, education and details of experience to File No. 1678-V.

SENIOR BUYER with 7 to 10 years diversified purchasing experience. Electrical engineering or engineering training desirable; also administrative or supervisory ability. Location Toronto. Apply to File No. 1679-V.

TWO MECHANICAL OR ELECTRICAL ENGINEERS for the design and development of meters and clocks, required for large electrical organization in Quebec City. Apply to File No. 1682-V.

INSTRUMENT ENGINEER (electrical or mechanical preferred) required for large oil refinery in Montreal east. Applicant should have not less than three years experience as instrument engineer or not less than 5 years general electrical engineering experience. Would be expected to take charge of instrument department under general supervision of power engineer. Salary open. Applications will be treated confidentally and should include full particulars as to qualifications, together with recent photograph. Apply to File No. 1684-V.

RESIDENT ENGINEER wanted, for construction of proposed Granville bridge in a Vancouver, B.C. Duration of work approximately two years, starting about March 1, 1951. Applications should be made by letter giving full details of experience, professional qualifications, age, etc., and salary expected. Apply to File No. 1685-V.

SALES ENGINEER or contact man required by a firm of inspection engineers in Montreal. Must have considerable experience and be between 30 and 40 years of age. Apply to File No. 1686-V.

RESIDENT ENGINEER required by large well established Canadian company, minimum 10 years experience in Hydro Electric construction, competent in design, construction experience in field. Age approximately 40 years. Location overseas. Apply to File No. 1687-V.

BRITISH ADVERTISER seeks Canadian engineering firm with reputation, willing to join with long established English counterpart. Enquirer to provide capital, select tools and supervise projects directed to both government equipment and rearmament programs. Also industrial manufacturer of small engines, motorcycles, etc. Apply to File No. 1688-V.

DESIGN ENGINEER preferably mechanical required by large organization in Montreal. Applicant must have admisistrative ability. Salary range $5,000.00. Age 30 to 40 years. Apply to File No. 1690-V.

GRADUATE ENGINEER for design work on buses, required by large organization in Montreal. Apply to File No. 1690-V.

GRADUATE ENGINEERS AND DRAUGHTSMEN, mechanical, civil, electrical required for projects in Ontario and Quebec. Preference to those with 3 years practical experience. Apply to File No. 1697-V.

MECHANICAL (practical) Production Engineer, with thorough knowledge of metal working machinery, plant layout, processing, tooling and die making, production control for Western Canada Manufacturer selling all across Canada to other manufacturers and to wholesalers. Prefer man of 40 or older. Permanent and good future for a good practical factory manager and producer. Apply to File No. 1704-V.

AIRCRAFT HYDRAULIC DESIGNER required by large Montreal aircraft manufacturing firm. Must have 4-5 years experience and sound overall knowledge of system layout, flow calculations and detail component design. Apply to File No. 1703-V.

TECHNICAL REPRESENTATIVE required in Montreal by Canadian Branch of British textile firm, manufacturing textile and cable machinery. Applicant must have executive ability as position offers exceptional opportunity. Apply to File No. 1706-V.

SCIENTIFIC OFFICERS wanted. Applicants should be Canadian citizens who are graudates in science, preferably with post graduate training. Research or general experience in some particular scientific field is desirable in certain positions. War service will be considered an additional qualification in some positions and a requirement in others. The main duties will pertain to the co-ordination, control and dessemination of scientific information in most of the major fields of science and technology. Salary $2,700.00 - $3,800.00 depending upon qualifications and experience. Apply to Box 1274, Station B, Ottawa, Ontario. Apply to File No. 1707-V.

DESIGN ENGINEER approximately ten years experience in structural material handling and mechanical design. Boiler design experience an asset but not essential. Location Western Canada. Apply to File No. 2000-V.

CITY ENGINEER required in Western Canada. Applicants should state age, qualifications, salary required and details of previous experience. Preference will be given to applicants possessing municipal engineering experience. Apply to File No. 2003-V.

HYDRAULIC ENGINEER with several years' experience on reinforced concrete design nad hydraulic structures, location Southern Ontario. Please quote File No. 13709. Apply to File No. 2005-V.

GRADUATE ENGINEER required by firm located in Western Canada, to handle all packaging equipment and installations throughout Canada, as well as all machines and equipment in plant. Headquarters in Winnipeg. Recent graduate required. Apply to File No. 2006-V.

RADIO TECHNICIANS required by small manufacturer located in the Maritimes, for aircraft electronic equipment maintenance. Applicants should have some experience. Apply to File No. 2007-V.

PRODUCTION MANAGER for small light engineering unit located in the Maritimes, employing approximately 60 people. Duties include production methods and layouts, produce own cost estimates on jobbing basis and be wholly responsible for operation of plant production facilities and personnel. Apply to File No. 2007-V.

CHIEF DRAUGHTSMAN required to establish small drawing office in electronics plant, located in the Maritimes. Mechanical design experience of electronic equipment, small mechanisms and structures. To be responsible for mechanical design, drawing system and draughting personnel. Mechanical draughtsmen also required. Apply to File No. 2007-V.

SENIOR ENGINEERS required by small manufacturer located in the Maritimes. Age 25 or over. University degree in engineering or physics. Three or more years experience in electronics in a senior capacity. Preferably with experience in radar problems. Salary $4,000.00 to $6,000.00. Junior Engineers also required with same type of background. Apply to File No. 2007-V.

FULLY QUALIFIED TEXTILE TECHNOLOGIST, graduate of textile institute, required in Montreal by industrial consultant. Applicant should have industrial engineering experience. Give full details as to experience and education to File No. 2012-V.

SALES ENGINEER, excellent opportunity for right man. Ontario sales and service for power house chemicals with established and growing firm. Degree in chemical engineering and knowledge of power plants and water treatment desirable but not essential. Prefer ages 25 to 35. Apply to File No. 2013-V.

MECHANICAL DRAUGHTSMEN, detailers, checkers, all grades from 2 years experience and up for plant in production of heavy armament work. Forty minutes by tramways from Phillips Square, Montreal. Apply to File No. 2014-V.

TWO INDUSTRIAL ENGINEERS, graduates in mining, required by large organization in Province of Quebec. Applicants should have some experience underground to do time study work, eventually leading to senior positions in methods and layout work. Reply giving full details of previous experience and salary desired. Apply to File No. 2015-V.

CIVIL OR MECHANICAL ENGINEER required by large mining organization in Province of Quebec for design and layout of buildings and equipment for asbestos milling operations. Reply giving full details of previous experience and salary desired. Apply to File No. 2015-V.

SUPERVISOR OF UNDERGROUND DISTRIBUTION. Large Canadian organization requires well qualified electrical engineer for its Brazilian operations, duties will include long range planning of all underground distribution systems and of allied substations, review of the present underground distribution practices and reducing operating cost, making such studies as required by the chief of system planning or the chief electrical engineer. Apply to File No. 2017-V.

ASSISTANT PRODUCTION SUPERINTENDENT required by large firm of long standing manufacturing men's shirts, pajamas, etc., for plant near Three Rivers, Quebec. Experience in manufacturing these lines or similar necessary. Applicant would be required to plan for high production, improve methods, lower costs, etc. Good position to right party. Apply to File No 2018-V.

RESEARCH CHEMIST required by chemical firm in Ontario for laboratory research under supervision. Minimum age

23 years, bachelor's or master's degree in chemistry or chemical engineering. Two or three years technical experience or Ph.D. in lieu of experience. Apply to File No. 2019-V.

CHEMIST required by chemical firm in Ontario for the development of textile chemicals. Minimum age 27 years. Degree in chemistry or chemical engineering with 5-10 years technical (laboratory or production) and sales experience. Position reqiures both research and sales abilities combined with practical knowledge of textile industry. Apply to File No. 2019-V.

ASSISTANT WORKS MANAGER required by chemical firm in Ontario. Age 30 to 35 years. Degree in chemical, mechanical or civil engineering, minimum of 5 years experience in industry. Responsible for overall supervision of plant operations, capable of maintaining discipline and assuming responsibility. Apply to File No. 2019-V.

SALES ENGINEER, recent graduate, preferably mechanical or electrical required by well established supply house with nation wide representation. Experience in equipment sales, of value but not essential. Training period to be spent in Montreal. Good opportunity for advancement to party interested in making career of this work. Apply to File No. 2020-V.

ARCHITECTURAL DRAUGHTSMAN required by large pulp and paper manufacturer in Eastern Canada for general architectural designs covering building changes on existing buildings and new buildings, etc. Apply to File No. 2021-V.

ENGINEERING DRAUGHTSMAN required by paper industry located in Montreal. Must be fully qualified. Apply to File No. 2023-V.

THREE FULLY QUALIFIED ENGINEERS required by a firm of management consultants located in Montreal. Salary open. Apply to File No. 2024-V.

MECHANICAL OR CIVIL ENGINEER required by national beverage company to act as plant superintendent in plant situated outside of Montreal. Applicant should be between 25 to 35 years of age. Salary open. Apply to File No. 2025-V.

Situations Wanted

GRADUATE CIVIL ENGINEER AND LAND SURVEYOR with proven ability to carry out responsibilities. Available on short notice. Over 23 years of wide experience on four continents. Experience includes design layout and field supervision of: roads, dams, buildings, drainage, irrigation works. Veteran C.R.E. and E.A.E., married, bilingual. Situations held in Canada: Chief of survey parties, resident engineer. Abroad: as district and assistant chief engineer for over 19 years in the British, Turkish, Iraqi, Government Services. Apply to File No. 489-W.

MECHANICAL ENGINEER, S.E.I.C. 1950 graduate, University of Toronto. Age 24, single. Experience in machine shop and repair and maintenance work. Presently employed in structural steel, foundry and machine tool industry as plant layout and maintenance engineer. Interested in permanent position leading to responsibility. Willing to work and learn. Available on short notice. Apply to File No. 505-W.

GRADUATE MECHANICAL ENGINEER, M.E.I.C., P.Eng., (Ontario), age 31, married. Presently employed in Toronto. Desires responsible position with manufacturing firm. Nine years experience in mechanical and structural design, inspection, shop liaison, and sales and service. Apply to File No. 2586-W.

MECHANICAL ENGINEER, Jr.E.I.C. (McGill, 1947). Age 25, married and family of two. Experience consists of four years of summer work as instrumentman on highway construction; several months as sales engineer in pumps and allied electrical equipment; one year including specialized training in fire inspection work for United States fire insurance company. For the past two years have been a full partner in a road building outfit in Western Canada. Desires permanent position where responsibility, organization and sales ability are important qualifications. Starting salary and location are secondary factors. Available immediately. Apply to File No. 2858-W.

GRADUATE DRAUGHTSMAN, designer, Jr.E.I.C., B.Eng. Desires a position in the structural design field, preferably reinforced concrete and design. Age 24, McGill (Civil) graduate 1948. Two years experience in structural steel and reinforced concrete detailing and design. Prefer employment in Montreal area, will consider good position elsewhere. Presently employed. Available on short notice. Apply to File No. 3026-W.

MECHANICAL ENGINEER, B.Sc. 1941, single, veteran of R.C.A.F. Experience in laboratory work, aircraft maintenance, design of heavy machinery with emphasis on welding and applied stress analysis. Desires work of research nature. Willing to work outside Canada Apply to File No. 3058-W.

MECHANICAL ENGINEER, 1947, Jr.E.I.C., age 26, two years of experience in maintenance and one and one-half years of experience in design and installation in industrial plants. Desires quality control or industrial engineering work in Montreal. Apply to File No. 3208-W.

ELECTRICAL ENGINEER, M.E.I.C., P.Eng. Six years experience in design, manufacturing, sales and application engineering, including electronic test equipment design, manufacture of public address equipment, preparation of sales information and technical writing, application of motors, controls, transformers, switchgear, etc. Desires permanent position in power field, in design, operating or application engineering, not sales. Aims to advance into management or advisory engineering. Location preferred, Southern Ontario or British Columbia. Apply to File No. 3326-W.

CIVIL ENGINEER, B.Sc. 1947, Jr.E.I.C., P.Eng. (Quebec), age 26, married, with car, 3½ years varied structural experience with architects, fabricators and contractors, covering design, detailing and estimating of structural steel and concrete as well as liaison work, desires position with responsibility. Must include outside work in design and supervision, and/or liaison work, or sales promotion. Available on one months' notice to present employer. Ontario or Alberta preferred. Apply to File No. 3340-W.

GRADUATE ENGINEER, M.E.I.C., married. Approximately 14 years industrial plant and construction experience including positions as resident construction engineer and plant engineer. At present employed and would consider changing only if offered a similar or better position with suitable opportunity for advancement. Apply to File No. 3387-W.

SENIOR PRODUCTION ENGINEER, M.E.I.C., of internationally famous engineering concern would like to assist small or medium size engineering firm in Montreal area in quickly clearing up design, production, or estimating difficulties. Available Saturdays or evenings. Temporary assignments considered. 10 years wide experience, fully qualified. Apply to File No. 3392-W.

MECHANICAL ENGINEER, S.E.I.C. Graduated with honours from U.B.C. in May, 1950. Age 24, single and in good health. At present employed in non technical work in Ontario receiving supervisory training. Would like design development on research work anywhere in Canada. Available on short notice. Apply to File No. 3395-W.

ELECTRICAL ENGINEER, honours degree, A.M.I.E.E., M.A.I.E.E. 10 years experience world famous electrical manufacturing company wishes permanent position anywhere in Canada. Very adaptable having broad range of interests. At present in Great Britain. Available early 1951. Apply to File No. 3396-W.

ELECTRICAL ENGINEER, S.E.I.C. Graduated University of Alberta, 1950. Veteran, age 29; married, no children, desires permanent position anywhere in Canada. Have Naval electrical experience and training (E.A. 3rd Class), also experienced in electrical servicing. Have good technical background and excellent personality records Available immediately. Apply to File No. 3403-W.

CIVIL ENGINEER, Jr.E.I.C., 31 years, B.A.Sc. Toronto '43. 7 years experience in industrial and housing construction both in field engineering and job supervision. Desires position in Southern Ontario in construction or related industry. Apply to File No. 3404-W.

WELDING ENGINEER, M.E.I.C., P.Eng. B.A., B.Sc. Queen's 1941. Age 34, married. 7 years production and development experience in the fabrication of heavy industrial equipment with particular reference to welded pressure vessels. Desires continued experience in this or related fields. Available on short notice. Apply to File No. 3407-W.

MECHANICAL ENGINEER, M.E.I.C., graduate McGill 1943, veteran, age 30, seeks position as project or plant engineer. Broad experience in plant layout, design, construction, alteration and maintenance work. Employed during past 3 years on design and construction of large mill now nearing completion. Would consider alternative position as executive assistant or sales engineer Apply to File No. 3405-W.

CONSTRUCTION COST ENGINEER, Queen's 1948, R.C.A.F. Veteran, with experience in all phases of estimating, scheduling, cost control, material requisitioning and expediting, for both large and small industrial projects, desires an executive or supervisory position where hard work and initiative will lead to advancement. Other assets include wife, two children and own car. Location unimportant. Apply to File No. 3406-W.

GRADUATE CIVIL ENGINEER, M.E.I.C P.Eng. (Ont.). Age 38, married, family 2. Experience includes 10 years mining and 6 years pulp and paper covering—construction, plant engineering and design. Presently employed as assistant resident engineer. Ontario or Quebec province preferred. Available on reasonable notice. Apply to File No. 3409-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., age 25, five years experience in highway and bridge construction. Presently employed but desires position with more varied experience. Am interested in any type of engineering and will work anywhere. Available in three weeks. Apply to File No. 3411-W.

1950 GRADUATE University of Saskatchewan, distinction in Engineering Physics, 26 years, family of 2. Currently mastering in physics. Have background as resident engineer on municipal engineering project; ex-navigation instructor in R.C.A.F. Desire work in applied research or in general engineering Available May 1951. Apply to File No 3414-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.Eng., McGill 1949. Age 28. Single. Good health. Experience: two summers as junior draughtsman in pulp and paper mill, two summers as helper in foundry and boiler shop of firm manufacturing heavy machinery, spring 1949 to date as engineer with major oil company. Desires to obtain plant engineering experience with a firm located in the Toronto area. Apply to File No. 3415-W.

TWO PROFESSIONAL ELECTRICAL ENGINEERS, Jr.E.I.C., Honours graduates of Canadian Universities, having completed two years training with a leading Canadian Electrical Manufacturer, seek to better their positions. Professional employment with any progressive Canadian company will be considered. Apply to File No. 3416-W.

ELECTRICAL ENGINEER, S.E.I.C., B.A.Sc., U.B.C. 1950. Age 27, single. Experience: Radar mechanic R.C.A.F. One summer each as coal mine car repairer, tipple machinery operator, and electricians' helper in coal mine. Will work anywhere. Available immediately. Apply to File No. 3417-W.

MECHANICAL ENGINEER, S.E.I.C., graduate University of Saskatchewan 1950 Age 31, married. 4 years overseas with R.C.A.F. as wireless mechanic. Some boiler shop and pipe fitting experience. Would like to specialize in heating and air conditioning or in power house work. Willing to undertake any required training. Apply to File No. 3422-W.

ELECTRICAL ENGINEER, Jr.E.I.C. Assoc. A.I.E.E., B.Sc. University of New Brunswick 1949. Age 25 ,single. One year's experience in the manufacture and design of polyphase and single phase motors. Seeks position in design or production engineering in power field preferably in Montreal area. Available immediately. Apply to File No. 3423-W.

CHEMICAL ENGINEER, Laval 1949 single, bilingual, with summer experience in shipbuilding, galvanizing of steel and making of aluminium. Nearly two years experience in food industry in Montreal. Desires a position in industrial, sales or plant engineering with opportunity for advancement. Available on short notice. Apply to File No. 3432-W.

CIVIL ENGINEER, S.E.I.C. Will graduate from N.S.T.C. May 1951. Age 31. Married. Experience on the following projects. 1 summer, rodman on municipal street layout. 1 summer, instrument man on topographic survey. 1 summer, instrument man with Department of Highways. 1 summer, resident engineer on marshland reclaimation project. Desires position preferably in municipal engineering or in Maritimes with construction company. Apply to File No. 3438-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C., Sask., 1950. At present taking masters degree at University of Toronto. R.C.A.F. veteran, 5 years practical engineering experience. Willing to work hard and accept responsibility. References and detailed experience on request. Available May 1951. Apply to File No. 3439-W.

MECHANICAL ENGINEER, Sask. 1949 (with distinction), Jr.E.I.C., P.Eng., age 32, married, veteran, desires position in Hamilton area. Since graduation experience includes employment with contractor in refrigeration, air conditioning and ventilation, including design of systems and installation. Desires a change with a firm which will give more chances of using my engineering qualifications as present position does not allow a large enough scope for engineering work. Available on one month's notice to present employer. Apply to File No. 3442-W.

ELECTRICAL ENGINEER, Higher National Diploma 1949 (Power Course), Dundee Technical College, Scotland. P.Eng., Ont. One year experience as field engineer on design and reconstruction transmission and distribution lines in Scotland. Six years as technical officer in R.E.M.E. Four years as apprentice technician with power company in Pôland. Experience in diesel-electric and hydro-electric plants in planning office and line surveying. Wishes to find employment in power field or design, would like to learn from the start the Canadian way of work. Apply to File No. 3443-W.

CHEMICAL ENGINEER, Jr.E.I.C. (B.Sc., Queen's 1948). Age 29, married, one child Two years experience production supervision and development engineering in chlorine-alkali industry. Some experience in coal tar refining. At present employed. Desires position in Ontario or Quebec. Apply to File No. 3452-W.

SALES AND TECHNICAL SERVICE engineering employment desired by young engineer (24 years, single) expecting to graduate in Metallurgical Engineering (McGill) in May, 1951, S.E.I.C. Many summer months experience in the making, shaping and inspection of steel. Location is practically immaterial and applicant is willing to travel. Willing to start on training program if necessary. Available June 1st, 1951. Apply to File No. 3453-W.

CHEMICAL ENGINEER, S.E.I.C. Alberta. 1946. Age 29, married, one child. Background of successful experience in production control, cost reduction studies and process design in petroleum refining and synthetic rubber manufacturing fields. Capable of assuming responsibility. Available after graduation in business administration (U.W.O.) in May. Apply to File No. 3456-W.

METALLURGICAL ENGINEER, Jr.E.I.C., Toronto, 1948. Business Administration. University of Western Ontario, 1951. Desires position in production engineering or as technical salesman for a manufacturer of durable producers' and consumers' goods. Age 28, married. Naval Veteran. Over two years' experience with a large Canadian manufacturing firm chiefly as a production supervisor. Conversant with French. Available in May. Apply to File No. 3457-W.

CIVIL ENGINEER, Jr.E.I.C., P.Eng. (Ont.) B.Sc., University of Alberta, 1945, age 27, married. 1 year in highway location, design, estimates and construction; 5 years field and office experience in surveys, design, layout and construction supervision in transmission lines, tower footings, reinf. conc. and pile foundations, also some knowledge of municipal engineering. Presently employed in Ontario. Desire position in Alberta with consulting engineers, construction company, or other company with own engineering staff. Available after September, 1951. Apply to File No. 3458-W.

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Reviews — Book Notes — Abstracts

ABSTRACTS

DOCK AND HARBOUR AUTHORITY

Winter Navigation on the St. Lawrence:

J. G. G. Kerry. London, Dock and Harbour Authority, issues of November and December, 1950.

In this paper the author draws the conclusion that the Great Lakes and particularly Lake Ontario are large scale natural accumulators of heat energy, with temperatures in the mass of their waters never as low as the freezing point. This warm water, he believes, should be utilized to keep the river free of ice as far downstream as Ile aux Coudres opposite Baie St. Paul. Ice conditions in the Gulf of St. Lawrence are also discussed, and suggestions made for reducing the flow of heavy ice and low temperature water into this basin, thus making possible winter navigation on the St. Lawrence River.

A deep narrow channel is proposed at the lower end of Lake Ontario between Main Duck Island and Cape St. Vincent, 1500 feet wide and perhaps 50 to 100 feet in depth. The flow through this channel would be regulated at four points on the Seaway, namely Barnhart Island, Beauharnois, Montreal, and by a proposed barrage at Ile aux Coudres below Quebec. The channel would be so designed that velocities would be nearly constant in winter. Parallel levees would be built for cutting off the back waters from the channel and for holding the ice in the backwater areas until it melts in the spring. Joint control of the St. Lawrence and Ottawa Rivers would minimize variations in the flow below Montreal.

Turning to the problem of keeping the Gulf of St. Lawrence open for winter navigation, the author points out that ice from the Bay of Chaleur and the Bight of Prince Edward Island does not usually move out along lines such that it would block the ship track. On the other hand, ice from the Strait of Belle Isle, though limited in quantity, may include heavy and dangerous blocks of ice from the Labrador coast. The closing of the Strait of Belle Isle by a dam would be very costly, but if done, not only would this heavy ice be kept out of the Gulf, but waters along the north shore of the Gulf would also be warmer and the formation of ice there would be checked.

Pointing out that waters are generally clear of ice all winter along the north shore from Murray Bay and the mouth of the Saguenay to Sept Iles opposite Anticosti, belief is expressed that a barrage at Ile aux Coudres would cut off up-river ice and permit navigation without danger between all up river ports and Sept Iles. Between Anticosti and Port aux Basques in Newfoundland an ice pack may always be expected to form in February and March but it will become much more open if the preventive measures suggested in the paper are taken. From Port aux Basques to the ocean there is always an open ship track.

Mr. Kerry reminds his readers that more than two decades ago a paper published by the Department of Marine and Fisheries predicted that closure of the Strait of Belle Isle would free the ship channel from ice obstruction in winter. He feels that further official study and action are long overdue.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Alternating Current Circuits, 3rd ed.:
R. M. Kerchner and G. F. Corcoran. New York, Wiley, 1951. 598 pp., illus., $5.50.

Applied Nuclear Physics, 2nd ed.:
E. Pollard and W. L. Davidson. New York, Wiley, 1951. 352 pp., illus., $5.00.

Basic Refractories: Their Chemistry and Their Performance:
J. R. Rait. London, Ilife, 1950. 410 pp., illus., 60s.

Canadian Official Railway Guide with Airlines, January, 1951:
Montreal, International Railway Publishing Co., 1951. Monthly. Specimen copy: $4.00. Year subscription: $10.00.

Chimie Organique. Tome 3: Fonctions Complexes:
Albert Kirrmann. Paris, Armand Colin, 1950. 184 pp., 180 fr.

Effects of Atomic Weapons:
U.S. Dept. of Defense and U.S. Atomic Energy Commission. New York, McGraw-Hill, 1950. 456 pp., illus., $3.00.

Explanatory Handbook on the British Standard Code of Practice for Reinforced Concrete:
W. L. Scott and others. London, Concrete publications, 1950. 119 pp., illus., 9s.

Finishing Handbook and Directory, 1951:
London, Sawell productions, 1950. 246 pp., illus., 15/-.

Heaviside Centenary Volume:
London, Institution of Electrical Engineers, 1950. 98 pp., illus., $1.10.

Indium:
Maria Thompson Ludwick. New York, Indium Corporation of America, 1950. 276 pp., illus., $7.50.

Industrial Solvents, 2nd ed.:
Ibert Mellan. New York, Reinhold, 1950. 758 pp., illus., $12.00.

Institution of Mining and Metallurgy, Transactions 1946-1947; v. 56:
London, The Institution, 1950. 644 pp.

Mathematical Engineering Analysis:
Rufus Oldenburger. Toronto, Macmillan, 1950. 426 pp., illus., $6.00.

Measuring Diagram for Daylight Illumination:
P. S. Waldram London B. T. Batsford 1950. 5/-.

Mechanical World Yearbook, 1951:
Manchester, Emmott, 1951. 268 pp., illus., 3/6.

Nuclear Physics:
Francis Bitter. Cambridge, Mass., Addison-Wesley, 1950. 216 pp., illus., $5.50.

Oil Field Exploration and Development:
A. Beeby Thompson. London, Technical Press, 1950. v.1. 577 pp., v. 2. 630 pp., illus., $10.50 per volume.

Properties of Lubricating Oils and Engine Deposits:
C. A. Bouman. Toronto, Macmillan, 1950. 170 pp., illus., $2.85.

Tables for Conversion of X-Ray Diffraction Angles to Interplanar Spacing:
Washington, U.S. Dept. of Commerce, 1950. 159 pp., $1.75 (National Bureau of Standards, Applied Mathematics series, No. 10).

Theorie, fonctionnement et calcul des machines electriques. Tome I: Circuit magnetique. Machines a courant continu:
A. Guilbert. Paris, Dunod, 1951. 608 pp., illus., 2760 fr.

United Nations Scientific Conference on the Conservation and Utilization of Resources. Volume I. Plenary Meetings:
Lake Success, United Nations, 1950. 431 pp., $4.50.

Urban Mapping:
Ottawa, Central Mortgage and Housing Corp., 1950. 15 sheets.

Welded Deck Highway Bridges:
James G. Clark ed. Cleveland, James F. Lincoln Arc welding foundation, 1951. 247 pp., illus., $2.50.

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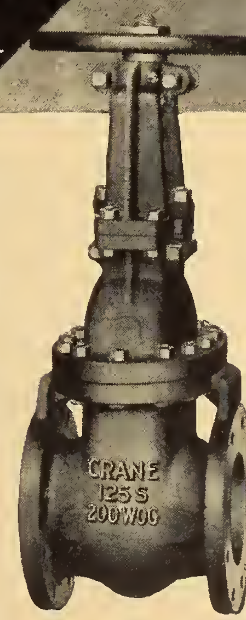

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TECHNICAL BULLETINS, ETC.

American Society for Testing Materials. Progress Reports:

Electron microstructure of steel; first progress report subcommittee XI on electron microstructure of steel. A.S.T.M. Committee E-4 on metallography.

...Reprints from ASTM Bulletin:

Exposure test site programme of the American Society for Testing Materials; reprint from ASTM Bulletin No. 169, Oct., 1950.

American Water Works Association. Tentative Standard Specifications:

No. 5W1.31-T 1950—Ferrous sulphate. No. 5W1.90-T 1950—Sodium fluoride.

Association of Consulting Engineers of Canada. Tariff of Fees:

Tariff of fees and general conditions, c1950.

British Electrical and Allied Industries Research Association Technical Reports:

No. G/T241 1950—An experimental synchronous contactor for repeated automatic operation, by H. W. Baxter. No. G/T244 1950—Flameproof electrical apparatus. Flonge gap protection and contoiner pressure with a fourth series of industrial atmospheres, by A. P. Paton. No. L/T191 1949—The breakdown of dielectrics by electric dischorges, by A. Morris Thomas. No. L/T222 1950—A review and discussion of dielectric constants of ionic crystals, by B. Szigeti. No. L/T229 1950—Corono and breakdown at frequencies up to 12 megacycles per second, by A. W. Bright. No. L/T230 1950—The determination of the temperatures of on electrical discharge in a gas, critical resume of published information, by H. Edels. No. L/T242 1950—The mechanical properties of dielectrics at high temperatures by W. Lethersich. No. M/T107 1949—The measurement of the time constant of a critically damped meter, by S. F. Pearce. No. O/T5 1949—Current-carrying capacity of bare stranded conductors, second report, by E. E. Hutchings and R. G. Parr. No. S/T63 1950—The collection of lightning fault statistics on overhead lines, by R. H. Golde. No. Z/T80 1950—The A.C. argon arc process for welding aluminium. The oscillographic analysis of the application of a commercial high frequency spark injector unit, by L. H. Orton and others.

British Electricity Authority. Reports:

Second report and statement of accounts for the year ended 31st March 1950.

British Society for Research in Agricultural Engineering. Reports on Tests:

No. RT 32/50044—Fergusson Hole digger. No. RT 33/33/50056—Fergusson tractor Model TE-H running on lamp oil. No. RT 34/50048—Roerslev beet topping and lifting units.

Canada. Department of Trade and Commerce. Publications:

Vol. 5 No. 9, Sept. 1950—Refined petroleum products.

Canada. National Research Council. Radio and Electrical Engineering Division. Progress Reports:

No. ERA-189, July-September 1950.

Canadian Chamber of Commerce. Bulletins:

Duties of a chairman.

Canadian Standards Association. Committee Lists:

As at 31 March, 1950.

Institute of Metals. Reprints:

No. 1262—On the phases occurring in alloys of aluminium with copper, magnesium, manganese, iron, and silicon, by Gosta Phragmen. No. 1263—The constitution of uranium-molybdenum alloys, by P. C. L. Pfeil. No. 1264—The uranium-iron system, by J. D. Grogan; with an appendix on an x-ray examination of uranium-iron alloys, by C. J. B. Clews. No. 1265—Deformation texture of drawn face-centred cubic metal wires, by Walter R. Hibbard. No. 1266—Lattice parameters of binary nickel-cobalt alloys, by A. Taylor. No. 1267—Communications metallurgy, by Earle E. Schumacher. No. 1268—The solubility relationships in the aluminium-sodium ond aluminium-silicon-sodium systems, by C. E. Ransley and H. Neufeld. No. 1269—"White rust" formation on zinc, by P. T. Gilbert and S. E. Hadden. No. 1270—Rolling and mechanical properties of magnesium alloy sheet containing 0-9.5% aluminium, by A. E. L. Tate. No. 1271—The surface condition of polished aluminium, with a note on the effects of surface scratches, by E. A. Owen and Y. H. Liu. No. 1272—Cast structures in super-pure and commercially pure aluminium, by V. Kondic and D. Shutt.

Iowa Engineering Experiment Station. Bulletin:

No. 170—Field measurements of the settlement ratios of various highway culverts, by M. G. Spangler.

Quebec Province. Department of Mines. Geological Reports:

No. 20—Geology of Quebec, Vol. 3: Economic geology, by John A. Dresser and T. C. Denis.

PAMPHLETS, ETC.

Conversion of Casey Jones:

Article on the application of diesel-electric locomotives to railroad use. Published in Imperial Oil Review, Nov. 1950, pp. 22.

Difficult Construction; a Corporate Biography in Terms of Structural Achievement:

The Arthur A. Johnson Corporation, New York, c1950.

Electric Power Supply:

T. H. Carr. Bradford, Cyril Williams, 1948.

Etancheite par l'asphalte:

Office des asphaltes, Paris, 1950.

Examples of Structural Steel Design (Part 2) to Conform with the Requirements of British Standard 449: 1948:

V. H. Lawton. London, British Constructional Steelwork Association, 1950. (British Constructional Steelwork Association publication No. 2)

Fatigue Tests of Spot-welded Steel Sheets:

George Welter. Reprint from The Welding Journal Research Supplement, Sept., 1949).

Fire Prevention Education. The Primary and Secondary School Programme for Fire Prevention and Fire Protection. A Canadian Teachers' Standard Manual:

Ottawa, King's Printer, 1950.

Report on a System of Water Supply for Curling, Corner Brook West, Corner Brook East and Humbermouth, Newfoundland:

R. de L. French. Montreal, 1950.

BOOK NOTES

Prepared by the Library of The Engineering Institute of Canada

BRITISH STANDARDS:

British Standards Institution, 24/28 Victoria St., London, S.W.1. British Standards are available from the Canadian Standards Association, National Research Building, Ottawa, Canada.

B.S. 1589: 1950—Thermal Insulating Materials. Plastic Composition Flexible and Loose-fill. 2/-

This standard relates to plastic composition, flexible, and loose-fill insulating materials for central heating and hot and cold water supply installations inside a building, which may be extended to short out-door runs of piping.

B.S. 1655: 1950—Flanged Automatic Control Valves for the Petroleum Industry (Face-to-face Dimensions). 2/6

The primary purpose of this standard is to ensure that valves of the conventional pneumatic diaphragm operated single or double beat type, of given sizes and standard flange ratings, will be interchangeble in a pipe line system irrespective of the design of the valve and by whom it is manufactured.

B.S. 1657: 1950—Buttress Threads, 3/-.

The present work provides for a standard form of thread and gives formulae for calculating suitable allowances and tolerances. A recommended system of gauging is also included. Preferred series for the diameters and numbers of threads per inch-of buttress are given. No attempt has been made to introduce a rigid pitch/diameter relationship.

B.S. 1669: 1950—Industrial Perforated Plates, 2/-.

This standard has been designed to cover industrial perforated plates having round and square apertures in the sizes and arrangements which are most commonly used, and tolerances on aperture sizes and pitch of apertures have been introduced. No attempt has been made to standardize other shapes of aperture such as slots.

BRITISH STANDARDS CODES OF PRACTICE FOR BUILDING:

British Standards Institution, 24/28 Victoria St., London, S.W.1.

Draft Code No. 305—Sanitary Appliances and their Installation, 3/-.

The present work deals with materials, appliances, design considerations, work off site, work on site, inspection and testing, maintenance. It is part of group of codes 300-309: "Building drainage, sanitary services and refuse disposal".

Draft Sub-Code No. 231.302—The Painting of Non-ferrous Metals, 3/-.

This code deals with the painting of non-ferrous metals in the forms in which they are more frequently used in buildings, e.g. metal claddings, linings, pipes, cast or extruded sections and fittings. The code also includes recommendations for the painting of these metals when they are deposited as coatings on iron or steel, e.g. galvanized iron.

CANADIAN STANDARDS:

Canadian Standards Association, Room 3010, National Research Bldg., Ottawa, Ontario.

No. B79, 1950—List of Standard Sizes for Cast-iron Radiators, 50c.

This list of standard sizes is intended to further large scale production of radiators of a few standardized sizes.

No. C22.2. No. 0, 1941—Revision of Appendix C Flexible Cords and Fixture Wires, 50c.

The following Tables give details on the various types of flexible cord and fixture wire and specify the minimum grades of flexible cords that may be used on portable electrical appliances of many kinds.

No. C22.2. No. 25, 1950—Construction and Test of Enclosures for Use in Class II, Groups F and G Hazardous Locations, 50c.

This specification is primarily intended to be used only as a basis for the preparation of approval reports on equipment of a type and capacity for which there are no testing facilities.

No. C22.2. No. 41, 1950—Construction and Test of Grounding and Bonding Equipment, 50c.

This specification applies to ground clamps, bonding devices, grounding and bonding bushings, water-meter shunts, armoured grounding wire, ground rods, and the like.

No. G 40.1, 1950 General Requirements for Delivery of Rolled Steel Plates, Shapes and Bars for Structural Use, 50c.

This specification covers a group of common requirements which, unless otherwise specified in the purchase order or in an individual specification, shall apply to rolled steel plates, shapes and bars under specifications G40.2,3, 4, 5, 6.

No. G40.2, 1950—Structural Rivet Steel, 20c.

This specification covers carbon steel for rivets for structural purposes. The steel shall be made by either or both of the following processes: open hearth, electric furnace.

No. G.40.3, 1950—Mild Structural Steel, 20c.

This specification applies to rolled steel shapes, plates and bars of structural quality. It does not apply to stay bolts of rivet steel. Steel made by either or both open hearth, electric furnace processes.

No. G40.4, 1950—Medium Structural Steel, 20c.

This specification applies to rolled carbon steel plates, shapes and bars of structural quality. It does not include rivet steel. Steel making processes, as per Specification G40.3.

No. G40.5, 1950—Carbon Steel Plates of Structural Quality; Plates 2 inches and under in thickness, 20c.

This specification applies to four grades of carbon steel plates of structural quality in thicknesses up to 2 inches incl. Chemical composition and physical properties of these steel plates are given in detail.

No. G40.6, 1950—Structural Silicon Steel, 20c.

This specification applies to special high strength structural steel plates, shapes and bars. It does not apply to eyebars or rivet steel.

No. O15.1, 1950—Physical Properties and Preservative Treatment of Eastern White Cedar Poles, 50c.

The general purpose of this work, has been the adoption of dimensions permitting different species of poles to be considered on an equivalent basis for engineering or purchasing requirements.

No. O15.2, 1950—Physical Properties and Preservative Treatment of Western Red Cedar Poles, 50c.

Same purpose and set-up as Specification No. 015.1.

No. S1, 1950—Steel Railway Bridges, $1.25.

This specification applies primarily to fixed railway bridge spans of 400 ft. or less in length and to viaducts. It is also applicable to simple spans of greater length and to cantilever bridges, continuous bridges, arch bridges, etc.

No. W55.1, 1950—Resistance Welding Equipment, $1.00.

This specification is intended to cover the primary electrical and mechanical features pertaining to certain recommended standard sizes of the various types of resistance welders.

No. Z76.1, 1950—Methods of Determining Weight of Coating (Stripping Test) of Galvanized Iron and Steel Articles.

These methods cover the procedure for determining the weight of coating of galvanized iron and steel sheets of wire, and describe a stripping procedure suitable for other galvanized articles.

No. Z76.2, 1950—Method of Determining Uniformity of Coating (Preece Test) of Galvanized Iron and Steel Articles. Prices. Price of Standards Z.76.1 and Z76.2 under same cover, is 50c.

The Preece test covers the procedure for determining the uniformity of coating by the use of a solution of copper sulphate on galvanized iron and steel articles such as wire, electrical metallic tubing and rigid conduit pipe, castings, forgings, structural steel, special hardware, bolts, screws, etc.

No. Z93.1, 1950—Fire Hazards Specification for the Construction and Test of Domestic Oil Burning Equipment, Vapourizing Sleeve Type, 2nd ed., 75c.

This specification states the minimum requirements for domestic oil burning appliances of the vapourizing sleeve type, with a burning rate not greater than one Imperial gallon per hour. Such appliances are considered as using a topped or distilled fuel oil, having a flash point of not less than 100°F. closed cup, and having a specific gravity of 28 to 40 degrees Baumé.

No. Z93.2, 1950—Fire Hazards Specification for the Construction and Test of Domestic Oil Burning Equipment, Vapourizing Pot Type, 2nd ed., 75c.

The purpose and scope of this specification are similar to those of specification Z93.1.

No. Z102.1, 1950—Moisture Vapour Barriers, 50c.

This specification covers the limits for moisture vapour transmission rate of flexible moisture vapour barriers. Moisture vapour barriers are flexible packaging materials which have the ability to resist the transmission of water vapour.

ARCHITECTS' AND BUILDERS' SIZE BOOK:

H. M. Tansley. London, Newnes, 1950. 206 pp., illus., 17/6.

The architect and his assistants on the drawing-board, the builder and his men, and all who are concerned with building, constantly need to know the sizes of components and fittings. The purpose of this book is to answer concisely and factually questions as to the size of a building element, other sizes available, types that will fit, etc. A number of firms are named and some trade names given.

AUSTRALIA 1950; THE HERALD YEARBOOK:

J. A. Alexander ed. Melbourne, Herald and Weekly Times, 1950. 800 pp., illus., $3.25.

A cursory glance through "Special Articles" in this volume reveals such titles as "Soil Erosion Problem in Australia"; "Aircraft Production in Australia"; "Nuclear Physics, Atomic Number and Isotopes"; "Development of the Leigh Creek Coalfield," and a host of others, comprising a total of 75 pages. All of these are signed articles.

The other 725 pages consist of regular yearbook information, but of a particularly broad scope, in some cases, world statistics being given. An informative article on the U.N. is included, and the book carries both a table of contents and an index. End paper bearing flags of the U.N. in colour add to the physical attractiveness of AUSTRALIA 1950.

CHEMISTRY OF INDUSTRIAL TOXICOLOGY:

Hervey B. Elkins. New York, Wiley, 1950. 406 pp., illus., $5.50.

In this book an attempt is made to treat industrial poisons primarily from the point of view of the chemist and engineer. This means that the harmful substances themselves will be emphasized, and the industrial processes in which they are used, rather than the symptomology and pathology of their effects on the human body. Emphasis is placed on the probable seriousness of injuries, rather than their complete physiological characterization.

ELECTRON MICROSCOPY. PROCEEDINGS OF THE CONFERENCE ON ELECTRON MICROSCOPY, DELFT, July 4-8, 1949:

The Hague, Martinus Nijhoff, 1950. 188 pp., illus., $2.25.

These proceedings are printed as an answer to a general demand for a book containing all the papers read at the Conference. About fifty papers are presented, on the origins of microscopy and of the electron microscope, constructional details, image formation and contrast, resolving power and apparatus, specimen techniques, and medical, biological, chemical and industrial applications. The book is well illustrated with drawings, photographs of equipment and reproductions of micrographic prints.

ELEMENTARY THEORY OF STRUCTURES:

J. C. Grassie. Toronto, Longmans, Green, 1950. 392 pp., illus., $5.00.

This book covers the fundamental principles of mechanics, as applied to the theory of structures. Its scope is confined entirely to determinate structures, and, in consequence, the book is suitable for all engineering students who require an elementary knowledge of structures. Enough typical examples have been worked out, to form an important feature of this book. Problems with answers are given at the end of each chapter.

HORIZONTAL DIESEL ENGINES:

R. A. Collacott. London, Temple Press, 1950. 122 pp., illus., 8/6.

This book has been written primarily for students and for users who have little technical knowledge or experience of Diesel engines. Operations, fuels, maintenance and selection are covered thoroughly, while specifications are given for all types up to 300 b.h.p. Chapters cover principles, engine details, fuel injection, cooling, lubrication, installation, operation, running and maintenance

INDUSTRIAL AND SAFETY PROBLEMS OF NUCLEAR TECHNOLOGY:

M. H. Shamos. New York, Harper, 1950. 368 pp., illus., $4.00.

This work contains the most important contributions prepared for 1950's Conference on industrial and safety problems of nuclear technology. Gordon Dean, chairman of the U.S. Atomic Energy Commission, leads with an article on the technological problems and dangers peculiar to the industrial development of atomic power. Eighteen other contributors, leaders in the fields of industrial development, nuclear research, radiation medicine, and casualty insurance, combine to make this the first practical discussion of problems linked with industrial uses of fissionable material.

KINEMATICS OF MACHINES, 5th ed.:

G. L. Guillet and A. H. Church, New York, Wiley, 1950. 299 pp., illus., paper.

Professor Church has retained and extended the Guillet approach that made earlier editions of this book so popular. This approach was characterized by an emphasis on practical applications and by frequent illustrations of these applications. The mechanisms with which this work deals at length are slider-crank mechanisms, cams, rolling contacts, gears, gear trains, flexible connectors, etc.

LIFE OF AN AMERICAN WORKMAN:

Walter P. Chrysler. New York, Dodd, Mead, c1950. 219 pp., $3.00.

This informal biography is the story of the head of one of America's greatest industries. It tells how Chrysler was already making his own tools when he became an apprentice in a railroad machine shop. The automobile industry was young and raw when he went into it, and he studied and improved every detail of its operation. He tells of his half-a-million-a-year job as head of the Buick division of General Motors, of the building and exhibition of the first Chrysler car in 1923-24, of the deal that gave him Dodge, and of his gradual building up of Chrysler Corporation to what it is today.

MOTOR SHIP REFERENCE BOOK, 19th ed.:

Compiled by the staff of "The Motor Ship." London, Temple Press, 1950. 187 pp., illus., 15s.

This book treats the new designs of Diesel propelling and auxiliary engines for ships. It contains chapters on the history of shipbuilding, engines (four-stroke, two-stroke, or double-acting), engine rooms, centrifugal separators, gas turbines, etc. This publication is very well illustrated with photographs and diagrams of equipment. It includes Lloyd's rules for the construction of heavy oil engines, as well as a list of builders of marine Diesel engines.

PHENOLIC RESINS—THEIR CHEMISTRY AND TECHNOLOGY:

P. Robitschek and A. Lewin. London, Ilife, 1950. 261 pp., illus., $6.75.

The authors' purpose in writing this book, has been to integrate theoretical knowledge and industrial practice, thus providing a link between the science and technics of phenolic resins. Included and discussed are the more fundamental modern trends and developments: particularly physics and kinetics on the theoretical side and pulp resin preformas on the technological side. There are 121 diagrams, 16 photographs, 49 tables and a meticulously complete index.

PLUMBERS' POCKET BOOK OF ROUGHING-IN DIMENSIONS FOR PLUMBING FIXTURES:

A consolidated service by Canadian Potteries Ltd., and other companies. 134 pp. illus., paper.

This new pocket-book contains roughing-in measurements on all fixtures manufactured in the four combined Canadian factories of the following companies: Canadian Potteries, Crane Steelware, Port Hope Sanitary, Alliance Ware. Drawings were produced from accurate physical measurements taken of every fixture. This is a useful "on-the-job" reference work for fixtures made of vitreous china, porcelain, enameled cast iron, or porcelain on steel.

PROBLEMS IN ENGINEERING DRAWING, 3rd ed.:

J. M. Arnold and others. New York, Prentice-Hall, 1950. $4.35.

This is an unbound volume of worksheets. Most of these sheets are partial layouts, making possible the presentation of a maximum amount of subject matter within a limited time: with such layouts, the student need not copy those portions with which he is already familiar. In conformity with modern industrial practice, many of these layouts are printed on tracing vellum; the others are printed on light and heavy drawing papers. The problems are grouped under several commonly used headings: lettering, multiview drawing and sketching, dimensioning, etc.

RECEIVING TUBE SUBSTITUTION GUIDE BOOK:

H. A. Middleton. New York, Rider, 1950. 215 pp., illus., $2.40.

This is a greatly enlarged and revised edition of the book WARTIME RADIO SERVICE published in 1944. This new book lists about 750 receiving tube types and their bases, including all of the following series: 4, 5, 6, 7, and 7L old-style base series, octal base series, loctal base series, 7-pin miniature series, 9-pin noval series, subminiature series. All substitutions listed here describe in detail the necessary data for changing or rewiring the sockets.

SECRETARY'S HANDBOOK. A MANUAL OF CORRECT USAGE, 7th ed.:

Sarah Augusta Taintor and Kate M. Monro. Toronto, Macmillan, 1950. 573 pp., $4.00.

Our chief observation on this book would be to remark on its misleading title or sub-title. We would suggest that a future edition be sub-titled "A MANUAL OF AMERICAN USAGE".

Misspelled and confusing words, rules of grammar, forms of address and sample letters, all are considered. But prospective buyers would be well advised to consider the purchase of this volume only if the individual involved has access to an English or Canadian volume of similar content.

SMALL PLANT MANAGEMENT; A GUIDE TO PRACTICAL, KNOW-HOW MANAGEMENT:

Ed. by Edward H. Hempel, Chairman Small Plant Committee of ASME. New York, McGraw-Hill, 1950. 548 pp., illus., $7.80.

This study provides a wealth of information on small plant management. It progresses in logical order through four sections: small plants as economic factors, management tasks, how to solve the important problems of small plant management, and small plant future. Among the pertinent topics discussed in these sections are financing and banking. The chapters are each written by an expert on the subject being studied.

WALLS AND WALL FACINGS:

Denzil Nield. London, Spon, 1949. 276 pp., illus., 18s.

This book is an attempt to bridge the gap between the educational textbooks for this subject and recent research information. It describes and discusses, against the background of a detailed analysis of requirements, traditional techniques modified to suit present conditions, and recent developments which to some extent have been proved. Part one is theory, and deals with strength, stability, durability, insulation, etc., while part two is practice, and deals with types of materials and walls.

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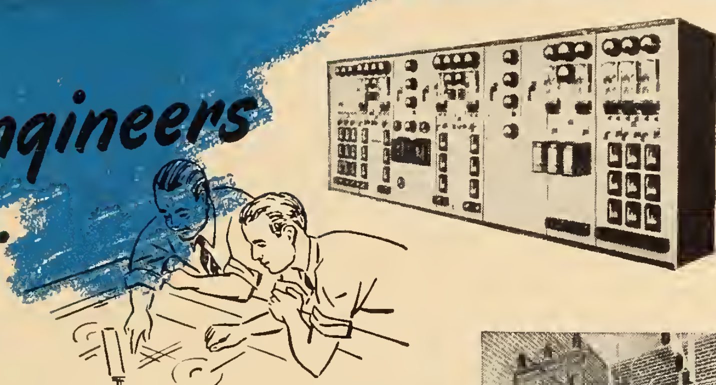

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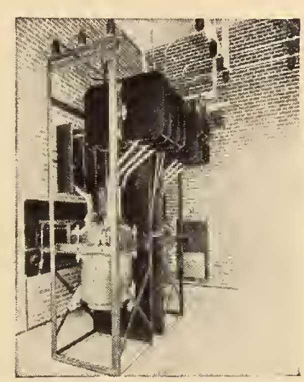

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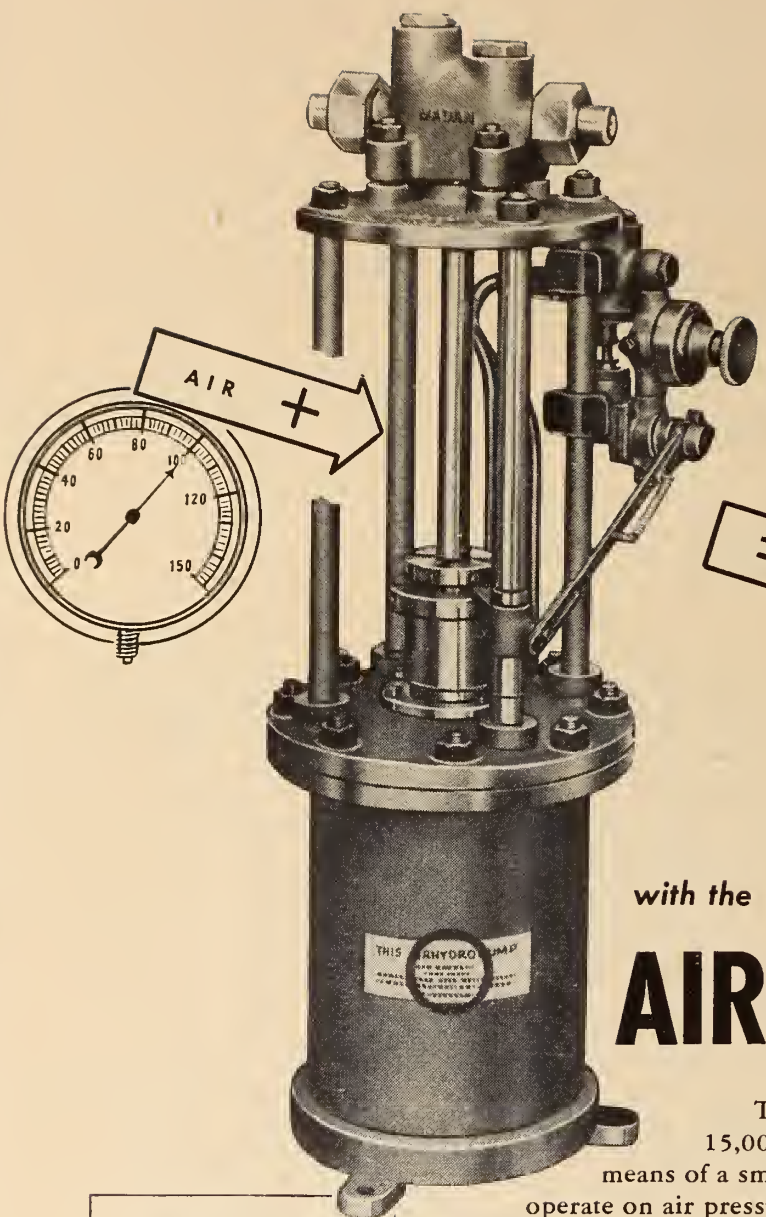

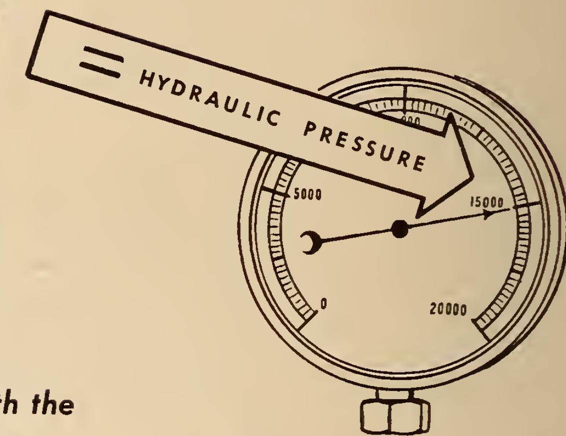

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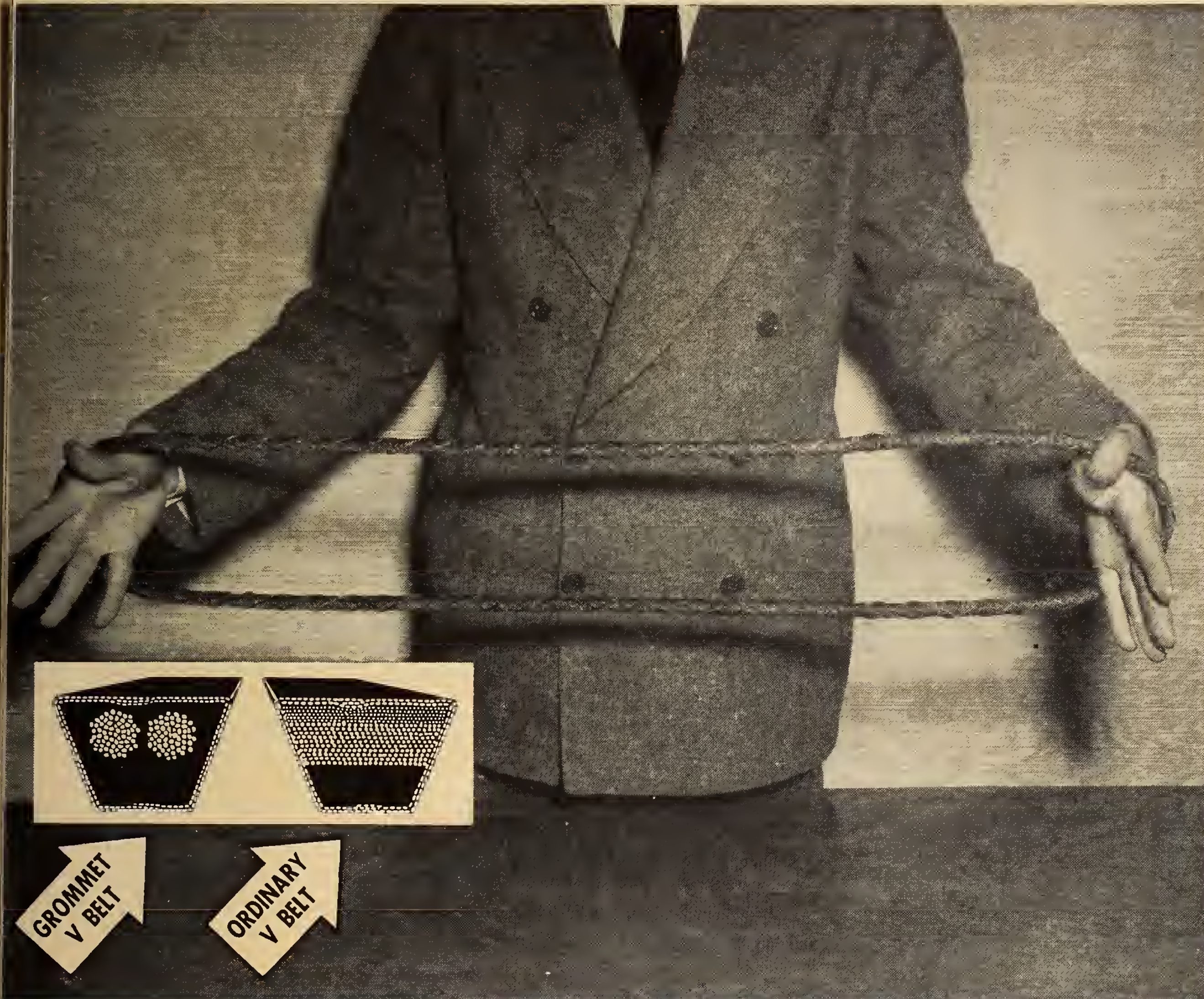

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New B.F. Goodrich grommet V belts cut costs 20 to 50%

A GROMMET is made by winding heavy cord upon itself to form an *endless* loop. Don't confuse it with an ordinary cable, which is merely a twisted cord, the ends of which must overlap to make a loop. The B.F. Goodrich grommet V belt combines all of the load-carrying cord into twin endless grommets, saves belt costs by working better, lasting longer.

Grommet belts are more flexible — They have no splice, no stiff section where cords overlap (85% of failures of ordinary belts occur in overlapped sections). B.F.G. belts have twin grommets, no fabric or plies in the middle of the belt that stiffen it and generate heat. They have more *elasticity*, less permanent stretch than any other belt.

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No "lost" cords — In an ordinary V belt much of the cord strength is lost — wasted in the centre of the belt where the cords don't pull their share of the load. In a grommet belt *all* the cords work *all the time.* There are no centre cords.

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MANUFACTURE OF SPUN IRON PIPES No. 6

CARRIAGE. — We have followed the pro-cesses involved in the manufacture of Stanton Spun Iron Pipes through their various stages, and we now approach the conclusion of our narrative.

Prior to the preparation for despatch, each pipe is stencilled with the name STANTON, together with any other markings that may be required.

Those destined for shipment overseas are pro-tected at their ends by Hessian caps or bags filled with wood wool.

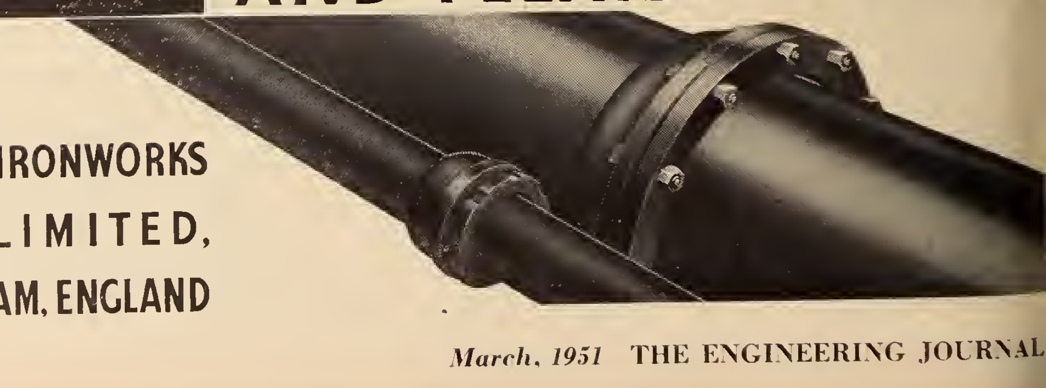
Pipes are finally transported from the Com-pany's own loading bays by road, rail and sea. A large fleet of lorries, together with railway wagons having direct access to the main lines, is continually employed in carrying Stanton Pipes for use all over the world.

CONCLUSION. — The end of the story of manufacture of Stanton Spun Iron Pipes has now been reached; for the pipes themselves, despatch from the Works and delivery to site is only the beginning of a lifetime's unfailing service.

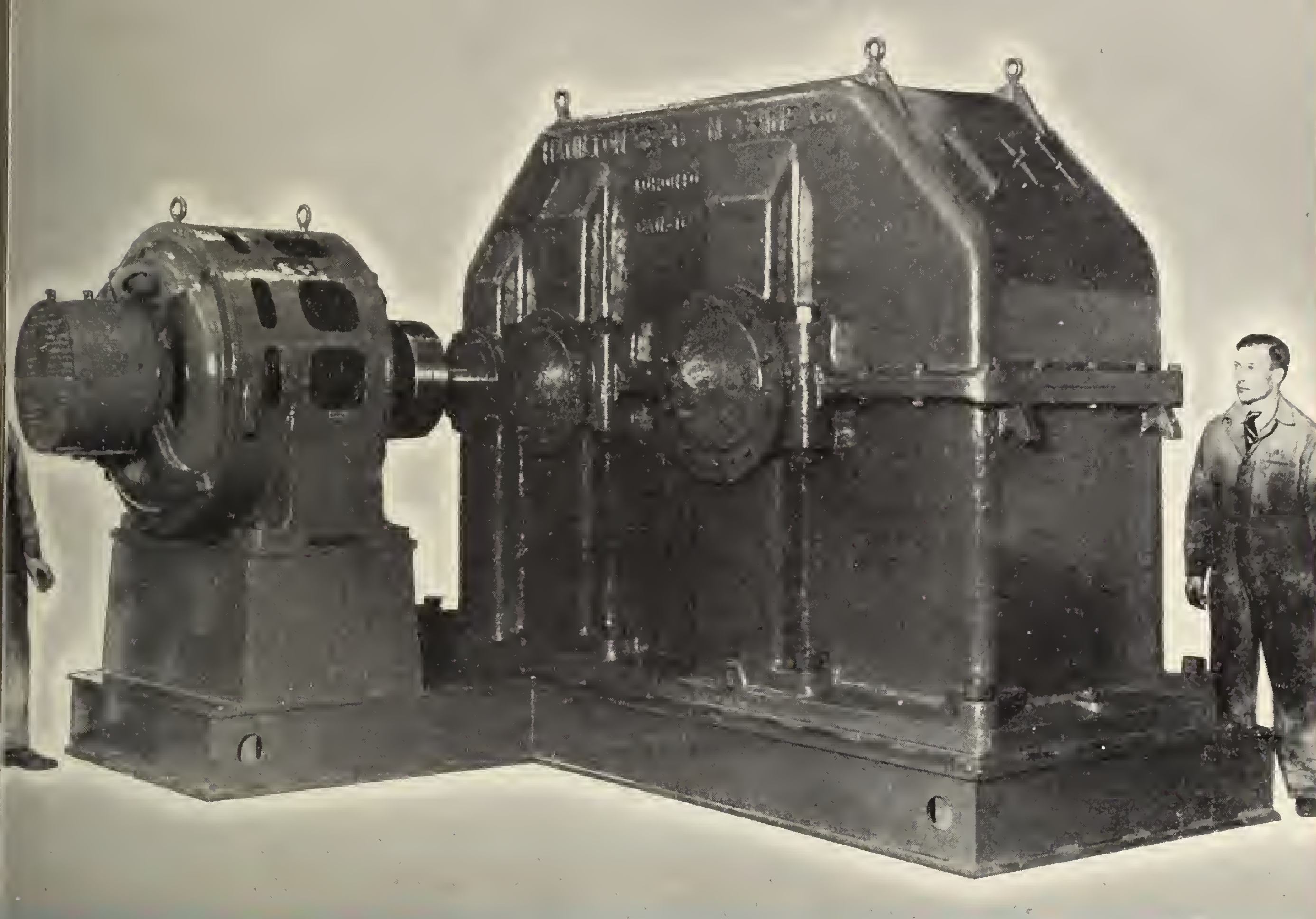
Stanton Pipes are as dependable in Nicaragua as they are in Norway, as long-lasting in Iraq as in Iceland, for the process of their manufac-ture ensures that adequate allowance is made for conditions prevailing at their destination.

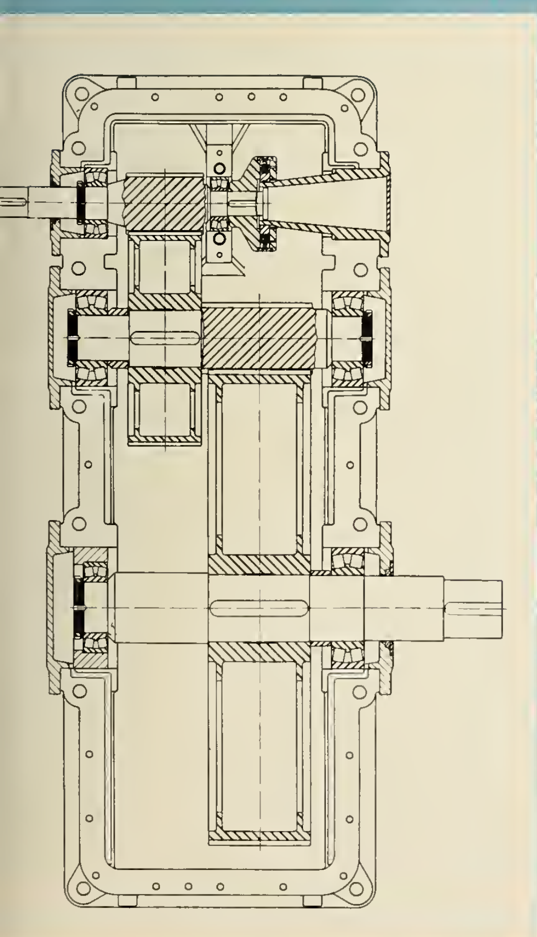
The lower of the two photographs on the left shows Stanton Pipes being laid in a street in the City of Victoria, capital of British Col-umbia, and Canada's second port.

STANTON SPUN IRON PIPES AND FLEXIBLE JOINTS



THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM, ENGLAND



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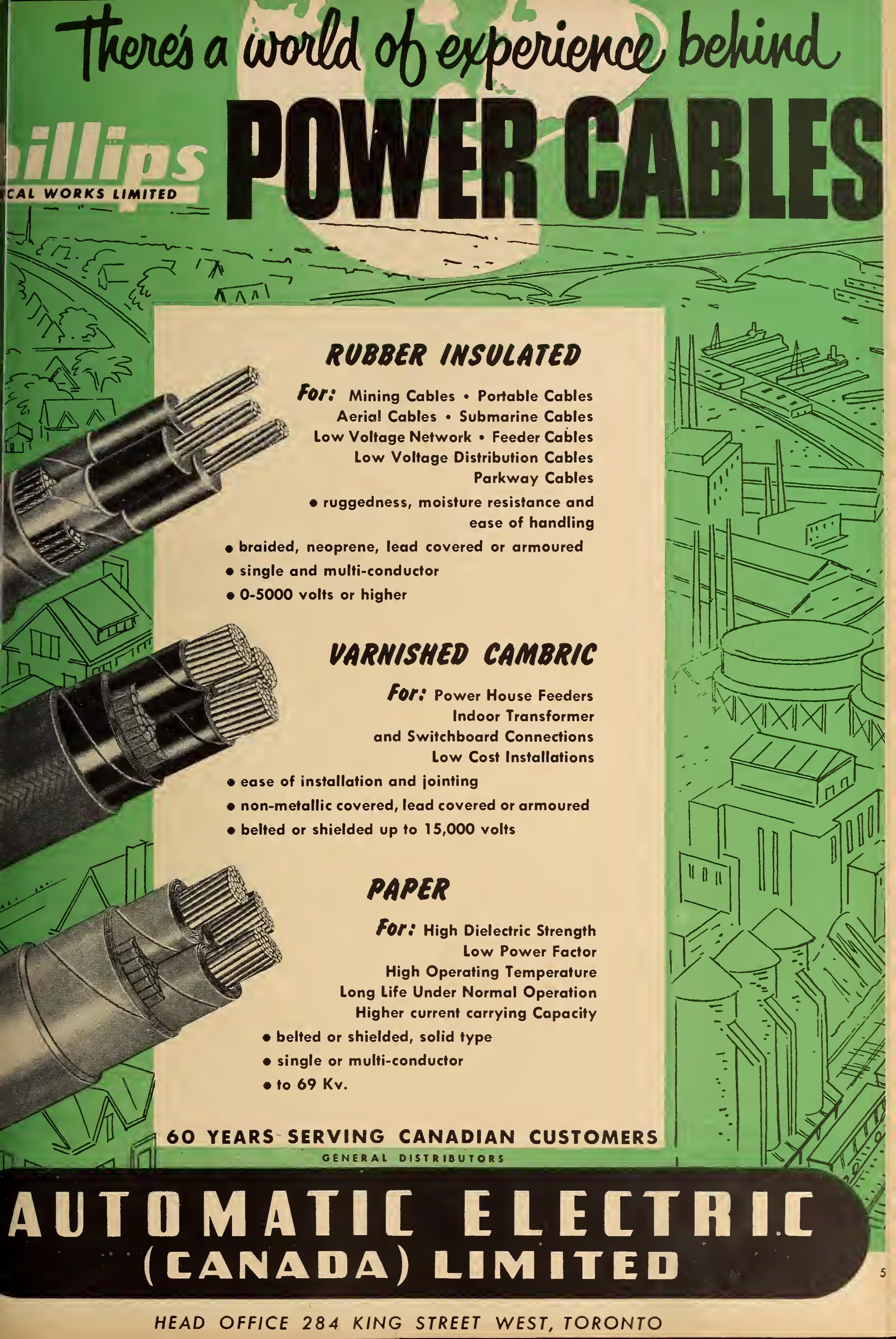
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Business & Industrial Briefs

A Digest of Information received by The Editor

Appointments and Transfers

Powell River Appointments. — The Powell River Co. announce the following appointments. Dr. Ralph Patterson has been named technical director. Dr. John Keays is now superintendent of research and development, and Don Blake has been named projects engineer. C. R. Hogan has succeeded Mr. Blake as assistant mechanical superintendent.

●

J. M. Courtright.—The Shell Oil Company of Canada Ltd. has appointed J. M. Courtright as manager of the purchasing-stores department. He will make his headquarters in the Toronto office of the Company.

In his new position Mr. Courtright will be in charge of Shell's extensive buying organization throughout Canada. Before his present appointment he was sales manager of the Company's British Columbia operations.

●

Alchem Limited.—J. G. Hutcheon has been appointed service engineer for the Western Canadian district of Alchem Limited. A native of Calgary, Mr. Hutcheon graduated last year from the University of Alberta. His territory will extend from Swift Current, Saskatchewan to the Pacific coast. He will make his headquarters in Calgary. Mr. Hutcheon replaces E. Ross Welsh who has been placed in charge of the company's Montreal office.

●

A. E. Cooper.—Arthur E. Cooper has been appointed chief engineer of the heating controls and commercial divisions of the Minneapolis-Honeywell Regulator Co. Ltd., Leaside, Ont. Mr. Cooper is a graduate of Queen's University in Mechanical Engineering. Before joining Minneapolis-Honeywell he was production manager of the appliance and metal products division of Dominion Electrohome Industries at Kitchener.

●

Northern Electric Division.—Northern Electric Co. Ltd. has established a seventh sales district which includes the Company's branches at Edmonton, Calgary and Lethbridge. J. E. Milburn, manager at Edmonton since 1947, has been placed in charge of the new district, which was formed out of the eastern side of the former Alberta-B.C. district, while Edmonton has been raised to the status of a district headquarters.

In announcing the split of the former Alberta-B.C. district, A. L. Brown, manager of the general sales division, explained that the Company distributing houses and sales offices in British Columbia will now be known as "Pacific District." The headquarters of the district will be at Vancouver.

●

H. G. DeYoung.—H. George DeYoung has been appointed works manager of Atlas Steels Limited according to an announcement made by Edward P. Geary, executive vice-president of the Company. Mr. DeYoung comes to Atlas Steels from Treadwell Engineering Company, Easton, Pa., where he was assistant to the president.

●

Hall's Barton Ropes.—Antony Gibbs & Co. (Canada) Limited, 230 Bay Street, Toronto, have been appointed Ontario and Quebec Agents for the Hall's Barton Ropery Co. Limited, of Hull, England.

Hall's Barton, who have been in business for over 150 years manufacture all types of wire and manila rope.

●

General Electric Sarnia District.—S. E. Tripp has been appointed to take charge of Canadian General Electric "Supply" sales in the Sarnia district. He will serve the expanding industrial life of the area, specializing in construction equipment, industrial heating, chemical materials, and related products.

●

H. K. Impey.—Herbert H. Gee, vice-president in charge of sales of Jenkins Bros. Ltd. has announced the appointment of Harry K. Impey as Alberta sales representative. Mr. Impey will make his headquarters at 107 Clarke Building, 10160-102nd Street, Edmonton.

H. K. Impey

Thompson Electrical Works.—Philip A. Wait has been named president and Henry J. Waldorf has been named vice-president and chief engineer of Thomson Electrical Works, Montreal. Formerly known as Fred Thomson Company, the firm was founded in 1893. It is still under the same independent ownership and is the largest plant devoted to the repair of electrical equipment in Canada.

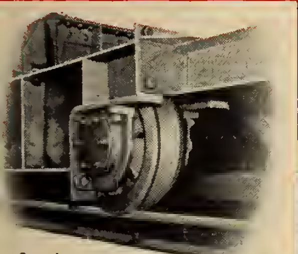
(*Continued on page 254*)

Note these dates...

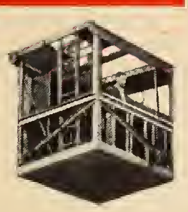
ANNUAL MEETING

May 9-10-11

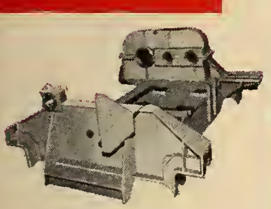
No Compromise
ON DESIGN!



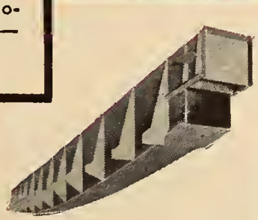
Sturdy, unit-built wheel and axle assembly—quickly removable.



Special attention to engineering of electrical equipment and comfort of operator.



Welded trolley frame, pioneered by Dominion Bridge. Design provides positive location of bearing housings—permanent alignment.



Welded girder of latest design. Other types: riveted, lattice, and I-beam.

IN more than fifty years of crane building, Dominion Bridge has maintained a pre-eminent position by adhering rigidly to these basic principles:

1. Every crane receives special engineering study and is designed and built to suit the application *exactly.*

2. Every component is built to the well-known Dominion Bridge standards of quality.

1000 cranes operating satisfactorily in Canada and many other parts of the world bear witness to the soundness of these principles.

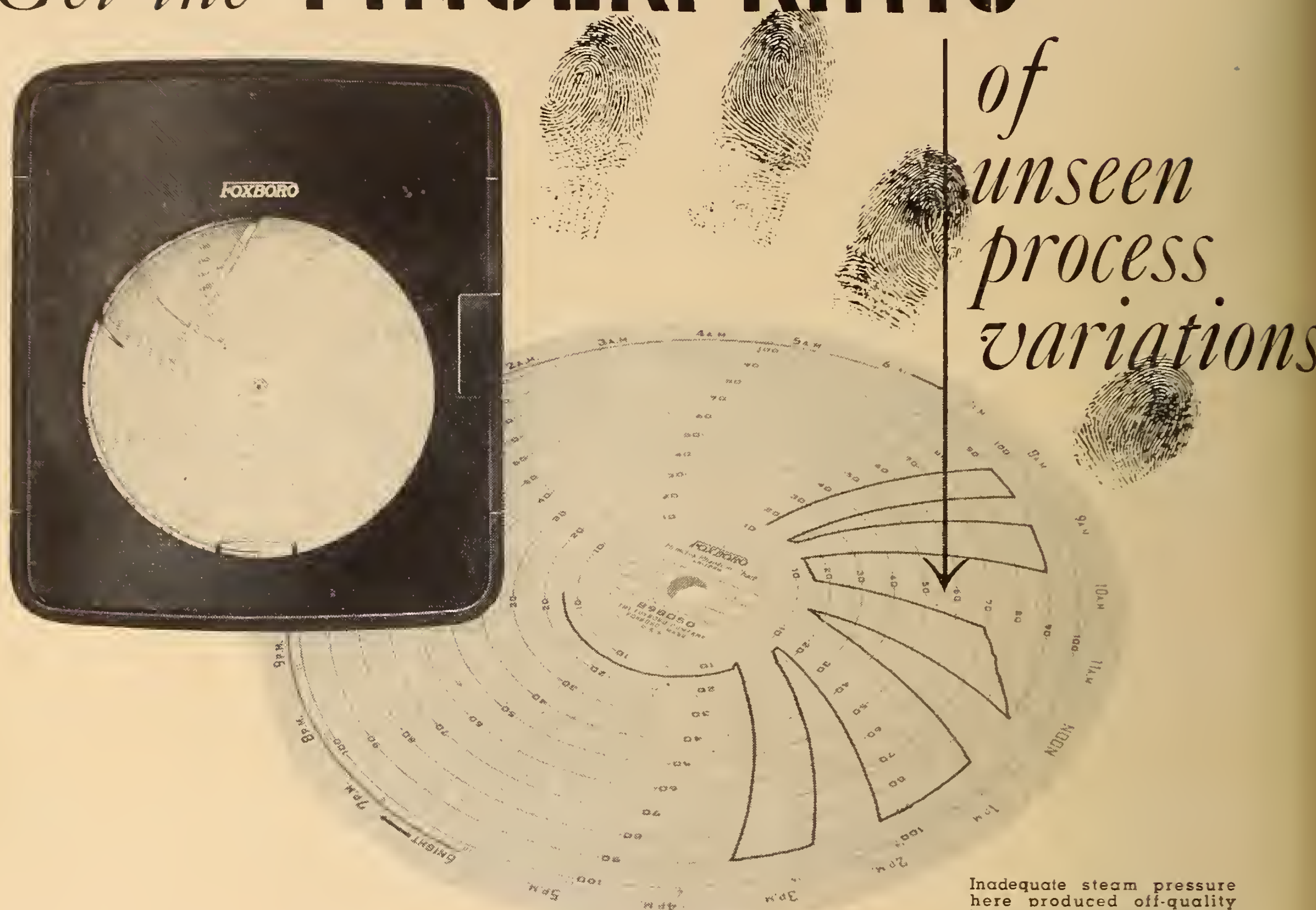
MECHANICAL DIVISION*
DOMINION BRIDGE
COMPANY LIMITED

*OTHER DIVISIONS: Platework, Boiler, Warehouse, Structural.

Plants at: Vancouver, Calgary, Winnipeg, Toronto Ottawa, Montreal

Assoc. Companies at: Edmonton, Sault Ste. Marie, Quebec, Amherst

Get the "FINGERPRINTS" *of unseen process variations*



Inadequate steam pressure here produced off-quality batch that could have gone undetected. "Fingerprints" on the Foxboro record gave timely warning for quick correction.

. . . with Foxboro Recorders for temperature, pressure, flow

Off-standard processing leaves its telltale fingerprints, clearly and unfailingly, when Foxboro Recorders are on the job. Only at neglected points can it go undetected. To reduce the chances of off-quality batches in your operation, cover *all* the critical process variables, *now* . . . by installing additional recorders.

For the highest accuracy and dependability under day-in, day-out service, be sure to specify Foxboro Recorders — for temperature, pressure, and flow. Precision engineering, plus skillful manufacture result in instruments of the highest quality. Their ultra-sensitive mechanism responds instantly to the slightest variations — writes them down, continuously, and without attention except routine changing of charts.

Now is the time to bring your process instrumentation up to date. A small investment in instruments today can repay you every day for years to come. Write for Bulletin 198-2. PEACOCK BROTHERS LIMITED, 412 St. Patrick Street, Montreal, P.Q. Also Calgary, Noranda, Sudbury, Sydney, Toronto, Vancouver and Winnipeg.

FOXBORO RECORDERS

A CANADIAN PRODUCT BY THE FOXBORO CO., LTD.

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 250*)

International Nickel.—Dr. John F. Thompson, President of the International Nickel Company of Canada Limited, was elected to the additional office of Chairman of the Board of Directors, according to a recent announcement by the Company. Dr. Paul D. Merica, executive vice-president and a director, was elected a member of both the executive committee and the advisory committee of the Company.

Dr. Thompson has been with the Company since 1906. He was elected assistant to the president in 1928 and was made a director and member of the executive committee in 1931. He was appointed vice-president in 1932, executive vice-president in 1936, and a member of the advisory committee in 1937. He succeeded the late Robert C. Stanley as president in February, 1949.

Dr. Merica has been executive vice-president of the Company since February, 1949. He first became associated with International Nickel in 1919, becoming a director of research and subsequently associate manager of the development and research department. He was elected assistant to the president in 1931, a director in 1934 and a vice-president in 1936.

•

Festival of Britain.—Resident engineer in charge of the whole of the South Bank site of the Festival of Britain is a Torontonian, Colonel Leonard Adlard.

•

New Equipment and Developments

Magnifying Device.—A device — half microscope, half television receiver — that magnifies living tissues up to 25,000 times life size, has been invented by a British scientist. An ordinary microscope magnifies only up to 5,000 times, and the electron microscope works only on dead tissues.

•

Ontario Hydro Operations.—In the current annual report of the Hydro Electric Power Commission of Ontario, the following information is given.

Expenditures for capital construction in 1950 for the total system were $142,000,000. For 1950, the Ontario Hydro supplied 309 individual municipalities with power. The report states that the Commission supplied power to the municipalities at cost.

$593,000,000 is given as the cost of the post war construction and development programme of the Commission. This includes nine hydro electric projects, two steam electric stations and one steam electric source of purchased power. The total of some one million four hundred housand horsepower of new capacity is o be in service by 1952.

The Commission states that it will press for the development of power on the St. Lawrence River, which, it is claimed, is indispensable to Ontario's future expansion in every field.

The total investment of the Commission and the municipalities distributing system in power undertakings, at October 31st, 1950, amounted to $869,955,377. Revenue for the year amounted to $62,007,799.

•

Marine Gas Turbine.—According to information released by the British government the first gas turbine ever made for driving ocean-going ships has been built by British engineers and has successfully completed rigorous tests.

•

Concrete Testing.—Redesigned to separate the loading and weighing units, a new concrete testing machine of 100,000 lb. capacity is announced by Baldwin-Lima-Hamilton Corporation of Pittsburgh, Pa. A two-unit design prevents transmission of load shocks to the indicator and keeps the operator out of range of flying or falling particles from breaking specimens. Welded construction of the loading unit and simple structural lines of both units give a good appearance to the machine.

The new machine is similar in operation to the 90,000-lb. machine which it replaces. It is designed primarily for testing 2-in. cubes and 3-in. by 6-in. cylinders but the stroke and dimensions of the working space are large enough to permit many other uses. Complete information may be obtained from the manufacturer.

•

British Industries Fair.—For details regarding the British Industries Fair communicate with: United Kingdom Trade Commissioners in the following cities: Ottawa, 56 Sparks Street (Telephone 3-4085); Montreal, 1111 Beaver Hall Hill (Telephone UNiversity 3381); Toronto, 67 Yonge Street (Telephone ADelaide 2174); Winnipeg, 403 Royal Bank Building (Telephone 92-3153); Edmonton, 10053 Jasper Avenue (Telephone 4-2417); Vancouver, 850 West Hastings Street (Telephone PAcific 8381).

•

Mine Diesel-Locomotive.—Ruston & Hornsby, Ltd., of Lincoln, England have developed a new series of flameproof locomotives for underground use. The new locomotive is powered by a 75 horse power Diesel engine. It is a 10-ton machine and it incorporates several unique features.

Close attention has been paid to those points which are of great importance to the mining industry—maximum visibility for the driver, compactness combined with accessibility, simplicity of control, reasonable first cost, and reliability.

It is claimed that the locomotive can be used in either gassy or naked flame mines. It is the first machine of British design to have a driving position at each end and adequate protection has been afforded for the driver.

To effect simplicity of control, only two levers are used, one for gear changing and the other for applying the air brakes. When wishing to change driving stations both these levers are detached and carried by the driver to the other end of the machine. From either control point the driver is enabled to engage each of the four forward gears and, in addition, has one reverse position to enable him to back up to trains without the necessity of changing ends.

The locomotive is of unit construction throughout each unit—engine, radiator, gearbox, etc., being easily detachable without affecting adjacent units. All parts of the locomotive, other than the

"Business & Industrial Briefs"

This section of the *Journal* is intended to keep readers informed on developments and changes in those business and industrial enterprises, and on new products, which affect the engineer.

If you write with respect to any of the items in this, or other sections, please mention

THE ENGINEERING JOURNAL

main frame, axles and jackshafts, are completely interchangeable from one machine to another of the same type irrespective of the gauge of the locomotive.

Complete information on this new equipment may be obtained from Ruston & Hornsby Ltd., 36 Lombard St., Toronto 1, Ont.

•

Pressurized Buildings. — "Tomorrow's buildings may be pressurized as well as being scientifically heated and cooled, if progress in indoor climate control continues at its present pace." This was a statement made recently by W. H. Evans, vice-president of Minneapolis-Honeywell Regulator Co. Ltd.

Mr. Evans made his statement when describing an electronic control system which, he said "is one hundred times more sensitive than ordinary heat regulating setups". The system being described by Mr. Evans is believed to be the first practical means of controlling radiant floor panel heating. Basically, this sensitive control is attached to a three-way thermostatic system, including an anticipating outdoor thermostat, a room thermostat and a sensing element in the water line. The system was developed during three years of research and experimentation at the Honeywell laboratories, where the personnel worked in cooperation with the universities of Minnesota and Purdue. Complete details may be obtained from Minneapolis-Honeywell Regulator Co. Ltd., Leaside, Ont.

•

Tungsten Reserves.—On February 22 the Right Hon. C. D. Howe announced in the House of Commons that the Canadian government has taken steps to purchase for $328,000.00 the known tungsten ore reserves of the Emerald property in British Columbia. The purchase was made from Canadian Exploration Ltd.

Equipment has been ordered to build a mill of 250 tons daily capacity and the mine, which has been closed down for some years, is being rehabilitated. It is expected that initial production of tungsten concentrates will be obtained by next fall.

•

Oxygen Equipment.—Dominion Oxygen Co. Ltd., 159 Bay St., Toronto 1, announce the new "Linde" L-26 Oxygen Therapy Liter-Flow Adaptor which makes it possible to administer oxygen from an industrial type oxygen regulator and a cylinder of oxygen. The new adaptor converts pounds per square inch pressure to "liters-per-minute" flow.

In emergencies, the L-26 Adaptor can be especially useful to disaster and rescue crews in industrial plants, and to civilian defence organizations in augmenting available hospital-type therapy regulators.

The Adaptor is approximately 4 inches long. It contains no moving or fragile parts. It can be carried in the glove compartment of an automobile or in a small satchel.

•

Rubber-Metal Bonding.—According to "Trade Topics", Messrs. Aero Research Ltd., Duxford, Cambridge, England, have developed a new simple and cheap method of bonding rubber to metals so

Stainless steel tableware . . . handsome and durable . . . will never tarnish, chip or break, adds grace and beauty to any table setting.

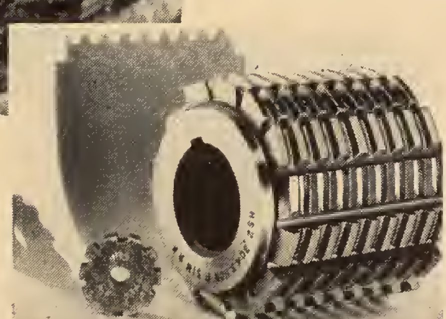
Stainless steel jewelry retains its gleaming lustre without polishing . . . cannot stain even the most delicate skin.

PRODUCTS TO CAPTURE THE FEMININE FANCY... TOOLS TO SERVE CANADIAN INDUSTRY...

made from Atlas Special Alloy Steels

Creative imagination and the practical advantages of indestructible, permanently beautiful stainless steel combine to produce things women can't resist. More and more Canadian fabricators are using Atlas stainless steel to increase product appeal . . . to add strength without excess weight, polished appearance without polishing, complete resistance to tarnishing, weathering and corrosion.

In every major Canadian industry, too, other Atlas specialty steels are used in the really *tough* spots . . . in mining drills, in key components of countless machines, in tools of close to diamond hardness which cut, saw, punch and shape other metals to a million uses.



Hundreds of industrial operations depend upon the efficiency of cutting tools made from specially compounded heat-resistant Atlas High Speed Steels.

e steels used in mining drills which bite into ielding rock must have special qualities of dness, shock resistance and ability to meet eptional stresses. Atlas Mining Steels have en specially developed for all types of ling applications.

8-51

The fine tool and alloy steels produced by Atlas for Canadian industry include—

ATLAS HIGH SPEED STEELS

Designed for cutting and machine tools which must have high resistance to deformation and wear even when cutting edges become heated to a visible red in operation.

ATLAS NIPIGON - ATLAS SPARTAN-7 - ATLAS POWHATAN - ATLAS A.C.X.
ATLAS TROJAN - ATLAS SIXIX

Write for Atlas Technical Bulletin No. 8, which gives complete metallurgical data and handling instructions for Atlas High Speed Steels. Address your request to:

ATLAS STEELS LIMITED Welland, Ontario

Office and warehouses at: MONTREAL • TORONTO • HAMILTON • WINDSOR • WINNIPEG • VANCOUVER

ATLAS STEELS

lastingly and firmly that the two materials can be considered a part of each other. As a result the use of rubber as an engineering material in reducing vibrations and absorbing impacts may be greatly increased.

The new method is known as the "Redux" process. The secret is to treat the rubber surface with sulphuric acid, thus hardening it a little and covering it with fine cracks which gives it better adhesive properties. After simple treatment with Redux Liquid resin and powder, the rubber and metal are clamped together under pressure. To effect a permanent bond the metal and rubber can be baked in an oven or pressed in a steam-heated hydraulic press. The use of these adhesives is not restricted to metals only, but with them rubber can be satisfactorily bonded to bakelite, tufnol, delaron, etc. For further details communicate with the Company.

•

Feeding Coiled Strip.—George F. Clash & Sons Ltd., Cobham Mill Road, West Drayton, Middlesex, England have recently designed a new type of stock reel for feeding coiled strip metal to presses. Unlike other reels it is turned by the natural spring of the coiled strip material and snatching is thereby eliminated. The reel is recommended for use with presses having automatic feeds as the supply of strip adjusts itself automatically to the pull of the feeding device.

The reel lies in a horizontal plane—its axis is vertical and it is free to revolve on a stand. The coil of strip material lies in the reel and is drawn from the centre of the coil, instead of from the outside as with other reels.

The strip is taken over a simple support to the feeding mechanism of the press and, as the inner layer of the coil reduces in diameter when the strip is withdrawn, its natural spring is induced to turn the reel. Standard reels will accommodate coils up to 24 in. in diameter and 6 in. in width, while a smaller size of reel 12 in. in diameter is made for small coils. The manufacturer will be pleased to supply further details.

•

Swiss Industrial Fair.—The Swiss Industries Fair, Basle, to be held from April 7 to 17, 1951 will again this year give an imposing survey of the latest achievements of Swiss textile machinery industry covering a wide range of machines of the highest efficiency.

Among the textile machines on display will be the latest spinning mill machines, ring-spinning frames, with high-draft arrangements—which simplify and shorten the working cycle—and ring-spinning frames with moving spindle rails which are available for worsted spinning processes and with which cops of substantially increased lengths can be built up.

Other automatic high-efficiency preparatory machines will also be shown. These include wrap-tying, reeding and reaching-in machines and a unique dropper-pinning machine. The exhibits will also include various automatic weft winders for silk, rayon, crepe, cotton, staple fibre, etc.

In addition to the extensive textile exhibit, special sections will be devoted to the display of electric clocks for industrial and public buildings, tools, equipment for the chemical, pharmaceutical, and cosmetic industries, electrical appliances and special machinery for the graphic arts, food trade, leather, and metal working plants, paper mills, and woodworking industries. Engine and plants and machinery for a great variety of industrial processes will be exhibited in a special section.

For more detailed information apply to the Swiss Legation, 5 Marlborough Ave., Ottawa, or to the Swiss Consulates at: 1572 McGregor St., Montreal; 159 Bay St., Toronto; 402 West Pender St., Vancouver; 416 Main St. (McIntyre Block), Winnipeg.

●

Hoist Over-loading.—W. C. Dillon & Co. Inc., 1421 South Circle Ave., Forest Park, Chicago, Ill. have announced an overload warning signal designed to protect hoists and cranes as well as the life of the operator.

The original version of this device served only as a cut-off for the hoist motor. Now the new unit combines this feature with a self-contained warning klaxon, light, and batteries.

The unit can be set to operate at any one point between 500 and 10,000 pounds and it is claimed that accuracy is within ½ of 1 per cent. To change the switch cut-out, point in the field, it is necessary only to lift a weight of desired capacity and turn adjustment screw until the switch operates. If load exceeds the safe limit, the motor automatically cuts out. The operator must then press a reverse switch to return the load to the floor. Surplus weight *must* be removed before a pickup can be completed.

●

Wax As Lubricant.—S. C. Johnson & Son, Limited, Brantford, Ontario, have developed new uses for certain types of wax as a metal working lubricant.

Recent tests, conducted in a variety of metal working manufacturing plants, show that special blends of waxes used in place of conventional lubricants permit the drawing of stainless steel far beyond its theoretical capacity. This also serves as a replacement for the copper flashing on stainless steel wire used for cold heading. Wax blends, it is claimed, are also proving useful in the drawing of aluminum. Metal fabricators, too, find that the use of wax as a lubricant extends the life of tools and dies and in some cases completely eliminates degreasing.

For additional details of these new developments communicate with the Johnson Company at Brantford, Ont.

●

D.C. Power Supplies.—Canadian General Electric Co., Limited, 212 King St. West, Toronto, have announced a new line of metal-enclosed d-c power supplies. These new products utilize selenium rectifier stacks, and are applicable wherever d-c power is required.

The new conversion equipment may be used for excitation of synchronous motors; operation of d-c elevators, cranes, and machine tools; and for conversion of a-c feeders to d-c.

Designed for indoor installation, the rectifier units are mounted in a metal casing consisting of one to four separate sections, mounted vertically, one on top of the other, and bolted together. A removable front panel permits easy access to all component parts.

The new units can be furnished to supply either 125 or 250 volts d-c from a 208-, 230- or 460-volt, three phase, 60 cycle a-c supply. Convection cooled units are available in ratings of 0.75, 1.5, 3 and 5 kw. Fan-cooled units are rated at 7.5, 10, 12.5, 15, 18.5, 20 and 25 kw. When larger ratings are required, two or more rectifier units may be connected in series and/or parallel to increase the current or voltage rating of the installation.

Built without moving parts, except for the fan in the higher-rated units, the power supplies need little maintenance. The fan requires greasing approximately twice a year.

●

British Oil Refineries.—Britain's output of refined oil products last year totalled 9.4 million tons compared with 2.5 million tons in 1938. New refineries under construction will bring the output to 25 million tons by 1953—more than eight times the 1938 rate of production.

●

Water Hampering Manitoba Oil Well.—An official of the California Standard Company said that an abundance of water is making Manitoba's first producing oil well difficult to control.

The well is 8½ miles west of Virden in southwestern Manitoba. Originally tested at about 72 barrels daily, the excess of water has cut oil production to a net of 15 barrels daily.

John Orr, resident geologist for California Standard, said: "While we have never thought it was a really terrific well, it has shown that there is oil in Manitoba and we intend to produce it."

The well now is throwing up about 60-per-cent water.

The company is drilling a second well a quarter-mile south of No. 1.

●

Canadian Trade Fair.—The British machine-tool group has booked about 30,000 sq. ft., 5000 more than last year at the 1951 Canadian International Trade Fair. Seven separate British trade associations and a number of private firms have also taken blocks of space to exhibit a wide range of machine tools, mechanical handling equipment, printing machinery, scientific instruments, and related products. In the eight capital goods classifications, 40,000 sq. feet has already been booked.

●

Lincoln Electric Expansion.—The Lincoln Electric Co. of Canada Limited, has announced plans for an addition to its factory. The new wing, covering 45,000 square feet of floor space, will more than double existing manufacturing facilities.

The new building will have an all-welded steel frame and will include many other modern developments for efficient and low cost production. Two 70-foot spans over the entire length of the building will give unobstructed floor and overhead space, thus allowing complete freedom in planning the most economical assembly lines and use of modern and economical handling equipment.

An electrical grid system in the floor will permit connection of machines anywhere in the plant, thus eliminating overhead wiring. The paved courtyard will be radiant heated to keep it free of snow. The flat roof will carry a four-inch water bath for summer insulation.

●

Cobalt Production.—It was announced recently, by the Rt. Hon. C. D. Howe, Minister of Trade and Commerce, that to stimulate further production of cobalt to meet future defence and essential requirements for the metal, the Canadian Government will purchase Northern Ontario concentrates for a period of three years on the following basis:

"For ores and concentrates containing 10-11.99% cobalt—$1.35 per lb. of cobalt

Note!

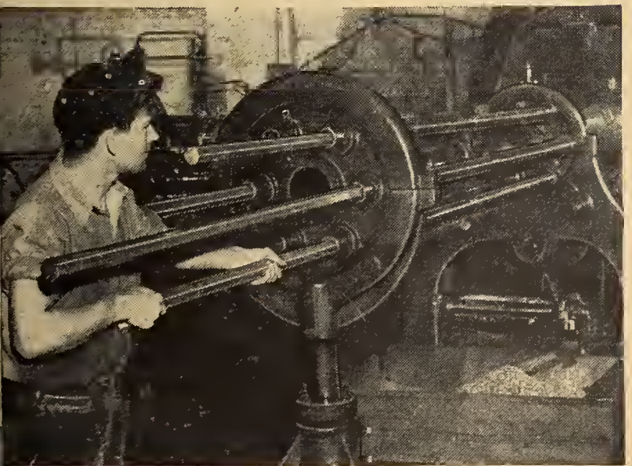
Annual Meeting

May 9-10-11

Anaconda CO-OPERATES WITH INDUSTRY

Anaconda copper is extensively used in the manufacture of sink faucets shown being assembled.

In this tank coupling nuts are immersed for copper, nickel and finally chromium plating.



Brass rods are fed to an automatic screw machine which transforms them into parts for home appliance manufacturers or plumbing supplies.

Photographs courtesy Wallaceburg Brass Limited.

Copper Answers Industry's Needs

FORTY-SIX years ago—in 1905—a young Canadian started a business which was destined to become one of the largest of its kind in the country. His name, H. W. Burgess, the company, Wallaceburg Brass Limited.

Today, Wallaceburg Brass Limited, still guided by its original founder, is nationally known for the manufacture of plumbing fixtures, automobile parts and home appliance units. One of the basic ingredients of these products is brass supplied in increasing quantity by Anaconda.

Here, then, is another of the many industries which depend on the unique combination of characteristics found in copper and its alloys—malleability, tensile strength, and resistance to corrosion. Such properties have proved the answer to hundreds of production problems. Perhaps they can solve your needs, too. Write Anaconda American Brass Limited, Main Office and Plant: New Toronto, Ontario. Montreal Office: 939 Dominion Square Building. Anaconda—since 1922 Headquarters in Canada for Copper and Brass.

ANACONDA
Copper and Brass

or copper and its alloys...consult ANACONDA

contained; 12-13.99% cobalt—$1.40 per lb. of cobalt contained; 14% or over cobalt—$1.45 per lb. of cobalt contained.

The Deloro Smelting and Refining Company, will act as buying agents for the Government, and that Company's smelter facilities will be used to convert such ores and concentrates into metal to establish a Canadian emergency stockpile.

The new price schedule represents an increase of approximately 50c per lb. of metal. The ores and concentrates will be purchased by the Deloro Company on the basis of assay determinations by the Temiskaming Testing Laboratory at Cobalt, Ontario. Minimum shipments acceptable will be 5-ton lots. The silver content of such shipments will be paid for on the basis of Deloro's customary tariff. (There has been some criticism of these prices—Editor.)

Trade Fair Opening.—Sir Robert Sinclair, K.C.B., K.B.E., immediate past president of the Federation of British Industries, and chairman of the Imperial Tobacco Company, Bristol, England, will open the Fourth Canadian International Trade Fair, to be held in Toronto May 28 to June 8.

Tree Height Calculator.—Forest engineers of the federal Resources and Development Department have designed a shadow-height calculator to determine tree heights observed on aerial photographs. This technique replaces the lengthy calculations required by older methods.

Gift to British Children. — Bepco Canada Limited, Canadian representatives of a number of well-known British concerns, recently provided nearly 600 packages of candies for distribution at the annual party for children of Lancashire Dynamo & Crypto Company employees. The party was held at the Company's social and athletic club at the Trafford Park works.

British Tractors.—Ferguson tractors have already earned $20 million for Britain. Seventy machines were recently delivered to Nova Scotia and New Brunswick.

Clay Product Testing.—Until quite recently there has been some doubt among engineers that vitrified clay products are truly elastic like other common structural materials. A relatively new method of strain measurements for these materials has now proved that ceramic materials are elastic. Stress-strain diagrams have been plotted and accurate moduli of elasticity ranging from 6,000,000 to 9,000,000 pounds per square inch have been obtained from them at Ohio State University's Engineering Experimental Station.

Prof. J. O. Everhart has applied the results of his studies to the practical problem of sewer pipe behavior under load. He believes that the data he has obtained can be used as a basis for revision of national and local specifications for sewer pipes to remove present inconsistencies. Details of the equipment used for the tests and experiments conducted by Prof. Everhart may be obtained from the Baldwin Locomotive Works of Pittsburgh, Pa.

New Brunswick Power.—A total of 257,267,035 kwh. were produced by plants of the New Brunswick Electric Power Commission and purchased from private producers during the fiscal year ended October 31, 1950, according to information issued in the Commission's 31st Annual Report.

›f this total, the Commission's own
lities produced 242,302,755 kwh., the
k of which was borne by the three
ım plants at Grand Lake, Saint John,
l Chatham. The remaining 14,964,280
n. were purchased from private pro-
ers and redistributed.
ι new 27,000 hp. hydro-electric de-
opment on the Tobique River is now
construction and an expansion at the
ınd Lake steam plant is also under
y. Mileage of high voltage transmis-
ı line increased from 566 in 1949 to
in 1950. Most of this mileage is
)00-volt line.
ersonnel at the present time total
›ut 1,150 of whom 104 are employed
the headquarters in Fredericton.

●

ltage Regulators.—A complete new
e of three-phase, dry-type, induction
tage regulators to meet the ever-in-
asing industrial demand for regulated
ee-phase power at low voltages, is
ilable from Canadian General Elec-
:'s transformer division.
This new line includes both self-cooled
l forced-air-cooled regulators in stand-
l 10 per cent and 20 per cent (raise
l lower) ranges of regulation.
The new standard line is being offered
ratings from 120 to 600 volts and from
to 85 kva. Three-phase, dry-type rat-
s have been available in these sizes
the "Triplex" assembly, which con-
s essentially of three single-phase reg-
tors on a single base. However, the
v arrangements of the three-phase
ıding on a single core makes possible
onsiderable saving for users of three-
phase voltage regulators in the ratings being offered.

The manufacturer emphasizes that the new design is not intended to entirely replace the "Triplex" assemblies. Apply to any CGE office for complete details of this new equipment.

●

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Industrial Shower Mixer.—Recommended especially for hotels, hospitals, clubs, schools and industrial plants, Crane Limited offer descriptive literature on a "Rada" Thermostatic Shower Valve. It is claimed that this new valve holds the temperature of the shower steady and prevents sudden changes in temperature. To obtain the temperature desired the user merely turns on the "hot" and "cold" valve and sets the regulator at the temperature required. A special stop prevents too high a temperature being inadvertently used. Complete information may be obtained from

Crane Limited, 1170 Beaver Hall Square, Montreal or at any Crane branch.

●

Conveyor Chain.—S-815 Flat-Top Conveyor Chain is the subject of a new 4-page illustrated folder (No. 2344), published by Link-Belt Limited, Eastern Avenue at Leslie and Keating Street, Toronto 8. The folder gives dimensions and pertinent data on this light, durable, efficient type of conveyor chain and its cut tooth sprocket wheels—for the transportation of small containers, bottles, packages or parts through such operations as washing, bottling, packing, capping and labeling. Copies are available.

●

Multiple Punching.—Wales-Strippit of Canada Limited, 344 Sherman Avenue North, Hamilton, Ontario, have produced a new brochure which introduces, illustrates, and describes the Wales Multiple Hole Punching System.

As stated in an earlier issue of the *Journal* this system provides a simple, fast, convenient and economical method of punching holes in sheet metal parts by permitting the entire set-up to be made outside the stamping press or press brake. In addition, the punch and die units are interchangeable, permitting the same units to be used and re-used in an infinite number of set-ups.

Copies of the brochures are available. Ask for "Brochure M" and apply to the manufacturer at Hamilton.

●

Plant Housekeeping.—In the February 1951 issue of the C.I.L. Oval there is an interesting article on "Good Housekeeping in Factories" entitled "Dirt and Disorder". The author is Miss Winnie Rowles, women's personnel supervisor at the C.I.L. Nylon Plant, Kingston, Ont. For copies of this number of the "Oval" apply to the editor, the C.I.L. Oval, Box 10, Montreal, Que.

●

Fluorescent Lighting.—Standard types of fluorescent lighting are explained from all angles in the new 32 page brochure issued by J. A. Wilson Lighting & Display Limited, 280 Lakeshore Road, Toronto 14, Ontario.

This publication carries a complete description of fluorescent fixtures carried by the manufacturer, and describes, in detail, the installation, usage and other technical data which is valuable to the selection of correct lighting.

Five full pages in the publication carry general information and illumination data which will be most useful to lighting engineers.

The publication is called "Standard Fluorescent Lighting Equipment". Copies may be obtained from the Company.

●

Embankment Stabilization.—An economical solution to embankment stabilization is offered in a new manual published by Armco Drainage & Metal Products, Inc.

The 16-page illustrated booklet "Armco Bin-Type Retaining Walls" not only describes how the walls are used but shows how strength plus flexibility is incorporated in their design.

Photographs illustrate how the walls are simply and economically installed with a minimum of excavation.

Illustrated case histories also show where Armco bins have been used for embankments along highways, railr… lakes, streams and city streets. Techn… data on selection of design, and the … required for various types of sect… as well as sketches showing typical … plications are included. For copies … this publication apply to Armco Dra… age & Metal Products of Canada Li… ited, Guelph, Ontario.

●

Semi-Instantaneous Heaters.—A new … page bulletin on Whitlock-Darling ty… "R" Semi-instantaneous Heaters is n… available to *Journal* readers. The B… tin, No. 25, contains illustrations … diagrams showing typical installatio… plus other valuable information on d… mestic, industrial, and commercial hea… ing and commercial heating boosters.

For copies of the publication apply … Darling Brothers Limited, 140 Prince … Montreal, Que.

●

Heat Treating Furnaces.—Surface Combustion Corporation, Toledo, Ohio, has just published an eight page bulletin on heating and heat treating furnaces intended primarily for defence production. The bulletin covers heating for forging as well as heat treatments to develo… the required properties for the production of all kinds of ordnance material. Among the items covered in the bulletin are ammunition, guns, tanks, aircraft, and ships. The production of engines, power transmission equipment, as well as tools and special parts, is als… covered.

Copies of the Bulletin may be obtained by writing to Surface Combustio… Corporation, Toledo, Ohio. Ask for Bulletin SC-150.

●

"Dominion Engineer".—No. 2 of Volume 18 of the Dominion Engineer is devoted to an article entitled "Economic Implications of Korean Crisis". The author is Professor Sumner H. Slichter of Harvard University. After giving reasons why it is vitally important to in-

crease productive capacity, Dr. Slichter estimates that 33 billion of output a year will be needed for replacing and expanding this production. For copies of the "Dominion Engineer" apply to the Dominion Engineering Co. Limited, P.O. Box 220, Montreal, Que.

●

Taylor Instrument Quarterly.—Taylor Instrument Company of Canada Limited, 110 Church Street, Toronto, is Canadian publisher and distributor of a quarterly publication called "Taylor Technology". This magazine will be of particular interest to engineers who wish to obtain up to date information on the application and uses of the control, registering, and metering equipment sold in Canada by the Taylor Company. Copies of the publication may be obtained from the Company.

●

Johns-Manville "Power Specialist".—Canadian Johns-Manville Company, Limited, 199 Bay St., Toronto, publish periodically a publication called "The Power Specialist". In the issue under review the following are the titles of feature articles: "70 Years of Public Service — Cleveland Electric Illuminating Company helps to build a bigger and better community"; "Old pipe lines made new"; "Report from Italy"; "Weather-to-be"; "They drink the Pacific" — this article describes new techniques and materials for evaporating salt water; "Cat cracker by Esso"; "New Asbestos Find". To be placed on the mailing list for this publication, please communicate with the Company.

●

Nickel News.—The International Nickel Co. of Canada Limited, 25 King St., West, Toronto, publish a magazine known as "Nickel News and Topics". The publication contains articles on the use and applications of nickel, and is now in its 22nd volume.

The publishers will be pleased to place the names of Journal readers on their mailing list for regular receipt.

●

Chemical Digest.—The Chemical Digest is the name of an interesting publication of Foster D. Snell Incorporated, chemists and engineers, 29 West Fifteenth St., New York 11, N.Y.

No. 1 of Volume 17 contains articles on the planning and direction of research, the use of atomic energy, iron ore supplies, and an extract from the Journal of Commerce headed "Lignin — Problem or Profit?"

●

Industrial Preparedness.—The Canadian Industrial Preparedness Association is an organization which encourages active participation in industrial preparedness for the common defence of Canada. The Association publishes from time to time a leaflet known as "The Bulletin". In a recent issue, the following articles are presented:—"North Atlantic Treaty Organization and Defence Production Requirements", "Current Defence Contracts", "Concern Over Material Shortages". For copies of this Bulletin please apply to the Canadian Industrial Preparedness Association, 1410 Stanley Street, Montreal.

●

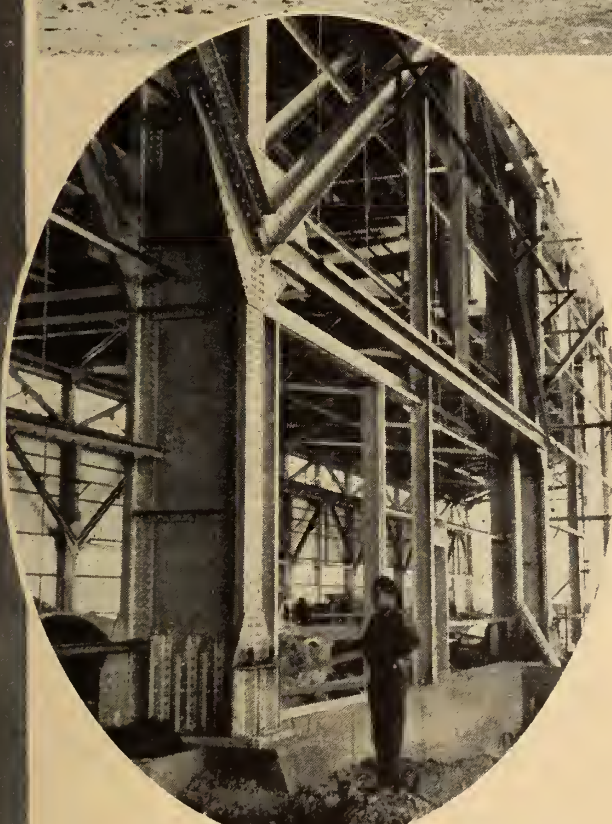
Ontario Hydro Research.—Each quarter the Hydro Electric Power Commission of Ontario publishes "Hydro Research News" which should be of interest to a number of Journal readers. To obtain sample copies communicate with — The Editor, Hydro Research News, Hydro Electric Power Commission of Ontario, University Avenue, Toronto.

●

Imperial Oil Review.—One of the most widely distributed of Canadian Publications used in the interest of shareholders and employees is the Imperial Oil Review. The publication is of a semi-technical nature and it describes the operations of the Company, the economic aspects of oil production and distribution, and carries numerous news items and feature articles on current activities in the oil production field. The publication is recommended not only for the nature of its contents but for the pleasing manner in which the articles are presented. For copies apply to The Editor, Imperial Oil Review, 56 Church Street, Toronto, Ontario.

●

Power Notes.—The Diamond Power Specialty Corporation, Windsor, Ontario, are Canadian distributors of an interesting publication known as "Power Notes". Intended primarily for steam, mechanical, and consulting engineers, it is issued on a bi-monthly basis. In the most recent issue there are papers on "The Penetron" by Andries C. deWilde, of the Research Department of Detroit



Edison Company, and "Water Column Piping Gives Trouble" by H. D. Fisher. This article describes an incident which occurred during the starting up of a new boiler installation, and the methods used to correct the trouble. For copies apply to the Company at Windsor, Ontario.

•

Building Research Congress.—Early in September of this year there will be a building research congress in Great Britain. The organizers of the Congress, most of whom are members of the various British Professional Societies, have recently issued a complete programme of the meeting. Copies may be obtained by applying to the organizing secretary, Building Research Congress 1951, Building Research Station, Watford, Herts, England.

•

Soil-Cement News.—The Portland Cement Association, Chicago 10, Illinois, issue at regular intervals a bulletin known as "Soil-Cement News" which covers developments and progress in construction and research in the field of soil-cement. To obtain copies of this publication communicate with any Canadian manufacturer of cement.

•

Centennial Brochure.—One of the best-produced and most interesting publications to come under review in this section during recent months is a brochure issued by Fisher & Ludlow Limited of Great Britain, to illustrate the activities of the Company during the past 100 years. The publication is produced on a high grade of paper and it is filled with interesting text material and four colour illustrations made from paintings by eminent British artists. The publication describes the plant of the Company, the products and expansion throughout 100 years of operations. In addition to the paintings there are numerous beautifully produced photographs. For copies of the publication write to Toon and Heath, Winfield House, Poplar Road, Solihull, Birmingham, England.

•

Worm Gear Speed Reducers.—The Cleveland Worm and Gear Company, 3249-59 East 80th Street, Cleveland 4, Ohio, advise that current catalogues and bulletins covering the full line of Cleveland Worm Gear Drives will be supplied to Journal readers on request.

•

Humidity Control.—The Surface Combustion Corporation, Toledo 1, Ohio, have recently inaugurated a new bulletin "The Humidity Engineer", which deals with interesting installations of the Company's Kathabar Humidity Control Systems.

•

Diesel Electric Sets.—Caterpillar Tractor Company has just issued a new 16 page booklet dealing with "Caterpillar Diesel Electric Sets". The booklet covers leading particulars, specifications, and performance data for units ranging from the 314-kilowatt D397 to the 165-kilowatt D364. Copies may be obtained from any Caterpillar dealer.

•

Steam Traps. — Velan Engineering Company, 1216 Drummond Street, Montreal, will supply on request, a data sheet which gives the outstanding features of the Company's universal steam trap which was originally developed in Europe and put into production in North America last year.

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Note!

ANNUAL MEETING

May 9-10-11

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

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rice $6.00 a year in Canada, British Possessions. Inited States and Mexico, $7.50 a year in oreign Countries. Current issues, 75 cents a opy, back issues $1.00 a copy. To members nd affiliates, 25 cents a copy, $2.00 a year. — uthorized as second class mail, Post Office epartment, Ottawa.

"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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CONTENTS

15,200 copies of this issue printed

Steam Generating Stations of The Hydro-Electric Power Commission of Ontario

by

Richard L. Hearn, M.E.I.C.

General Manager and Chief Engineer,
Hydro-Electric Power Commission of Ontario,
Toronto, Ont.

A paper to be presented to the Sixty-fifth Annual General and Professional Meeting of The Engineering Institute of Canada, Montreal, May 11, 1951.

Recalling plans made in 1944 for meeting anticipated power demand for twenty years ahead, the author shows how sights had repeatedly to be raised as loads grew beyond expectation. Delay in ratifying the Seaway treaty made steam plants necessary to increase the Hydro's proportion of dependable high-load-factor power.

The main features of each of the two steam plants now building are given, as well as a description of their fuel supply. Looking ahead, the paper outlines how demand will be met after plants now under construction are fully loaded, and discusses future plans for integration of the various systems and interconnections with systems in neighbouring provinces and states.

The purpose of this paper is to give a general review of the reasons why the Ontario Hydro is constructing two large steam generating stations, one at Toronto and one at Windsor. The main features of each plant will be described, and a brief outline given of the events which led up to the Ontario Hydro's decision to build steam stations along with new hydraulic generating stations.

During 1944 and 1945, the Ontario Hydro's engineering staff made a detailed analysis of their existing power supply, together with a study of possible future demands up to 1965. Our huge post-war expansion programme has been largely based on those studies. In December, 1945, power for the supply of the Southern Ontario system load was obtained entirely from hydro-electric plants situated on the Niagara and St. Lawrence rivers, the Ottawa river and its tributaries, the Trent Valley system and rivers in the Georgian Bay area. The dependable peak capacity totalled about 1,562,000 kilowatts.

The plants supplied by the Niagara and St. Lawrence rivers have a much more dependable supply of water than any other river system in the province. The dependable run-off and storage from the Ottawa and its tributaries, the Trent Valley and its tributaries, and the rivers of the Georgian Bay area, are subject to a much greater extent to the effects of high and low run-off as controlled by precipitation and the watersheds feeding these rivers, than either the Niagara or St. Lawrence.

During the winter of 1946-1947 the Ontario Hydro had prepared for its consideration a report on the new developments which would be needed to meet the expected Southern Ontario system load requirements in the succeeding years. Since that time the programme recommended in the report has been periodically reviewed in the light of information becoming available after each year's operation, and the programme has been modified accordingly.

Loads Increased Faster than Expected

Based on the studies made in 1947 of previous load conditions and probable future trends, it was decided that plans for future power supply should be based on an estimated peak demand in December, 1952 of 2,300,000 kilowatts. The estimate was based on a long-term growth of about 60,000 kilowatts per year for the fifteen years starting in 1946. On this basis, additional generating capacity apart from the hydro-electric plants already being built, would be required by 1952.

Various plans were developed for the accomplishment of our objective. After careful consideration, it was decided to proceed with the plan which not only furthered the development of the natural resources of the Province, but was also the most economical. The plan we chose also had the advantage of being capable of expansion or contraction as required. It envisaged the construction of hydro-electric plants on the Ottawa river at La Cave, Chenaux and Des Joachims and a steam plant in the western end of the Southern Ontario system.

As you know, we proceeded with development of the hydro-electric sites, while for the steam plant we recommended the construction of a generating station having a capacity of 120,000 to 180,000 kw., on the basis of minimum annual cost and its flexibility in meeting the expected future load growth. Thus approval was given to proceed with the construction of the J. Clark Keith generating station at Windsor. This station would have an initial capacity of two 60/66,000-kw. units, with provision for future extension to permit the installation of additional units.

During 1947 and 1948 the new generating station at Stewartville, on the Madawaska river, came into operation and a second unit was installed at DeCew Falls. These installations provided an additional capacity of 120,000 kw., but the growth in load in 1948 in the Southern Ontario system turned out to be nearly double our long-term estimate of 60,000 kw. Consequently in January, 1949 the estimate of load for 1952 was increased from 2,300,000 kw. to 2,500,000 kw. We made plans for further generating capacity, including the second steam generating station to be located at Toronto.

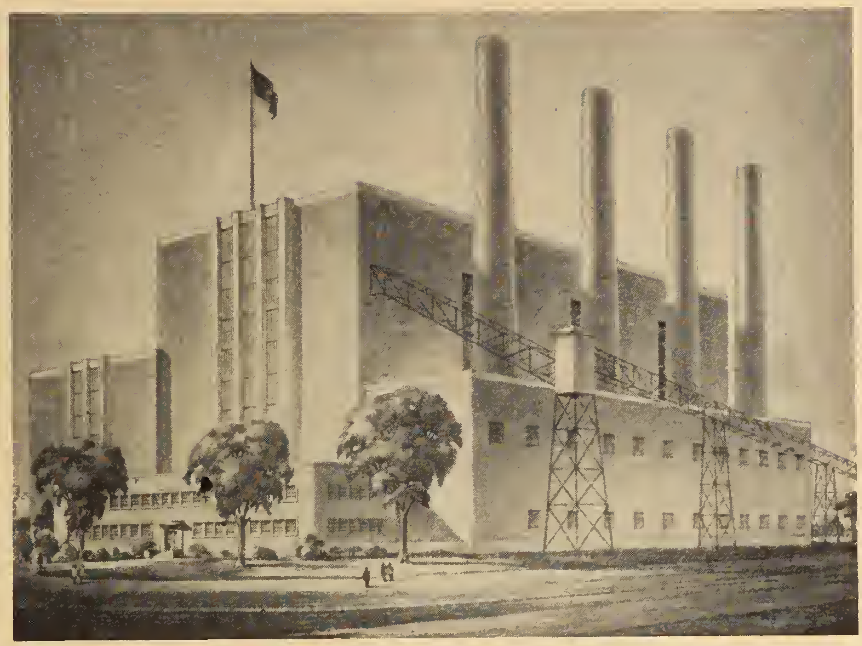

Fig. 1. Architect's drawing of the Richard L. Hearn Generating Station, Toronto.

Delay on Seaway Called for More Steam Power

With our then authorized programme of hydro-electric expansion, the total system resources by 1952 would be about 2,330,000 kw. (exclusive of fuel-electric resources, which will amount to approximately 350,000 kw.). Of this total about 915,000 kw. would be supplied by plants on the Niagara and St. Lawrence rivers, where the flow is dependable and of a high-load factor. The remaining 1,415,000 kw. would be obtained from hydro - electric plants on other rivers, where the flow is dependent on run-off and storage conditions which can vary greatly.

From a comparison of these figures, one will clearly see that the percentage of dependable-flow plants with high load-factor will be only 40 per cent. In 1945, previous to the construction of plants at La Cave, Des Joachims and Chenaux, the percentage was 60 per cent. Another factor influencing the decision was that in 1949 there were no hydraulic sites of sufficient capacity, or of a high-load-factor nature, which could be economically developed in the time required.

Even had the St. Lawrence development been approved in 1949, power from it would not have become available until some time in 1954 or 1955. The new steam plant would still have been necessary to provide for the deficiencies prior to 1954, and after that time would have provided a balance between hydraulic and steam resources of the Southern Ontario system. As no agreement was reached on the development of the St. Lawrence site, it was considered prudent to

Fig. 2. Architect's drawing of the J. Clark Keith Generating Station, Windsor.

proceed with a second steam-electric station to go into service late in 1951 or early in 1952.

One of the important items that influenced the location of the second steam plant in the Toronto area was the favourable site conditions, and the fact that it was close to a very heavy concentration of load. The present load in the Toronto area is approximately 651,000 kw., or some 30 per cent of the total system load for Southern Ontario.

The Toronto Steam Plant

The Toronto plant is to be known as the Richard L. Hearn Generating Station, and will have two units in service by the end of 1951. The first unit will be a 25-cycle, 88,000 kw. unit. It has been so designed by the manufacturers, at our request, that it can be changed to 60-cycle operation by changing the generator rotor. The second unit will be a 60-cycle, non-convertible unit having a capacity of 100,000 kw. The first unit was made a 25/60 cycle convertible unit, in order to provide initial supply at 25 cycles, because of the very high rate of load growth which is being experienced at that frequency. We found that the overall cost for a station with a convertible unit was much less than that for a station with a 60-cycle unit needing frequency-changers and associated equipment to convert the output for use at 25 cycles.

In the Richard L. Hearn generating station at Toronto, each steam generator will produce 850,000 lb. steam per hour at 875 p.s.i.g., at 900 deg. F. at the superheater outlet, with feed water at 365 deg. F. and one per cent blow down. Each unit is equipped with 16 pulverized-coal burners, which are fed from four coal pulverizers. At full load the quantity of coal burned will be about 40 tons per hour per unit.

The turbines are directly connected to the generators, and of the four units to be installed at Toronto, the first and third will supply electrical energy at 25 cycles and the second and fourth at 60 cycles. Later the first and third units will be converted to 60 cycles, and their design is such that this conversion can be readily done by taking out the rotor of each unit and substituting one designed for 60-cycle operation.

The speed of the turbines, when they are operating at 25 cycles, will be 1,500 revolutions per minute, which will be increased to 1,800 revolutions per minute for 60-cycle operation. The capacity of each unit on 25-cycle operation will be about 88,000 kilwoatts, and on 60-cycle operation, 100,000 kilowatts. The turbines are equipped

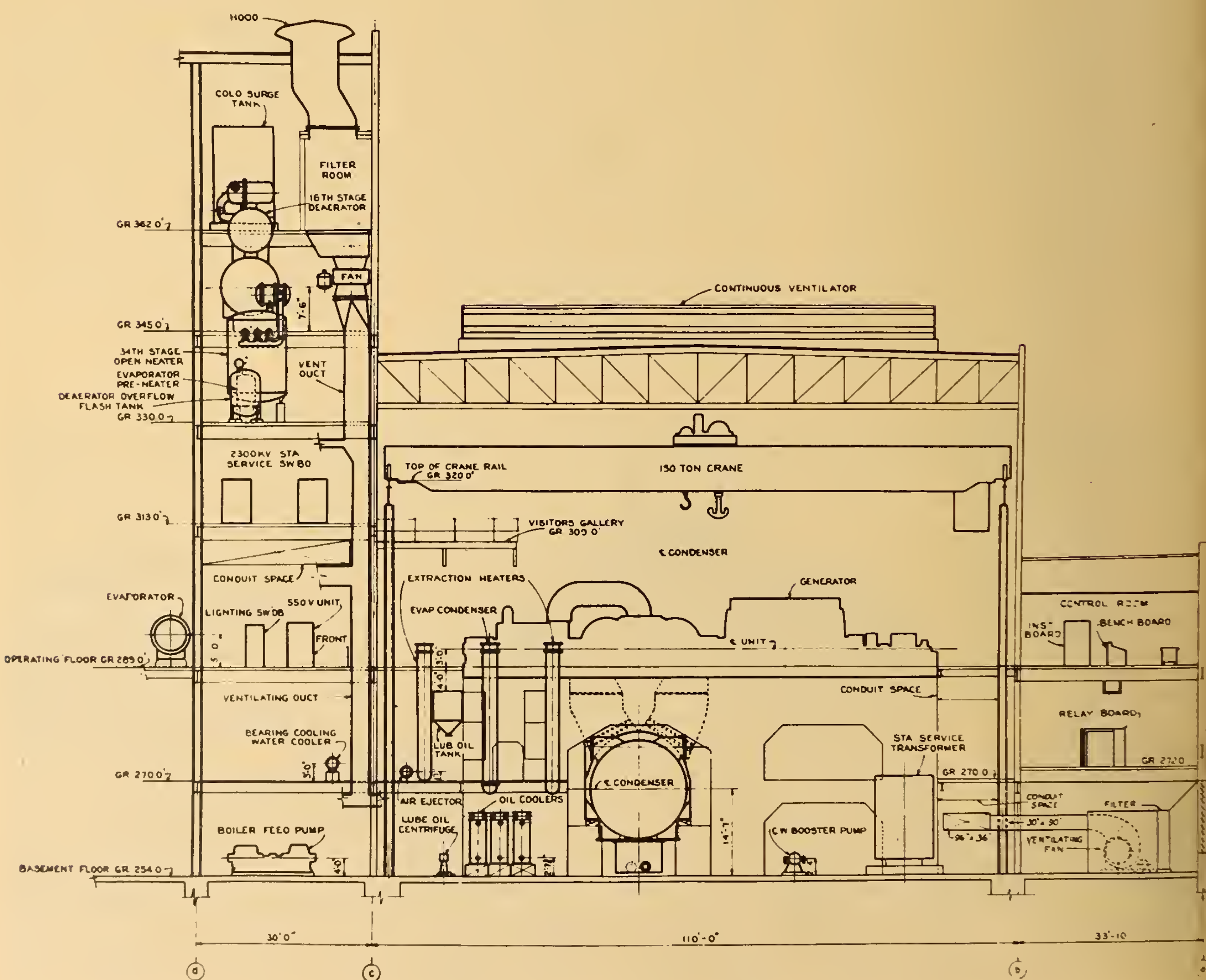

Fig. 3. Cross section of turbine room of the Hearn Station, showing machine locations.

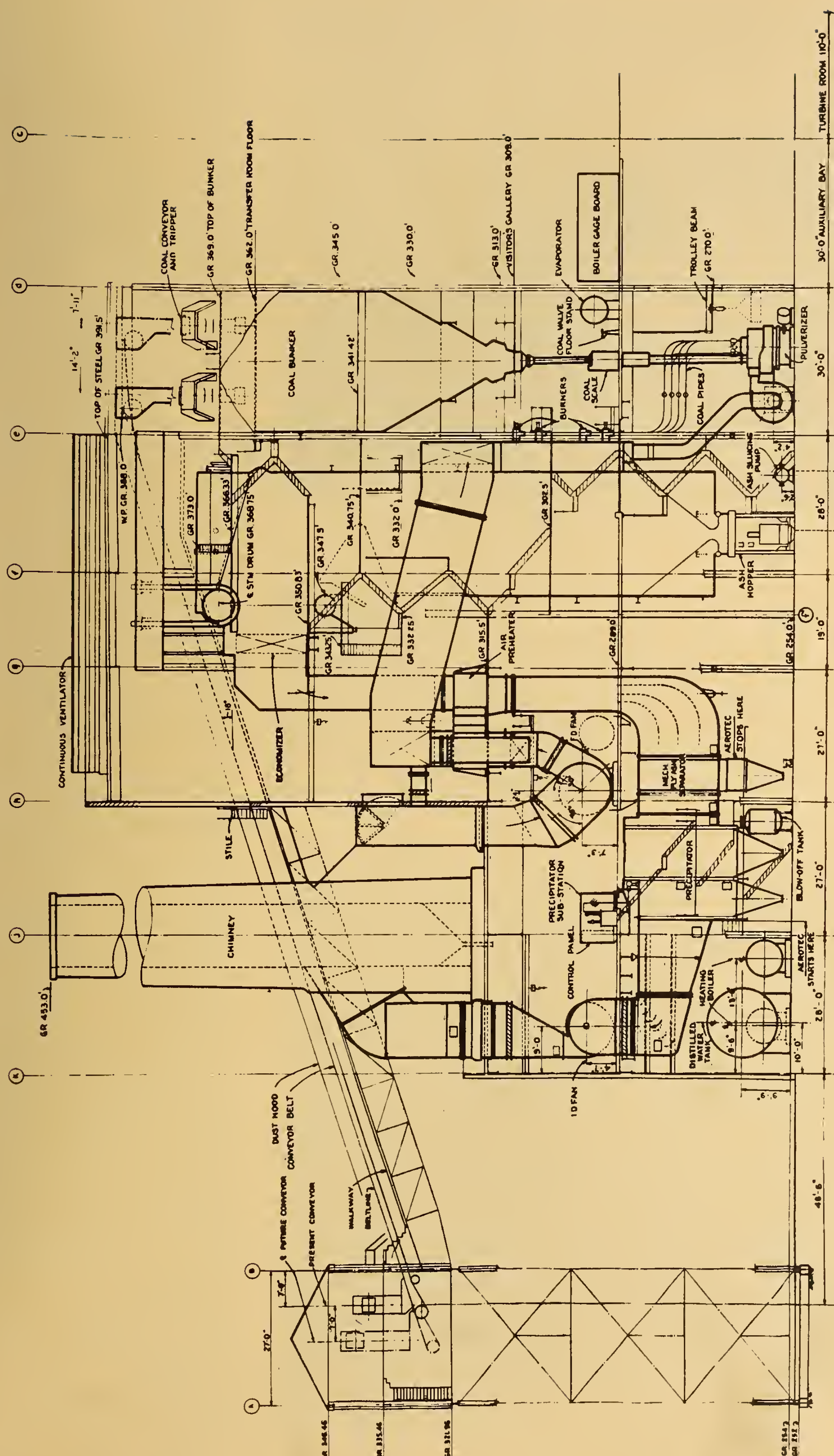

Fig. 4. Cross section of boiler room of the Hearn Generating Station, showing machine locations.

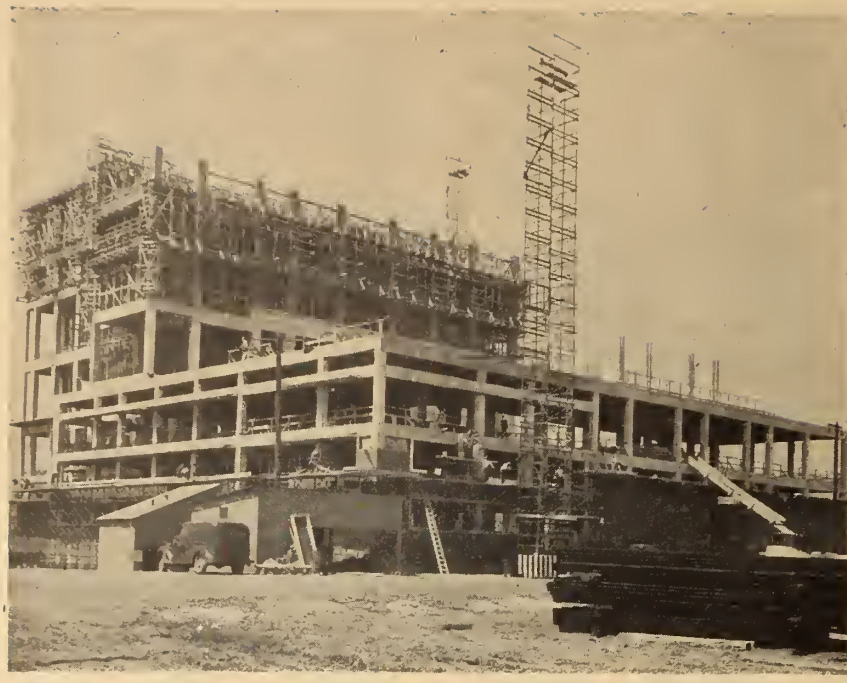

Fig. 5. Concrete structure of the J. Clark Keith Generating Station.

with turning devices to turn the rotors over slowly during the warm-up period.

The generators, in accordance with modern practice, will be hydrogen-cooled, and will be operated normally at a hydrogen pressure of ½ pound per square inch, which may later be increased to 5 pounds per square inch if necessary, when operating under conditions of overload. The exciter and pilot exciter will be directly driven from each generator. These generators will produce electrical energy at 11,000 volts on 25-cycle operation, and at 13,800 volts on 60-cycle operation.

The condensers at Toronto will be of the two-pass type. Each turbine exhausts into a surface condenser, which has two steam nozzles connected to the turbine exhausts by flexible rubber expansion joints. Each condenser has a maximum continuous capacity to condense 620,000 pounds of steam per hour. Cooling water for the condensers will be pumped from the turning basin in the harbour at the rate of 52,000 United States gallons a minute.

The water will be drawn through trash racks and travelling screens, and handled by means of three vertical axial-flow pumps, which will serve two units. Each pump is of sufficient capacity to serve one unit, but the third has been installed to act as a standby for either of the units. The cooling water will be chlorinated sufficiently to prevent the formation of slime in the condenser tubes. The tube surface totals 60,000 square feet and is made up of ⅞ inch outside diameter Admiralty metal tubes, each 26 feet long between tube sheets. The axis of the condensers will be set at 90 degrees to the axis of the turbines.

In addition to firming up with Hydro plants in times of low flow and low run-off, the steam station at Toronto will protect the Toronto area against serious interruptions on transmission systems, just as the station at Windsor will protect that area from similar interruptions. Thus the reliable power supply to both Toronto and Windsor will be materially improved.

Decision to Add Further Units

During the fall of 1950 Ontario Hydro decided, in view of the tremendous load growth in the Southern Ontario system caused by the greatly increased demands of all types of consumer and the defence programme, that the preliminary estimate of primary demand in December, 1953 would be about 2,825,000 kilowatts and 50,500,000 kilowatt-hours a day. This was based on the assumption that the continued growth beyond 1950 would be of the same order as that which had taken place in the previous two years. In the fall of 1950 the estimated dependable capacity of existing resources and those under construction was 2,693,000 kw. and 50,075,000 kilowatt-hours per day. It was again evident that additional generation would be required to supply the estimated loads in December, 1953.

After considering the possibility of sub-normal water conditions, possible plant outages, and possible increased purchases of power, it was decided that in the time available the only economical and reliable way to augment system resources was the installation of third and fourth units at the steam station at Toronto and a third unit at Windsor. The two additional units at Toronto will be similar to the first two; one a 25/60-cycle and the other a 60-cycle. The third unit at Windsor will be a 60-cycle, 66,000-kw. unit. These additional units will be available for service in 1952 and 1953.

Windsor Steam Plant

The general design of our new steam stations is along modern lines including steam generation, power generation, power transformation and transmission with auxiliary equipment.

The principal features of the Toronto plant are found in the Windsor plant, but differences exist and these are as follows: Each steam generator at Windsor, with superheater and economiser, will produce 650,000 lb. steam per hour at 875 p.s.i.g., 900 deg. F. at the superheater outlet, with feed water at 418 deg. F. and 1 per cent blow down. Each is equipped with 12 pulverized coal burners, which are fed from 4 coal pulverizers. At full load the quantity of coal burned will be about 30 tons per hour per unit.

At the Windsor plant there will be 3 generators, each of 66,000 kilowatts capacity, running at 3,600 revolutions per minute and delivering electrical energy at 13,800 volts. The main and pilot exciters are driven through a gear reducer connected to the generator. The steam turbine at Windsor will have five stages of feed-water heating, but in other respects will be similar to the Toronto plant. The condensers will be of the single-pass twin-shell type.

At Windsor, coal handling is different, by reason that the self-unloading ships will discharge into a hopper at Hydro's docks. From there a boom-type conveyor will stack the coal into a crescent-shaped pile, from which it will be transferred by mobile equipment to permanent storage. From this stage it will be handled as at Toronto.

Fuel Supply

Both at Toronto and Windsor the fuel supply for the steam generators can be coal, oil or gas, but coal will be used initially. It will be delivered during the navigation season by self-unloading ships, and transferred to the stock pile by means of mobile equipment consisting of standard tractors and carry-all scrapers. The coal will be reclaimed from the stock pile by the same equipment and delivered to a hopper, from where it will be conveyed by belt through rotary crushers and thence by conveyor to the coal bunkers. From here the coal will pass through controlled weighing scales and will be discharged into pulverizers, to emerge with a fineness such that 72 per cent of it will pass through a 200-mesh screen.

From the pulverizers the coal is picked up by the air from high-pressure fans and discharged through the burners into the combustion chamber. The secondary air needed for these burners is supplied from forced draught fans, which pass it through Lungstrom preheaters, raising its temperature to about 500 deg. F., having extracted the heat from the flue gases.

The flue gases leave the Lungstrom air-heater at a temperature of about 330 deg. F. and pass through a centrifugal type of dust collector to an electric precipitator, where almost all of the fly-ash is removed. Induced draught fans draw the gases through the precipitator, and from its outlet they are discharged through 200-foot chimney stacks to the atmosphere. An interesting refinement in the equipment is a photo-cell device which will record the amount of fly-ash in the discharged gases. Smoke elimination will be 97 per cent efficient, and well in excess of the requirements of the city of Toronto's anti-smoke by-law.

Steam will Take the Peak Loads

In addition to providing the needed capacity, and providing a minimum reserve, these two steam generating stations will also have a second function to perform, namely to take care of peak-load demands on the system. Engineering studies indicate the economies of the combination of steam with hydro, when analyzed on the basis of variable flow on the rivers and peak demands on the system.

With this planned generating capacity becoming available, as shown below, we estimate that by

Summary of Hydro's Post-War Development Programme 1945-1954

Construction of Generating Plants as at December 31, 1950

System and Development	*In service*	*Dependable Peak Capacity Kw.*
In Operation:		
Southern Ontario System		
DeCew Falls (Extension) — Niagara region	Sept. 1947	57,000
Stewartville—Madawaska river	Sept. 1948	63,000
Emergency fuel-electric units	Nov. 1949-April 1950	61,000
Des Joachims—Ottawa river	7 units July-Dec. 1950	350,000
Chenaux—Ottawa river	2 units, Dec. 1950	30,000
Thunder Bay System		
Aguasabon—Aguasabon river	Oct. 1948	40,000
Pine Portage—Nipigon river	July 1950	60,000*
Northern Ontario Properties		
Ear Falls (Extension)—English river	June 1948	6,000
George W. Rayner—Mississagi river	July 1950	42,000
Authorized and Under Construction:		
Southern Ontario System		
Des Joachims—Ottawa river	1 unit, Feb. 1951	50,000
Chenaux—Ottawa river	6 units, June 1951	90,000
La Cave—Ottawa river	8 units, Nov. 1951-Oct. 1952	204,000
J. Clark Keith—Windsor	1 unit, Sept. 1951	66,000
	1 unit, Nov. 1951	66,000
	1 unit, Nov. 1952	66,000
Richard L. Hearn—Toronto	1 unit, 25/60 cycles, Sept. 1951	88,000
	1 unit, 60 cycles, Nov. 1951	100,000
	1 unit, 25/60 cycles, Nov. 1952	88,000
	1 unit, 60 cycles, Feb. 1953	100,000
Sir Adam Beck—Niagara No. 2	6 units, 1954/55	450,000**

* Ultimate capacity planned, 120,000 kw. ** Installed capacity.

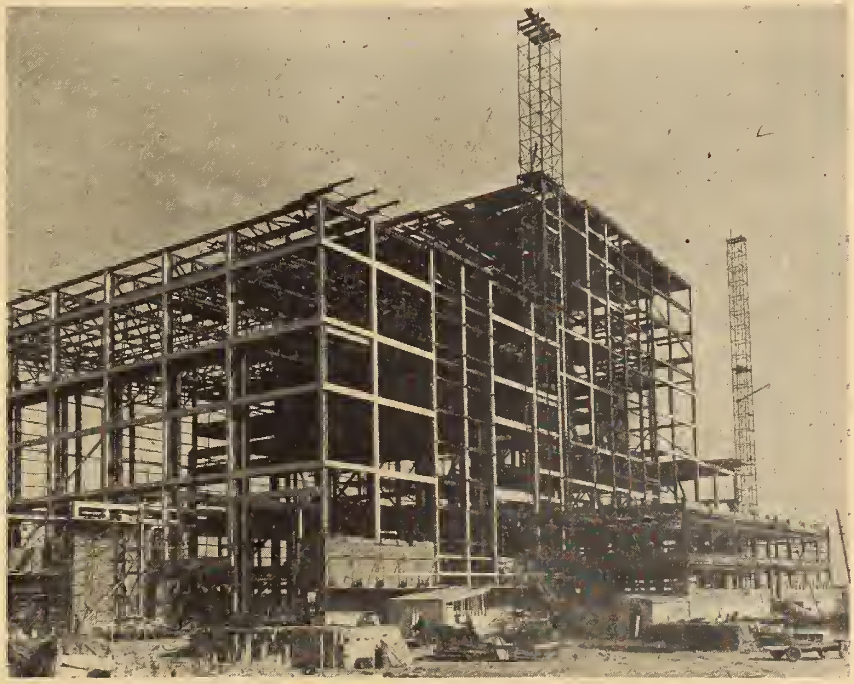

Fig. 6. Steel framework of the Richard L. Hearn Generating Station, seen from the south-west corner, including framework for the administration building.

1952 we shall be able to permit full supply of our primary demands.

Capital Cost

The total estimated capital cost of the 1945-1954 programme is likely to be $925,000,000.

Future Expansion

Studies made in 1950 of the growth in load showed that additional power will be required for the Southern Ontario system after the completion of our present programme in 1953. Even if the St. Lawrence development were to be approved this year, the Commission would not be able to get a supply of power from this source until, say, 1956.

We have, therefore, as the result of successful negotiations between Canada and the United States last year, gone ahead with the redevelopment of Niagara Falls. We have done much preliminary work on a new station to be built close to the Sir Adam Beck—Niagara No. 1 generating station at Queenston. The new development will be known as the Sir Adam Beck-Niagara generating station No. 2, and will use water under a 300-foot head instead of 135 feet to 180 feet, as at present at the Toronto Power and Ontario Power plants at Niagara Falls. This station will have a capacity of 450,000 kilowatts and is expected to be in operation in 1954. Until it is in operation we expect that the Toronto-Windsor steam stations, together with the three new plants on the Ottawa river, will be capable of providing the capacity to meet all demands.

Integration of System

The generating capacities of the other systems operated by the Ontario Hydro, namely the Thunder Bay system and the Northern Ontario Properties, are at present adequate, as a result of our postwar expansion programme in each system, both of which we completed last year. We have, however, made many studies with the ultimate aim of integrating the Southern Ontario, Northern Ontario and Thunder Bay systems. This integration would have operating advantages both from the point of view of reliability of water supply and power supply.

Last year we built a tie-line from the Southern Ontario system to the Northeastern region of Northern Ontario Properties. We have at present under construction a tie-line from the Thunder Bay system to the Northwestern region of Northern Ontario Properties, and we hope in the not-too-distant future to interconnect the Northeastern region with the Thunder Bay system. When this occurs we shall have a huge provincial network extending from Patricia district in northwestern Ontario to Abitibi in the northeast, and linked to the Southern Ontario system, which runs from Beauharnois in the east to Windsor in the southwest.

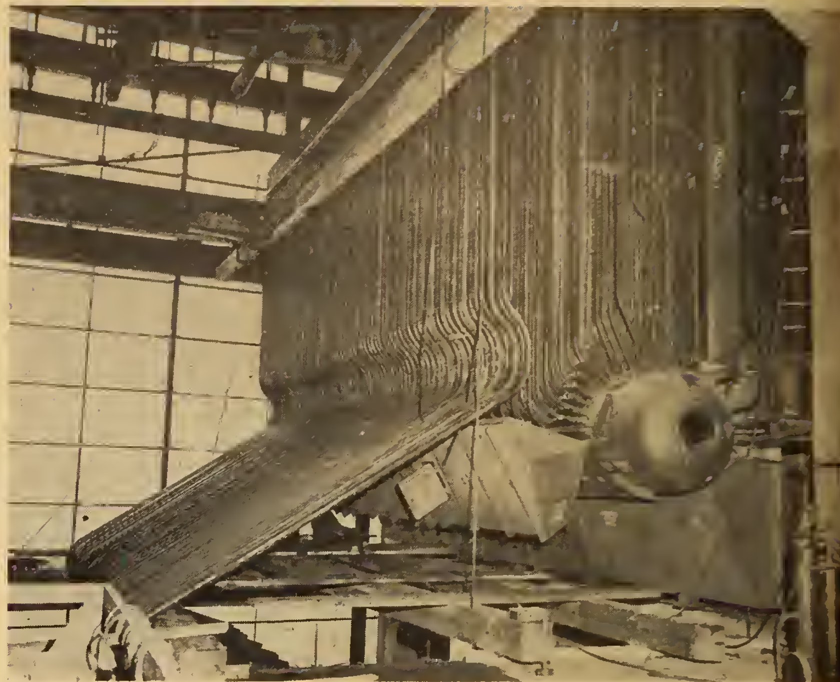

Fig. 7. Steam generator tubing at the J. Clark Keith Generating Station, Windsor.

The authorities in this province, in conjunction with those in the Province of Manitoba, are continuing studies with a view to an interconnection which would benefit both provinces in the future. Studies are also being made in connection with further interconnections with the United States which would be beneficial in time of emergencies.

At present, Ontario, Quebec and New York State are already interconnected, so that in the future we can look forward to a vast network of power lines stretching from Manitoba on the west to Quebec on the east and from James Bay in the north to New York State and Michigan in the south.

Details of Construction

Following is a synopsis of the engineering firms responsible for the design, and the supplies of generating units, for each plant:

Richard L. Hearn Generating Station, Toronto

Supervised by: The Hydro-Electric Power Commission.

Consulting Engineers and Designers: Stone & Webster Engineering Corporation.

Turbine Generator: C. A. Parsons & Co. Ltd., England.

Steam Generating Units: Babcock-Wilcox & Goldie-McCulloch of Galt.

Estimated Cost: $67,000,000. Expended to Dec. 31, 1950, $10,000,000.

J. Clark Keith Generating Station, Windsor

Supervised by: The Hydro-Electric Power Commission.

Consulting Engineers: H. G. Acres & Co., Niagara Falls.

Turbine Generator: English Electric Company, England.

Steam Generating Units: Babcock-Wilcox & Goldie-McCulloch, Galt.

Estimated Cost: $35,000,000. Expended to Dec. 31, 1950, $10,500,000.

It is impossible in a paper of this length to give the names of all manufacturers who have supplied, or are supplying, equipment for these plants, but a comprehensive list will be available in the near future.

PROGRAMME*

of the

Sixty-fifth Annual General And Professional Meeting

of

THE ENGINEERING INSTITUTE OF CANADA

at

THE MOUNT ROYAL HOTEL, MONTREAL

MAY NINTH TO ELEVENTH

1951

*Subject to slight change.

REGISTRATION

$4.00 Members, Juniors • Non-Members **$5.00**

(no fee for ladies and students)

Opens 3.00 P.M., Tuesday, May 8

9.00 A.M. to 6.00 P.M., May 9 - 11

• WEDNESDAY, MAY 9TH

10.00 A.M. *THE FIRST FIVE YEARS OF PROFESSIONAL DEVELOPMENT — A CHALLENGE TO MANAGEMENT*

A symposium of the Training Committee of the Engineers' Council for Professional Development
A. C. Monteith, Vice-President in charge of Engineering and Research, Westinghouse Electric Corp., Pittsburgh, Pa.; H. K. Breckenridge, Vice-President, West Penn Power Co., Pittsburgh; K. B. McEachron, Jr., Manager, Technical Education Division, General Electric Co. Schenectady, N.Y.; J. C. McKeon, Manager, University Relations, Westinghouse Electric Corp., Pittsburgh, Pa.

11.00 A.M. *QUEBEC'S TITANIUM DEVELOPMENT*

M. J. O'Shaughnessy, M.C.I.M., Plant Superintendent, Sorel Operations, Quebec Iron and Titanium Corp.

LUNCHEON
WEDNESDAY, MAY 9th
Champlain Room

Speaker: Prof. A. L. Phelps, McGill University

"The Engineer and his English".

12.30 P.M. **$2.75 per person**

2.15 P.M. *CANADIAN MILITARY AIRCRAFT—1946-51*

Group Captain E. C. Luke, O.B E., M.E.I.C., Chief, Logistics Planning Section, Royal Canadian Air Force, Ottawa.

SPECIAL FEATURES OF BRITISH POWER TRANSMISSION

C. W. Marshall, M.I.E.E., Deputy Chief Engineer, British Electricity Authority, London, England.

3.15 P.M. *MAINTENANCE OF VITAL SERVICES UNDER ENEMY ACTION*

N. M. Brydon, M.E.I.C., Managing Director, Brydon Construction Co. Ltd., Glasgow, Scotland.

RESEARCH IN GAS DYNAMICS AT McGILL

D. L. Mordell, M.E.I.C., Assoc. Prof. of Mechanical Engineering and Director of the Gas Dynamics Laboratory, McGill University, Montreal.

4.15 P.M. *CANADIAN INDUSTRIAL PREPAREDNESS*

Maj. Gen. G. B. Howard, General Manager, Canadian Industrial Preparedness Association, Montreal.

WESTERN GAS RESOURCES IN THE ECONOMY OF CANADA

Dr. G. S. Hume, O.B.E., Dept. of Mines and Technical Surveys.

8.30 P.M. *ANNUAL GENERAL MEETING*

Reports and election of officers.

• THURSDAY, MAY 10TH

9.30 A.M. *PANEL DISCUSSION — MANAGEMENT AND PUBLIC RELATIONS*

A panel of leaders from business and industry.
Moderator—Paul Kellogg, M.E.I.C.

ELECTRO-THERMAL DE-ICING OF AIRCRAFT

J. L. Orr, M.E.I.C. Senior Research Officer, Low Temperature Laboratory, National Research Council, Ottawa.

LUNCHEON
THURSDAY, MAY 10th

Muriel's Room will be open at the usual luncheon hour but there will be no formal arrangements for the meal. The hotel dining rooms are the Hunt Café and Normandie Room on the main lobby floor and the Coffee Shop and Cafeteria in the lower lobby. The information desk will supply details of other restaurants for which Montreal is noted.

12.30 P.M. *INSPECTION TRIP TO BEAUHARNOIS PLANT OF THE QUEBEC HYDROELECTRIC COMMISSION.*

Luncheon on arrival at 1.30 p.m. as guests of the Commission.

Bus tickets $1.00 per person.

or

2.30 P.M. *INSPECTION TRIP TO PLANT OF CANADAIR LIMITED*

Builders of the Sabre jet fighter and the North Star transport aircraft.

Bus tickets .75c per person.

• FRIDAY, MAY 11TH

9.30 A.M. *STEAM GENERATING STATIONS OF THE ONTARIO HYDRO*

R. L. Hearn, M.E.I.C., General Manager and Chief Engineer, Hydro Electric Power Commission of Ontario, Toronto.

THE NEW PRINCE RUPERT PLANT OF COLUMBIA CELLULOSE CORPORATION

S. B. Roberts, M.A.S.M.E., Chief Engineer, Celanese Corp. of America, New York City.

10.30 A.M. *THE ST. LAWRENCE WATERWAY — NATIONAL OR INTERNATIONAL*

J. G. G. Kerry, M.E.I.C., Port Hope, Ont.

FIELD WELDED DIGESTERS FOR THE COLUMBIA CELLULOSE PLANT

P. E. Savage, M.E.I.C., erection engineer, Dominion Bridge Co., Montreal.

LUNCHEON
FRIDAY, MAY 11th
Champlain Room

Speaker: Dr. O. M. Solandt, Aff. E.I.C., Chairman, Defence Research Board, Ottawa, Ont.

12.30 P.M. **$2.75 per person**

DINNER - WEDNESDAY, MAY 9th
Champlain Room

The address of the retiring president, James A. Vance, M.E.I.C.

7.00 P.M. Dress Informal **$4.00 per person**

2.15 P.M. *LIME KILN OPERATION AT SHAWINIGAN CHEMICALS*

R. H. Hall, Plant Research Dept., Shawinigan Chemicals Ltd., Shawinigan Falls, P.Q.

AIR SANITATION

E. A. Allcut, M.E.I.C., Prof. and Head, Dept. of Mechanical Engineering, University of Toronto, Toronto, Ont.

3.15 P.M. *ELECTRONIC CONTROLS*

E. W. Hutton, M.A.I.E.E., Electronics and Regulator Control Engineering Division, General Electric Co., Schenectady, N.Y.

SOME MODERN ASPECTS OF TUNNELLING

Brian H. Colquhoun, M.I.C.E., M.E.I.C., Brian Colquhoun & Partners, Consulting Engineers, London, England.

4.15 P.M. *INSTRUMENTATION FOR CHEMICAL PROCESSES*

J. V. Quinn, Process Engineer, Chemical Development Division, Canadian Industries Ltd., Montreal; and J. A. Rice, Field Engineer, Fischer & Porter (Canada) Ltd., Toronto.

"MURIEL'S ROOM"

Once again the Institute's friends in industry are making this traditional rendezvous possible, and will welcome members, their ladies and guests.

PLEASE WEAR YOUR REGISTRATION BADGE

PLEASE NOTE

Prices for meals include gratuities and provincial tax. Tickets must be obtained in advance and refunds cannot be made less than three hours in advance of any function.

ANNUAL BANQUET AND DANCE

Ballroom **7.30 P.M.**

Speaker: Sir William Stanier, F.R.S., Hon. M. I. Mech. E.
Consultant to the British Railways.

Chairman: James A. Vance, President of the Institute.
Presentation of medals and prizes, induction of the incoming president and introduction of new council.

RECEPTION AND DANCE — 9.30 P.M.

The retiring president James A. Vance and Mrs. Vance, the incoming president Ira P. Macnab and Mrs. Macnab, and the chairman of the Montreal Branch, E. R. Smallhorn and Mrs. Smallhorn, will receive the members, their ladies and their guests.

$5.00 PER PERSON

$2.00 PER PERSON (DANCE ONLY) **DRESS OPTIONAL**

IMPORTANT

THE COMMITTEES WILL DO EVERYTHING POSSIBLE TO ASSURE YOUR SATISFACTION IN MONTREAL. IT WILL HELP IF YOU INDICATE YOUR WISHES AS EARLY AS POSSIBLE. ENTERTAINMENT AND RECEPTION COMMITTEE MEMBERS WILL WEAR RED BADGE RIBBONS.

HOTEL ACCOMMODATIONS AND TRANSPORTATION

The Mount Royal is the headquarters hotel and all activities, unless otherwise noted, will be held there. All those planning to attend are urged to make requests for room reservations as early as possible. Late requests, and those who so specify, will be assigned space in nearby hotels or tourist accommodation.

All requests for convention reservations should be addressed to:—

The General Secretary,
The Engineering Institute of Canada,
2050 Mansfield St.,
Montreal 2, Que.

If desired accommodation is unavailable, delegates will be assigned to the next best that can be obtained. Unaccompanied delegates should indicate whether they will be prepared to share twin-bedded double rooms. It is most satisfactory of course if such sharing arrangements can be worked out in advance and indicated on the application for reservations.

Special reduced convention fares have been authorized for rail travel in Canada. If you plan to travel by rail, please ask for the rail certificate which entitles the delegate and members of his family to round-trip tickets for one and one-half times the one-way fare plus twenty-five cents.

Trans-Canada Air Lines have special convention rates for parties of ten or more. Your local T.C.A. agent will gladly supply details.

Fig. 1. View of the new Trenche Development from downstream.

TRENCHE

Shawinigan's Latest and Greatest Development

A paper based on information supplied by the Engineering Department of The Shawinigan Water and Power Company

On December 14, 1950, at inauguration ceremonies in which Quebec's Premier Maurice Duplessis took part, the first unit of the Shawinigan Water and Power Company's hydro-electric power development at Trenche on the Upper St. Maurice was officially placed in service, seven months ahead of schedule. This, the sixth site to be developed to date, is the largest of this Company's power plants on the St. Maurice river, and was designed and constructed by the Shawinigan Engineering Company, a subsidiary of the parent company. Its full capacity will be 390,000 hp. in six units, five of which are expected to be in service by early summer of 1951.

A large part of the power it produces will be used at the new titanium plant at Sorel, Quebec. The Trenche development, on which some $40 millions has been spent, is situated 130 miles upstream from Trois-Rivières. One existing plant lies further upstream, while four more are built between Trenche and Trois-Rivières. Four additional sites on the upper St. Maurice remain to be developed. Completion of Trenche will bring Shawinigan's total installed capacity close to 1¾ million horsepower. The total potential of the St. Maurice may be placed at about 2½ million horsepower.

The site selected is at a narrowing in the river between high rock hills. The power house and intake structure are at the west end; the latter is connected to the west bank by a concrete bulkhead wall. Adjacent to the intake structure on the east are a log chute and four small regulating sluices and east from these, extending across the river, is the main dam, a massive gravity type structure 460 feet in length with a maximum height of 230 feet. Between this main dam and the east bank of the river are four 50-foot main sluices. Water is conveyed from the intake to the powerhouse through six 20-foot diameter concrete covered steel penstocks, 350 feet long.

The maximum river discharge at the development is 170,000 cubic feet per second, through five turbines, four regulating gates and four sluices. The total head on the plant is 160 feet. The head pond or forebay extends for six miles upstream. In it, at its deepest point, the Shawinigan Company's new head office building on Dorchester Street in Montreal could be entirely submerged.

The St. Maurice River

The St. Maurice, the second largest tributary of the St. Lawrence, has its watershed wholly within the Province of Quebec. It rises in a series of lakes near the Hudson Bay height of land, and flows 240 miles in a southeasterly direction through the Laurentian

Mountains to Trois-Rivières, where it joins the St. Lawrence. Its drainage basin is approximately 16,000 square miles. While a small portion of its drainage area near the outlet is a part of the St. Lawrence plain, suitable for agricultural purposes, by far the greater portion is rugged and generally important for its timber, fur, and game as well as its developed and undeveloped waterpower.

Meteorological records of several stations within the St. Maurice watershed show that the minimum annual precipitation is 26 inches, the maximum 46 inches and the average 36 inches. Records of river surface elevations have been maintained at Shawinigan Falls since 1901. A rating curve of river flow in cubic feet per second has been made by metering over a wide range of discharge. From these records it has been determined that, under natural flow conditions — that is, before any storage was provided, the minimum flow at Shawinigan Falls was 5,800 cubic feet per second and the mean average annual run off 25,600 cubic feet per second, equivalent to 61 per cent of the average precipitation.

In order to develop fully the power possibilities of the river it was quite evident that storage reservoirs would have to be created. Since 1908, and particularly since 1918, the regulation of the St. Maurice has been improved considerably by the addition of storage on the Manouan river, aggregating 20 billion cubic feet, and by the construction of Gouin dam near the headwaters of the St. Maurice which, creating one of the world's largest artificial reservoirs, impounds 220 billion cubic feet, or 280 billion cubic feet with flashboards. In 1930, further storage was provided when the Mattawin dam on the Mattawin river, an important tributary of the St. Maurice, forming a reservoir with a capacity of 33 billion cubic feet, came into operation. These dams are owned by the Province of Quebec and are operated by the Quebec Streams Commission.

Through the operation of these and other reservoirs the minimum flow of 5,800 cubic feet per second has been increased to more than 20,000 cubic feet per second at Shawinigan Falls, and proportionately at all other developments on

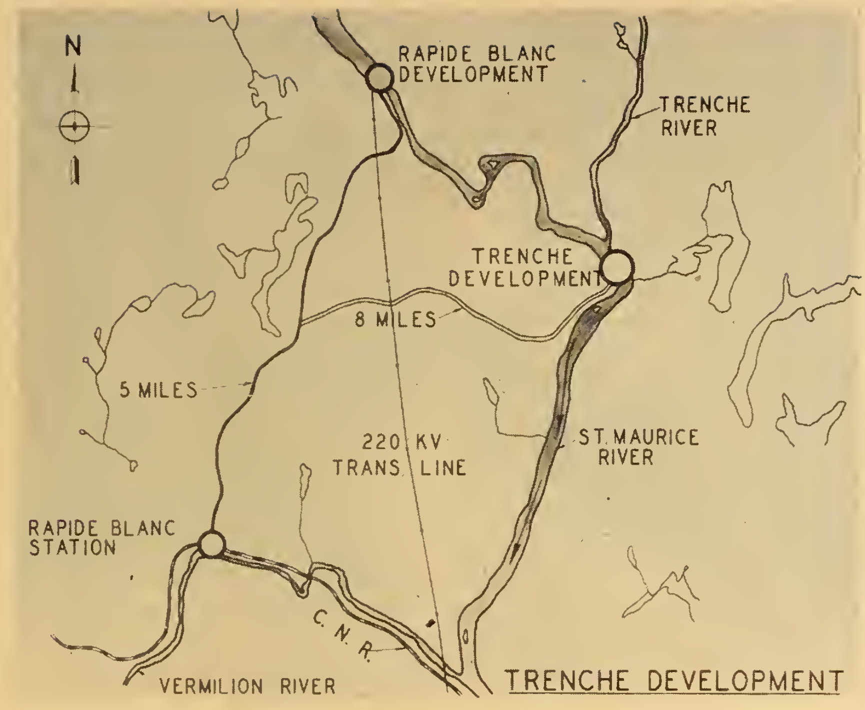

Fig. 2. The upper St. Maurice River showing location of the Trenche Development.

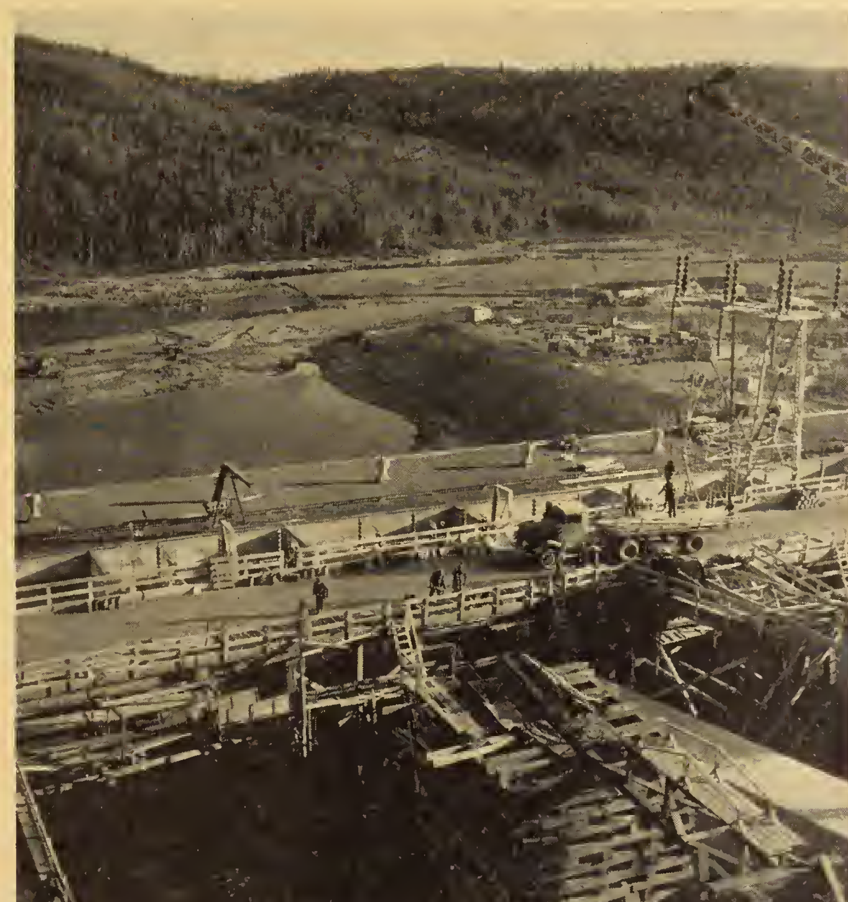

Fig. 3. The top of the intake section of the Trenche dam. The tailrace in the background, drained almost dry while the headwater level was being raised, is some 235 feet below the crest of the dam.

Fig. 4. The sluiceway design was developed with the help of model studies in the hydraulics laboratory at Ecole Polytechnique, Montreal. Shown here during testing are Prof. R. Boucher and J. A. Thomas, hydraulic engineer, Shawinigan Engineering Co., Ltd.

the river. As a result of these storages the prime power capacity of the St. Maurice has been more than trebled. The lower section of the St. Maurice with developments at La Gabelle, Shawinigan Falls, and Grand'Mere, utilizing 285 feet of head on 16 miles of river, has an installed capacity of 862,900 horsepower, of which 489,900 horsepower is concentrated at Shawinigan Falls.

Fig. 5. View from the east bank showing, in the foreground, the sluice section, centre, the main dam and, background, the regulating gates and intake section. The length from shore to shore is 1,500 ft.

With the lower St. Maurice approxmately 75 per cent developed by 1928, and with the demand for power showing a steady rate of increase, it was quite apparent that the potential power on the lower reaches of the river would soon be completely developed, and that serious consideration should be given to the potential power resources of the upper reaches of the river.

Early in 1928 application was made to the Quebec Government for the power rights on the upper St. Maurice above La Tuque. In 1928, the Shawinigan Company secured a lease to develop the potential power on that section of the river, from the division line between the townships of Vallières and Dumoulin at river mileage 110, to the junction of the Manouan and the St. Maurice at river mileage 188, constituting a section 78 miles in length.

A comprehensive investigation of the power possibilities of the Upper St. Maurice was carried out from July, 1928, to December, 1929. During this period surveys were made for possible hydroelectric developments at 19 locations, and data was obtained relative to railways, timber limits and depots, Indian reservations, and fish and game clubs, which would eventually come within the flooded areas.

On completion of these developments, 622 feet out of a gross head of 630 feet on this 78-mile section of the Upper St. Maurice will be utilized. In addition to these projects La Tuque has been developed as a part of the Upper St. Maurice system, with a probable ultimate capacity of 267,000 horsepower, thus bringing the proposed ultimate installation on the upper half of the river to about 1,500,000 horsepower.

The first development to be constructed on the Upper St. Maurice (1930-1934) was at Rapide Blanc, about 35 miles above La Tuque. The next development was built at La Tuque, where 178,000 horsepower was brought into service in 1940. This project, owned by the St. Maurice Power Corporation, is controlled jointly by Shawinigan and The Brown Corporation and operated by the Shawinigan Company. The plant has been designed for an ultimate installation of 267,000 horsepower. In 1943 a fifth 44,500-horsepower unit was added, bringing the installed capacity to 222,500 horsepower.

With regard to the remaining four undeveloped sites on the upper St. Maurice aggregating 520,000 horsepower, Rapide Sans Nom with an ultimate installation of 252,000 horsepower is presently under investigation, while the other three—Rapide Allard, Rapide du Lievre and Rapide des Coeurs, require but little further study for the preparation of general plans.

Construction

Work was commenced on the Trenche project in April, 1948, by building a 26-foot wide gravel highway eight miles in length, connecting with the 10-mile construction highway built to serve the Rapide Blanc plant further upstream, making an access road some thirteen miles long from the Rapide Blanc siding on the C.N.R. to the site of the new development. Concurrently work was started on enlarging the railhead facilities for unloading freight, and on building a townsite for 2,500 workmen and their families, including bunkhouses and dining rooms for accommodating 2,000 workers, on the west bank of the river. Recreational facilities, schools, a church, theatre, hospital, bank, dancehall, laundry, as well as service establishments such as stores, barber shops and cobbler, were provided in the townsite.

Excavation of the rock bypass channel in midstream was begun in January, 1949, as well as on the cofferdams necessary to divert the flow of the entire river through the diversion channel.

Construction of the project reached the final stage last November 12th, when water was first admitted to No. 5 unit, setting it in motion for its test run. One week later, power was being fed out over the line.

Thereby was culminated a year and ten months of intense construction activity. Placing of concrete reached a peak last summer during the building of the main dam and sluiceways. Later, in the fall, the openings left in the dam to permit passage of the river flow were concreted up, sealing the dam and causing the water to rise against it, providing a head for the production of power.

This latter operation, known as the "closure" of the dam, was really two operations, and was accomplished in three stages. The main flow of the river had been passing through one large 50-ft. wide channel (permitting easy passage for logs and providing for flood conditions) and two 21-ft. wide lesser channels. These widths were chosen because stop logs and gates in these sizes were already designed (from previous projects) and could be used to make the closure. This enabled placing of orders for materials without the delay which new designs would have engendered. However, these gates could not sustain the high lift of water against them should one closure only be made. Thus, a further two 21-ft. openings were left higher up in the dam to pass the water and thus limit the depth until such time as the filling of the openings below with concrete had been effected.

The three stages of closure were as follows: First the large 50-ft. channel was closed off upstream and downstream with stop logs, the area unwatered and the whole filled with concrete. The water, of course, continued to flow through the two adjacent 21-ft. openings. In the second stage, gates were lowered to close these off, and water rose to the level of the upper set of openings as the pouring of concrete proceeded below. This operation completed, the gates were retrieved from below and used a second time to close off the upper 21-ft. openings. This third stage brought the water to the level of the sluiceway crests and provided a head for starting up the first machine.

Rock handling and concrete transportation equipment for the

Fig. 6. Sluiceway and flood channel under construction. The maximum discharge will be 170,000 cubic feet a second, including the projected five turbines, four regulating gates and the four sluice gates, each of which is 50 feet by 31 ft. 6 in. The sluice section is 260 feet long, and the flood channel extends 450 feet downstream from the sluice.

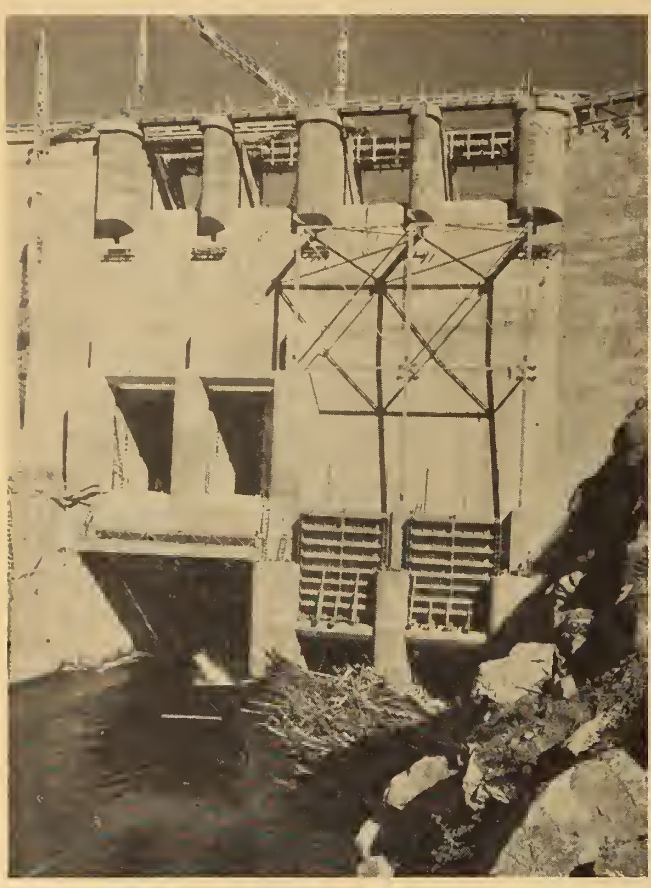

Fig. 7. Upstream face of the dam showing by-pass openings. Water is passing through 50-ft. channel (lower left) and two 21-ft. channels, closure gates for which are seen mounted above the openings. Above the 50-ft. opening can be seen the two additional 21-ft. channels for limiting the head on the lower gates.

job was all motorized. Placing of the concrete was effected by means of electrically operated stiffleg and guy derricks. Each of two concrete mixing plants consisted of two 2-yard Smith mixers with full batching equipment, using bulk cement. Coarse aggregate was mainly obtained by crushing rock obtained from the excavation, while fine aggregate was hauled from a gravel pit some three miles upstream.

The total rock excavated for the job amounted to half a million cubic yards. The total of concrete placed in all component parts of the structure was 550,000 yards. Peak progress on placing of concrete reached a rate of 75,000 yards per month. During the life of the job some 3,000 railway carloads of cement, 1,000 carloads of lumber, 700 carloads of equipment and 250 carloads of steel were hauled by truck over the 13 miles of access highway from railhead to site. Employment rose to a total of some 700 late in 1948, and peaked during the fall of 1949 at some 2,000, 300 of which was carpenter labour.

Power House and Equipment

The power house superstructure, 383 feet long by 58 ft. wide, is built of structural steel and brick walls, with reinforced concrete roof slab. The interior is sand-lime brick, and the generator room floor is paved with red quarry tile. The power transformers are banked in rear of the generators on the upstream side. Air-blast circuit breakers are located on an upper floor. The generator room crane is of 215-ton lifting capacity, with span of 53 feet.

The turbines are Francis type, built by Dominion Engineering Works, rated at 65,000 hp., turning at 128.6 r.p.m. They are fitted with plate steel scroll cases. Generators are rated at 53,000 k.v.a. each, 90 per cent power factor.

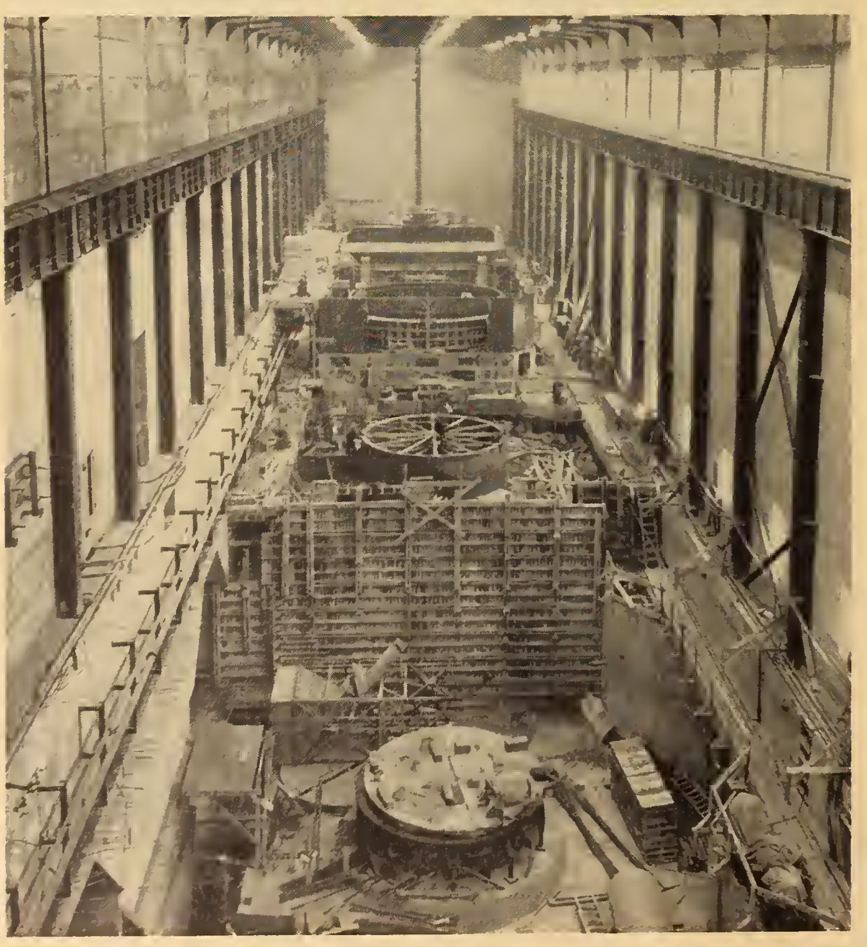

Fig. 8. Interior of the power house showing, in various stages of construction, four of the five units. The turbines are rated at 65,000 horsepower, turning at 128.6 r.p.m., and the generators are 53,000 kva., 90 per cent P.F., 13,800 volts, 2,200 amps, 3-phase, 60-cycle, 97 per cent efficiency at full load. The transformers, located in bays on the upstream side of the power house, are 53,000 kva., 230,000 h.v. star, 127 amps., 13,800 l.v. delta, 2,200 amps.

3,800 volts, 2,200 amps, 3-phase, 0-cycle, 97 per cent efficiency at ıll load, built by Canadian General Electric Company. The main ransformers are 53,000 k.v.a., 30,000 h.v. star, 127 amps, 13,-00 l.v. delta, 2,200 amps, built by Canadian Westinghouse. The air-blast circuit breakers are 220 k.v. Brown Boveri type and 13.8 k.v. Westinghouse type CA.

Six pairs of intake gates 18 ft. vide by 26 ft. high were supplied by the Dominion Bridge Co. Ltd., which company also supplied the our main sluice gates, 50 ft. wide by 31½ ft. high, as well as the our smaller regulating gates. All hese gates are of the fixed roller ype with electrically operated ıoists and are electrically heated or winter operation where necessary.

Power from the generators at 13,800 volts is fed to giant power transformers, mounted on a deck along the upstream face of the power house, which step it up to 230,000 h.v. star, 127 amps, 13,-individual generators and transformers operate as units paralleled only on the high voltage bus, in this respect following the general pattern of the nearby plant at Rapide Blanc. In the operating of the station, emphasis will be placed on automatic features of control, so as to minimize the amount of direct control by an operating staff.

The switching station is located between the power house and the intake section. The power will travel directly over a transmission line to the terminal station at Trois-Rivières. Protection of this line will be effected simply through the high voltage breakers at Trenche and at the terminal station.

The transmission line is a considerable undertaking in itself. It is 110 miles long, with conductors of aluminum reinforced with steel, carried on galvanized steel towers, and will cost about $4½ millions. It will follow the route of the present line between Rapide Blanc to Trois-Rivières.

When fully developed the St. Maurice River will have an ultimate installation of about 2,400,-000 horsepower, of which more than 1,600,000 horsepower is developed or under construction. Water from Gouin storage dam will generate power by flowing through ten hydro-electric plants operating under a total head of 1,021 feet, of which 511 feet have been utilized and 160 feet is presently under construction. √

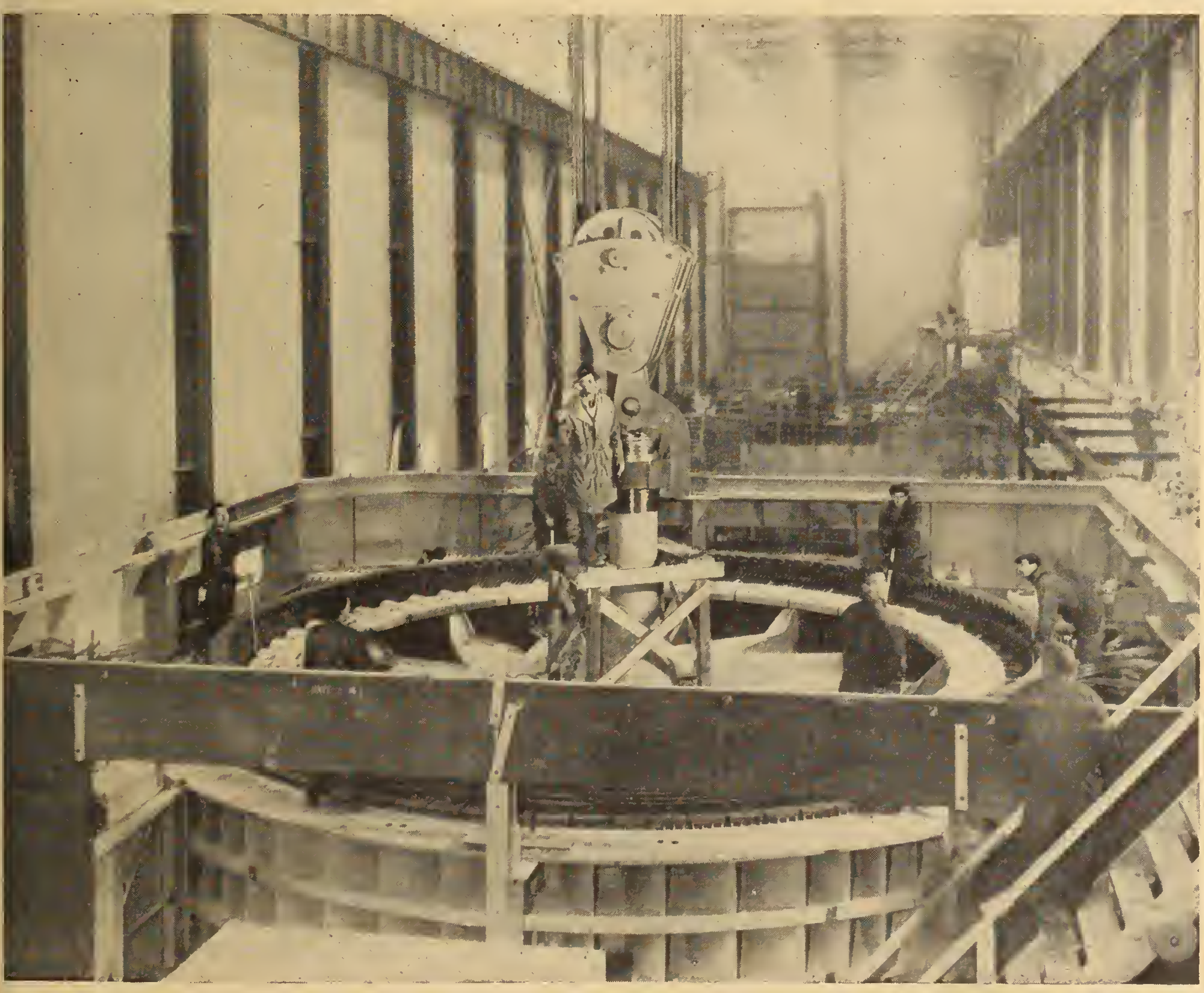

Fig. 9. The rotor for one of the machines in the Trenche power house being lowered into place with the 215-ton power house crane.

Field-Welded Digesters for the Columbia Cellulose Company

A paper to be presented before the Sixty-fifth Annual General and Professional Meeting of The Engineering Institute of Canada, at Montreal, May 11, 1951.

by

P. E. Savage, M.E.I.C.

Erection Engineer,
Dominion Bridge Company Limited, Lachine, Que.

For over 30 years the Dominion Bridge Company has been producing digesters for the pulp and paper industry, both in Canada and abroad. During the past 15 years a large number of shop welded sulphate digesters have been built. These conform to paragraph U 68 of the A.S.M.E. Code for Unfired Pressure Vessels,—that is, all welds are examined by X-ray and the final assembly is stress relieved. The largest units of this type produced by the Company to date run about 11 ft. 6 in. I.D. by 48 ft. face to face of nozzles, and weigh about 60 tons. Such a vessel is easily handled in the Lachine plant stress relieving furnace, is within most railway shipping clearances, and in most cases has not proven too difficult to place in the field as a unit.

Sulphite digesters, on the other hand, usually run considerably larger than this, 16 ft. dia. by 48 ft. face to face of nozzles being a rather small unit. Such a unit would not enter any stress relieving furnace now installed in Canada at least, and the large diameter would preclude rail shipment. Furthermore assuming it could be shipped, for example by a water route, handling and placing costs as a unit in the field would in most cases be prohibitive. Consequently it has been the Company's general practice in the past to ship sulphite digesters in sections, and to assemble, rivet and caulk them in the field.

History of the Contract

Early in 1947, the Company was asked to bid on the supply of sulphite digesters for a proposed new pulp mill near Prince Rupert, B.C. They were to be used in the production of high grade sulphite pulp by the Columbia Cellulose Company, a subsidiary of the Celanese Corporation of America. Each unit was to be about 18 ft. dia. by 56 ft. face to face of nozzles. Approximate comparative prices were requested on the conventional mild steel shell, to be tile lined for protection from the cooking acids, and alternatively on a stainless clad plate which could be used without additional lining.

Following the Company's standard practice, the mild steel alternative was estimated as field rivetted. The nature of the clad plate, of course, required that it be designed for field welding. After some months of negotiations and discussion, the purchaser finally settled on 5 digesters of conventional rivetted construction, 19 ft. 4 in. dia. by 60 ft. 9 in. face to face of nozzles. Design and construction was to be in accordance with British Columbia regulations. Working pressure at the top nozzle was specified as 125 p.s.i. The design was made based on using A.S.T.M. A 212 Grade B flange quality plate.[1] Using a safety factor of 5, heads, shell and cones worked out to 1⅜ in. thick, with longitudinal butt straps 1 in. thick and circumferential butt straps 15/16 in. thick. Each digester was supported on 8 columns of rolled H sections. The total estimated weight of each unit was over 150 tons.

Shortly after quoting on this proposition, an alternative price based on all welded digesters 19 ft. dia. by 59 ft. face to face of nozzles was requested. The working pressure at the top nozzle was raised to 135 p.s.i. The design and construction was to be in accordance with British Columbia regulations for unfired pressure vessels, Class I. (This is basically similar to the A.S.M.E. paragraph U 68 in that it calls for

(1) Carbon max. .. 0.33%
Manganese max. 0.90%
Phosphorus max. 0.04%
Sulphur max. . 0.05%
Silicon .... 0.15% to 0.30%
Tensile strength 70,000 — 82,000 p.s.i.

The paper describes the construction of five sulphite digesters 19 ft. diameter by 65 ft. high. They are an innovation to the pulp and paper industry in Canada at least, in that they were largely welded, radiographed and stress relieved in the field. The successful completion of the project opens new fields to industry, as it proves the practicability of producing high quality welded pressure vessels of large size without restrictions of shipping and handling.

An account is given of the background of digester construction by the author's Company, followed by a brief history of the contract and an outline of the preliminary planning of the work. The actual building of the units in sequence from shop fabrication to hydrostatic test is described.

welding operators to be government qualified, all seams radiographed, and the final assembly stress relieved.) Using a safety factor of $1\frac{1}{2}$, and the same material as for the rivetted design, plate thicknesses worked out to practically $1\frac{1}{4}$ in. throughout. The estimated weight of each unit was under 100 tons, less than 2/3 the weight of the rivetted design. This proposal was finally accepted by the purchaser.

Preliminary Planning

Some consideration was given to the building of a stress relieving furnace at the Vancouver plant, large enough to accommodate a complete digester. The units could then have been completely shop fabricated, shipped by water route and erected in one piece. It was decided, however, that it would be more economical to ship in sections, and to weld, radiograph and stress relieve in the field.

The original construction schedule called for the digester building and the adjoining buildings on either side to be erected before digester assembly was begun. It was, therefore, planned to set up a temporary shop in one of the buildings adjacent to the digester building. The equipment was to consist of handling facilities, welding machines, welding positioners, X-ray equipment and a small stress relieving furnace. It was proposed to weld all longitudinal seams in this shop, positioning the sections so that all welding would be done in the downhand position. These sub-assemblies would then be X-rayed, stress relieved, erected in their final position, and the circumferential joints welded and radiographed in place. It was not planned to stress relieve the circumferential joints. The stress in these seams is only half of that in the longitudinals, and the B.C. code does not require them to be stress relieved if, in the opinion of the Chief Inspector, "he is satisfied that, due to size, the digester could not be stress relieved as a unit." (Section 292.)

After giving careful consideration to the magnitude and importance of the work, the Chief Inspector requested an investigation of the possibility of stress relieving the complete units. It was known that large oil refinery vessels had been stress relieved in the field in both Canada and the United States. After looking into the matter carefully, it was decided that it was quite practical to carry out such an operation in this case. In general, the method adopted was to insulate the digesters on the outside and to circulate hot gases through them until they attained stress relieving temperatures.

This decision caused a reconsideration of the whole plan of field operations. It now appeared logical to assemble the digesters completely, and to weld, radiograph and stress relieve them all in their final location. It was felt that the additional expense and difficulty of making the welds in position would be more than offset by the saving of the cost of the temporary shop, and the provision of special handling equipment to erect digester sections only. Steps were therefore taken to schedule the digesters and the building steel so that everything could be erected at the same time, using the same erection crews and derricks.

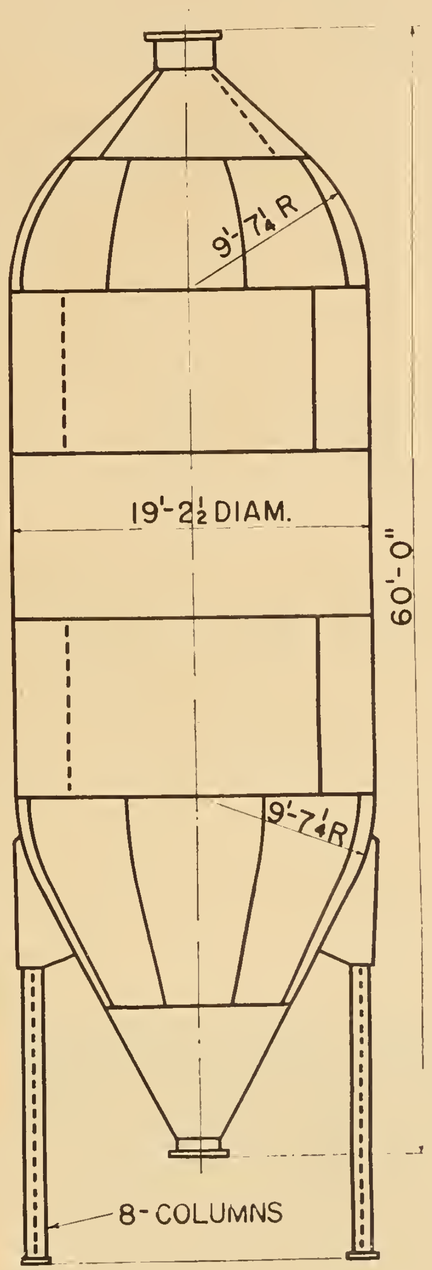

Fig. 1.

The general outline of the digesters was finally established as shown in Fig. 1. Note that the profiles of the top and bottom curved sections are the same. As a result, only one set of dies was required for the forming. The supporting rolled H columns are so turned that their weak axes are tangential to the cone. Consequently they deflect outward and inward at their tops relatively easily as the digesters expand and contract under temperature changes. This feature helps to minimize local bending stresses in the bottom cone, which is particularly advantageous during stress relief. This point will be discussed in detail in the description of that operation.

The connections of the legs to the shell gusset plates, and the leg bracing are all field rivetted. Since there were rivetters on the building project, this did not involve the organizing of additional field crews. Later on, two sulphite digesters were field welded for the Canadian International Paper Company at Gatineau, Que. There were no rivetting crews on this job, so the leg details were designed with a few bolt holes for assembly purposes, and the main strength of the connections was developed by field welding. Both types proved satisfactory. Incidentally, the 2 C.I.P. digesters were built to A.S.M.E. paragraph U 69, which required all welding to be done by qualified welders, welding spot checked only, and no stress relief.

Assembly clips were provided on all seams as shown in Fig. 2. These were located at approximately 3 ft. centres along all joints, and were designed to allow the digesters to be completely erected without doing any welding.

Choice of Electrodes and Joints

Selection of the most suitable type of welding electrode and the design of grooves for best field welding conditions were carefully studied. Due to the high strength of the main material, a high strength electrode was required. Various rods conforming to A.W.S. Classifications E 7010 and E 7011 were tried out. Satisfactory physical results were obtained with these

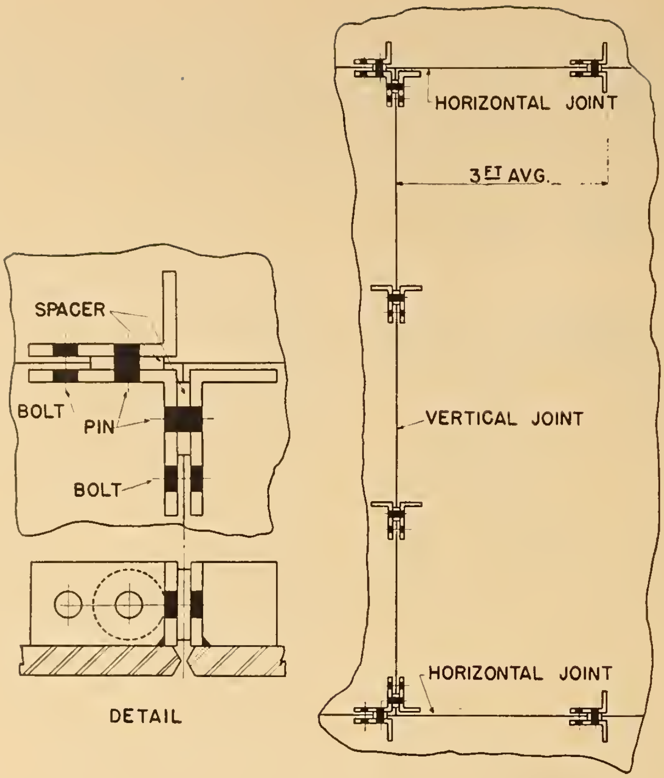

Fig. 2.

rods (an E 7010 electrode was actually qualified for the job) and competent welders could readily be taught to handle them. It was necessary, however, to preheat the plate to at least 200 deg. F. to prevent cracking of the welds. Such preheating in the field would prove costly, not only due to the labour and fuel involved, but also to less flexibility in the distribution of welders about the digesters. A lower production rate would also be expected due to hotter working conditions.

During the early discussions in the fall of 1948, the Industrial Engineering Department was in favour of using an electrode conforming to A.W.S. Classification E 7016. However, this rod was comparatively new, and it was not possible to obtain enough support from welding experts in either Canada or the United States to warrant trying it out on such a large project. By the fall of 1949, however, it had been sufficiently proven that several authorities favoured its use. A number of experimental welds were made, and it was found to produce excellent results without pre-heating. Although the technique of welding with this rod was new, it was found that with proper instruction good welders could easily adapt themselves to its use.

After various tests, grooves as shown in Figs. 3a, 3b, 3c and 3d were established as being most workable. For comparison, Figs. 3e and 3f show typical details of rivetted horizontal and vertical butt joints. The double Vee butt joint shown in Fig. 3a was used on all vertical joints on the straight sections. It is a fairly standard detail for such joints. After a few passes have been put in from one side, the root or first pass is chipped out to sound metal, and the joint completed.

The single Vee butt joint shown in Fig. 3b was used on top and bottom curved sections. This joint is covered by the A.S.M.E. Code, but is not normally acceptable under British Columbia regulations. However, after consultation with the Chief Inspector on its design, it was decided that the single Vee would be more satisfactory than the double Vee in that it minimized overhead welding. The only overhead work reqiured with the single Vee was the placing of a small back run after chipping out the root pass slightly.

The horizontal double Vee joint shown in Fig. 3c was designed to simplify chipping out of the root pass. This accounts for the slight eccentricity of the top half, and the 15 degree bevel on the outside of the lower half. The welding was started from the inside, and the root pass chipped from the outside so that the chipping tool was always running away from the curvature of the plate. The 15 degree bevel gave greater clearance for the chipping tool.

The horizontal single Vee joints shown in Fig. 3d are in the same category as the vertical single Vee. Note that a goodly portion of these butts can be considered as a downhand groove—that is, until the weld deposit is flush with the upper edge of the lower plate.

These grooves were all qualified using an E 7016 electrode under the supervision of the Province of Quebec Department of Labour. They all worked out satisfactorily in the field, but welding would have been a bit easier if all the grooves had been prepared with a

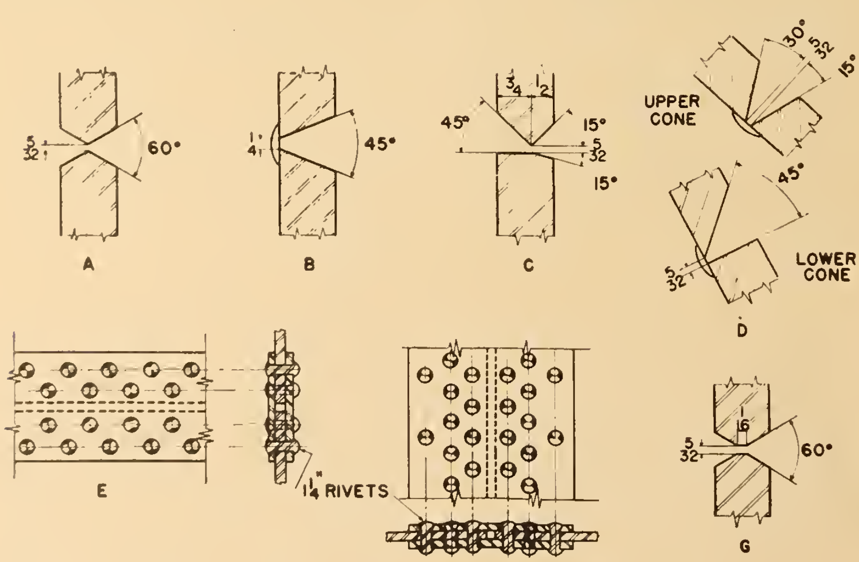

Fig. 3.

ight flat nose as indicated in Fig. g. The E 7016 rods take an appre-iably higher welding current than he ordinary mild steel rods, and he knife edges tended to burn off oo readily, giving in effect a wider pen joint with a flat nose. On both his contract, and that mentioned arlier for C.I.P. at Gatineau, vhenever a joint fitted up too losely in the field, it was opened p by chipping off the knife edge, iving the condition shown in Fig. ig.

Isotopes for Radiography

When it was planned to sub-assemble the digester sections in a emporary shop, it was intended to adiograph the longitudinal seams, ising a 250,000 volt X-ray machine rom the Vancouver shop. Radium

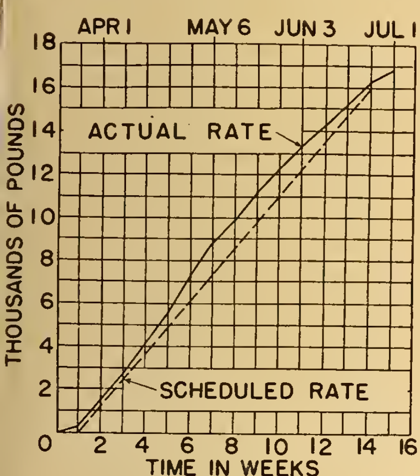

Fig. 5. Welding progress.

as a source of gamma rays was considered for doing the circumferential seams. After the decision was made to do all the welding in place, the use of the X-ray machine for all radiographing was studied. It was found to be workable, but he handling of the equipment appeared to be an awkward and expensive procedure.

About this time it was learned hat Chalk River could produce a adioactive isotope of cobalt known as Cobalt 60, which could be used as a source of gamma rays suitable or this type of work. After several discussions with the Industrial Radiology Department of the National Research Council, it was decided that it would be suitable or all field radiography of the digesters. Consequently, Chalk River was requested to prepare two sources approximately equivalent o 2 grams of radium, and one

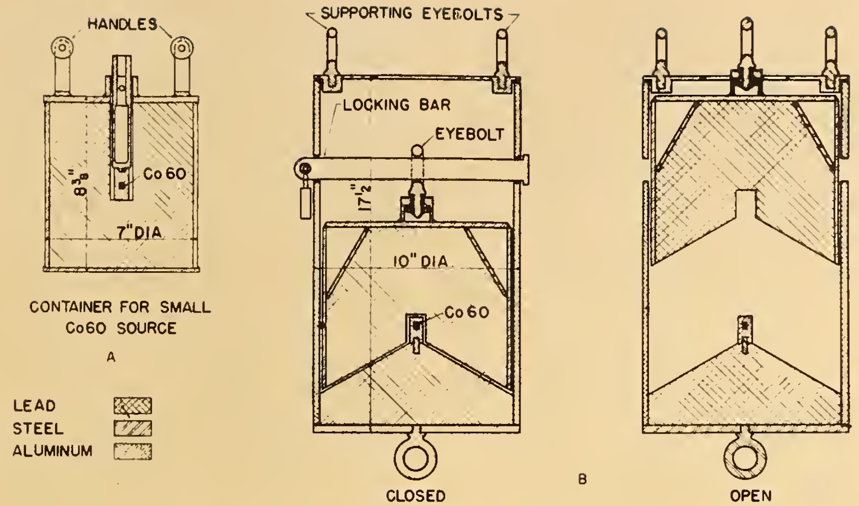

Fig. 4. Containers for large Co60 sources.

source approximately equivalent to 1 gram of radium.

While the sources were being prepared in the atomic pile, the Company developed containers to protect the operators and workmen from radiation. The container for the small source is shown in Fig. 4a. This is simply a storage box, as the source is small enough that it can be removed from the container and placed in position reasonably often without exposing the operator to excessive radiation. The larger

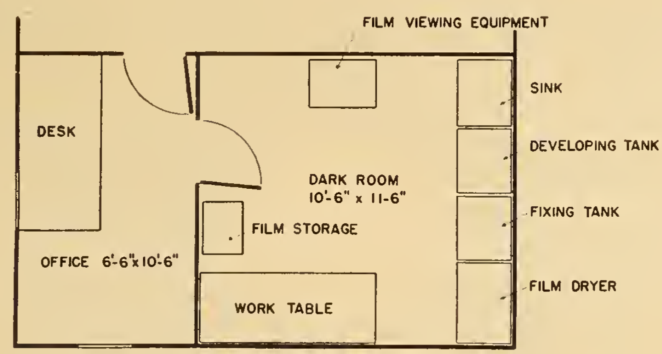

Fig. 6.

Fig. 7.

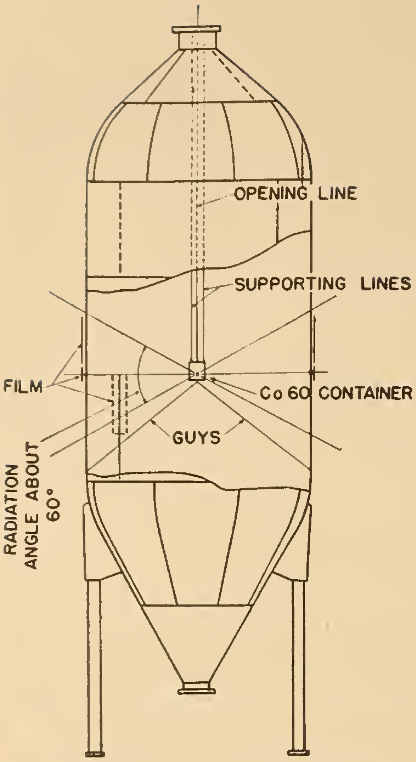

Fig. 8a.

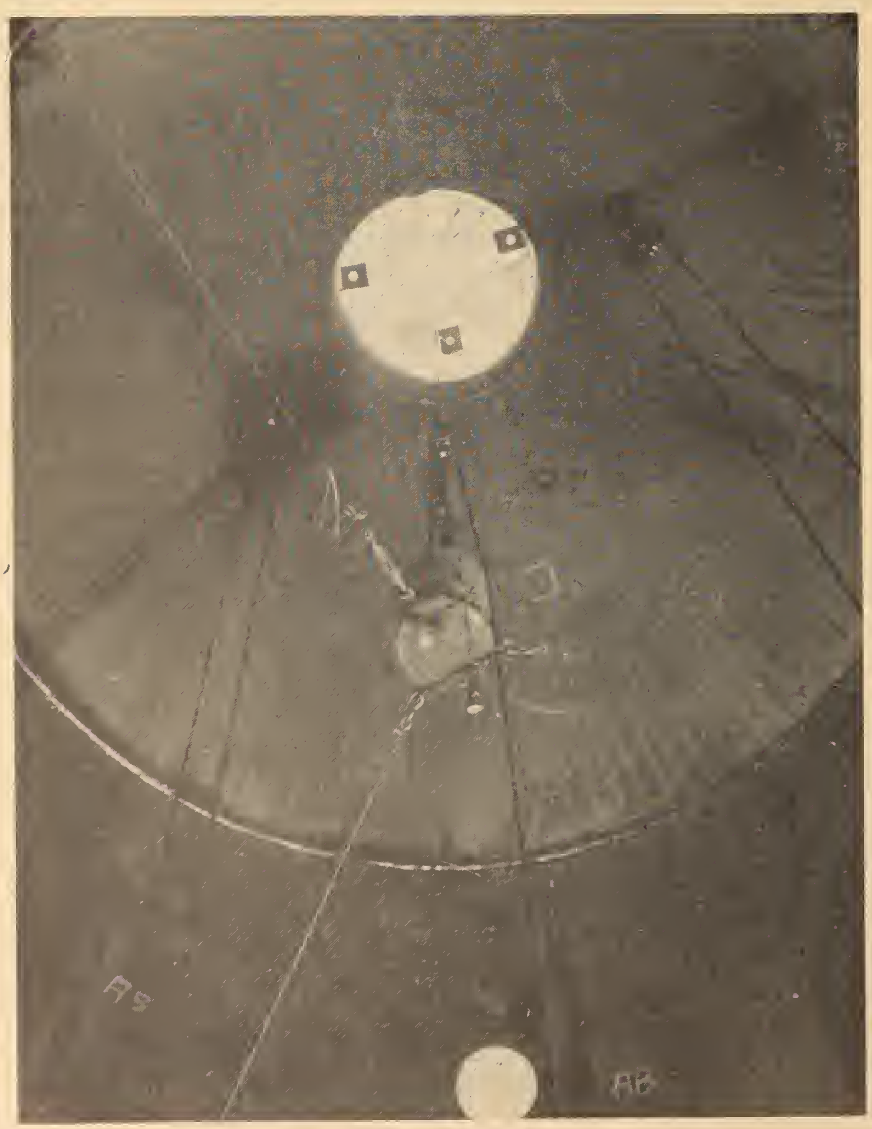

Fig. 8b.

sources, however, were much too powerful for this type of handling. The general features of their containers are shown in Fig. 4b. This arrangement has two important advantages. The first is that the source can be set in position while completely enclosed in its protective lead shield. When everything is set up ready for the exposure, all personnel can move to a safe distance, and the container be opened from a remote point. The second advantage is that all radiation except that in useful directions is thoroughly shielded.

The sources were shipped from Chalk River to the National Research Council at Ottawa during the fall of 1949. Late in October of that year, a member of the Lachine shop inspection staff, experienced in X-ray and gamma ray work, spent about two weeks in Ottawa working with N.R.C. experts on accurate measurement of the sources, selection of suitable films, and general development of techniques. These sources were by far the largest that Chalk River had produced up to that date, so it was the first opportunity to try out the isotope on what might be considered a full scale operation. (Actual strengths of the sources as checked at Ottawa were 1750, 1725, and 861 milligrams radium equivalent.)

Shop Fabrication

All digester components were fabricated in the Company's Lachine shops during the latter part of 1949. Straight shell plates were machine burned on the edges and rolled cold to shape. Dome sections were formed hot, using a full size die in a 2500 ton hydraulic press. They were then machined burned to dimension in a specially designed jig. Another jig was used to locate the assembly clips and leg gussets. Top and bottom cone sections were completely shop fabricated and X-rayed. All nozzles were welded in place, the welds being checked by the Magnaflux method. The top and bottom cone sections and the bottom dome sections were all stress relieved in the Lachine furnace. Everything except the straight shell sections was shop assembled and match marked, minor adjustments being made to insure the best possible fit in the field.

Field Assembly and Welding

The digesters were assembled in the field along with the building steel, all the work being handled by the same equipment and erection crews. This assembly was completed early in 1950. Weather conditions were not suitable for welding operations, and since the general schedule did not warrant any undue rush, nothing further was done until March 20th. By that time, the building was fairly well closed in, and weather records indicated that the temperature was not likely to fall below 40 degrees. About a month before, one of the Lachine field welding supervisors, who had done much of the actual welding on the experimental work on groove design and electrode selection, went to Vancouver. He acted in an advisory capacity to give the benefit of the experience gained in this experimental work to the Vancouver Erection Department, which was responsible for all the actual field work on the project.

Six training booths were set up

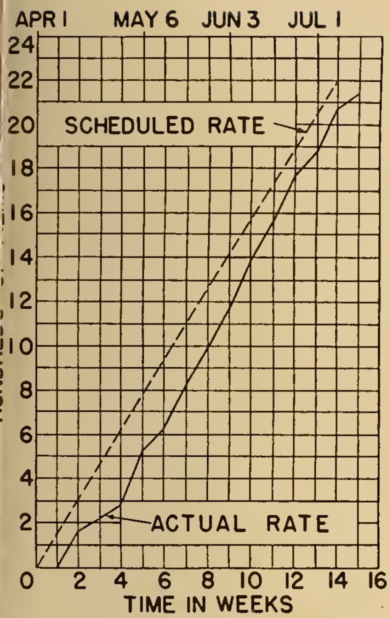

Fig. 9. Gamma ray progress.

n the Company's Vancouver shop, nd a group of 23 welders were elected for training and qualifying nder the B.C. Code. Vancouver ad already selected the foreman who was to be in charge of the work, and he and the Lachine upervisor co-operated closely hroughout the training period. All velders were given 2 to 3 days raining with the electrodes and rooves to be used on the job. All ractice plates were X-rayed, and he films gone over very carefully vith the men, to show them where hey were producing good work and vhere they were having trouble.

Each man then made his qualifi-ation plates, and a new group was rought in for training. In all, 23 nen were put through the school, nd all 23 qualified. It was felt that he careful planning and the use of he X-ray in training were the reatest factors in the unusual suc-ess in qualifying 100 per cent of he men tested. However, it was ound during the actual work that here was a wide variation in the uality of the work that the men vere able to turn out consistently. Towards the end of the job it be-ame necessary to weed out a few f the men who became too unreli-ble for economical production.

On March 20th, the welding fore-nan and some 10 welders arrived n the job and started final fitting p of the joints for welding. This vork involved checking the open-ng of the joints and correcting vhere necessary, the fairing up of he plates between the erection lips, the placing of backing strips, and the fitting of suitable strong-backs to help minimize welding distortion. Within 3 days production welding was begun with 2 men working on the single Vee butts of the bottom cone. The remainder of the men continued on fitting up, a couple of operators at a time being started on production work under close supervision, until the full production force which averaged about 15 men was built up.

In the meantime, the radiograph technician from Lachine had gone to Prince Rupert, and had the darkroom and equipment all set up ready to start control checking. Check radiographs were taken from the very start of production welding, using the small Co 60 source to take overnight spot checks, sometimes with grooves only partially filled. An average of 2½ pounds of electrode per man hour was deposited over the whole job, the records showing 6582 production man hours of welding to deposit 16,582 pounds of electrode. A weekly progress graph of actual production compared with the scheduled average rate was kept as shown in Fig. 5.

Just over 4 per cent of the weld footage had to be chipped and repaired. This was slightly more than had been expected, in view of the precautions taken. Welding rods were carefully stored in a dry place, and were placed in an electrically heated box for some time before use. All grooves were thoroughly wire-brushed with power driven tools just before welding to remove scale and rust, and each morning all grooves were dried out with heating torches. Also, the aforementioned radiograph spot checks were used as often as practicable. In spite of all this, defects persisted in cropping up. They

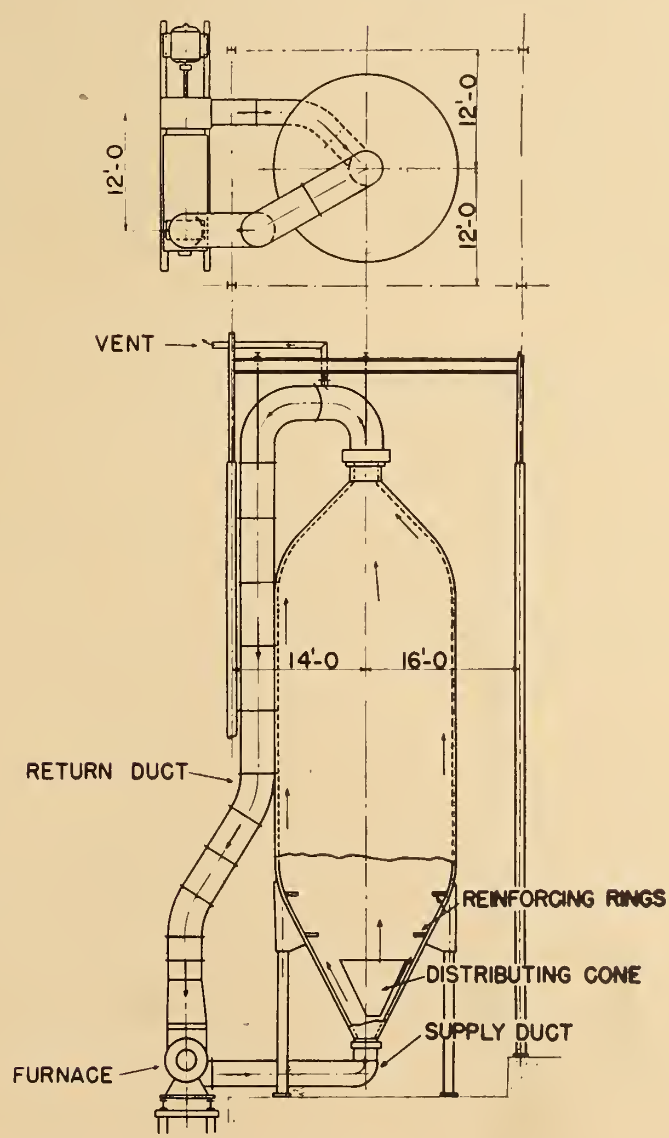

Fig. 10.

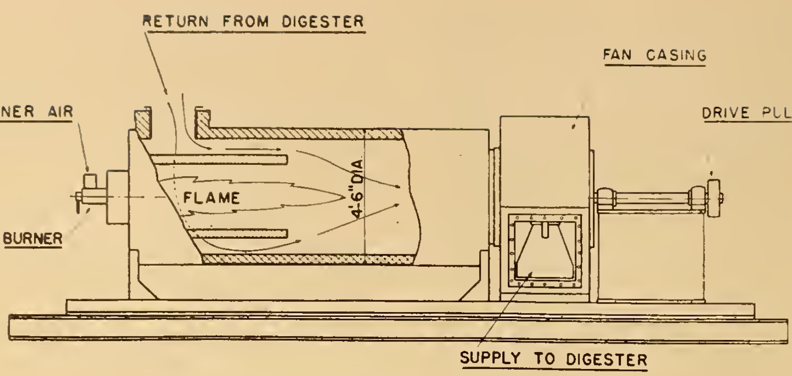

Fig. 11.

seldom occurred in isolated spots. When they were found, it frequently meant chipping out a large percentage of a seam. Practically all defects were slag inclusions; lack of fusion, porosity and cracks being almost negligible.

Since there was not sufficient electric power available to drive motor generator welding sets, all welding was done by gasoline driven units of 300 and 400 ampere capacity. These proved completely satisfactory, but of course, were considerably more expensive to operate than electric motor driven sets, due to gasoline and oil costs, and greater starting up and servicing labour requirements. Capital and maintenance costs are also appreciably higher than for electric driven machines.

Radiography

Due to the large number of films to be processed (an estimated 3,000 films 4½ in. x 17 in.), and the importance of observing results quickly for welding quality control, it was felt that a well equipped darkroom was a necessity. A large room was available in the Company's field office, so no crowding was necessary. Modern equipment of ample capacity was purchased and laid out as shown in Fig. 6.

Standard flexible cardboard film holders were used. It was at first thought that they could be secured to the digesters by means of heavy cord and industrial adhesive tape as is commonly done in shop work. It was found, however, that the tape was practically useless on the cold damp steel in the field. The technicians on the job developed a canvas strip with pockets for the vertical seams, and a system of wooden clips with light cable fastenings for the circumferential seams. Fig. 7 shows both arrangements clearly.

Lead screens were placed in the film holders both in front of and behind the film. Their function is to filter out scattered radiation and long wave radiation, which does not materially assist in the production of an image, thereby improving the quality of the radiographs. Thicknesses of 0.015 in. in front of the film, and 0.020 in. behind the film gave satisfactory results.

Standard radiograph procedure in this type of work requires that a defect 2 per cent of the thickness of the plate be visible. In order to prove that defects of this magnitude are being shown up, penetrameters are placed on the plate beside the joint and radiographed with the weld. These are steel plates, ½ in. x 1½ in., their thickness being 2 per cent of the thickness of the plate being radiographed. Three holes, 2, 3 and 4 times the penetrameter thickness (but not less than 1/16 in. dia.) are drilled through each penetrameter. All edges are square and free of burrs. It is specified that the outline of the penetrameter and the 3 holes be visible on the exposed film.

In order to make conditions most difficult, it is required that the penetrameter be placed on the side of the plate next to the radiation. This makes it more difficult to get a sharp outline of the penetrameter on the film, as there is a certain scattering of the rays as they pass through the plate, which causes a fuzziness around the edges of the image on the film. Figure 8a shows the setup used with the large Co 60 sources. Figure 8b is a photograph of the same assembly taken from below the source. It will be seen from Fig. 8a that, in the case of a circumferential seam exposure, 3 penetrameters at 120 deg. would prove that all films on that seam were exposed under identical conditions. Actually, 4 at 90 deg. were used on these seams. The same principle was used throughout—that is, at least sufficient penetrameters were applied to insure that all films in any one setup were being exposed under the same conditions.

The usual system for identifying radiographs is to apply small lead numerals and/or letters to the plate with adhesive tape, recording them on the film in the same manner as the penetrameters. This is quite satisfactory for normal X-ray work, but it was thought that, with the large number of films to be exposed at once, the time and labour to place the lead numbers and letters would be excessive. Consequently, a system was developed using a perforated serial number on each film. Using a code system, the serial number gives the digester number, the seam, and the exact position on the seam of each film exposed. The films for any given setup were all perforated and loaded into the cardboard exposure holders in the darkroom beforehand, the holders being marked correspondingly with crayon. The system proved readily workable, and was an effective timesaver in the setting up of an exposure.

Protection

In order to protect the technicians and workmen from excessive radiation, three methods were used. The first was the generous use of warning signs and barriers to keep all unauthorized persons at a safe distance. The second was the use of dental X-ray films supplied by the Health Radiation Branch of the National Research Council. These films were worn by the technicians and a few of the men working nearest the sources. Each week these were air mailed to Chalk River where they were developed and their density checked. Naturally, the density of the film is a measure of the radiation to which it, and therefore its wearer, has been exposed.

The third method was the use of pocket ionization chambers. This device is about the size of a fountain pen, and is basically a condenser. It is fully charged in a special charging unit at the start of each day's work. Exposure to radiation reduces the charge on the condenser, so that a measure of the charge at any time is a measure of the radiation to which it and the wearer have been exposed. There are different types of these instruments on the market. Those used on this job could be read directly at any time, the charge scale being calibrated directly in milliroentgens. The National Research Council's standard of a maximum exposure of 50 milliroentgens per day was used. There was no difficulty in carrying out the work and staying within this limit, although to do so required careful planning by the technicians. As far as is known, there were no psychological problems amongst the men caused by the use of the isotope.

The exposure time for a circumferential joint on the full diameter of the digester was some 35 hours. As a result, much of the radiography had to be done at odd times in order to prevent over-exposing the workmen to radiation. Many of the long exposures were made over week ends and holidays, so that the radiography staff had to work all sorts of odd hours. Fortunately, the film used had considerable latitude, so that an appreciable over-run of the optimum exposure time was permissible without adversely affecting the results.

It is of interest to note that the half life of Cobalt 60 is some 5.7 years, so that by the time the work was well started, sufficient decay had taken place that an allowance for it had to be made in exposure time calculations. Information and graphs developed by the National Research Council proved most useful in the calculations of exposure times.

Fig. 9 shows the record of actual radiograph progress compared with the scheduled average rate. Progress lagged behind the schedule throughout, but never enough to cause any great concern. In any case, it could not be speeded up without taking the chance of exposing men to excessive radiation.

Stress Relief

The general arrangement of equipment for stress relief was as shown in Fig. 10. The heating unit, shown diagramatically in Fig. 11, is essentially an oil fired furnace, followed by a circulating fan. The fan is of stainless steel capable of handling 20,000 c.f.m. of cold air when driven by a 40 hp. motor. It is good for a maximum temperature of 1400 deg. F. The furnace is fired by a proportioning oil burner, and has a capacity of 3,000,000 B.t.u. per hour. Once the oil-air ratio for any one fuel rate is established on the burner, a single lever controls both the oil and air supply over the range of the burner.

The fan is driven through a Vee belt drive, and the fuel pump and primary air blower are driven by other Vee belts off the fan shaft. An indicating ammeter is provided in the motor circuit to check on possible fan or motor over-loading. Steel duct sections for the hot gas supply were 30 in. square, and return ducts were 42 in. diameter. Both were lined with 3 in. of insulating concrete. Expansion joints giving ample clearance in both vertical and horizontal directions were provided at the top and bottom of the digesters and at the return inlet to the fan. A 12 in. vent pipe with a control damper was provided at the top of the return duct system. This bled off gas to compensate for the air added at the furnace to support combustion.

Five chromel-alumel thermocouples were attached to the shell at strategic points and connected to a multiple point recording instrument. Supplementary thermocouples were placed at several additional points over the vessels, and check readings recorded at intervals over the whole stress relief period. A sixth thermocouple was placed in the supply duct just at the fan outlet, and connected to a single point recorder. This instrument was also equipped as a controller, to operate a motor regulat-

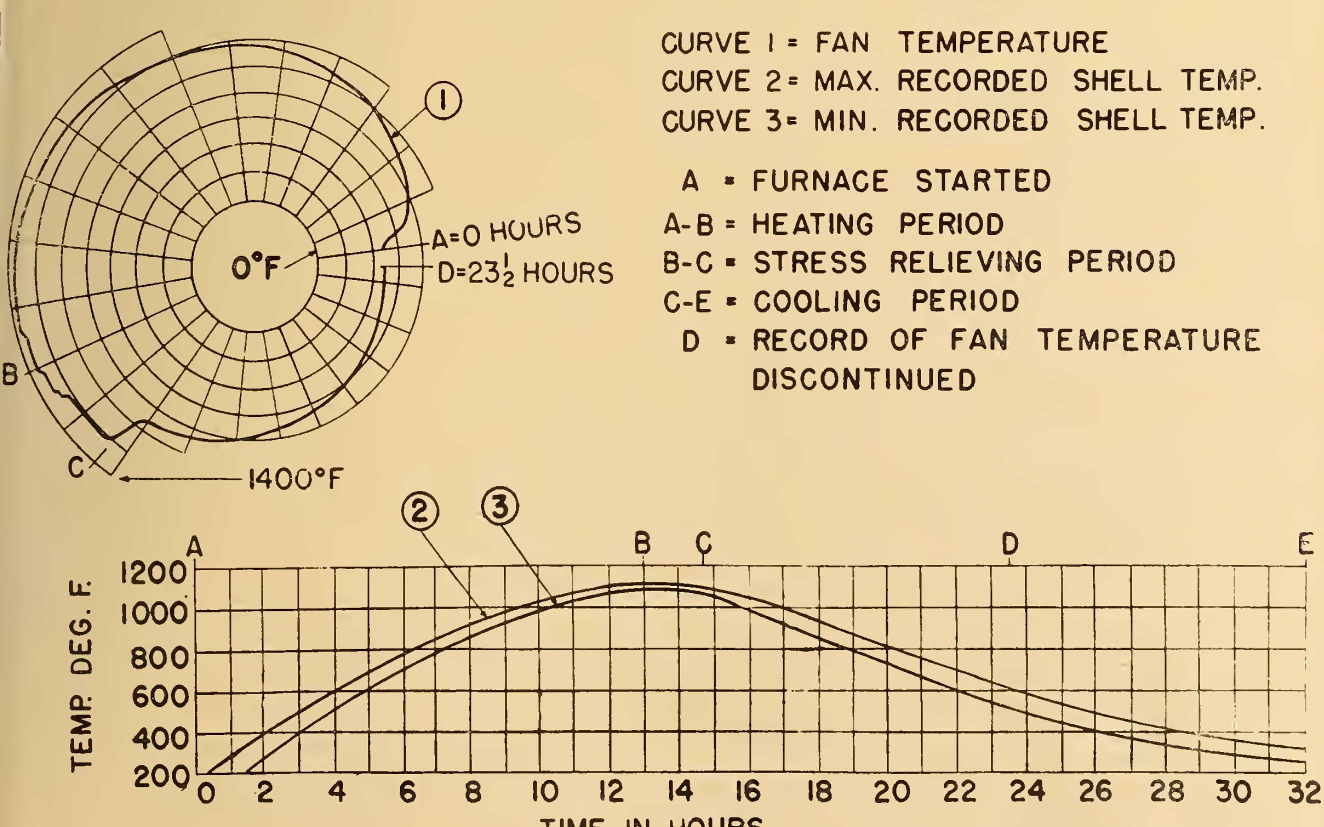

Fig. 12.

ing the oil-air flow to the burner with relation to temperature. The control motor had not been delivered when the rest of the equipment was ready to run, so it was necessary to operate manually. Due to the large amount of steel to absorb heat, and the large radiating surfaces, temperature changes of the system were slow, and manual control proved quite adequate.

To ensure good distribution of the hot gases against the sides of the vessel, a steel distributing cone as indicated in Fig. 10 was used. It was offset from the digester centreline to compensate for the tendency of the hot gases to channel up the side of the unit opposite the inlet duct. Blank steel covers were provided for all openings, those in the large nozzles having a 1 in. pipe nipple in their centre. The object of these was to provide improved circulation of gases through the nozzles, and therefore more uniform heating. In practice they were found unnecessary, and actually undesirable, as the blast of hot gases from some of them set fire to parts of the scaffolding during the first operation. Consequently the nipples were all capped off for the treatment of the last 4 units. Fortunately the possibility of fire had been foreseen and two firemen were on hand with ample equipment throughout all stress relieving.

The digesters were lagged with two 2 in. layers of rockwool blankets, the joints being staggered. Each blanket was 4 ft. by 8 ft., encased in 1 in. chicken wire for ease in handling. This material was not guaranteed for the temperatures to be reached during stress relief, but tests conducted in the Company's furnace at Lachine indicated that it would stand up for the duration of the job. Actually, mechanical damage sustained during the repeated handlings proved much greater than that due to temperature. Enough material was purchased to cover one and one half digesters, which was just enough to complete the job.

The approximate expansion on the maximum diameter at stress relieving temperature is about 1½ in. This meant that the legs had to be deflected outwards ¾ in. as a cantilever beam fixed at the base. To cause this deflection on the weak axis of the column section used, a horizontal force of nearly 1000 lb. is required. This would naturally result in an equivalent force being applied inward to the bottom of the digester through the gusset plates.

Since the yield point of steel at stress relieving temperatures is very low, it was felt that failure might occur if this force were allowed to act on the unsupported plate. Consequently, temporary reinforcing rings as indicated in Fig. 10 were welded into the 8 bottom sections of each digester. These plates were welded in place in the shop before the leg gussets were applied to help keep distortion due to that operation to a minimum. After the lower joints were welded up, these plates were made into continuous rings by welding in splice straps at the joints.

In addition to providing stiffening to the plate, it was felt desirable to reduce the horizontal thrust somewhat. To accomplish this, it was planned to jack the bases of the columns outward about one-half the calculated ¾ in. deflection, which would reduce the thrust at the top by some 50 per cent. It was felt that the remaining force of about 500 lb. per column would not be excessive. In practice, it was found that the contraction due to the welding of the 8 vertical joints drew the tops of the columns in almost exactly the desired amount, so it was not necessary to jack out the bases.

The large increase in the diameter at the top of the columns results in an increase of about ½ in. in the chord length between the columns. Consequently small bolts were placed in the leg bracing connections to allow them to slip the amount of this increase. Also, the bolts in the connections between columns and gusset plates were not really tightened, but just snugged up, to minimize the fixing effect of this large joint.

Figure 12, copied from the recorder and control charts for number 3 digester clearly show the stress relief cycle. A complete observation sheet recording temperatures, draft conditions at various points, damper and burner settings, etc., was also kept for each digester. Note that the soaking period for stress relief is based on paragraph W 462 of the A.P.I.—A.S.M.E. Code, which allows temperatures down to 900 deg. F. with corresponding longer soaking times.[2]

The first operation went pretty much according to plan and time schedule, and although minor changes and adjustments were tried on subsequent units, no significant improvement was accomplished. In general there was nothing critical in the whole operation in the way of damper positions, drafts, etc. The only thing that had to be watched closely was the temperature at the fan, to avoid carrying over its safe limit of 1400 deg. F.

Following stress relief, each digester was cleaned down and the bottom cone reinforcing plates removed. They were then subjected to hydrostatic test—a hammer test at one and one half times the design pressure, and straight pressure test at twice the design pressure.

Organization

The co-operation between everyone concerned was largely responsible for the successful completion of the whole project. This includes the co-operation between all interested departments of the Dominion Bridge Company, as well as that between the Columbia Cellulose personnel and the Company. The assistance given by the Industrial Radiology Department of the National Research Council was invaluable. Special mention must be made of the progressive attitude taken by the British Columbia Boilers and Machinery Inspection Department. Their appreciation of the special conditions and problems to be met in pioneering of this type proved most helpful.

In the early planning stages of the contract, at least six departments of the Company were at work on various phases of the project. It soon became obvious that the contract could not be carried out in the ordinary routine manner due to the large number of departments involved and the geographical conditions. Consequently the author was made co-ordinator, with a view to preventing omissions or duplication of work, to schedule and co-ordinate shipments, and to act in a consulting and advising capacity to all departments concerned as to the influence of field conditions and requirements on their work.

As the writer is mainly concerned with field problems, this paper has naturally leaned rather heavily towards field engineering, organization and construction.

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(2) Temperature, Deg. F.	Holding Time Hrs./inc thickness.
1100	1
1050	2
1000	3
950	5
900	10

Standards for Citizenship

The Roy V. Wright Memorial Lecture

by

Arthur T. Vanderbilt

Chief Justice, Supreme Court of New Jersey, Newark, N.J.

Reprinted from the November 1950 issue of "Mechanical Engineering".

I come here tonight in the name of friendship. Roy V. Wright had a great capacity for friendship, active, helpful friendship with many different kinds of men. One reason for that was that he was a man—one of the relatively few men—who did his duty in every field of life and not merely in one narrow specialty.

In his own special work as an editor, none stood higher. He recognized his duty to his profession and gave it an extraordinary year of activity as the president of this Society, but he didn't stop with that high honour; he continued to serve it in various capacities, not the least important of which was as the promoter and the chairman of the A.S.M.E. Engineers' Civic Responsibility Committee. He was equally active in his community, in his church, in the Y.M.C.A., in the work of the local hospital of which he was president, and in a dozen other ways. In addition to all this he was active for many years in politics, first, as a member of the governing body of Essex County, New Jersey, one of the dozen largest counties in the nation; then, as a member of the Republican State Committee; and, finally, as a member of the State Senate.

For busy professional men, pressed with heavy responsibilities, many of which cannot be delegated, the inevitable tasks of political activity in a democratic society with free competition in politics as well as in enterprise are bound not only to be time-consuming, but to be thoroughly irksome. Nobody but a thoroughly good citizen such as Roy Wright was would ever take the pains or spend the time that is required in politics the way he did for years.

Delivered at the inauguration of the Roy V. Wright Lectureship, under the auspices of the Engineers' Civic Responsibility Committee, at the Annual Meeting, November 27 to December 2, 1949, of The American Society of Mechanical Engineers.

The Roy V. Wright Lecture was established as a tribute to Dr. Wright's participation as a citizen in the affairs of his community and in recognition of the stimulus his speeches and leadership gave to participation by all engineers in civic affairs.

Dr. Wright was a past-president and Honorary Member of A.S.M.E. and until his death the active leader of the A.S.M.E. Engineers' Civic Responsibility Committee. Editor.

But he did not stop here; he loved to work with young engineers, and so for many years he held the instructorship in civics and government at the Newark College of Engineering. The work culminated in the preparation, along with Mrs. Wright, and the publication of "How to Be a Responsible Citizen." After reading a score of books in that field, I still think theirs is by all odds the best.

It is peculiar pleasure for an erstwhile lawyer now removed to the seclusion of the bench to come to address a body of engineers, because I know, contrary to the general opinion among the profession, that the engineers have been among the first to awake to a growing sense of their responsibility as citizens. I consider the report published in 1944 by the Society for the Promotion of Engineering Education to be one of the greatest educational documents in American history. At a conference, held at Buck Hill Falls two years ago and sponsored by the Carnegie Corporation, of leading educators from the five professions of business, divinity, engineering, law, and medicine — a strange group some of you will think — it was the engineers and the divines who showed, at least in my opinion formulated after a quarter of a century of participation in politics, any real conception of what is expected of us today as citizens. I don't know whether it would be true of lawyers as a whole, but the professors of law who attended the conference were as unwilling to face not only the realities but the ideals of political life quite as much as the educators in business and medicine. For this neglect, can there be any doubt that business—and through business the whole country—has been paying the penalty for the last quarter to a half century? And is it not equally obvious that the default of the medical profession to see and do its duty as citizens is at least responsible for the specter of socialized medicine which is sending the shivers up and down the medical spine?

We often speak of this as an

age of science. Half a century ago many good people were very much troubled over the apparent conflict between science and religion. All too many people have resolved that conflict by forgetting religion. Then we began to speak of the times as the age of technology, the age of mass production. The emphasis was on the satisfaction of material wants. As Emerson put it a century ago:

> Things are in the saddle
> And ride mankind.

But such designations of our age are grossly superficial. This is not the age of science; this is not the age of technology; this is not the age of mass production; this is not even the age of atomic energy or the atomic bomb.

Like it or not, we must each of us sooner or later face up to the fact that this is an age of politics, and in many parts of the world the age of power politics. In every continent except ours you will find dictators struggling to suppress democracy. Even here government has taken over large areas of activity undreamed of a quarter of a century ago. You get four very definite reminders of this a year from the Collector of Internal Revenue and I know not how many times from state and local authorities. This is an age of power politics, because people no longer think of government as an institution to live under, an institution that will protect them from force and violence at home or abroad and give them the opportunity to live, to work, to play, and to prosper. On the contrary, many people now look on government as an institution to live on. The growth of government employment in America is something that should claim your attention. According to a study by Fabricant, published by the Falk Foundation, in 1900, there was one person out of 28 on the public payroll (I am not taking into consideration the millions of people who are being paid either to raise or not to raise something); in 1920 there was one out of every 15 on the public payroll; in 1940 there was one out of every 11; and in 1948 there was one out of every 8. Every engineer, I am sure, has the statistical ability to plot the curve and tell us the exact year in which everybody will be on the public payroll. The only question that will remain to be solved in that millennium is who will make the money to meet the public payroll that we shall all be on, for it is notorious that governments do not make money, they merely spend it, and the most we can hope is that they spend it wisely.

This perennial reaching out of government is almost as grave a danger as the international threat that faces us on almost every continent. But with all of these involvements at home and abroad we face what seems to me to be an even more sinister phenomenon in our own domestic life. I personally do not like to have statistics thrown at me, and I shall not indulge excessively, but three figures tell the story of what is happening to us by our own volition. In 1940 only 59.5 per cent of our eligible voters took the trouble to go to the polls to vote for the next president. In 1944 the percentage had dropped to 56.4 per cent. In 1948 it had again dropped to 51.2 per cent. If this curve continues, it is plain that in 1952 we shall elect our president, a ruler with greater powers than any other in the world, by a majority of a minority of the eligible voters. This default not even to take the trouble to vote was dramatically illustrated in the Congressional elections. In 1938, thirty-eight million people voted for members of Congress, but in 1942, when we were well in World War II, eleven months after Pearl Harbor, the number of citizens who voted for members of the Congress that was to wage the war and perhaps dictate the peace dropped from 38 million to 28 million. Compare, if you will, these shameful figures with the recent election in Italy where 93 per cent of the people voted, or the still more recent election in Austria where 95 per cent of the people voted. I hope it is not true that we need to be deprived of our liberty as the citizens of these other countries were to make us recognize the practical worth to us of the great privilege of voting. Our failure to vote is, just a symptom of the disease which has many other unhappy manifestations. A nationwide poll made not so long ago revealed that 67 per cent of the people answering a questionnaire said they would not like to have their sons go into politics, and 50 per cent of all the people said that a man could not go into politics and remain honest. Think of that! Of course, there are dishonest politicians just as there are dishonest businessmen, but no one suggests that we should not go into business because some businessmen are faithless. After a quarter of a century or more of political activity, I have the firm conviction that the percentage of dishonest politicians is no greater than the percentage of dishonest businessmen, or dishonest labour leaders, dishonest anything else. How are we to run a democratic representative system of government if good people are too good for public affairs?

I cannot deny that politics may be a mean game. I have known what it is to be subjected to public attacks which everyone knew were absolutely untrue. It is very disagreeable; it makes a man of integrity very angry. But as I see it, we have the alternative of either doing our share year to year, month to month, and week to week in this disagreeable game of politics or every quarter of a century or less sending our sons—and it may well be next time our daughters—into the frightful ordeal of total war, not to mention imposing on our children and our grandchildren and their children in turn a staggering national debt which it seems almost impossible ever to meet. For any sane man or woman there can be no question as to what the choice will be.

And yet the fact is that most men shrink from running for public office. Very often their employers discourage them. Still more often the women of the household dread the inevitable rough and tumble to which the head of the house will be exposed. I know something about this at firsthand, for my chief political job over many years was to persuade men to run for office. They never ran any risk of being defeated. If they ran on our ticket, they were sure to be elected. They weren't called upon to put up big campaign contributions. All they had to do was to run; but all too often the little woman back home would say no, and that would be the end of the participation in politics of an otherwise desirable citizen.

Now that I am completely out of politics I am going to tell you something that I have never reealed before. I am going to tell ou how I learned as a matter of ıd experience to overcome the pposition of the ladies. When we anted a man to run, we would ave the right committee wait on im, not at his office, not at the lub, but at his home with his wife resent. When the good lady beins to hesitate, you just ask her, Won't you pray over it?" No oman can ever turn you down on hat. Then the next step is to ask, Why shouldn't we pray right ow?" If you can get them to pray ight on the spot and make your ppeal a very personal one, you ill find that there are very few omen who have the courage to urn God down. It is a very good ystem and I commend it to you ll.

Another great difficulty, of ourse, emanates from the dislike f many corporations to having heir employees and junior executives in politics. In fact, there are great many corporations which ike to have their lawyers, their ngineers, and their accountants n firms which have both Republicans and Democrats so that they vill always have a friend in the uling camp. Either the total pposition of corporations to their nen getting into politics or their fforts to play a bipartisan game end to destroy sound government, ınd sooner or later they will come o realize it.

You may think the situation hat I am describing is something of recent growth. Not so at all. *Fortune* ran a survey some years ago of the 67,000 graduates of the twelve leading preparatory schools n the United States. Some of these schools had histories running back for a century or two. Out of that tremendous number of picked men there was but one president, one justice of the United States Supreme Court, and 27 senators. For all too long our best brains have been going into business, into science, and into the law, and neglecting politics. When the article I refer to appeared, it so aroused the president of one of the New England colleges, who was speaking at one of the very preparatory schools involved, that he asserted that one could not go into politics and be a gentleman, as if that were the end of it all. Now really, I suppose if we are called upon to choose between being a good citizen and what he called being a gentleman, all of us would prefer to be good citizens. It is much more essential to the welfare of the country and to the continued existence of our children and grandchildren. Well, there you have the problem—a world in turmoil, the men who should be our public leaders uninterested in government and politics, and our citizens when they do vote not always voting intelligently.

When I moved out 25 years ago to the little town in Essex County where I now live, a town which prides itself on its intelligence, one of my friends, a Princeton graduate and a Harvard Law School man at that, called me up and said, "We are having an election for the school board next week and I hope you are going to vote." "Yes," I said, "I expect to." "Everybody up here is voting for Nos. 1, 3, and 5 on the ballot." "Tell me," I said, "who are 1, 3, and 5, and who are 2, 4, and 6, and also No. 7, if there is a No. 7?" I could feel the temperature dropping to the freezing point. "Do you have to be as legalistic at home," my neighbour said, "as you are down at the office?" And when I tell you that one of the men running in the election in which I was being asked to vote blindly was Dr. Frank B. Jewett of the Bell Telephone Laboratories, one of the greatest engineers of our times, you will see how important it was that I should know whether he was 1, 3, or 5, or 2, 4, or 6 before I voted, and I insist that I was not being legalistic merely because I wanted to know who the candidates were.

Many years ago I went to a political meeting in Montclair, where I was asked to pinch-hit for a speaker while we were awaiting the arrival of Dwight W. Morrow, who was campaigning for United States Senator. Not being a trained political speaker, I suggested that we would play a game. If you want to become the most unpopular man in your town, I suggest that you play this same game and I will guarantee you results. There was my audience of 300 or 400 Republican county committeemen and women, the Republican members of the election boards, the presidents and other officers of innumerable Republican Clubs of Montclair, the Montclair that likes to call itself "the Athens of America." "Raise your right hand," I said, "and then drop it when you can't answer a question. At the end I will test to see that you know the answers that you claim to know when you keep your hand up." All raised their hands. "Who is the President of the United States? the Vice-President? the two United States Senators?— remember, there are two." Hands began to fall. "And who is your Congressman, not any Congressman but your own Congressman? and your Governor? and your State Senator? and your twelve Assemblymen?" By this time there were just a few hands left. "And your nine Freeholders? and the County Clerk? etc." Finally I said, "And who are the five Commissioners who govern Montclair?" At the end there were only two hands up in the entire audience! All the rest did not know even the names of the people for whom they had voted, not to say anything about their character and capacity for the things they were supposed to do. It was really quite shocking. Imagine how the ordinary citizenry of Montclair would make out if these active politicians in my audience did not know the answers; and if Montclair, what about all the rest of the United States? It is no easy job, is it, to be an intelligent voter?

And how difficult it is to vote honestly! In the diary of John Burroughs, the naturalist, who was probably as honest a man as ever lived, you will find this note on the day after the presidential election in 1912: "Woodrow Wilson won. It might have been worse; it might have been Taft. Voted for T.R. out of friendship—something he would never have done for anyone." Now, here you have an honest man admitting that he cast his vote for the presidency, not on the basis of who was the best man for the office, but on the basis of personal friendship. How can we ever hope for sound government if we vote for a man simply because he has the best profile, or wears the best clothes, or has the best voice, or the best Harvard accent, or the best anything else other than the capacity to be the best officer?

Now, when you think of all of the parasites who vote, not for friendship, but because of a job given to the family or the promise of some post that they may never get or because they think it best suits their individual pocketbooks, you will realize how far we have got to go before we will have achieved the first fundamentals of good citizenship. Indeed, not until men and women go into the voting booth and exercise their franchise with the honesty and intelligence that they would exercise as jurymen or women charged with the passing upon some defendant's life, can we hope for good government.

I have mentioned jury duty. I should hesitate to repeat my performance in Montclair by asking all who have ever asked to be excused from jury service to raise their hands. I really don't care to lose friends everywhere, but jury service is one of the few things that the state asks of us in peacetime beyond voting, and its proper exercise is essential to an honest administration of justice. Here is a field which requires almost as much improvement as that which I have indicated is needed in the selection of our public officials. There is almost no limit to the devices and the stratagems to which the ordinary citizen will resort to evade his duty to act as a juror. And yet we must all realize that the honest administration of justice, the very issue of liberty and life on the one hand and the safety of society on the other depend on the performance by the average citizen of his duty as a juror.

Our country really asks very little of us in voting and in jury service and yet if we do not attend to these fundamental responsibilities, we may be very sure that we are helping to bring on the day when the state will ask of us the ultimate duty of military service, which no one may refuse. Not only will the command come to us, but to the younger generation, a command that might have been escaped if each and every one of us had done his full duty in peacetime as a citizen. A man may be just as patriotic in peacetime as in war, though strangely enough we have a tendency always to think of patriotism as exclusively a wartime virtue.

I have dwelt on some of the fundamental responsibilities of citizenship: honest, intelligent voting; jury duty, an absolute essential to the administration of justice in this country; and military service in time of crisis. In addition to all of these official duties, however, each of us has an equally important unofficial duty as a citizen.

Ours is a country that is run in the last analysis by public opinion. If we are to really do our full duty as citizens, we must be ready year in and year out to play our part in the molding of public opinion. Let me give you an example or two of what I have in mind. I happened to be in London in February, 1938, the day after Anthony Eden resigned from the Cabinet in protest against Neville Chamberlain's policies of appeasement. I happened to have lunch with five judges of the House of Lords, the highest court in England. They quite frankly explained to me the meaning of Mr. Eden's resignation, and I equally frankly asked them why they had not listened to Charles Lindbergh, who earlier that month had said in the English press on his return from Germany that he had seen 30,000 warplanes there. Now, whatever may be Mr. Lindbergh's shortcomings as a politician and a statesman—and I think they are serious—he at least is a good aviator and he surely could recognize warplanes when he saw them. And yet the English practically threw him out of the country because, as the judges said, "Our people want peace and they don't want to have anybody telling them about warplanes in Germany. Our people just don't want to know how many planes the Germans have." And so for a year and a half, instead of preparing themselves to meet the 30,000 warplanes, the English did nothing.

We do not have to go abroad to find similar examples of failure of public opinion to meet its responsibilities. Back in October, 1937, President Roosevelt made a very courageous speech in Chicago, popularly known as the Japanese Quarantine Speech. That was nearly two years before World War II started and well over four years before we went into the war. The chances are that if we had heeded that speech, World War II might have been avoided or at least confined to the European area, but the fact is that practically every newspaper in the United States, Democratic and Republican alike, accused the President of being a warmonger. We had no intelligent public opinion in the United States in the realm of international affairs to back him up at that time. Consequently his ideas on this subject died aborning and the road for Pearl Harbor was prepared. The attitude of those carefree but unfortunate days was reflected in a bit of verse I saw in a college newspaper:

The cow is in the cornfield.
The cat is in the lake,
The baby is in the ashcan,
What difference does it make?

Well, as you can see as engineers it makes a lot of difference. The cow, if it ate enough corn, would die. The cat in the lake would spell pollution to the waters. Somebody would certainly feel very badly if anything happened to the baby in the ashcan. And yet we were all saying in those days, "What difference does it make?" That was the spirit of the times and it brought us to a very sad pass. Accordingly, I have no hesitancy in saying that our great unofficial duty as citizens as the molders of public opinion is fully as important as our duty to vote, to act on juries, and to render military service if called on.

Everywhere we turn abroad we are faced with problems that seem to be almost beyond solution. Difficult as these problems are, I am more concerned with what is going on in our midst. The Director of the Federal Bureau of Investigation, Mr. J. Edgar Hoover, tells us that there is a serious act of violence committed in the United States every twenty minutes, but he adds that this is insignificant when compared with what communism is doing to us, especially in our labour unions. These are matters wherein we should bring the force of our influence to bear on public opinion. Equally deplorable is the steady drift year after year of government away from the states and toward Washington, away from the localities where citizens live to the state capital. The constant tendency in government seems to be toward centralization, and centralization inevitably spells bureaucracy. We are becoming so accustomed to the high cost of government that we regard it as normal. Last July the President in his annual message on the economic state of the Union said, "One of the things we must do is to increase inheritance taxes." I can't help but think of an estate of thirty-six million dollars, where represented one of the parties in iterest. The will provided for pecific legacies of four and a half nillion. Then the testator gave all f the rest, residue, and remainder f the estate to his wife. The question that I want to put up to you s how much did she get out of the hirty-six million dollars after ineritance taxes and specific legacies vere paid? The answer is less than ne-half million dollars, and yet the 'resident suggests that inheritance axes are not enough!

I will not say anything about income taxes, but I am wondering onstantly why someone doesn't ise up and say, "The war is over, et's get back to peacetime taxes," ut no—all of us are taking warime taxes as the customary thing or peacetime. That is the great anger of war, that its dictatorial owers will be perpetuated in time f peace.

I have indicated some of the nain problems which confront the verage citizen. I can hear many eople say, "We haven't got the ime! We haven't got the time! Ve are all so busy getting started. Ve are all so busy running some orporation that we are the head of or getting ready to be the head of that we just haven't got time to hink of our duties as citizens." Vell, if we were but willing to give ip our many secular holidays to he work of citizenship, we would nave more time for that purpose han we would know what to do vith. It would be interesting for each and every one of us to jot lown in the course of a year just now many days, or hours, or ninutes each of us gives to his luties as a citizen. I warrant for he average man it would be less han an hour in the course of a year, and for many much less than hat. We have neglected our birthright. Indeed, many of us seem to nave failed to recognize what it really is—freedom, greater than nas been known anywhere else in the civilized world or anywhere else in the pages of recorded history.

Of what avail the plow or sail,
Or land or life,
If freedom fail?

The only thing that is going to stop freedom from failing in this country is the attention of every man and woman, especially those who have the intelligence and character to be leaders, to performing his or her duties as a citizen. √

Efficiency?

The legend of the efficiency of North American industry has become almost a tradition. We are prone to look down our noses at the outmoded ways of the rest of the world and to feel that we alone possess the secret of how to do anything with the least expenditure of time, labour and materials. Without denying that, on the whole, our industry is probably more efficient than others, there is still room for improvement.

In its June, 1950, issue *Construction Methods and Equipment* analyses the results of observations on highway construction made by a joint committee of the Highway Research Board and the U.S. Public Roads Administration. Seven classes of equipment and 33 projects were studied.

After allowing for bad weather and other periods when work was manifestly impossible, the following table shows how little of the available time was really used. Calling the time during which equipment could and should have been working 100 per cent, it actually worked only as the figures show.

	Per cent
Asphalt plants	63
Bituminous pavers	26
Dual-drum paving outfits	52
Euclid loaders	48
Power shovels	51
Tractor-scraper units	79
Wheel-scraper units	60

The average for all equipment is only 39 per cent.

Lost time was due to many causes, among them lack of operators, breakdowns, interference with other equipment, waiting for help, moving from one part of the job to another, starting up and closing down and shortage of materials. Some of these are inevitable, some would seem to be the resuts of inadequate planning.

Construction is admittedly less efficient than manufacturing and because of its nature probably always will be, but the figures quoted make one wonder if perhaps a rigid analysis of many manufacturing operations might not show comparable conditions. √

The *New Grand Haven*

When completed, the recently launched *New Grand Haven* will be the largest railway freight car ferry in the world, being 60 feet longer and having 12 feet more beam than the present largest. The principal dimensions of the vessel are: length overall, 466 ft.; breadth extreme, 71 ft.; depth to upper deck, 42 ft. 3 in.

Power is supplied by twin screw Vickers-Skinner steam unaflow machinery, capable of developing a total brake horsepower of 10,000 and giving the vessel a designed maximum service speed of about 18 knots.

The unusual proportions of the vessel, coupled with the high speed created special propulsion problems and the form of the ship and of the propellers was the result of exhaustive model tests which were commenced before the order was placed. For safety and strength the vessel has double bottom construction throughout and eight main watertight bulkheads.

A minimum of forty maximum size fully loaded freight cars can be taken each trip on five tracks and special attention has been given to attaining ample clearances. Freight cars will be loaded and unloaded over special stern bridges and the structure of the aft end of the vessel is designed to take particularly heavy loads and units too large for normal rail transportation.

The contract for this vessel was signed in April, 1950, and, bearing in mind the great difficulties in obtaining steel, etc., it is believed that the launching of this ship complete with engines and boilers in so short a time sets something of a building record for a vessel of this size.

The vessel was designed by Mr. R. Lowery, naval architect, Canadian Vickers, Limited, and all working and detail drawings were made by Vickers own staff. It is expected that the *Journal* may be able to present more complete design and construction details in the form of a paper in a future issue. √

Pulp and Paper Research

by

J. S. Hart

Chief, Chemical Pulping Group,
Pulp and Paper Research Institute of Canada.

An address delivered to the Engineering Institute of Canada, at Montreal, on Thursday, November 30, 1950

Drawing attention to the importance of pulp and paper production as Canada's leading industry, Mr. Hart explains the origin and operation of the Pulp and Paper Research Institute of Canada, under joint control of the Industry, the Government of Canada, and McGill University.

Describing the various processes employed in the production of pulp and paper, he gives examples of how research, both fundamental and applied, is aiding the industry, in directions such as making stronger paper; increasing the pulp content of rayon; finding new uses for lignin; and in developing uses for by-products. In conclusion he points out that the tree is self-perpetuating and, with the help of research can become the basis of a well balanced chemical industry with a great future ahead of it.

Research in the pulp and paper industry has been extensive, and can be described only briefly in the space at our disposal. However, it is proposed to give some of the outstanding achievements arising from research and to indicate what may be expected in the future.

The application of the fruits of research to commercial operations is of importance. The pulp and paper industry in Canada is our largest manufacturing industry, and the future usefulness of its enormous capital investments must be assured. One of the principal means to this end is the organization and operation of scientific research, together with the development of its findings into practical form.

This has been realized by the industry in Canada. After the first war, through the leadership of some of its prominent men, the Pulp and Paper Research Corporation was formed. The object was to provide a centre in which the necessary research could be conducted. It was provided that the Department of Cellulose and Industrial Chemistry at McGill University, as instituted by the E. B. Eddy Endowment, should be combined with the new organization, and the whole known as the Pulp and Paper Research Institute. An integral part of this new organization was the Pulp and Paper Division of the Forest Products Laboratories of Canada, which had been continuously carrying out pulp and paper research since before 1914.

This organization was under the control of the three parties involved viz. the Canadian Pulp and Paper Association, representing the Industry, McGill University and the Canadian Government. This year, again under the leadership of several prominent men in the industry, the Institute was reorganized as a single legal entity with a federal charter, a board of directors, a full-time president and its own business office.

Under this new set-up the Institute is undergoing a period of expansion in which its facilities and scope will be greatly increased. It is planned that attention will be given to more diversified training of personnel for the industry. Graduate education has always been considered a major purpose of the Institute along with both fundamental and applied research and the attendant testing, calibration and library services.

Pulp Contains Cellulose and Lignin

Before proceeding, it would be well to briefly explain what is meant when we talk about pulp and paper. The pulp we are talking about is an agglomeration or mass of fibres obtained principally from trees, but in some cases from other plant materials. These fibres are composed of a substance called cellulose, so named because it is the main constituent of wood cells. These cells constitute about fifty per cent of the solid material of the tree.

The remaining solid material is composed for the most part of a substance called lignin, which surrounds and holds in place the cellulose fibres. There are other components, related to cellulose, which are grouped under the general name of hemi-cellulose. Paper, on the other hand, is a deposition of these cellulose fibres from a suspension in water, in the form of a sheet which is subsequently dried.

A full account of the development of the pulp and paper industry, past, present and future, would commence with the raw materials, continue through the two basic processes for converting them to pulp and paper, with all the ramifications of those processes, and would end with by-products and off-shoots of the industry. It will be impossible here to give such a complete account, and it is intended to mention raw materials only briefly, then to continue with methods of isolating the fibres and forming a sheet of paper.

Quality and Proportion of Fibres

It has been mentioned that the tree is the main source of cellulose fibre, and that only about 50 per ent of the tree is in this fibrous form. For this reason, anything that can increase the number of trees, or ensure a continuous supply of trees, will be a step in the right direction. Forest management, as a means of providing the continuous supply, is one of such measures.

The number of species of trees that can be made available for pulp making and the quality of the fibres in such trees, are vast fields for research. It must be remembered that a relatively small proportion of the trees drained from our natural resources goes into pulp making. Approximately 2 per cent becomes pulp and

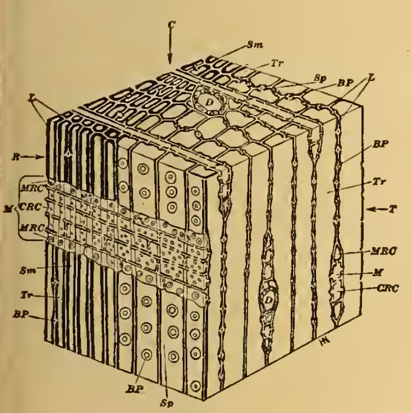

Fig. 1. Diagram of a small block of spruce wood, greatly enlarged, showing a part of one annual ring.

about the same percentage is lost owing to insects, disease, fire and wind.

Insects and disease are the subjects of intensive research, and here much progress has been made. However, much remains to be done, as exemplified in the fight against the spruce budworm. This insect is responsible for enormous losses, and while research has shown a means for combating it on a small scale, methods have still to be perfected in order to overcome its ravages in our forests as a whole.

The quality of cellulose fibres is another vast field of research. Into this subject enter many fundamental problems of physical chemistry. But concerning the subject of raw material, it is only necessary to consider what has been accomplished by selective development of the various cereals and other foods, to realize what may lie ahead in the field of silviculture. We must first ascertain the desirable characteristics required, and then it may be possible to produce them.

Next we come to the isolation of these cellulose fibres from the raw material, by processes which may be either mechanical or chemical in their action, or a combination of both. The fibres themselves are cylindrical in form with elongated ends, and are situated with their longer axis parallel to the perpendicular axis of the tree. In mechanical pulping the fibres are separated by mechanical disintegration of the wood, the most common method of which is the groundwood process.

In this a log of wood is subjected to pressure grinding on a wetted revolving stone. The resulting fibres contain most of the non-cellulosic materials in the original tree. In chemical pulping wood chips are placed in a digester and cooked with various solutions. The lignin is dissolved by solvents under conditions which do not attack the cellulose to any appreciable extent, and the result is a pulp of almost pure cellulose fibre.

Groundwood Process

The groundwood process was the first commercial method for isolating fibres from wood. It is still a most important process to our Canadian economy in view of the fact that it furnishes approximately 85 per cent of our yearly output of 4½ million tons of newsprint. Spruce and balsam at first were almost exclusively used, but research has developed the use of jackpine in Canada, southern pine in the United States, and poplar to a limited extent in both countries. Similar applications of research will no doubt increase in the future.

Briefly, mechanical or groundwood pulp is produced by pressure grinding of a log of wood against a wetted stone. There are many variables involved in this operation such as the speed of the stone, quality of the stone, grinding pressure, grinding temperature, amount of water introduced, etc., which affect the quality of the pulp and economy of the process. A great deal of research into these factors has been carried on in all pulp-producing countries, and a considerable portion of this has been done at our Research Institute here in Montreal. Early research on groundwood quality at the Forest Products Laboratory, the fore-runner of the present Institute, led to the development of the Canadian Standard Freeness Tester, used the world over for controlling groundwood quality.

Of great advantage in groundwood research has been the development of a practical miniature grinder at the Institute, which simulates commercial grinding operations and allows the results to be applied to full-scale operations. A further important feature is that the fundamentals of grinding can be studied in a manner not practical with commercial grinders. Studies are adding continually to our knowledge of the grinding process which, up to the present, is incomplete.

Chemical Pulping

In chemical pulping cellulose can be destroyed during the cook, so it will be readily appreciated that the technique of dissolving the lignin, leaving the cellulose unharmed, should be well understood. Unfortunately such is not the case. The composition of lignin is still by no means established, and comparatively little is certain of the reactions by which lignin goes into solution. A major difficulty in establishing the structural formula for lignin in its original state lies in the fact that its structure changes during its solution, and until the original structure can be more definitely

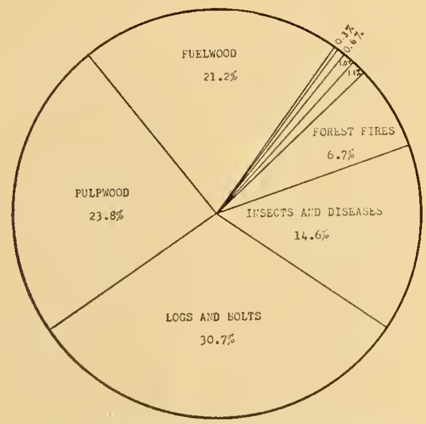

Fig. 2. Diagram showing how Canada's forest resources are used (period 1939-1948). (Hewn railway ties, 0.3% — Pit props, 0.6% — Poles, posts, rails 1.0% — Miscellaneous, 1.1%.)

Fig. 3. Canadian Standard Freeness Tester in use.

established we are compelled to follow empirical methods rather than verified laws of natural science.

The art of chemical pulping was developed over a number of years, largely through the experiences of operators. Research by various investigators first led to the discovery of the first principles of chemical pulping, but for many years the chemist had little to do with pulp making. Engineering research entered into the designing of better materials and methods of manufacture, but it is only quite recently that we are again delving into the physics and chemistry attendant on the isolation of cellulose fibres by chemical means. In all parts of the pulp-producing world the two main processes for making chemical pulp, i.e. the sulphite (or acid) and the alkali methods, are receiving attention, and progress is slowly but surely being made. These two main methods both arrive at cellulose fibres through dissolving the lignin with different solvents.

Sulphite or Acid Process

The sulphite, or acid, process dissolves the materials cementing the fibres together by means of a solution containing free sulphurous acid and a bisulphite of an alkali, in most cases calcium bisulphite. This process was discovered in 1867 and the first sulphite pulp mill in Canada was built at Merritton, Ontario, in 1885. Since that time, much progress has been made both in the technique of sulphite pulp manufacture and in the fundamental knowledge of the process.

The original inventor, and those who later developed sulphite manufacture, were faced with the problem of finding suitable materials to withstand the action of the hot sulphurous acid. Lead-lined vessels were used at first; but these were not suitable for large digesters. Next the practice of lining them with acid-proof brick was developed. This, however, did not protect the pumps, valves and piping, and so-called acid-resisting bronze became the metal used for these purposes. This bronze was not entirely resistant to acid. It was somewhat better than iron or steel but annual replacement was still a major item. Research in the steel industry developed acid-resisting or stainless steel, and this has replaced, almost entirely, the use of bronze. A well-equipped sulphite mill today has installed about 650 lb. of finished stainless steel per ton of daily capacity, in the acid and digester departments alone.

Effect of Hot Liquor on Equipment

Though research on stainless steels has been done by the steel industry, certain special alloys have been developed in conjunction with the sulphite mills. Use of these steels by the mills has spurred research in pulp manufacture along new lines. Two major developments, made possible by stainless steel, have been indirect cooking with forced circulation and the hot acid system.

In the former the cooking solution is withdrawn from the digester continuously during cooking and, after passing through a heater, is returned to the digester. The heater can be dispensed with and the liquor circulated only. With hot acid systems the digester relief, both liquid and gas, is collected and stored under pressure, thus retaining the heat. Both these developments require pumps and pipes to withstand the hot acid under pressure. This was not practical with bronze, but is a simple matter with stainless steel.

Sulphite manufacture uses enormous quantities of sulphur dioxide. This is produced in the acid plant by burning elemental sulphur. In the development of the sulphite process it was soon apparent that large amounts of scale formed in the digesters and fittings. This scale was for the most part calcium sulphate and must have come from sulphuric, rather than sulphurous, acid. Research into its formation has been extensive, and has led to great improvements in the combustion of the sulphur, such as new types of burners with spray coolers for rapidly cooling the gas.

Sources of Sulphur

The elemental sulphur of this continent comes principally from Texas. Before the war research had developed an additional source at the Trail Smelter, where large quantities of sulphur dioxide escaped in the flue gas and killed vegetation over a large area. The company was forced to find ways for removing this sulphur from waste gases and, as a result, a new source became available through research. Many mills, particularly in the West, used this sulphur prior to the war. It is believed a more profitable use has now been developed, and Texas is again the main source for pulp mills.

Mention should also be made of a Canadian development for producing sulphur dioxide through burning iron pyrites. This is not extensively used, principally because Texas sulphur is more economical. However, at least one mill is using this method successfully, due to extensive research.

Calcium and Other Bases

Calcium in the form of limestone is prevalent in all sulphite-producing countries, and is relatively cheap. Therefore, calcium is used almost to the exclusion of all other suitable substances. It has however certain disadvantages, such as the slow rate of diffusion of the calcium ion. Because of this, a generous time allowance is necessary to ensure complete penetration of the wood chips, before elevating the temperatures to a point where solution of the lignin takes place. Calcium also forms insoluble compounds with the resins in the wood and this substance, called pitch, is a frequent source of trouble to the paper maker.

Originally, other bases were expensive and generally their cost was prohibitive. But as supply has become more plentiful research in their use is keeping pace. The three most common bases are magnesium, ammonia and sodium, developed in that order. A new mill has been built at Longview, Washington, by the Weyerhaeuser Company, applying methods and procedures developed by themselves and the Howard Smith Paper Mills Limited of Cornwall, for using magnesium instead of calcium. One of the principal features is that the waste liquor can be burned and the process chemicals recovered.

Also on the West Coast, the Crown Zellerbach Company and the Soundview Pulp Company have combined their research and development facilities to endeavour to perfect the use of ammonium bisulphite. The penetration of this liquor into the chip is very rapid; thus the cooking time can be shortened, resulting in a greater digester turn-over. The problem of recovery of chemicals has not yet been solved, but research has made great strides in that direction and no doubt it will be before long. By the use of both these bases the quality of the pulp is said to be improved.

Fundamental Research

Much of the story of sulphite, so far, has been concerned with the development of the process from the results of research. Fundamental research has been extensive, and is continuing all over the world. Great advances have been made in Sweden in elucidating the theory of the steps by which lignin goes into solution in the sulphite process. Work on this phase, as well as other aspects, notably the rate of penetration into the chip, are continually in progress at the Research Institute, as well as other centres in Canada and the United States. With respect to penetration studies, the Institute has long been a pioneer.

The realization of the importance of this work governed the choice of programme of many investigators at the Institute, working under the direction of Dr. Otto Maass prior to the last war. Their work was directed towards a critical study of how to achieve penetration rapidly, how to condition chips with liquor in a manner that will aid and accelerate subsequent cooking, and how to eliminate the detrimental influence of entrapped air. In other words, an attempt was made to find out as much as possible about the chemical, physical and mechanical factors governing the penetration of cooking liquors into chips. This work was interrupted by the war, but is now being resumed with good results.

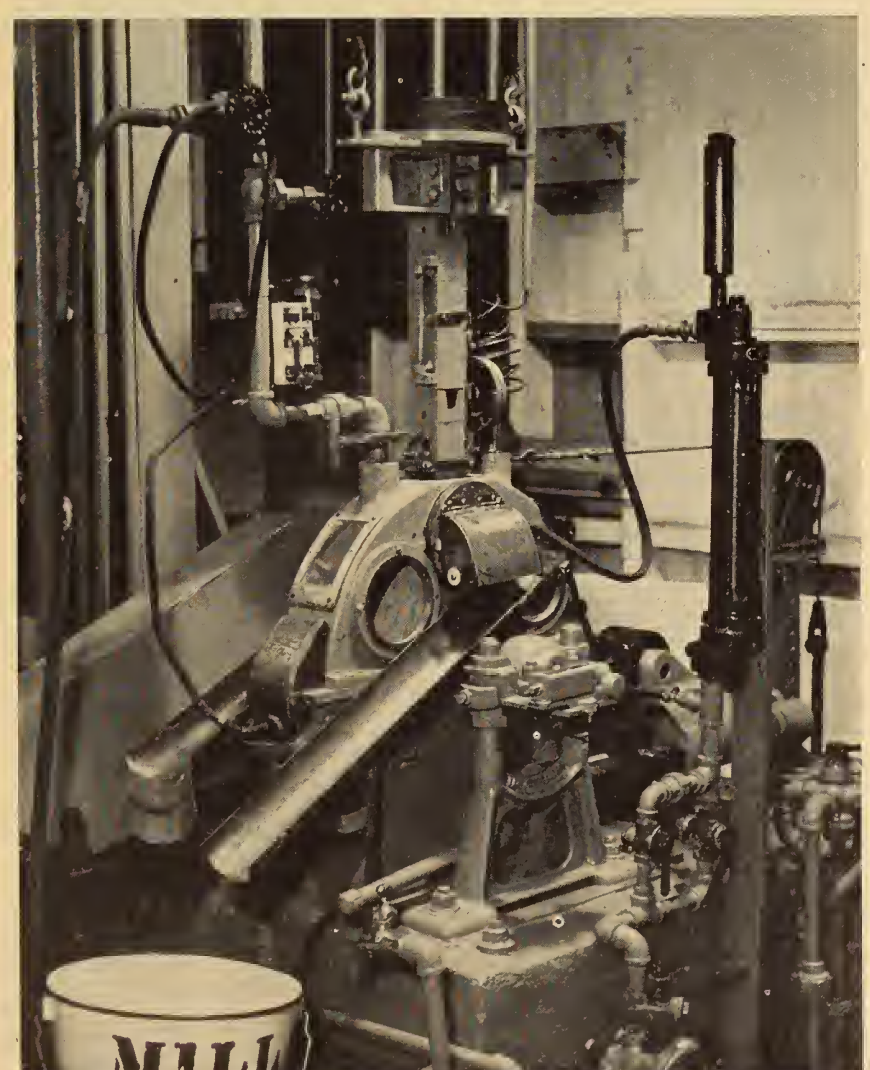

Fig. 4. Miniature grinder at the Pulp and Paper Research Institute of Canada.

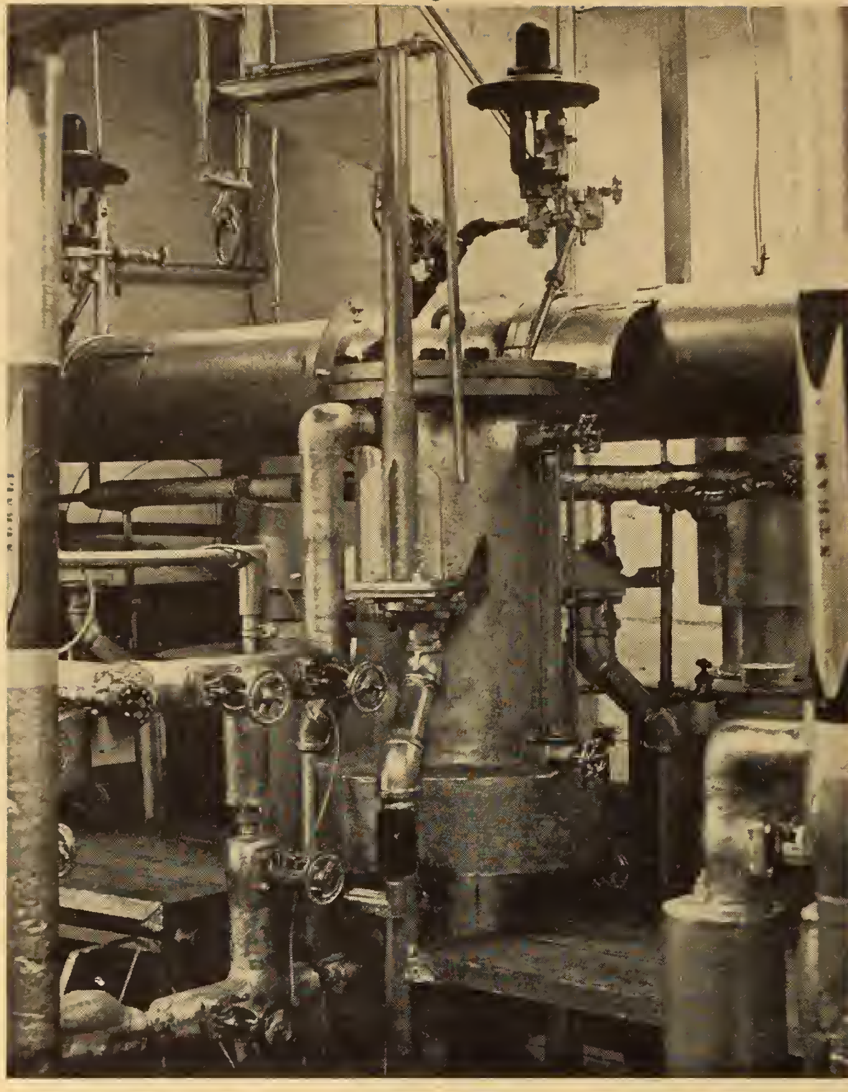

Fig. 5. Digester at the Pulp and Paper Research Institute of Canada.

Alkaline Process

The other main branch of chemical pulping is the alkaline process, in which the lignin is dissolved by an alkali, usually caustic soda. This outdates the sulphite process, and was for many years the means by which straw, rags, bamboo, etc., were reduced to a pulp. Its use with the new-found raw material, wood, was a natural development. The first soda-pulp mill in Canada, the second on this continent, was started at Windsor Mills, Que., in 1864. In 1879, research conducted in Danzig led to the use of sodium sulphate or salt cake as a source of caustic soda. The resultant pulp was considerably stronger when sodium sulphate was added, than that produced by caustic soda alone. It became known as kraft pulp, and is today the principal alkaline pulp produced. In Canada its production is not as great as that of sulphite, yet amounts to over a million tons annually.

The recovery of the process chemicals in alkaline pulping was of great economic importance, and much research has been done on this subject. Originally the liquor was burnt with no attempt at recovering the heat, though much thought was given to such a process. One of the pioneers in this field was Mr. G. H. Tomlinson of the Howard Smith Paper Mills, whose efforts led to the production of the B and W, Tomlinson Furnace, now widely used in all parts of the world.

Other companies have also developed furnaces for a similar purpose. All employ the principle of spraying the concentrated liquor into the furnace, where it is ignited and the heat from the combustion is used for making steam. This steam is returned to the pulp and paper mill, and the process thereby becomes almost self-sup-

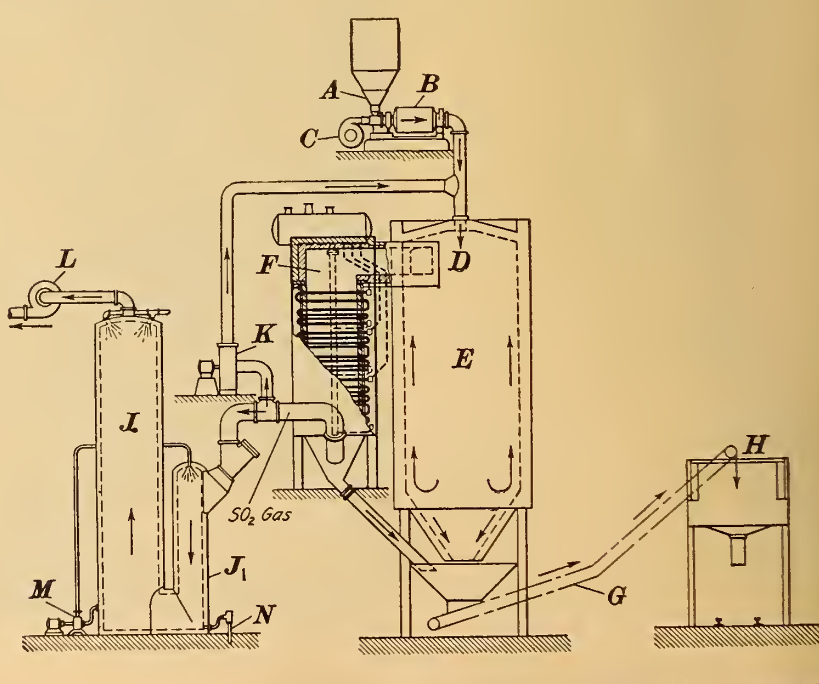

Fig. 6. Diagram of the Nichols-Freeman Pyrites Flash Roaster. (From: Pulp and Paper Manufacture. Vol. 1).

Legend

A, feeder; B, ball mill; C, primary air fan; D, burner nozzle; E, combustion chamber; F, dust chamber; G, cinder conveyor; H, hopper; J, J_1 scrubbers; L, gas fan; M, pump; N, waste pipe.

porting in steam. The slag from the furnace is returned to the alkali plant, where it is recovered in its original form and is used for making up fresh cooking liquor.

Such a system recovers some of the sulphur in the slag as sodium sulphide. However, some is lost in the flue gases, and much research has been done on this feature. It is of particular importance, because the obnoxious odours coming from a kraft mill are caused by various sulphur compounds. If these can be changed to a non-volatile form, the obnoxious smell may be reduced. Again the Howard Smith Paper Mills has been a leader in this field, and has developed the oxidation tower where the black liquor is oxidized with air before burning. In this way more sulphur is retained in the system and some of the smell can be reduced.

Alkaline Liquor Does Not Attack Metal

Unlike the sulphite industry, metals used in the alkaline process presented no problem. At least that was the case until recently. Since iron is relatively stable in the presence of caustic soda, all digesters, pumps, fittings, etc., were made of this material, and records of early digesters show the digester life as around twenty-five to thirty years. However, digesters installed in the "thirties" have averaged only about 15 years and, at the present rate of corrosion, those installed since 1947 have an expectancy of only four to six years. This is a serious problem which confronts the industry and is being actively investigated in all alkaline pulp-producing countries. From the mass of evidence so far available, it is difficult to isolate any common factor, and much detailed research is necessary. The Pulp and Paper Research Institute has been asked to take the lead in this matter for the alkaline mills in Canada, and an extensive investigation is planned.

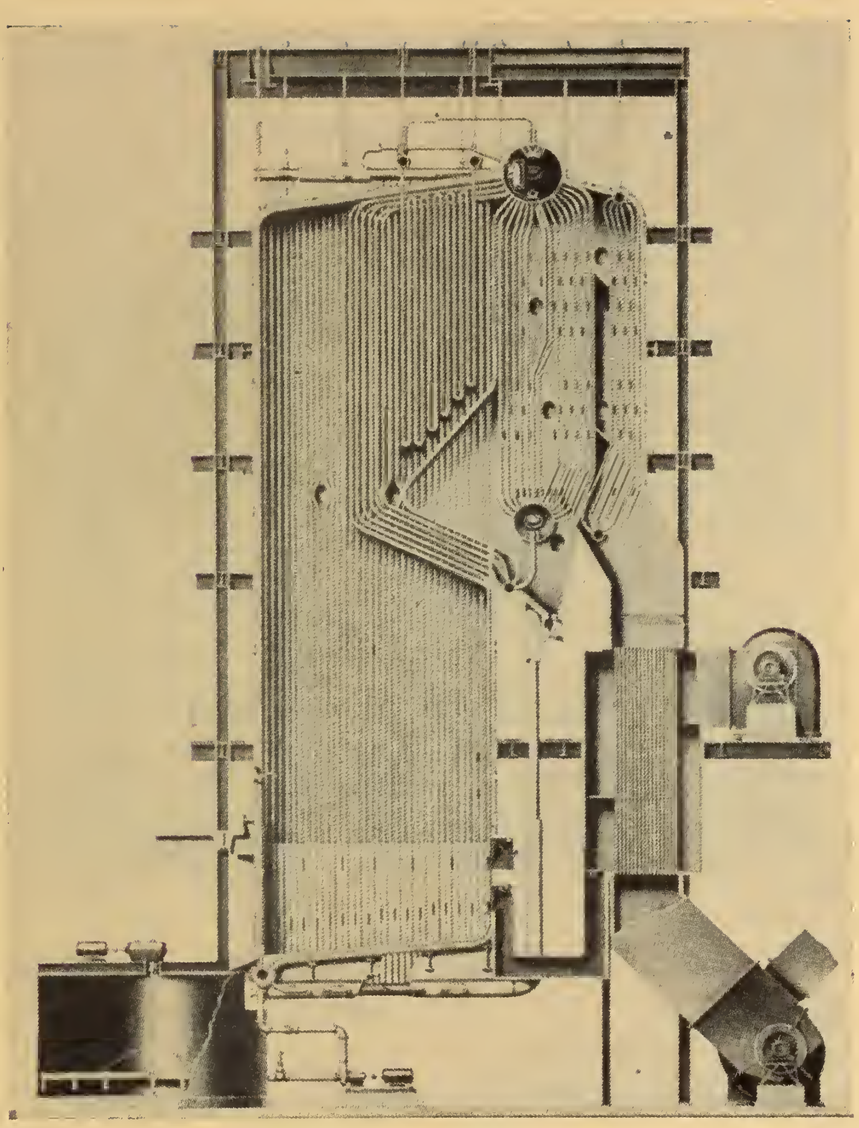

Fig. 7. B. & W. — Tomlinson Recovery Unit.
(Courtesy: The Babcock & Wilcox Company.)

Bleaching Widens Use of Woods

In chemical pulping, either acid or alkaline, it is not practical to remove the last traces of lignin adhering to the fibres. Cellulose, itself, is a colourless substance, and the residual lignin with the fibre gives a definite colour to the product. With sulphite, this lignin is readily removed with chlorine, but with alkaline pulps it is not so simple. For a long time kraft, with its brown colour, was used for coarse grades of paper only. It was not until research developed the multi-stage bleaching technique that white pulp from the kraft process became commercially feasible.

This in turn opened up a tremendous source of raw material. Certain woods, notably the pines and Douglas fir, have a component which inhibits acid pulping. In addition they usually contain a large quantity of pitch, which is not soluble in acid but which can be removed by the alkaline process. In the early "thirties", very little pulp was made from southern pine or Douglas fir. Since then an enormous industry has grown up, fostered by the benefits research has given to producing excellent pulps from these woods.

Semi-Chemical Pulp

In describing chemical pulping procedures, our story has been concerned with the isolation of the cellulose fibres in as pure a state as possible. It has also been brought out that these fibres comprise about half of the tree, the remainder being non-fibrous materials, principally lignin. The cost of raw materials has increased at an astounding rate in the last few years. This is caused by many factors, but certainly one prime reason is the increasing scarcity of pulpwood. Thus anything that

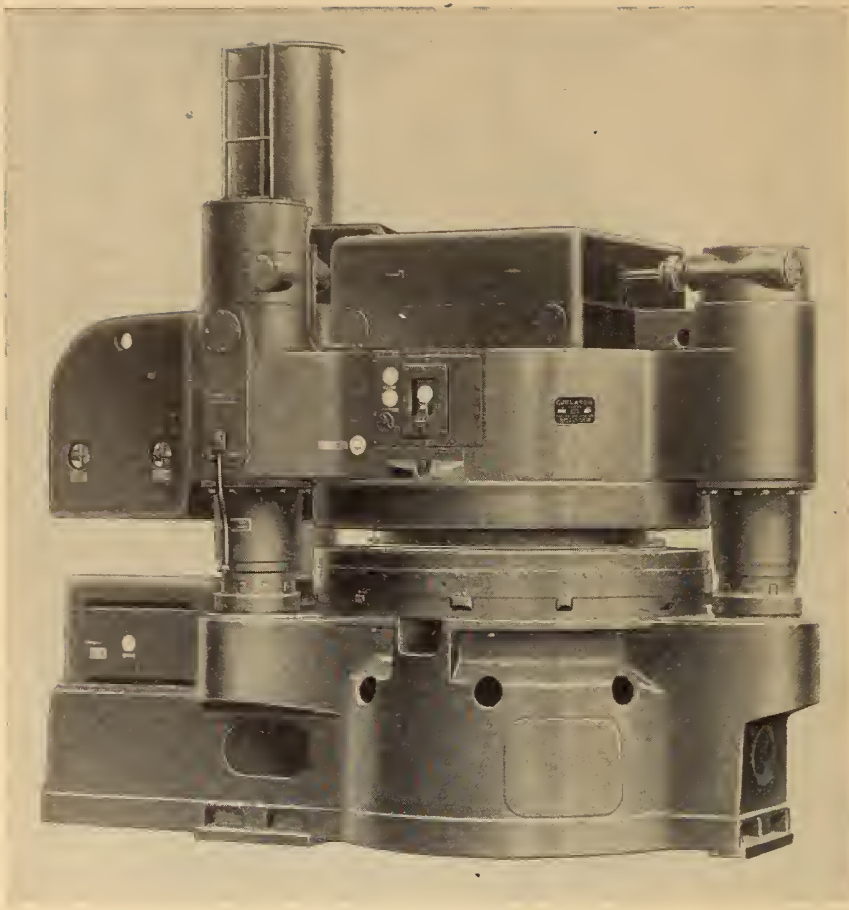

Fig. 8. The Curlator.
(Courtesy: Price Brothers & Company, Limited.)

can result in an increase in the usable half of the tree will be profitable, and will also provide better utilization of our forest resources.

Much effort is being expended on research with that end in view. The ideal is a fibre, with as much non-fibrous material adhering to it as is possible and with the necessary pliability and felting properties. Such a product is given the general name of semi-chemical pulp. As might be supposed, sufficient chemical action is given in various ways to soften but not entirely dissolve the lignin bond, so that the fibres can be separated by subsequent mechanical action.

The yield of semi-chemical pulp may vary over wide ranges, and with higher yields the quality would be expected to fall off. Such is the case, but as the results of research become utilized, both in the technique of cooking and in perfecting the mechanical means for defibring, higher percentages of better quality pulp are being produced.

One of the developments for cooking, whereby the lignin is softened but not appreciably dissolved, is the so-called neutral sulphite process, developed by the United States' Forest Products Laboratory at Madison, Wisconsin. This process changes the form of the lignin in a similar manner to the initial steps in the regular acid sulphite method. The changed lignin does not go into solution to any great extent, because of the neutral character of the solvent. The amount dissolved can be regulated to a certain degree by controlling the pH.

The Curlator

Semi-chemical pulp can also be made by the alkaline process where a partial cook is achieved by less drastic conditions in the digesters. Yields of 60 to 65 per cent of good fibre are obtained after mechanical treatment of the softened chips. This is a recent development and is the outcome of extensive research.

In the development of design many improvements have been made in conventional-type refiners. The result is that the fibres in the partially cooked or softened chips are separated, without much cutting of the fibres taking place. This allows the high yields of good quality pulp in semi-chemical pulping. In addition to this progress on conventional types, a refiner has been built making use of an entirely novel principle. This is known as the Curlator, and was developed by members of the technical staff of Price Brothers at Kenogami and Riverbend. By means of this refining machine, which uses a circular rubbing action, yields of acceptable sulphite pulp for newsprint in the order of 65 per cent have been obtained. This is a remarkable advance over the customary 46 to 50 per cent yields, and the possibilities of the Curlator have not yet been fully developed.

Continuous Pulping

All chemical pulping, with the exception of some semi-chemical installations, is done by batch processing. Continuous pulping on the face of it would seem to offer many advantages, and much research along these lines is being conducted throughout all pulp-producing countries today. One development is nearing completion in Sweden, but has yet to be tried over an extended period.

One problem connected with continuous pulping is the question of complete and uniform penetration of a cooking solution into the chips. In the batch processes a generous allowance of time assured penetration, which may not necessarily be uniform. This problem has received attention at the Institute and considerable progress has been made. Our techniques are not ready for publication yet, but they should prove to be of great assistance in overcoming the problem of penetration in continuous or batch cooking. There is no doubt, however, that continuous cooking is nearing our doorstep and we must be ready to receive it when it arrives.

Stronger Paper Through Research

It is only from a water suspension that the bonding of fibres occurs to any appreciable extent. By the action of mechanical work on the fibres in the presence of

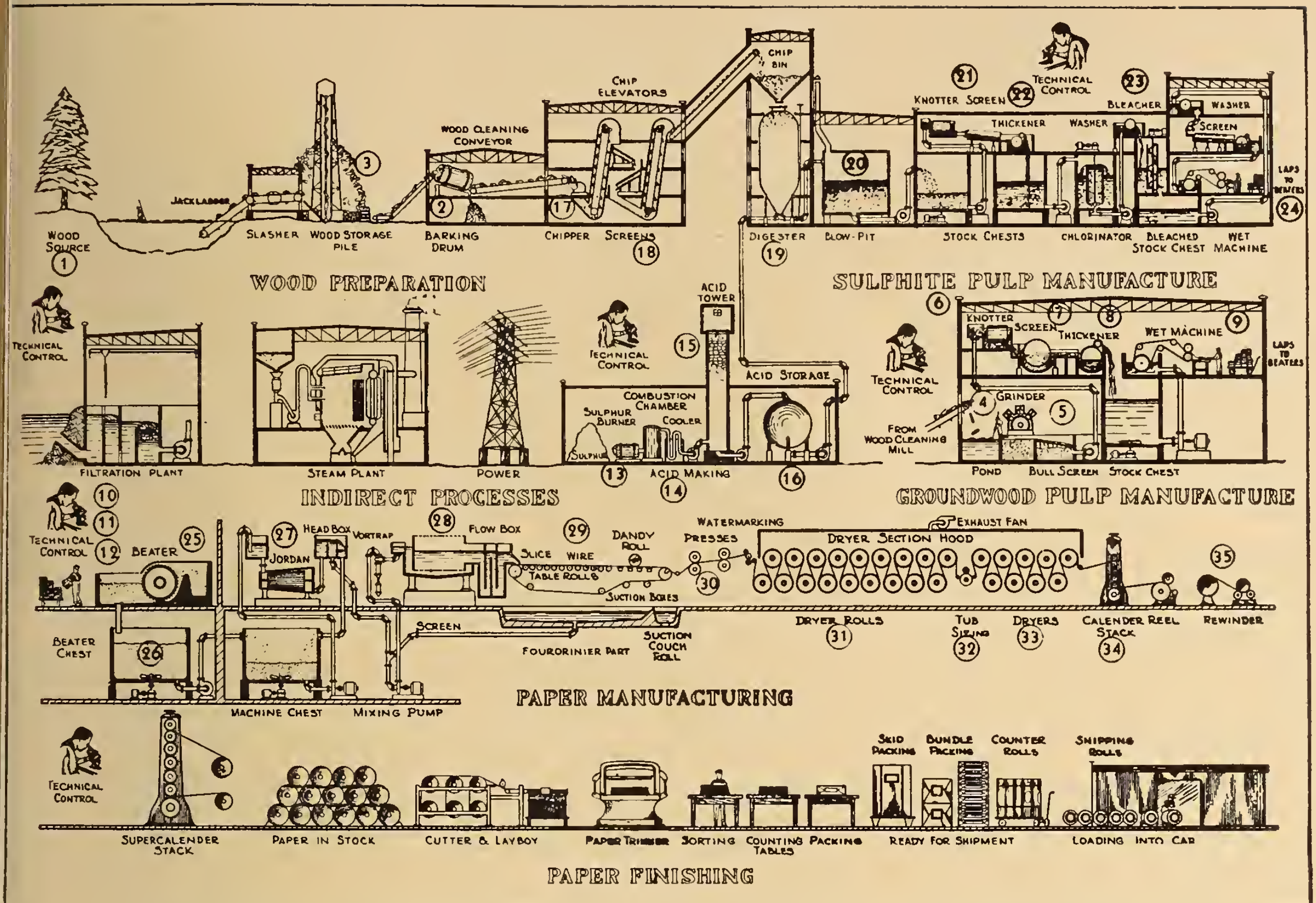

Fig. 9. Diagram showing the manufacture of paper. (Courtesy: The E. B. Eddy Company.)

Legend

1. LOGS — of spruce and balsam, cut on timber limits, are delivered to the mills by river drive, ship, rail and truck.
2. BARKERS — remove bark by rubbing the logs against one another.
3. STORAGE PILES — supply wood in winter.
4. GRINDERS — produce mechanical (groundwood) pulp by pressing the wood against revolving grindstones.
5. SLIVER SCREENS — remove large pieces of wood.
6. COARSE SCREENS — remove larger particles of wood.
7. FINE SCREENS — remove smaller undesirable particles of wood.
8. THICKENERS — remove excess of water not needed in pumping pulp.
9. WET MACHINES — remove water and form thick wet sheets (laps) of pulp.
10. FILLER — clay or pigments for printing quality.
11. RESIN SIZE — prevents ink penetration into paper.
12. COLOUR — dyes produce the required shade.
13. SULPHUR BURNER — burns sulphur to make SO_2.
14. GAS COOLER — cools gas in water-cooled coils.
15. LIMESTONE TOWERS — produce cooking acid from gas, limestone and water.
16. ACID STORAGE — of cooking acid from towers.
17. CHIPPERS — cut logs into chips by revolving knives.
18. CHIP SCREENS — remove oversize chips and wood dust.
19. DIGESTERS — acid-proof-lined steel vessels in which part of the wood is dissolved by acid and steam under pressure leaving only cellulose.
20. BLOWPITS — into which the pulp is discharged and washed.
21. SCREENS — remove dirt and large particles of pulp.
22. THICKENERS — same as No. 8.
23. BLEACHER — whitens pulp for fine papers.
24. WET MACHINES — same as No. 9.
25. BEATERS — brush out the fibres and mix them with filler, size and colour.
26. STOCK CHESTS — store beaten pulp.
27. JORDAN — cuts and brushes fibres further.
28. FLOWBOX — spreads the diluted pulp through the slice onto the machine.
29. WIRE — forms the wet mat of interwoven fibres deposited from the dilute pulp by drainage and suction.
30. PRESSES — remove water and compact the sheet.
31. DRYERS — remove water by passing the sheet over steam-heated cylinders.
32. SIZE PRESS — applies size to the sheet's surface.
33. DRYERS — dry the sheet.
34. CALENDER STACK — of polished rolls smooths the sheet.
35. WINDER — rewinds and slits the complete roll into smaller rolls as ordered.

water, the cohesive force is greatly increased. The increase in tensile strength of a sheet of paper through mechanical work on the pulp, or "beating", was supposed to be the result of an addition of water to the fibre structure, and the pulp was said to have become hydrated. This term is still in use but research has shown that it is not the whole story, if indeed, it is the story at all.

Little evidence has been found for hydration in the chemical sense. There is some additional retention of water, it is true, but there is also a great increase of fibre surface through fibrillation and swelling of the fibres. Various theories have been put forward to account for the results obtained. Dr. Boyd Campbell, of the Institute staff, has long been a leader in this field, and no doubt we are close to the truth. This great advance in fundamental knowledge has accounted for much of our progress in papermaking techniques, and has contributed to more than doubling the speeds of paper machines.

A recent development in paper manufacture is the production of paper having good strength when wet. This has long been a dream of papermakers, and is now effected, for the most part, by the addition to the slush pulp of melamine and urea resins. This particular product has developed enormously since 1942. During the war it was used extensively for paper for the printing of maps for the armed services. Among peace-time uses, the most common is for paper towels.

Use of Isotopes and Electron Microscope

Those of you who have seen a paper machine in operation will realize the necessity for removing the water rapidly once the sheet has been formed on the wire. But the forming of this sheet, or the uniform deposition of the fibres, is of equal importance. This has developed, for the most part, through trial and error. It is only recently that a concentrated scientific attack has been made to understand the factors involved. It is too early to announce results but, undoubtedly, a big advance in our fundamental knowledge will be made possible from trials just completed at the Baie Comeau mill of the Ontario Paper Company.

These trials were conducted by members of the staff of the Institute and made use of radioiodine as an atomic tracer. Radioactive iodine from Chalk River was introduced at various points in the headbox of the paper machine, and its path through to the finished sheet could be traced effectively. This is the first time that radioactive tracers have been applied to a paper machine in this manner. We believe that much valuable information will result. Use of isotopes is not restricted to paper machines. They could also be used, for example, in tracing the path of activated sulphur during chemical pulping.

In the field of fundamental cellulose chemistry, the usefulness of this tracer technique has been compared with that of the microscope, the spectroscope, or X-ray analysis. It is possible to label elements, or atoms or groups, which can then be introduced into cellulose, and the steps in the mechanisms under investigation can be observed. A practical development may well result from use of this tool to study the synthesis of cellulose in the living plant by the assimilation of carbon dioxide. It may be used as well in the so-called bacterial cellulose, which certain microorganisms synthesize from simple sugars in the laboratory. Undoubtedly much will be heard of this tracer technique in forthcoming months, both from the standpoints of fundamental cellulose chemistry and of plotting the paths of larger particles such as the fibres themselves in the pulp stream.

In the last few years research into the submicroscopic structure of the cellulose fibre has added much to our knowledge, and is giving us a clearer understanding of its behaviour under different conditions. We are getting closer to that happy state when we will be able to specify correctly our requirements for a pulp to meet some particular need. The development of tools to assist in this research has been of importance. One of the most important is the electron microscope.

Many different means are used today to measure the quality of pulp. Most of these measure the properties of a mass of fibres, but do not give much indication of what has happened to the individual fibres. This information is of vital importance if we are to understand what causes the difference between acid and alkaline pulps, so as to eventually improve them. This is another field of endeavour at the Institute.

More Pulp in Rayon

We have, so far, considered cellulose as a fibre for subsequent use in papermaking. However, a large amount of wood pulp produced today is made specially for use in the rayon industry. This wood pulp has always been made by the sulphite process. In the manufacture of rayon an appreciable quantity of cotton linters has always been mixed with the pulp, but through extensive research in improving the quality of the latter, it has largely replaced the cotton. As an example, within the last ten years or so, wood pulp has been increasingly used in the production of cellulose acetate or celanese, whereas formerly cotton linters were used exclusively. Much of the research on improving pulp quality for rayon was carried out at the laboratories of the Canadian International Paper Company at Hawkesbury.

We have been considering sulphite as the wood pulp used for dissolving pulp, but recent advances in the alkaline cooking process have produced pulps that are suitable for the rayon industry. During the war, much of our explosives in Canada were made from kraft pulp, which was nitrated to produce nitro-cellulose.

By-Products

It has been mentioned that only about half of the tree is in fibrous form and that, in cooking, these non-fibrous substances are dissolved as much as possible. That statement is true in the main although, since one method of cooking employs an acid and the other an alkali, the so-called waste liquors will have a slightly different composition with respect to the amounts of hemi-cellulose dissolved and the form of the lignin constituent. Thus each type may be considered separately.

For many years research has been carried out on the utilization of sulphite waste liquor. The first thought was to use it as a fuel, as is done with the black liquor in the alkaline process. However, the fly ash presents a problem and burning is not used extensively, unless fuel costs are a major factor, such as is the case in Sweden. The new magnesium base development, mentioned previously, includes the recovery of the process chemicals and the burning of the liquor as a fuel is part of the process. For some years the waste liquor has been concentrated and used as a road binder. The concentrated liquor is also used as a binder in the linoleum industry.

The sugars in the original tree are present, for the most part, in the sulphite waste liquor and the liquor is treated to produce yeast of alcohol from them. These processes have been developed extensively in the last few years. One mill in Canada, The Mersey Paper Company at Liverpool, Nova Scotia, has been producing yeast for some years. Alcohol is made at Thorold and at Gatineau. From sulphite waste liquor certain fine chemicals such as vanillin are also produced. Research will, no doubt, increase the number of these in the future.

In dealing with components other than lignin in the waste liquors, we must consider the original tree. In it are many organic chemicals, some of which may be recovered after pulping. There are, for instance, certain fats and sugars which will vary in amount according to species and locality. In the alkaline process the fats can be recovered and a product known as tall oil results. This has a wide use in commerce, and the original supply came from a species of nuts grown in Japan.

During the war the natural supply was curtailed and a great amount of research was undertaken in order to recover tall oil from alkaline black liquor. This occurred for the most part in the Southern United States, since Northern woods did not yield large amounts. Associated with tall oil recovery there are certain other very valuable chemicals that can be used in the drug industry, though they are difficult to isolate. Research is continuing in this field.

Uses for Lignin

We now come to lignin, which forms between 25 and 30 per cent of the original tree and, with the exception of water, is by far the largest component in the effluent from a pulp mill. The structural formula of lignin is not definitely known, although the substance itself has been isolated in certain forms for over a century. Chemists, as well as physicists, are searching out all the factors of this problem and are endeavouring to find lignin's composition as well as its uses. Much progress has been made, and one of the leaders in this field is the Pulp and Paper Research Institute, where the late Dr. Hibbert, and now Dr. Purves, have contributed much to our present knowledge.

Lignin is a thermoplastic and so should find a use in the plastic field. This has been developed at Howard Smith into the product which you all know as Arborite. This is not a moulded plastic but the lignin is used as a laminating agent with a paper base. Widespread use of lignin in this way gives promise of becoming an economic industry.

There are other possible uses for lignin, most of which are in the research stage in many laboratories all over the world. Some of these recently reported, are:

a) A tanning agent for leather.
b) An additive to oil-well drilling muds; it controls the viscosity of the mud and plugs holes through which water comes.
c) As a soil builder; as a mulch or fertilizer. If an acid soil is needed, the material is good.
d) As a dispersing agent in the rubber industry to disperse carbon black.
e) As a dispersing agent for use in making concrete, it saves one bag of cement in six when mixed at one quarter pound in 100 pounds of cement. The cement mixes better, less water is used and tougher concrete results.
f) A treatment for boiler feed water. It prevents scaling.

Tree Can Support Chemical Industry

It is apparent that research in the field of lignin chemistry has much to offer. In conclusion, this should be emphasized and a general comment added on the application of research to the whole industry. Our principal raw material, the tree, is self-perpetuating under proper forest management. It contains all the ingredients of a well-balanced chemical industry. Within the next quarter century we can surely expect great advances in our knowledge of the uses for this valuable raw material. We may visualize the paper industry as ever increasing its service to the community.

In the universities and paper laboratories of the United States, a recent publication listed 319 different research projects that are in progress. These are, for the most part, related to fundamental problems. In Canada such a list is not readily available but, in the various universities and mill laboratories, we know much work is being carried out. At the Pulp and Paper Research Institute of Canada, we have one of the most complete chemical pulping laboratories on the continent. Here research is continually in progress, both for our general knowledge and, at times, for the requirements of some particular mill. We are not alone in the feeling that important advances are in the making all over the pulp and paper manufacturing world, wherever intelligent research is being carried out. Canada will not lag in this effort. √

Soil Mechanics Conference

The programme of the 4th Annual Canadian Soil Mechanics Conference in Ottawa last December included three papers of general interest. Two of these dealt with problems encountered in construction in northern Canada but little known generally. J. A. Pihlainen told of difficulties in building house foundations on permafrost, and N. W. Radforth described recent studies of muskeg. A paper was also given by the chairman on special foundation problems in Canada, covering difficulties caused particularly by the geology and weather of the Dominion. Reports heard by the delegates included some results of investigations of house foundations following the recent Winnipeg flood. The engineering design of the emergency dikes at Winnipeg was described, along with difficulties in their construction.

Another interesting problem discussed was the "salvage" of a gymnasium in a western city from complete destruction due to drying out of the underlying soil. One wall had sunk over one foot and the structure was about to be condemned. When the cause was discovered, tie rods were installed to hold the wall in place, and means were devised to keep the soil moist in order to prevent further shrinkage.

Among the ingenious methods reported was one which makes use of radioactivity to find the moisture content of soil in situ. A source of neutron radiation, shielded so that the radiation can only pass through the surrounding soil to reach a nearby element sensitive to the rays, is lowered into a bore hole. After exposure, this element is brought to the surface and the amount of radiation to which it was subjected is read with a Geiger counter. From this, the moisture content of the soil at the level of the source can be found. √

A Note on Stress Distribution in Crane Girders

by

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The usual crane girder is composed of a channel and an I-beam, fastened together so as to form a structural member having the cross-section of Fig. 1. Either riveting or welding may be used to unite the two members. This note reports the results of experiments carried out on such a beam in order to determine the distribution of stress across the section. The conclusions should apply to other beams in which the flanges are extended in the direction of the neutral axis.

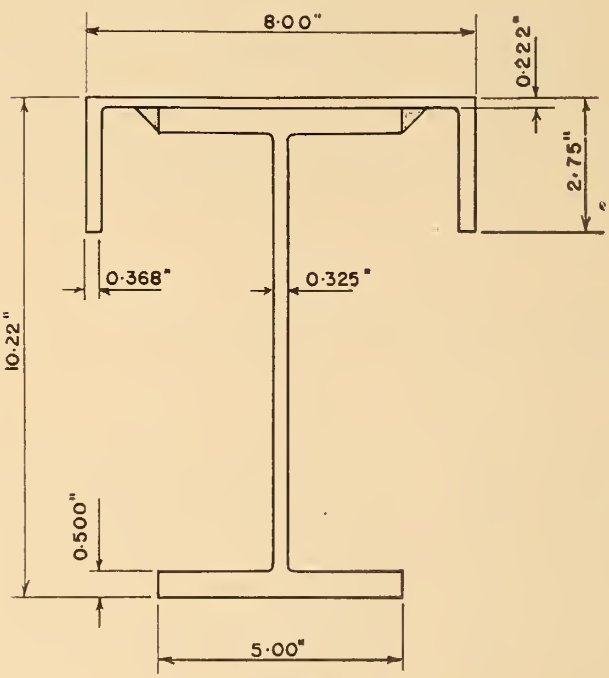

Fig. 1. Cross-section of beam.

The beam and channel were of aluminum alloy (Alcan 26ST) as shown in Fig. 1 and of approximately the following properties:

Ultimate strength	70,000 p.s.i.
*Yield strength	62,000 p.s.i.
Elongation	11 per cent
Shearing strength	45,000 p.s.i.
Modulus of elasticity (Tension E_t)	10,500,000 p.s.i.
Modulus of elasticity (Compression E_c)	10,700,000 p.s.i.

*0.2% offset.

Two continuous ½-inch fillet welds were used to fasten the beam and channel together. The general arrangement of loading is shown in Fig. 2. In order to obtain a fairly complete picture of the distribution of strain across the section, eighteen electrical resistance

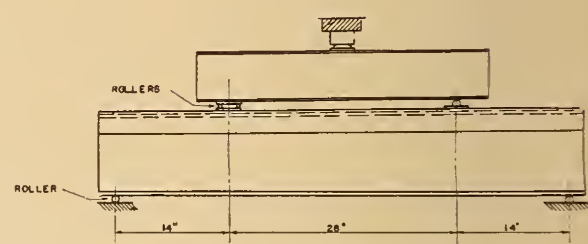

Fig. 2. General arrangement of test.

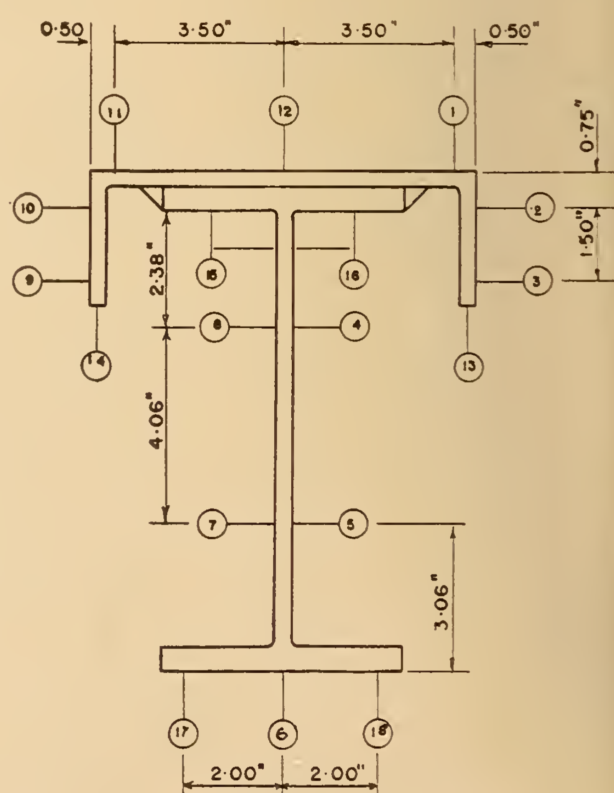

Fig. 3. Location of strain gauges.

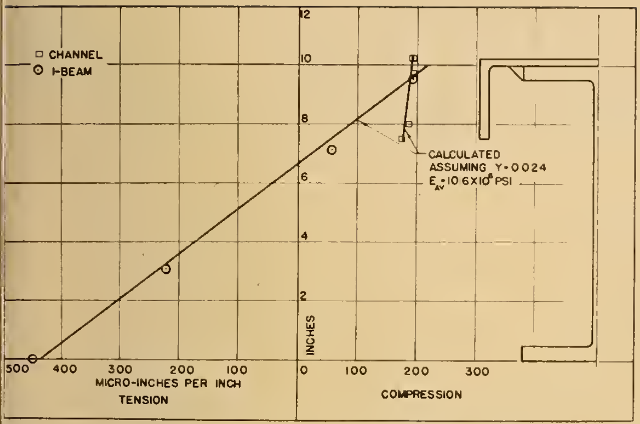

Fig. 4. Typical experimental results.

strain gauges were secured to the beam at mid-span in the locations shown in Fig. 3.

Typical results are shown graphically in Fig. 4. Each point on the graph represents the average reading of all the gauges at a particular distance from the neutral axis. For example, the three gauge readings on the upper surface of the compression flange are averaged to give a single reading. The maximum difference between an average and an individual reading was 14 per cent. These differences indicate that the load has some tendency to twist the channel.

The results show clearly that, if the whole beam is considered, plane sections do not remain plane. Considering the I-beam only, sections appear to remain plane, but the strains in the channel are different from those in the I-beam at the same distance from the neutral axis. The strains in the channel are approximately constant across its whole area.

Although plane sections do not remain plane, the observed values of the maximum strains, both on the tension and compression sides of the beam, agree fairly closely with values indicated by the theory of simple bending. This is indicated in the following table:

	Calculated Value	*Observed Value*
Depth to neutral axis	3.79 in.	3.90 in.
Maximum tensile stress for a moment of 140,000 in. lb	4605 p.s.i.	4720 p.s.i.
Maximum compressive stress for a moment of 140,000 in. lb	2730 p.s.i.	2680 p.s.i.

A check on the accuracy of the experimental work is obtained by comparing the total tensile and compressive forces at the cross-section under consideration. This leads to the following result, based upon the strain readings shown in Fig. 4.

Moment 140,000 in. lb.

Tension in flange of I-beam,	$1068\ E \times 10^{-6}$
Tension in web of I-beam,	$386\ E \times 10^{-6}$
Total tension,	$1454\ E \times 10^{-6}$ lb.

Assuming $E_t = 10.5 \times 10^6$ p.s.i., total tension = 15,250 lb.

Compression in flange of I-beam,	$580\ E \times 10^{-6}$
Compression in web of I-beam,	$109\ E \times 10^{-6}$
Compression in channel,	$692\ E \times 10^{-6}$
Compression in weld,	$48\ E \times 10^{-6}$
Total compression,	$1429\ E \times 10^{-6}$ lb.

Assuming $E_c = 10.7 \times 10^6$ p.s.i., total compression = 15,270 lb.

Interpretation of Results

The reasons for the experimental results become apparent if a free-body diagram of the channel is considered (Fig. 5). External loads are applied through bearing plates to the upper surface of the web of the channel. These are balanced by reactive forces supplied by the I-beam on which the channel rests. The exact distribution of these reactive forces is unknown, but it is such that the bending moments induced in the channel by the vertical forces are very small and probably negligible. At the same time, the web of the channel is compelled to take the same strain as the top flange of the I-beam. This is accomplished by means of forces transmitted through the weld. These forces build up gradually in the portions of the beam subjected to shearing force. Their line of action is uncertain, but it is near the controidal axis of the channel; it is not surprising, therefore, that the distribution of stress across the channel tends to be uniform.

It is possible to calculate the stresses produced by any given moment, on the basis of the following assumptions:

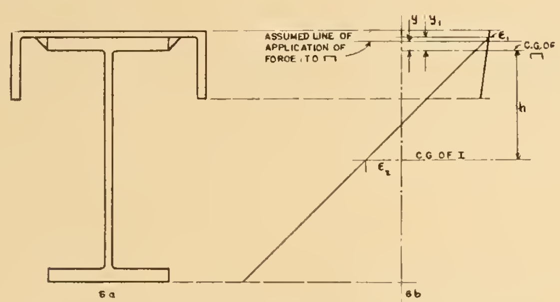

Fig. 6. Distribution of strain across the section.

(a) That plane sections of the I-beam and channel remain plane, though the two are not in the *same* plane.

(b) That the moduli of elasticity in tension and compression are equal.

(c) That the strains in beam and in channel at some given distance from the neutral axis are equal.

Consider the composite section shown in Fig. 6a, and let it be assumed that the distribution of strain for a given moment M is as shown in Fig. 6b. Let ϵ_1 be the common strain of beam and channel, assumed to occur at the upper surface of the beam, and ϵ_2 be the axial strain on the beam. Then the axial force on the beam $= \epsilon_2\, EA_I$. This must be equal to the axial force on the channel, since the resultant forces in tension and compression due to the bending in the beam and the

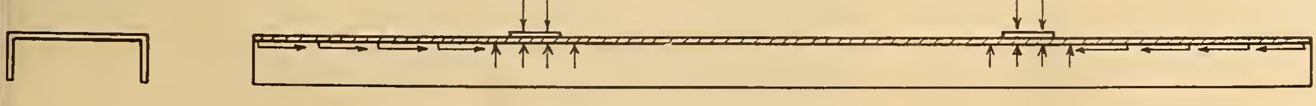

Fig. 5. Longitudinal section of channel.

channel must balance. The load on the channel therefore consists of a force $\epsilon_2 EA_I$ applied at an assumed distance y from its centroidal axis. This is equivalent to an axial force $\epsilon_2 EA_I$ and a moment $\epsilon_2 EA_I y$.

The strain produced by this force and moment at a distance y from the centroidal axis of the channel is,

$$\epsilon_1 = \frac{\epsilon_2 A_I}{A_C} + \frac{\epsilon_2 A_I y y_1}{I_C}$$

$$= \epsilon_2 \left[\frac{A_I}{A_C} + \frac{A_I y y_1}{I_C}\right] \quad (1)$$

where the subscripts $_I$ and $_C$ distinguish the properties of the I-beam and of the channel, respectively.

The total moment of resistance of the section $M_T = M_I + M_C +$ moment due to axial forces in beam and channel, where M_I and M_C are the bending moments in the I-beam and the channel, considered separately.

$$M_T = (\epsilon_1 + \epsilon_2) EZ_I + \epsilon_2 EA_I y + \epsilon_2 EA_I h$$

where h is the distance between the center of gravity of the I-beam and that of the channel.

Substituting for ϵ_1 from (1)

$$M_T = \epsilon_2 EZ_I \left[\frac{A_I}{A_C} + \frac{A_I y y_1}{I_C} + 1\right] + \epsilon_2 EA_I y + \epsilon_2 EA_I h$$

Letting $\epsilon_2 E = s_2$

$$M_T = s_2 \left[Z_I \left(\frac{A_I}{A_C} + \frac{A_I y y_1}{I_C} + 1\right) + A_I (y + h)\right]$$

Hence, if M_T is known, s_2 may be determined, and using equation (1) s_1 may also be found. The only quantity in the above equation that is uncertain is y which depends upon the assumed line of application of the horizontal forces applied to the channel. This may be estimated, or it may be determined experimentally. For the results shown in Fig. 4 the stresses in the channel are 1960 p.s.i. at the top and 1780 p.s.i. at the bottom. If P be the axial force in the channel,

$$s = \frac{P}{A_C} + \frac{Pyc}{I_C}$$

$$1960 = \frac{P}{3.96} + \frac{Py\,(0.78)}{2.83}$$

$$1780 = \frac{P}{3.96} - \frac{Py\,(1.97)}{2.83}$$

from which $y = 0.024$ in.

For this value of y and for a moment of 140,000 in. lb., the preceding expressions give $s_2 = 1095$ p.s.i. and $s_1 = 2362$ p.s.i. These lead to the following values for the depth to the neutral axis and for maximum tensile and compressive stresses:

Depth to neutral axis	3.64 in.
Maximum tensile stress for a moment of 140,000 ins.	4520 p.s.i
Maximum compressive stress for a moment of 140,000 in.	2540 p.s.i.

These values agree reasonably closely with the observed values given previously, but even closer agreement can be obtained if the properties of the channel are modified to allow for the weld metal. If this is done, and an average value of E of 10.6×10^6 p.s.i. is assumed, the calculated line shown on Fig. 4 is obtained.

These experiments were carried out in the materials laboratory of Queen's University, with the assistance of Mr. K. Haraldsen and with the financial support of the National Research Council. The Aluminum Company of Canada co-operated by providing the aluminum alloy sections.

New Large Milling Machine

In accordance with its policy of modernizing plant and equipment at its Lachine shops, the Dominion Bridge Company has recently installed a huge plano-milling machine manufactured by Messrs. Kendall and Gent of Manchester, England. The machine has already demonstrated its ability to reduce operating times and costs particularly in the accurate machining of large crane components.

The machine was built to Dominion Bridge specifications, and its main features are as follows: Number of milling heads—2. Rate of feed for table—1 in. to 12 in. per min. Rate of feed for vertical head—1 in. to 8 in. per min. Max. longitudinal table travel — 22 ft. Max. distance table to vertical spindle cutter—5 ft. 6 in. Adjustment of vertical spindle—10 in. Total weight of machine—70 tons. Max. distance upright to a vertical spindle—8 ft. 6 in. Travel of side head on upright—4 ft. 3 in. Adjustment of horizontal spindle —14 in.

In the photograph the new machine is shown planing the trolley frame for a 60-ton capacity crane.

The Engineer's Stake in Public Relations

Contributed by the Management Division and presented at the Fall meeting, Worcester, Mass., September 19-21, 1950, of The American Society of Mechanical Engineers.

by

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Compared to the struggles of other professions for favourable public recognition, engineering is twice blessed. Both its origin and its recent past have bequeathed it a favourable, though not prominent, public standing. In the minds of people who understand the creed, philosophy, and contributions of engineering, the collective image of the profession is a positive one of objective research, constructive effort, and service to mankind.

Some other professions are haunted by dark symbols created in the past. Doctors shudder at the word "quack." "Shyster" gives the legal profession a chill. "Bloated" capitalist and "cheap" politician are familiar expressions. Leading businessmen and statesmen are not immune to them. The study of word meanings is full of such labels which, through usage, association, and deliberate twisting have become derogatory symbols. Among the leading professions, engineering alone has not been successfully labelled with a negative symbol.

Theory of Conditioned Reflexes

The significance of "symbols," i.e., words, sounds, and marks which stand for something else, was first determined by the noted Russian physiologist and Nobel prize winner, Ivan Petrovich Pavlov. Pavlov's discoveries emerged from his experiments which formulated the theory of conditioned reflexes. His experiments, initially conducted on dogs, followed a systematic pattern. A bell was rung and immediately afterward powdered meat was placed in the dog's mouth. The meat evoked a natural reflex in the dog; its mouth watered. When this procedure had been repeated three or four times a day for about ten days, it was found that striking the bell without giving any powdered meat would cause the dog's mouth to water. Thus a conditioned reflex was established in that a specific response followed promptly upon a sensory stimulus which had previously produced no such result.

Applied to humans and simply stated, this means that people are responsive to repeated physiological stimuli, and—more importantly—mental stimuli. The effects of repeated mental stimuli are familiar to all of us. We often hear clangorous radio advertising, having no educational value but accompanied by such insistently repetitive theme songs, catchwords, or just noise, that we learn about the advertised product in spite of making no conscious effort to learn, or even while making a deliberate effort to ignore it.

In essence, what we repeatedly see, hear, read, or experience about specific subjects establishes symbols in our minds for those subjects. Our feelings and expressions on these subjects are automatically released when the symbol is presented.

Symbols—such as names or insignia—may be either good or bad. They will vary with the audience and may change character from generation to generation. For example, the Ku Klux Klan was once a tolerated organization identified by an outlandish, but respected, costume. Now, due to a changing sense of values on the part of the public, the hooded figure is a sinister, unwelcome symbol. "Uncle Joe" Stalin once beamed down from posters put up by our Government, here in New York. Now his name and caricature are used to accent alarming situations. Today the U.N. is a symbol of co-operation and hope, while the Air Force symbolizes protection and power.

Commercial Symbols

Of less importance in world affairs but of no less significance to their possessors are the kinds of symbols associated with commercial enterprises.

If, for instance, an automobile company today possesses a good symbol, it is due to the practice of sound engineering, good manufacturing, and positive public relations. If the mention of a certain automobile evokes generally favourable comment, it is because the commentator has experienced quality performance and service from his car, or knows of people who have. Additionally, he probably has been well treated by his serviceman, has known employees of the company who were responsible citizens, has read of the accomplishments of the company, seen its advertising, learned of the leadership of its executives, and has come to possess many other opinion-forming facts of a positive nature.

Good symbols do not come into being by happenstance. They evolve from a definite philosophy of doing business. If a product is well designed and efficiently manufactured and can be sold competitively, its favourable acceptance and endorsement of the company behind it are largely accomplished by the practice of good public relations. Likewise, acceptance of an institution or a profession depends not only upon its philosophy and practice but also on repeated positive presentation of its story to the public. In short, if mention of a firm, a product, an institution, or a profession evokes favourable comment from a large number of people, then the symbol of the subject has become respected through repeated friendly associations.

Obscurity of the Engineer

In spite of the generally favourable standing of engineering, there is evidence that the profession is not fully understood and appreciated by the general public. If you were to take a poll of passersby on the street, asking each of them to name a great engineer, chances are they would scarcely be able to name one. Yet, most of these people could unhesitatingly name a great general, or a great statesman, or a poet, or actor, or even a great scientist.

Chances are that those who could name a great engineer would name one who achieved wide public recognition through some activity other than the practice of his profession. Better-informed members of the public might reply with the names of George Goethals, Julius Krug, Herbert Hoover, or George Washington. An engineer can become famous—if he also happens to be President of the United States.

The relative obscurity of one of the most brilliant and original engineers was commented upon lately in the editorial columns of the *New York Herald-Tribune*, in connection with a tribute to William J. Wilgus.

These are excerpts from the editorial:

"In a predominantly engineering civilization—a civilization surrounded and sustained by the works of the engineer, and incapable of living for an hour except as these almost miraculous constructions function as they were intended to do—it is remarkable how few engineers ever reach public prominence.

"We duly honour our poets and statesmen, our philosophers and soldiers and great salesmen and scientists, but we seldom know who our engineers are. William J. Wilgus was well known in New York; yet hardly one in every million who has gone through the Grand Central Terminal or frequented the present Park Avenue can have connected his name with those major improvements, in which his was the inspiring and guiding mind.

"He was an outstanding engineer in an engineering civilization; but civilizations rarely recognize their greatest architects."

This indifference on the part of the public to the significant achievements of engineers is sometimes attributed to the technical nature of the profession. It is said to be too complicated and too remote ever to appeal to public imagination. But in view of the performance of other professions, this argument is not valid.

Scientists Widely Recognized

Scientists, working in the purely abstract realm, have done a superb job of dramatizing their profession. Harold Urey, Robert Oppenheimer, Vannevar Bush, Harlow Shapely, Roy Chapman Andrews, and at least a dozen more bright lights of science are recognized by large segments of the public. Their stories are told and retold, their counsel is sought, and their advice is very frequently accepted. The very fact of their recognition should dispel the idea that the public is not interested in technical subjects. What the scientists have done is to strip abstract and mathematical subjects of their technical embroidery and explain them in terms of human interest and public benefit. They have recognized their responsibility to the public to interpret their work in terms of what it means to the advance of human knowledge. The attendant benefits of this advance imply progress in national defence, public health, advancing living standards, and many other subjects of general concern and interest. Engineers could do the same thing quite as capably and establish a greatly improved symbol.

Engineers, individually and collectively, have an important stake in improving their public relations so that the profession will achieve wider understanding, with its corollary benefits. Also, greater appreciation will better enable the profession to meet and handle forces which threaten it. The present public understanding of the engineering profession is one of the first factors to consider in planning to improve public understanding.

Public's Concept of the Engineer

Look at the national picture of the engineer fostered by Hollywood. The movies usually show an engineering hero in riding boots, peering through a transit and waving for a building or a bridge to be moved over a little.

Aeronautical engineers depicted in the movies fly their own creations into the wild blue yonder and on the ground are invariably humped over a drawing board, sweating out an over-glamorized artist's conception of an improbable aircraft.

Chemical, mining, and electrical engineers are generally left out in the cold, but now and then they have been portrayed as eccentric individuals possessing some pocket-size gadget that an unscrupulous mob is trying to steal to use against mankind. Automotive engineers have been shown as begoggled auto-race drivers grinding up a dirt track to prove a sensational new unpatented carburettor while a furtive gang is trying to steal the invention.

Advertising portrayals of the engineer have, in general, been more factual and complimentary. However, there have been some awful bobbles due to inadequate research or failure to check on technical details.

At the community level there is widespread misunderstanding of an engineer's function, whatever his field. It has been said that an untold number of wives, when they state that their husbands are engineers, are asked, "With what railroad?" When exact titles are given, such as "stress analyst at the Concrete Airplane Corporation," members of the lay public still do not know what the engineer does. They are not interested in, and will not remember, unusual technical titles. They understand that doctors heal the sick, lawyers guide people's legal relationships, mechanics fix things, and so on. They will have to be told what engineers do to appreciate their place in the scheme of things.

Also in the community there appears to be an insufficient proportion of engineers who take the lead in civic projects, organize worth-while activities, or speak before important civic groups. Programme committees often consider technical people a bit dull and pedantic. If an engineer is suggested as a speaker, someone will tell about an engineer he knows, Harry Hemisphere. It is recounted that Harry won't say a ball is round, but will say: "It appears to be round at the prevailing temperature and under existing light conditions, but, without having proper instrumentation and criteria for round balls, I cannot risk my professional integrity by stating that the ball is round."

Though this characterization may be overdrawn, there are many engineers whose analytical talents render them virtually inarticulate and hardly candidates for speaking appearances.

Companies, schools, and local and national engineering societies frequently find it difficult to get eminently qualified engineers to write interesting papers and present them effectively. Lay groups experience the same reticence. One result of this reluctance to lead is that the professional standing of engineering slips relative to the standing of other more active groups. Doctors and lawyers are social, civic, and political-minded because their living depends directly upon the symbol they and their professions maintain.

Practices which may damage the prestige of the engineering profession constitute a leading problem. People who seek to trade on the term "engineer" are blurring the outline of the profession. There are "cosmetic," "display," "promotion," "personnel" and many other so-called engineers. Unless the limits of professional engineering are publicly defined, and this practice discouraged, someday we may find supermarkets with "vegetable engineers."

Students at engineering schools periodically follow "fads" for certain branches of engineering which threaten the college with overstaffing in one field and shortages in others. At the seat of this difficulty is the failure of the profession, collectively, to present accurately the opportunities existing throughout engineering. Every engineer has a vested interest in the appropriate distribution of his fellow members throughout the profession. If there is disillusionment or displacement of engineers, or the profession loses its allure for capable young men, its future growth and standing are imperilled.

Time for Public Relations Programme

To meet the problems facing their profession, engineers can undertake a programme within the scope of their present activities by applying well-known public-relations principles. The profession is fortunate in having the organization and machinery to conduct a successful programme for greater public recognition and appreciation. The national societies, with their experienced headquarters staffs and their network of chapters, form the ready-made organization. The machinery is provided by the general-circulation engineering publications, national, regional, and local meetings programmes and flow of paper presentations. What is needed additionally is a representative expression by members that they recognize their stake in public relations and want to do something about it.

An engineering public-relations programme should include these objectives:

1. To gain wider public recognition of the role of the engineer in modern society. This would help maintain the prestige of the profession and assure its attraction for the best-qualified young men.

2. To take definite steps in meeting threats to the profession. By making clear the requirements and defining the limits of the profession, shadowland "engineers" can be discouraged from using unqualified titles.

3. To inform engineers how their stake in public relations has a direct bearing on their income and the security and prestige of their positions. The values of participating in social, economic, and political affairs at all levels would be emphasized.

To gain wider public recognition, individual engineers and their societies should draw public attention to the profession itself through a major, annual, newsmaking event which would represent all of the branches of the profession. Such an event, properly staged, would give the profession an opportunity to reiterate its creed and cite the accomplishments of engineering in terms of public interest. This annual event would serve to draw national attention.

But national attention is not enough. A continuing programme should be planned to draw more attention at the community level throughout the year. Steps should be taken to assure engineers that speaking and writing, appearing on radio and television programmes, and engaging in civic affairs and other public enterprises are not unfashionable for members of the country's third largest profession. Rather, it should be emphasized that the future standing of the profession may depend upon such activities.

The nationwide public-relations programme of the medical profession, in defending itself against socialization, has been hugely successful partly because of the high public standing of many of its members. When these respected and well-known members of the community speak for or against some issue, the standing they have acquired through prior civic activities at the local level lends immeasurable weight to their argument.

To meet threats to the profession, the engineering societies could get together to publicize the extent of the engineer's training and the stringent requirements he must meet. It could be made unpopular for unqualified people to trade on the designation "engineer." Doctors have popularized the intern and his long and intensive training. The legal profession makes a big to-do about how terrifying and tough the bar exams are and how many fail to pass each bar. The Air Force has for years widely broadcast the numbers of student pilots who couldn't pass the supremely difficult air-cadet course. The object of this dwelling upon failures and rough courses is to spotlight the qualifications of the accomplished individual to serve the public.

Unrecognized Qualities of the Engineer

The public would probably be astonished to learn of the weeding-out process that takes place in the engineering schools. Also, they might be surprised to know of the unpublicized, but difficult, requirements of the State Board professional - engineering examinations. Such requirements as five years' practice of engineering under specified conditions before qualifying for the State Board, among others, should be known more widely. People can be guided to take interest in a professional field that assures such high-caliber men and levels of knowledge.

The individual engineer's stake in public relations can be spelled out in terms of how he will benefit by participation in public affairs. Qualification for management posts is often based on the many facets of a man's personality, seldom on his deep concentration and immersion in one subject. Engineers experienced in dealing with people are often selected to represent their company on important matters. Engineers who become successful in dealing with people, in addition to their understanding of cold materials, are better able to put across engineering ideas and changes, develop personal prestige, and advance to greater engineering responsibility.

Engineering groups all over the country are surrounded by untapped gold mines of information on how their profession can participate in public affairs. Dealers in ideas, editors, writers, commentators, politicians, advertising men, public-relations people, and many others, are generally pleased to appear on engineering programmes and explain the nature of their work and its relation to engineering. From these people, engineers can learn how their activities can be related to the public interest.

Within companies, engineers can extend greater co-operation to their advertising, sales, and public-relations departments. Occasionally, engineers suspect that their work will be given a razzle-dazzle treatment by the interpretive departments, so they withhold co-operation. This problem could be resolved, wherever it exists, by articulate engineers taking interest in the interpretation of their work and trying to instruct the other departments. Public-relations departments are perennially looking for technical articles, engineering accomplishments, and publicity items. These people can do much to help in the preparation of interesting articles and frequently can take the curse of stuffiness off technical papers. In companies where this co-operation is requested, engineers receive excellent representation in many company and public activities. Engineers need only seek out this potentially valuable assistance in helping them tell their story.

Public Role of Engineering

Former President Herbert Hoover recently emphasized engineering's public role and need to tell its story when he said, "The engineer's works are out in the open where all men can see them. He cannot deny he did it. The doctor's mistakes are buried in the grave. The voters forget when the politician changes the alphabetical names of his falling projects. Trees and ivy cover the architect's failures. The lawyers can blame the judge or the jury. Unlike the clergyman, the engineer cannot blame his failures on the devil."

If the engineering profession ever decides to follow a plotted course of improving its public relations, it will again be twice blessed: Because it has done tremendous good and promises to do very much more, and because it is not a pressure group, and the only axe it has to grind is that it wants to be known for the good work it has done and is doing.

Shipbuilding Activity in Canada

This photo represents the climax of many weeks of planning and preparation for the launching of the largest vessel ever built at the yards of the Port Arthur Shipbuilding Co. Ltd.—and the largest tanker ever built for service on the Great Lakes.

S.S. Imperial Redwater is the second and slightly larger of two tankers built for Pipe Line Tankers Ltd., for service between the pipe line terminal at Superior, Wisconsin and the refineries at Sarnia. She is 620 feet long with a beam of 68 feet and will handle some 175 million gallons of Alberta crude oil each shipping season. Her sister ship, *Imperial Leduc,* was built and recently launched at Collingwood, Ont.

FROM MONTH TO MONTH

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

Registration of Technical Manpower

The following letter from the Minister of Labour is printed herewith under instruction of Council. It is Council's wish that each and every member of the Institute shall complete his questionnaire and return it as quickly as possible.

Many members will realize that a similar record was made several years ago for the Wartime Bureau of Technical Personnel.' The Institute understands that these records are still intact, but agrees they must be brought up to date. Therefore members are urged to file the information even though it may be largely a duplicate of that supplied previously.

The Department of Labour is to be commended for its prompt action on this important matter.

MINISTER OF LABOUR—CANADA

Ottawa, March 10, 1951

Mr. James A. Vance, President, and Members of Council.

Gentlemen:

As you will no doubt have learned from recent public announcements, the Department of Labour is embarking on a project to review the records of technical and scientific personnel in Canada with the object of bringing them up to date. Each such person will shortly be given the opportunity to co-operate in this task by listing his particulars as of 1951 on an appropriate questionnaire form.

In view of the whole-hearted co-operation received from your Institute and its members when the roster of technical personnel was first built up during World War II, I do not hesitate to request your assistance in this 1951 programme. Speaking for both my Department and for the Government, I can assure you it is realized that the sympathetic support of all professional societies involved is of the greatest importance to the effectiveness of this plan. With this in mind, it would be appreciated if you could find occasion to refer to the matter in an early issue of your official publication requesting each member to do his part by completing and returning the questionnaire when it is received.

As the new records are compiled, we shall be in a position to arrive at an up-to-date assessment of existing resources of skill as possessed by this important segment of Canadian manpower.

Yours very truly,

(Signed) MILTON F. GREGG

Bridge Failure

The news of the collapse of the Duplessis Bridge at Three Rivers, Quebec, came as a shock to everyone, and in particular to engineers. At this late writing there is no indication as to the cause, and doubtless any clear and final statement will be long delayed because of the necessity of a careful analysis of all the elements that might have entered into it. In the meantime however there is much interesting conjecture and idle rumour.

The bridge, which consists of two crossings separated by an island in the St. Maurice River, broke into the news in 1950 because of the discovery of fractures in two of the steel girders, one on each crossing. These failures were followed by a careful investigation, which is reported to have indicated that the trouble was due to faults in the material, not to design or fabrication. The question arises naturally as to whether or not the same trouble accounted

Cover Picture

The skyline of Montreal, headquarters of this year's annual meeting, as seen from the chalet on Mount Royal.

for the more recent and disastrous failure. It is at this point that the facts are hidden from the outside observer and possibly also from the insider. However, reports from persons who saw the restoration work underway indicate that the failures are from different causes because, during the repairs of the fractured girders last year, all girders were reinforced with riveted splices at all points similar to those where failure occurred. The girder which fractured last year in the west crossing was not one of those that went down.

The story of the design and construction of the bridge appeared in *The Engineering Journal* of January, 1949. It is interesting to read that account now. From it we find that each crossing was an all-welded structure designed as a continuous girder for its full length, free at both ends and fixed at the centre pier. The spans which collapsed were the four to the west of the centre pier on the west crossing. The four to the east of this pier remain standing.

At the time of writing it has not been possible to examine the piers or the steelwork of the collapsed section, because of the condition of the ice. The fast water has kept certain portions of the river open, and at other spots the ice is too thin for safety. This is borne out by the fact that a tractor and driver were lost through the ice, when trying to raise one of the motor cars involved in the tragedy.

It has been stated authoritatively that the cause of the disaster cannot be determined until the fallen structure can be examined. Doubtless this will mean examination in the field and in the laboratory. Hence it is not likely that the great puzzle will be solved for some time to come. However in the meantime it is likely the arguments will continue, and various periodicals will come forth with a variety of answers. *The Engineering Journal* will not be one of them. It appears as if every engineer associated with the design of the structure is a member of the Institute. The Institute thus is so close to this unfortunate affair that the *Journal* does not propose reaching any conclusions on its own, but will await the official word that will come in time from those who really know.

Another Milestone in Unification

On February 22 an agreement was signed between the Institute and the Association of Professional Engineers of Manitoba which marks a further step toward unification of the engineering profession in Canada.

The agreement follows the pattern of those that have operated so successfully in Saskatchewan, Alberta, New Brunswick and Nova Scotia. It combines fees, provides for reciprocal E.I.C. membership and registration, and does much to eliminate duplication of activities and administrative procedures. Ultimately it should make registration and E.I.C. membership synonymous in Manitoba and give all professional engineers in that province the advantage of the Institute's branch activity.

The historic signing ceremony is pictured on the opposite page. At the table are W. D. Hurst, president of the Manitoba Association, and President J. A. Vance of the Institute. Standing behind are (l. to r.) C. S. Landon, registrar of the Association; C. L. Fisher, vice-president of the Association; J. B. Stirling, vice-president elect and

E.I.C. — Manitoba Association banquet in Winnipeg.

Signing ceremonies in Winnipeg.

chairman of the Institute's Committee on Professional Interests; T. E. Storey, chairman of the Winnipeg Branch of the Institute; E. P. Fetherstonhaugh, past-president of the Institute; and L. Austin Wright, general secretary of the Institute.

On the facing page, the head table at the dinner includes: (l. to r.) Vice-President Fisher; Mr. Patton, associate editor of *The Winnipeg Tribune;* L. A. Wright; Alderman McLeod, representing the city of Winnipeg; Frank Evans, K.C., the principal speaker; President Vance; President Hurst; C. Rhodes-Smith, attorney-general of Manitoba; Mr. Stirling; T. H. Kirby, Institute Councillor for the Winnipeg Branch; and C. S. Landon.

Secretary of I.M.E. Retires

Some months ago the Institution of Mechanical Engineers, announced that its secretary Sir Henry Guy had found it necessary to tender his resignation because of ill-health. Recently the Institution appointed as his successor, Mr. Brian G. Robbins.

Sir Henry Guy is a good friend of the Engineering Institute of Canada and is known personally to more than a few members. The general secretary, past-president J. B. Hayes, and President Vance, in particular have come to know him well through the Conferences of Commonwealth Engineering Institutions held in London in 1946 and in Johannesburg, South Africa, last year.

The following are highlights only of Sir Henry's impressive career. From 1907 to 1910 he attended University College, South Wales, where he gained diplomas in mechanical and electrical engineering and won the Bayliss Prize of the Institution of Civil Engineers, a Royal Research Scholarship, and a Whitworth Exhibition Prize. He joined the British Westinghouse Company in 1910 and became chief engineer of the mechanical department of its successor, the Metropolitan - Vickers Electrical Company in 1918. In 1936 he was elected to the board of Metropolitan Vickers Electrical Export Company. He resigned in 1941 to become secretary of the Institution of Mechanical Engineers.

Sir Henry Guy

Sir Henry has served the profession in many capacities. He is a Fellow of the Royal Society and has served on its council and that of the British Standards Institution. He has been on the Executive Committee, of the National Physical Laboratory and chairman of its Engineering Research Committee. Other committees of which he has been a member, or chairman include The Committee on properties of steam and the Power Plant Section of the British Electrical and Allied Industries Research Association; the Advisory Council on Scientific Research and Development of the Ministry of Supply, and the Gun Design and Static Detonation (bombs) committee of that Council; the committee on Armament Development of the Ministry of Supply; the committee of The Royal Aircraft Establishment; the committee on Technical Organization of the Army; the Board of Chemical Warfare; The Ordnance Board; the Mechanical Engineering Advisory Committee of the Ministry of Labour; the Advisory Council to

Brian G. Robbins

the Scientific and Industrial Research Committee of the Privy Council; the Mechanical Engineering Research Board, the Fuel Research Board, and many others. In 1946 he was appointed a trustee of the Imperial War Museum.

He has contributed many papers to the literature of the profession and has been the recipient of the Thomas Hawksley Gold Medal, the Parsons Memorial Medal, the Honorary Associateship of Manchester College of Technology, and the honorary degree of D.Sc. of the University of Wales. He was created a Knight Bachelor in the New Year's Honours list of 1949.

It is particularly interesting to note that during Sir Henry's tenure of the secretaryship, the membership of the Institution of Mechanical Engineers increased from 14,000 to 35,000.

Sir Henry's successor, Mr. Brian G. Robbins, obtained his mechanical engineering degree at the City and Guilds (Engineering) College, South Kensington after a period of service with the Royal Engineers at the end of the First World War. For research work which followed the degree course and led to the Diploma of the Imperial College, he was awarded an Unwin Scholarship. He went to Vauxhall Motors Ltd., Luton, for 4 years after which he returned to college for a period of research and teaching. Later he joined the Institution of Automobile Engineers as assistant secretary and was appointed Secretary in 1934.

At the outbreak of World War II Mr. Robbins entered the War Office where he was with the Directorate of Military Training. He was released from R.E.M.E. in 1945 with the rank of Lieut. Colonel.

In 1947 the Institution of Automobile Engineers Amalgamated with the Institution of Mechanical Engineers and Mr. Robbins became an assistant secretary of the latter organization. He succeeded Sir Henry Guy as secretary in January of this year.

The Engineering Institute of Canada sincerely wishes Sir Henry Guy improved health, and long years of enjoyable leisure, in which he will find many more opportunities to contribute to the advancement of the profession. To Mr. Brian Robbins the Institute extends its congratulations and best wishes for a long and fruitful period as senior permanent officer of one of the world's most distinguished professional engineering bodies.

Engineering Training for Canadians in Britain

In recent months, the *Journal* has published details relating to the Athlone fellowships for postgraduate engineering study and training in the United Kingdom.

The United Kingdom High Commissioner's Office has announced the names of the first young Canadian engineers who are to receive two years of the best engineering training Britain can offer. They are as follows:

McGill, Montreal—Ross Edwin Chamberlain, S.E.I.C.; Constantine Bachovzeff; Ralph Gilmour Wilson, S.E.I.C.; J. Montague Squire; Noel Bernhard Montagnon.

Ecole Polytechnique, Montreal—Florian Boivin, S.E.I.C; Pierre Bourassa, S.E.I.C.

Laval University, Quebec — Renaud Hinse, S.E.I.C.; J. Joseph Alfred Brisson, S.E.I.C.; Henri Pierre Tardif, JR.E.I.C.

Queens University, Kingston — Alan James Williams, S.E.I.C.; Francis Walter Slingerland, JR.E.I.C.; George Rennie Sinclair, S.E.I.C.; Wallace Graham Breck.

University of Toronto—John Michael Armour; Gordon Thomas Leist; Donald Charles Leigh; James Nelles Matthews, S.E.I.C.; Thomas Lang Moffat; Barry Warren Prior; William Ashall Firstbrook; John Thomas Koski; Donald Hugh MacDonald, JR.E.I.C.; Donald George Stephenson.

University of Manitoba, Winnipeg—Peter J. Waugh, S.E.I.C.; Dalton Horace Minty; Andrew John Moffat, S.E.I.C.; Vernon Leroy Dutton, M.E.I.C.; Kenneth Henry Williamson, JR.E.I.C.

University of Saskatchewan, Saskatoon — Robert Emanuel Collin; William Trevor Link.

University of Alberta, Edmonton — George Walter Jull, S.E.I.C.; William James De Coursey, S.E.I.C.

University of British Columbia, Vancouver—John Alfred Heath Lund, S.E.I.C.; Henry Frederick Naylor; John Blakely Nuttall, S.E.I.C.

University of New Brunswick, Fredericton—Gerald Reade McCully, S.E.I.C.; Eugene Lancelot Fytche.

Of this group, 12 will be placed in British Universities, another 12 in industry, and the remainder will take one year's training in both industry and universities.

Closely related to these fellowships are the apprentice and postgraduate training schemes regularly in effect in many important British Industries, which schemes have been made available in recent years, to selected young Canadian engineers—in fact to engineers from all parts of the world. The Brush-Associated British Oil Engines group of companies, Austin Motors Ltd., British Thomson-Houston, Coventry Gauge and Tool Company and The National Gas Turbine Establishment are companies which have been drawn specifically to the *Journal's* attention but it is implied that there are many others.

One of the many proofs available that these Engineering training schemes meet present-day requirements, none is more immediately convincing than the fact that students from all parts of the world are taking advantage of them. Austin Motors have students from twenty-seven countries, B.T.H. from eighteen, including two men from the United States. As applied to graduate engineers, the schemes generally include a two- to three-year's course of practical training and many of the companies also award research scholarships leading to Ph.D. degrees.

An Important Award

The Council of the Institution of Mechanical Engineers has awarded the 1951 James Watt International Medal to Dr. H. H. Blache, of Denmark, for his contributions to the advancement of mechanical engineering, and particularly for his pioneer work in the development of the large Marine Diesel Engine.

Dr. Blache was nominated by the Danish Society of Engineers.

The James Watt International Medal was founded to commemorate the bi-centenary of the birth of James Watt, on 19th January, 1736, an event which was destined to bring about a revolution in the utilization of power. It takes the form of an award every two years of a gold medal to an engineer of any nationality who is deemed worthy of the highest honour the Institution can bestow and that a mechanical engineer can receive. In making the award, the Institution has secured the co-operation of the principal engineering Institutions and Societies in all parts of the world as nominating authorities. The Engineering Institute of Canada has participated on behalf of this country.

Previous recipients of the medal have been:

Sir John A. F. Aspinall (Britain), 1937; Henry Ford (U.S.A.), 1939; Professor Aurel Stodola (Switzerland), 1941; A. G. M. Michell (Australia), 1943; Dr. F. W. Lanchester (Britain), 1945; Professor Stepan Timoshenko (U.S.A.), 1947; Dr. Fredrik Ljungstrom (Sweden), 1949.

Pictured above and below are groups at the Shawinigan Falls meetings.

The President Visits St. Maurice Valley Branch

The March meeting of Council was held at the Cascade Inn at Shawinigan Falls on Saturday, March 10th, in conjunction with the presidential visit to the St. Maurice Valley Branch.

During the trip the presidential party took the opportunity to visit the site of the Duplessis Bridge failure. The lower photograph, taken against one of the entrance pylons of the bridge as a backdrop includes (l. to r.) general secretary Austin Wright; J. O. Martineau, councillor, Quebec Branch; Harold Young, Dominion Bridge Company; President Vance; Vice-President J. F. Wickenden; R. E. Kirkpatrick, chairman, St. Maurice Valley Branch; Frederic Poliquin, Alderman, Three Rivers; S. E. Williams, past chairman, St. Maurice Valley Branch.

The upper picture was taken at the Chateau de Blois in Three Rivers. In the front row are: (l. to r.) Mrs. W. R. Mackay and Mrs. C. H. Neil, of Three Rivers; Alderman Poliquin; Mr. Vance; Mr. Kirkpatrick; Mr. Wickenden; Mrs. Vance; Mrs. Wickenden; Miss M. McLaren, E.I.C. Headquarters. In the back row are (l. to r.) E. A. Cross, Toronto Branch councillor; R. C. Flitton, past-councillor, Montreal; Mr. Williams; L. A. Duchastel, councillor, Montreal Branch; Mr. Wright; Mr. Martineau; W. R. MacKay, a member of the St. Maurice Valley Branch executive; R. N. Coke, councillor, Montreal Branch; C. H. Neil, St. Maurice Valley Branch executive; C. Williams, branch secretary; I. R. Tait, councillor, Montreal Branch; C. G. de Tonnancourt, vice-chairman, St. Maurice Valley Branch.

Meeting of Council

Secretary's Notes

At a meeting of Council, at Headquarters, January 20, 1951, Vice-President R. E. Heartz was in the chair.

Tariff Item 180-e

There was a general discussion of the subject, the outcome of which was that the Institute's Committee on Professional Interests under the chairmanship of J. B. Stirling was asked to take on the responsibility of making the necessary representation to the Tariff Board at the end of the month.

It was announced that the Institute had arranged for a meeting of engineers representing a great variety of interests to take place in the Institute auditorium on the afternoon of Thursday, January 25th in order to discuss the problem with them. On the basis of the outcome of this discussion the brief would be prepared. It was the general opinion that the Institute would be agreeable to the continued exemptions from customs duties of plans for machinery and production equipment.

Civil Defence

Mr. Allan C. Ross of Ottawa was appointed as the Institute's representative of the National Research Council Committee which had been set up to study the subject of shelters in relation to building structures.

It was agreed that the Council of the Institute should advise the branches of its policy with regard to the Institute's participation in civil defence. Council did not believe that this was a matter which at the moment should be handled on the national level but did agree that members of the branches should be encouraged to participate in the activities at the branch level. It was agreed that a letter along these lines would go out immediately to the branches.

Lecture Course

It was reported by the field secretary that a series of lectures of a non-technical nature had been arranged for young engineers in the Toronto area. The course is to consist of twenty lectures and the persons attending the lectures were to pay a fee to cover at least a portion of the cost. Twenty-two young men had reported for the course.

Manitoba Agreement

The scrutineers appointed by the chairman opened the councillors' ballot on the proposal for a co-operative agreement with the Association of Professional Engineers of Alberta. They reported that of 148 ballots returned all but 5 were in favour of the proposal. It was reported also that the ballot taken by the Association in Manitoba was approximately 11 to 1 in favour of the agreement. It was announced that the ceremony of signing the agreement would take place in Winnipeg on Thursday, February 22nd. at which it is expected the president, the Chairman of the Institute's Committee on Professional Interests and the general secretary would attend.

Toronto Office

The Finance Committee reported the receipt of a substantial sum of money from the Toronto branch for the assistance which the Toronto office of the Institute had been able to render the branch.

Technical Sections—Montreal Branch

The general secretary presented a request from the Montreal branch that the auditorium at Headquarters be made available to them on Mondays, Tuesdays, Wednesdays and Thursdays throughout the season. Previously the space had been made available to them on Tuesdays and Thursdays, and every other Monday. This further request was for the balance of the Monday evenings and for all of the Wednesday evenings.

The Montreal branch in their communication indicated that they had established six separate technical sections and were prepared to have meetings four nights a week if the auditorium were made available to them. It ws agreed that their request be granted to be effective at the beginning of the Fall programme in 1951.

Legal Action by Former Advertising Agent

The general secretary reminded Council that some time ago action had been taken by the former advertising agent for *The Engineering Journal*, claiming payment of a substantial amount for commissions on advertising that had been sold previous to the cancellation of his contract. The general secretary explained that the lawyers and the officers of the Institute had not been able to see any justice in the claim and accordingly had refused to make payment. The case had now come to trial although it was not expected that any decision would be handed down for at least one month's time.

The annual report of Council which included reports of committees and branches, was presented and approved.

Regional Meeting of Council

A letter was presented from the Lakehead branch in which the request was made that a regional meeting of Council be held there in the month of June. Council looked with favour on the proposal and the general secretary was instructed to notify the branch.

News of Other Societies

The triennial reunion of the **Engineers' Alumni Association** of the University of Toronto is planned for Friday and Saturday, October 26 and 27, 1951, at the Royal York Hotel.

The 1951 convention of **The Canadian Section of the American Water Works Association** is scheduled for May 21 to 23, 1951, at the Royal Alexandra Hotel, Winnipeg, Man.

The summer general meeting of the **American Institute of Electrical Engineers** will take place in Toronto, Ont., June 25 to 29, 1951, at the Royal York Hotel.

O. W. Titus, M.E.I.C., of Canada Wire & Cable Co., Toronto, Ont., is chairman of the general committee.

The spring meeting of the **Society for Experimental Stress Analysis** will be held at The National Bureau of Standards and The Wardman Park Hotel, Washington, D.C., May 16, 17, 18, 1951. All inquiries should be addressed to Dr. Edward Wenk, Jr., c/o The David Taylor Model Basin, Washington 7, D.C.

The fourth annual meeting of the **Heat Transfer and Fluid Mechanics Institute** will be held at Stanford University, Stanford, California, on June 20, 21, 22, 1951. The Institute will consider advances in the fields of heat transfer, fluid mechanics, and related fields.

Sponsors for the Institute are: California Institute of Technology; Stanford University; University of California; University of Santa Clara; University of Southern California; and the following divisions of The American Society of Mechanical Engineers. Applied Mechanics, Gas Turbine Power, Heat Transfer, Hydraulics.

The complete programme will be issued in May, and will be published in the May issue of *Mechanical Engineering*. Further information may be obtained from A. L. London. Dept. of Mechanical Engineering, Stanford University, Stanford, California.

An **Applied Mechanics Conference** will also take place at Stanford University, June 22, 23, 1951, arranged by the Applied Mechanics Division of the American Society of Mechanical Engineers, (29 West 39th Street, N.Y.). Subjects of discussion will be dynamics, elasticity, experimental stress analysis, strength properties of material and plasticity.

The National Society of Professional Engineers announces the election of new officers who will assume office on July 1, 1951. L. L. Dresser of Tulsa, Oklahoma, has been named president of the Society.

The semi-annual meeting of the **American Society of Mechanical Engineers,** (29 West 39th Street, New York 18, N.Y.) will be held at the Royal York Hotel in Toronto, Ont., from June 11 to 15, 1951.

Sessions of the **International Conference of Naval Architects and Marine Engineers** are scheduled as follows: London, England, June 25 to 30, 1951; Glasgow, Scotland, July 2 to 4, 1951; Newcastle, England, July 4 to 6, 1951. The secretary of the conference is at 10 Upper Belgrave Street, London, S.W. 1.

The **Measurements Section** of the **Institution of Electrical Engineers,** (Savoy Place, London, W.C. 2) announces a conference on electrical instrument design in London, England, May 28 to 30, 1951.

Plans are proceeding for the **Third World Petroleum Congress** at The Hague, Holland, May 28 to June 6, 1951.

National Committees have been formed in many countries. Enquiries regarding the Canadian Committee and Canadian participation in the Congress should be addressed to Dr. R. K. Stratford, Imperial Oil Ltd., Sarnia, Ont.

The programme of the 9th **International Management Congress,** Brussels, Belgium, July 5 to 11, 1951, has been released. The International Committee of Scientific Management (C.I.O.S.) and the Belgian national committee have announced subject matter, travel arrangements, etc.

Canada is collaborating in the presentation of several subjects. For further information, Canadians should contact the Canadian Management Council, 549 Burnside Place, Montreal 25, Quebec.

Elections and Transfers

At the meeting of Council held in Niagara Falls, Ont., Saturday, March 17th, 1951, a number of applications were presented for consideration and on the recommendation of the Admissions Committee the following elections and transfers were effected:

Members:

W. F. Ball, *Kitchener, Ont.*
B. Baranowski, *Burlington, Ont.*
D. Beaulieu, *Montreal, Que.*
K. Bulins, *Corner Brook, Nfld.*
J. S. Bury, *Trinidad, B.W.I.*
H. Chaput, *Ottawa, Ont.*
J. N. Dickie, *Hamilton, Ont.*
D. N. Fraser, *Montreal, Que.*
W. H. Gauvin, *Montreal, Que.*
J. Gilmore, *Montreal, Que.*
B. A. Hesketh, *Montreal, Que.*
N. M. Hobbs, *Montreal, Que.*
D. C. Hutchinson, *Calgary, Alta.*
F. W. Iveson, *Perth, Ont.*
W. J. Kedzierski, *Montreal, Que.*
V. B. King, *Woodstock, Ont.*
A. D. Lindsay, *Montreal, Que.*
W. B. McMullen, *Sudbury, Ont.*
P. T. Mikluchin, *Toronto, Ont.*
R. C. Mitchell, *Hamilton, Ont.*
L. F. Pepino, *London, Ont.*
W. G. Siebrasse, *Montreal, Que.*
M. I. Speigel, *Sudbury, Ont.*
J. A. Stewart, *Montreal, Que.*
C. H. Templeton, *Winnipeg, Man.*
D. R. Tennent, *London, Ont.*
I. A. Usher, *Toronto, Ont.*
F. H. Vercoe, *Hamilton, Ont.*
C. M. Wells, *Montreal, Que.*
G. E. Willan, *Burlington, Ont.*
D. F. Wood, *Montreal, Que.*

Juniors:

J. Allen, *Sarnia, Ont.*
C. M. Armstrong, *Windsor, Ont.*
F. G. Burchell, *Copper Cliff, Ont.*
J. Deptuck, *Arvida, Que.*
R. H. Hales, *Macdonald College, Que.*
W. J. Keough, *Sarnia, Ont.*
T. B. J. Kruzelnicki, *Winnipeg, Man.*
B. D. Mathers, *Toronto, Ont.*
A. McGregor, *Moose Jaw, Sask.*
D. L. S. Pearce, *Montreal, Que.*
D. R. Rowe, *Yorkton, Sask.*
A. H. Todd, *Hespeler, Ont.*

Transferred from the class of Junior to that of Member:

A. D. Allin, *Rolphton, Ont.*
D. B. Baker, *Montreal, Que.*
W. D. Barron, *Montreal, Que.*
R. A. Bowie, *Montreal, Que.*
R. A. Bowman, *Victoria, B.C.*
A. M. Cameron, *Kirkland Lake, Ont.*
E. M. desRivieres, *Quebec, Que.*
J. N. Galli, *Montreal, Que.*
L. A. Glen, *Montreal, Que.*
P. G. Gregory, *Sorel, Que.*
L. G. Grimble, *Edmonton, Alta.*
A. D. Harkness, *Lachine, Que.*
M. N. Joubert, *Quebec, Que.*
L. S. Heinze, *Ottawa, Ont.*
E. H. Martin, *St. Vital, Man.*
J. D. MacMillan, *Beaupre, Que.*
R. W. McNally, *Hamilton, Ont.*
D. P. MacVannel, *Ottawa, Ont.*
J. R. Menard, *Rimouski, Que.*
C. E. Mercier, *Joliette, Que.*
E. W. Montgomery, *Ft. Garry, Man.*
F. H. Nowman, *St. Catharines, Ont.*
G. A. Potts, *Brantford, Ont.*
D. A. Sinclair, *Windsor, Ont.*
R. F. Stapells, *Montreal, Que.*
C. H. Townsend, *Hamilton, Ont.*
E. R. Welsh, *Montreal, Que.*

Transferred from the class of Student to that of Junior:

J. H. Schuster, *Brooklyn, N.Y*

The following Students were admitted:

R. F. Allen	C. H. McAdam
V. W. G. Arnold	R. K. MacDonald
N. W. Bethune	K. A. McCaskill
W. E. Bonnell	J. R. McGovern
D. F. Brandon	M. E. McPherson
G. A. M. Burton	W. B. Maxwell
H. D. Connor	M. W. T. Matthews
V. C. Dohaney	R. W. Myers
J. Dunlop	G. W. Newman
D. T. Durrant	K. O. Oliver
E. A. Godfrey	D. W. Patterson
J. P. Hartt	R. S. Pollock
C. R. Hansen	D. W. Prendergast
E. J. Hebert	F. C. Reddy
A. M. Heise	L. D. Rose
J. M. Henry	J. A. Ryan
J. Hodder	Y. Saar
W. F. Iwanson	W. J. Smith
G. L. Johnson	J. H. Washburn
M. R. Levesque	J. P. Walsh

Applications through Associations

By virtue of the co-operative agreements between the Institute and the Associations of Professional Engineers, the following elections and transfers have become effective:

Alberta

Member:

J. L. Phelps, *Whitehorse, Y.T.*

Junior to Member:

J. E. Flavin, *Edmonton, Alta.*
D. I. Hougan, *Edmonton, Alta.*
T. H. Newton, *Edmonton, Alta.*
M. E. Stewart, *Edmonton, Alta.*

Saskatchewan

Member:

S. J. Hartridge, *Saskatoon, Sask.*

Junior:

H. Fleming, *Regina, Sask.*

Students:

J. M. Childs, *Saskatoon, Sask.*
J. A. Heal, *Saskatoon, Sask.*
B. Kahane, *Saskatoon, Sas.*
D. A. Lane, *Saskatoon, Sask.*
I. C. Rorquist, *Saskatoon, Sask.*
D. L. Stewart, *Saskatoon, Sask.*
L. W. Vigrass, *Saskatoon, Sask.*

Junior to Member:

B. Boyson, *Regina, Sask.*
N. L. Iverson, *Saskatoon, Sask.*
R. H. Persson, *Prince Albert, Sask.*
W. L. Saunders, *Regina, Sask.*

Student to Junior:

L. T. Johnson, *Regina, Sask.*
W. A. Willison, *Moose Jaw, Sask.*

Manitoba

Member:

D. F. Kenney, *Winnipeg, Man.*

Nova Scotia

Junior to Member:

A. F. Chisholm, *Halifax, N.S.*

New Brunswick

Members:

W. H. Crandall, *Moncton, N.B.*
A. J. Cyr, *Fredericton, N.B.*

Junior to Member:

R. D. C. Clark, *Rothesay, N.B.*
W. D. Fanjoy, *Saint John, N.B.*
J. A. Flood, *Renforth, N.B.*
D. R. Holyoke, *Saint John, N.B.*
R. S. Myles, *Fredericton, N.B.*
H. S. McCleave, *Saint John, N.B.*
R. R. McIntyre, *Moncton, N.B.*
G. D. Reeleder, *Woodstock, N.B.*
R. G. Scott, *Fredericton, N.B.*

Student to Member:

R. A. Park, *Moncton, N.B.*
D. R. Robson, *Sackville, N.B.*

Correspondence

Having been advised that a group of engineers in Ottawa had tried a somewhat novel approach to the housing problem, the Editor inquired, and the result was the following interesting description of their project.—Ed.

Ottawa, Ont.,
January 8, 1951

Dear Mr. Editor:

I have your letter of December 27, 1950, and am happy to reply to your enquiry about the Fairhaven housing project near Ottawa.

The purpose of Fairhaven Co-operative Community is to provide high quality housing in a desirable community employing co-operative organization to achieve reasonable costs. The Fairhaven idea arose as a result of the serious shortage of adequate housing which developed in the Ottawa district during the war years. A number of engineers from the National Research Council formed a study group on housing in 1946. The result of their studies was the formation of Fairhaven Co-operative Community Incorporated, a company chartered in November, 1947, under the Companies Act of Ontario to provide housing for its members. The membership was not and is not restricted to any particular group of people and although several of the members are National Research Council engineers there are some members from other government departments and others in private businesses. Included in the group are three architects.

Photos above and below are views of the Fairhaven project.

Soon after incorporation the Co-operative acquired a very desirable site just off the Montreal Road near the Rockcliffe Airport at Ottawa. The first job to be tackled was a topographical survey of the site. From the information obtained, a large scale relief map of the property was prepared and the work of subdivision began. This was a rather long and arduous task since it was realized that the ultimate success of the venture depended on very careful attention to this matter. The land is rolling and somewhat rocky in spots. Many fine trees were in existence and were prizes we were most anxious to keep. The general aims adhered to during the subdivision were

(1) to provide lots of about 150' x 200'

(2) To adjust lot boundaries so that each lot contained a particular geographic feature which would enhance its house building possibilities. For example split level houses were envisaged for some of the lots so that the lot boundaries were adjusted to make full use of the rock ledges and slopes which make split level houses feasible.

(3) to provide a road which would service the houses with minimum interference with the natural beauty of the site

(4) to spare as many of the fine trees as possible

(5) to provide community parks

(6) to provide a suitable septic area on each lot.

With information from the Community Planning Association and the keen effort of several members of the group, a plan was finally adopted which met most of our equirements and satisfied the members. Some small modifications were incorporated at a later date in order to satisfy the requirements of the Ottawa Area Planning Board.

The members then set about building the roads, removing trees, clearing ground, etc. A monthly quota of hours to be donated by each member was established. If a member fails to meet his quota he pays a fine of 75 cents for each hour of default. Money raised in this way is used to reimburse the more enthusiastic members who work over the quota, or to hire outside labour.

In order to ensure an overall blending of the architecture, the Board of Directors of the Co-operative must approve all house plans. Careful attention is given to the location of each house to avoid interference with neighbouring houses and activities. While there is no set policy with regard to the style of house, it is a general principle that each house must be a commonsense design suited to the lot in question. It has been recommended to all members that they seek the services of an architect.

The plan of operation for the co-operative is that the group as a whole should develop the property and community facilities. The individual member looks after the building of his own house and becomes the owner of both house and lot. The deeds to the individual lots incorporate restrictions which are designed to protect the group interests.

Because the members have undertaken this development as a group, coupled with the sound guidance that the company has received from its engineer members, a most attractive community is taking shape. The total cost to each member which covers his own lot, the community facilities, and other group assets such as a considerable quantity of lumber cut from the surplus timber contained on the property amounts to several hundred dollars less than the price asked for unimproved lots in neighbouring subdivisions. Purchases in quantity for the group have also provided significant savings.

Included in the 20 members are 11 engineers and 2 architects. All members have much the same educational and social background. The forty or so children of the members will attend the new Maplewood school which has been built on property adjoining the Fairhaven site.

President of the Fairhaven company is C. Kenneth Rush, JR.E.I.C. Others of the Board of Directors are G. Y. Slader, JR.E.I.C., W. F. Campbell, L. Churchward, and C C. J. Bond.

I wish to thank you for your interest. Any further information we can supply will be forwarded at your request.

Yours very truly,

C. Kenneth Rush, JR.E.I.C.

Quebec Bridge Undergoing "Face Lifting"

Tourists, residents and engineers at large will be equally interested in the work now proceeding on the Quebec Bridge and its approaches. The bridge was completed in 1917 for railway traffic only and although it still ranks as the largest cantilever bridge in the world, the roadway added in 1929, which was then built as wide as the available space between the two railway tracks would permit, has for some years been considered to be of inadequate width for vehicular traffic.

As part of a large general scheme for improving the approach to Quebec from across the St. Lawrence River, the present roadway is being doubled in width, whilst a new 780-ft. bridge, including a 480-ft. arch span, has just been completed across the Chaudière River on the same alignment as the Quebec Bridge The Chaudière bridge provides space for a three-lane highway of equivalent width to the new highway on the Quebec Bridge, and is part of an efficient feeder system to the main crossing.

The work is being carried out under the authority of the Quebec Government (Hon. Romeo Lorrain, Minister of Public Works, and Ivan E. Vallée, Deputy Minister), Dufresne Engineering Co. Ltd. being the official agents of the department for the work. The steel work for the new Chaudière Bridge and for the changes on the Quebec Bridge is being fabricated and erected by Dominion Bridge Company Limited.

The work is being done in two stages, and the photograph shows the first stage nearing completion. i.e. the construction of the new half section of roadway over the disused railway track. This part of the work will be finished during the present year, and the traffic will be diverted to the new section. Then the old roadway will be removed and the new roadway extended to its full width. Thus, by mid-summer of 1951, a continuous 30-ft. roadway providing for three lanes of traffic will be in operation.

The illustration also brings out clearly the 3-in. I-beam Lok grid flooring, manufactured by Dominion Bridge Co. Ltd. under licence from U.S. Steel Corporation. More than 100,000 sq. ft. of this flooring will be used for the bridge.

Quebec Bridge.

CABINET DU MAIRE

OFFICE OF THE MAYOR

MONTRÉAL

AU NOM DE LA POPULATION DE MONTRÉAL et en mon propre nom, je souhaite la plus cordiale bienvenue aux délégués qui prendront part au congrès annuel de l'Institut des Ingénieurs du Canada.

C'est un grand honneur pour la Ville de Montréal que d'avoir été choisie cette année comme le siège de ces importantes assises qui grouperont une élite d'ingénieurs qui jouent dans l'économie moderne un rôle de plus en plus considérable.

Je puis assurer les congressistes de l'Institut des Ingénieurs du Canada qu'ils recevront chez nous l'accueil le plus chaleureux et qu'ils conserveront de leur séjour au milieu de nous un durable souvenir.

ADOLPHE, MONTREAL

I EXTEND A MOST CORDIAL WELCOME to the delegates who will participate in the annual convention of The Engineering Institute of Canada, on behalf of the people of Montreal and in my own name.

Montreal is highly honoured in having been selected to be the site of these important deliberations which will unite top-ranking engineers who are contributing greatly to our modern economy.

I can assure the delegates of The Engineering Institute that they will be greeted in Montreal with a really warm welcome and that they will not soon forget their stay among us.

LE MAIRE DE MONTRÉAL

(CAMILLIEN HOUDE)

MAYOR OF MONTREAL

IRA P. MACNAB, M.E.I.C.

PRESIDENT

OF

The Engineering Institute of Canada

1951

The presidency of The Engineering Institute of Canada, one of the greatest opportunities for service to the profession, comes to Ira P. Macnab of Halifax as the culmination of a series of tributes that have testified emphatically to the high regard in which he is held.

Mr. Macnab was born at Malagash, Nova Scotia, and received his early education in local public schools. He spent seven years as an apprentice and journeyman machinist and then studied engineering at Mount Allison University and Nova Scotia Technical College, receiving the degree of Bachelor of Science in mechanical engineering in 1913. After two years as manager of a machine shop, he joined the Nova Scotia Light and Power Company and, by 1923, was superintendent of the tramway department.

In that year, he accepted an executive position with the Riverside Iron Works in Calgary. In March, 1924 he was asked by the Royal Securities Corporation of Montreal to inspect the properties of the Venezuela Power Company which the Corporation had acquired, and in May, 1925 was appointed general manager of that utility. He was transferred to the Monterey Railway Light and Power Company in 1930, and in 1931, returned to Halifax to join the Nova Scotia Board of Commissioners of Public Utilities.

In 1947 Mr. Macnab was appointed to his present position, general manager of the Halifax Public Service Commission.

Mr. Macnab realized very early that voluntary service to the representative organizations of his profession was essential to his own development. He was active in the organization of the Halifax branch of the Institute and was its vice-chairman when he left for Calgary in 1923. He was also on the council of the Association of Professional Engineers of Nova Scotia. His active contributions were interrupted during the period in South America and Mexico but he maintained his Institute membership and again lent his active support when he returned to Halifax.

He was chairman of the Halifax Branch in 1938 and again a member of the Council of the Nova Scotia Association. He was councillor for Halifax branch in 1939-40, vice-president of the Association during the same period, and in 1949 was simultaneously president of the Association and vice-president of the Institute for the Maritime zone. In 1950 he was elected president of the Dominion Council. He was active in the promotion of the Institute's joint agreement with the Nova Scotia Association which combines fees and membership and in effect allows the two organizations to function as one in that province.

Mr. Macnab's signal contributions to the American Water Works Association and its Canadian section, have been recognized recently through his nomination to receive one of the association's highest honours, the George Warren Fuller Memorial Award for distinguished service in the field of water supply.

Mr. Macnab has always taken an active interest in community work. After returning from Mexico he served three years as an elected representative of the Cumberland County Municipal Council. During the last war he was provincial chairman for Nova Scotia of the Disaster relief committee of the Red Cross. In 1942 he was appointed chairman of the committee to prepare a new Master Plan for the future development of the City of Halifax. This committee after three year's work proposed a plan which has formed the basis for the development of the city since that time. In 1949 he was chairman of the Community Chest drive in the City of Halifax and is now serving on the executive of the Halifax Civil Defence committee. For several years he has been a member of the Council of the Halifax Board of Trade.

He has served on the Board of Regents of Mount Allison University and is now a member of the Board of Governors of Nova Scotia Technical College. In 1950 Mount Allison further recognized his great worth by conferring on him the degree LL.D. (Honoris causa).

Mr. Macnab is the third president of the Institute from the Maritimes and he assumes the office at a time when the profession of engineering looms large on the national and international scene. His record of past services ensures that he will add further distinction to this high office.

and Ontario Land Surveyor, and has a large private practice.

Mr. Armstrong is an active member of the Border Cities Branch, is a past-chairman, and served two years as a councillor. He joined the Institute as a Junior in 1921, transferring to Associate Member in 1925, and to Member in 1940. He is president of the Ontario Land Surveyors Association, and is a Trustee of the Canadian Section of the American Waterworks Association. He has taken a keen interest in the welfare of the engineering profession.

J. B. Stirling, M.E.I.C., of Montreal, has been elected vice-president of the Institute to represent the Province of Quebec.

Mr. Stirling has been president of E. G. M. Cape & Co., Montreal, since May 1950. He joined E. G. M. Cape Company in 1915, and was a field engineer and a supervising engineer on many contracts of the Company. He became a partner in the firm in 1928 and vice-president in 1940.

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

He was born at Dundas, Ontario, and received his early education there. Graduating from Queen's University, class of 1911, he worked first on municipal construction projects in Ontario, Manitoba, Saskatchewan. He served in Canada, England and France with the R.C.E. in 1917 to 1919.

In 1948 Mr. Stirling was president of The Corporation of Professional Engineers. He is president of the Montreal Board of Trade, and a past-president of the Canadian Construction Association. A past-councillor of the Engineering Institute, and a past-chairman of the Montreal Branch, he has served the Institute's Committee on Professional Interests as chairman since 1944. He joined the Institute in 1913 as an Associate Member, transferring to Member in 1934.

Newly Elected Officers of the Institute

J. W. Sanger, M.E.I.C., general manager of the City of Winnipeg Hydro Electric System has been elected vice-president of the Institute to represent the Western Provinces.

Born in Bristol, England, Mr. Sanger received his technical training at Faraday House, London. From 1906 to 1911 he was district superintendent of the Midland Electric Power Company at Staffordshire, England. In 1912 he came to Canada and worked as distribution superintendent for the City of Winnipeg Hydro Electric System. During 1913 and 1914 he was assistant branch manager for the Siemens Company of Canada Limited. He returned to the City of Winnipeg Hydro Electric System in 1915 as power house superintendent. In 1922 he was appointed chief engineer of the system, and he received the appointment as general manager in 1944.

Additional professional contributions of Mr. Sanger have included service as vice-chairman, Manitoba Power Commission (1931-34); and as a member of the Manitoba Rural Electrification Enquiry Commission (1942).

J. W. Sanger, M.E.I.C.

Mr. Sanger joined the Institute as an Associate Member in 1921, transferring to Member in 1936. He was chairman in 1939 of the Winnipeg Branch of the Institute, and Councillor for the branch in 1942. In 1933 Mr. Sanger was president of the Association of Professional Engineers of Manitoba. He is also a member of the American Institute of Electrical Engineers.

C. G. R. Armstrong, M.E.I.C., consulting engineer, Windsor, Ont., will represent the Province of Ontario as vice-president of the Institute.

Mr. Armstrong was born at Merlin, Ontario, and attended highschool there and at Leamington, Ont. He graduated from the University of Toronto in 1920 with a degree of B.A.Sc. In 1924 he received his certificate as an Ontario Land Surveyor.

C. G. R. Armstrong, M.E.I.C.

He gained his early engineering experience with the International Nickel Company, on topographical and underground surveys at Creighton Mines. In 1920, he was assistant construction superintendent with Brunner Mond Canada Limited, at Amherstburg, Ont. In 1921 and 1922, he was on the staff of University of Toronto as a demonstrator in engineering drawing. The following year he entered the employ of the late J. J. Newman, consulting engineer and Ontario Land Surveyor at Windsor, and in 1925 entered the partnership of Newman and Armstrong in that city. Since 1944 Mr. Armstrong has operated his own business under the name of C. G. Russell Armstrong, consulting engineer.

J. W. Morris, M.E.I.C., has been elected councillor of the Institute to represent the Newfoundland Branch.

Mr. Morris who was born at Wallace, N.S., studied at McGill University where he received a B.A.Sc. degree in 1894.

He worked first on operation and construction for the Montreal Street Railway. He was later associated with the Royal Electric Company's hydro electric nstallations at DeCew Falls, Ont., and t Chambly, Que., and worked on general servicing for the Company in Quebec and Ontario. He was later in Kingston, Jamaica, and in Georgetown, British Guiana, as superintendent of construction for street railways. For

J. W. Morris, M.E.I.C.

many years Mr. Morris was associated with Reid Newfoundland Company, St. Johns, as superintendent of the electrical department. He was made general manager of the Newfoundland Light and Power Co. Ltd., on transfer of the company to the Royal Securities Corporation. Mr. Morris is now retired.

Mr. Morris became a Member of the Institute in 1920.

M. L. Baker, M.E.I.C., associate professor of mechanical engineering at Nova Scotia Technical College, Halifax, has been elected to the Council to represent the Halifax Branch.

Mr. Baker was born at Pinehurst, N.S. He was a machinist for the Acadia Gas Engines Ltd., Bridgewater, N.S., before

M. L. Baker, M.E.I.C.

attending Nova Scotia Technical College, from which he graduated in mechanical engineering in 1932. He worked for Hillis & Sons Ltd., Halifax as a sales engineer for a year before joining the staff of the N.S.T.C., as an instructor. He was appointed assistant professor of mechanical engineering in 1938.

He joined the Institute as a Member in 1945 and was chairman of the Halifax Branch in 1949. Active also in the Association of Professional Engineers of Nova Scotia, he was a member of council of the Association for the term 1948-50.

D. O. Turnbull, M.E.I.C.

D. O. Turnbull, M.E.I.C., who was chairman of the St. John Branch in 1950, has been elected to the Council of the Institute.

Mr. Turnbull has been in private practice as a consulting engineer in Saint John, N.B. since 1945. He had been in the Navigation Branch of the R.C.A.F. from 1939 to 1944.

Born at Rothesay, N.B., he studied at Rothesay Collegiate School and Ridley College, St. Catharines, Ont. He went to Royal Military College, Kingston, Ont., graduating in the class of 1929. He worked for a time for Canadian Industries Limited and in 1930 he joined the Foundation Company of Canada Ltd. He was a job engineer and later a job superintendent with the Foundation Company until 1939.

Joining the Institute as a Junior in 1932, he transferred to Associate Member in 1939 and to Member in 1940. He has been active in the Saint John

W. P. C. LeBoutillier, M.E.I.C.

Branch, and is a councillor of the Association of Professional Engineers of New Brunswick.

W. P. C. LeBoutillier, M.E.I.C., assistant general superintendent of the Kenogami Mill of Price Brothers & Company, Limited, has been elected to council to represent the Saguenay Branch.

Born at Quebec City, he attended Royal Military College, Kingston, graduating in 1925. He received a bachelor of science degree in civil engineering from McGill University the following year. He joined the Bell Telephone Company of Canada upon graduation and was posted to the Montreal division outside plant engineer's office, where he remained until 1929. At that time he left Montreal for the north country to work in pulp and paper industry, joining Price Brothers & Company Limited, at the Kenogami Mill. During World War II he served with the Canadian Army, returning in 1945 to Kenogami.

He has been a member of the Saguenay Branch since 1929 and during this period served as branch secretary, vice-chairman and chairman. He joined the Institute as a Junior, transferring to Associate Member in 1938, and to Member in 1940.

Milton Eaton, M.E.I.C., has been elected to the Council of the Institute to represent the St. Maurice Valley Branch.

M. Eaton, M.E.I.C.

Mr. Eaton is an electrical engineer for Shawinigan Chemicals Limited, Shawinigan Falls, Que. He was awarded the Gzowski Medal of the Engineering Institute in 1933 for his paper "Automatic Operation of Electric Boilers". He is responsible for later improvements in electric boiler controls described in a paper presented at the A.I.E.E. summer general meeting of 1947 and published in the October, 1947, issue of "Electrical Engineering."

Born at Whitewater, Man., he studied at McGill University and graduated with the degree of B.Sc. in electrical engineering in 1921. During 1921-22 he was on the engineering staff of the Shawinigan Water and Power Company at Shawinigan Falls, Que.

From October 1922, he was in charge of the electrical department of the Canadian Electro Products Co. Ltd., the company which in 1927 was incorporated as Shawinigan Chemicals Limited.

He joined the Institute as a Student in 1920, becoming an Associate Member in 1925 and a Member in 1940. He was chairman of the St. Maurice Valley subsection of A.I.E.E., in 1947-48; chairman of the St. Maurice Valley Branch of the E.I.C. in 1948-49.

H. Gaudefroy, M.E.I.C., who has been elected a councillor of the Institute to

H. Gaudefroy, M.E.I.C.

represent the Montreal Branch, is a professor at Ecole Polytechnique, Montreal.

Mr. Gaudefroy was born in Montreal and studied at Mont Saint Louis College and at Ecole Polytechnique where he graduated in civil engineering in 1933. He did post-graduate work at the Massachusetts Institute of Technology, obtaining a degree in electrical engineering in 1934. For the next four years he was an engineer with the Bell Telephone Company in Montreal, working on automatic central office equipment.

He joined the staff of Ecole Polytechnique in 1939 as assistant professor of mathematics. He was named associate professor in 1943, and assistant to the dean, and registrar. In 1947 he became a full professor.

A reserve officer of the R.C.A.F., with the rank of squadron leader, he is commanding officer of the University of Montreal Reserve University Flight. He has been secretary-treasurer of the Graduate Society of Ecole Polytechnique since 1940.

He has worked on committees of professional societies in which he holds membership — the Corporation of Professional Engineers of Quebec, the American Society for Engineering Education, and the Engineering Institute. He was chairman of the Montreal Branch of the Institute in 1950. He had joined the Institute as a Junior in 1934, transferring to Member in 1942.

A. S. Rutherford, M.E.I.C., vice-president of J. L. E. Price & Company Limited, Montreal, has been elected a councillor of the Institute to represent the Montreal Branch.

Mr. Rutherford, a Montrealer, entered the Royal Military College of Canada in 1917 and graduated in 1920. He went to McGill University where he received a degree of bachelor of science, in civil engineering in 1922. That year he joined

A. S. Rutherford, M.E.I.C.

Church Ross Company Ltd., engineers and contractors, for whom he worked as office engineer, field engineer and construction superintendent for six years. From 1928 to 1932 he was with George A. Fuller Company of Canada Ltd., Montreal as superintendent of construction of the Dominion Square Building, C.I.L. House, and the Canadian General Electric Building, in Montreal. In 1932 be became associated with J. L. E. Price, M.E.I.C., and A. Turner Bone, M.E.I.C., in the formation of J. L. E. Price & Company Limited, builders and contractors, and he was appointed the vice-president of the company.

From 1940 to 1945 he served in the Canadian Army, and held the following posts: with the Royal Canadian Engineers as company commander; Assistant Director of labour, Canadian Army; and C.R.E., Second Canadian Army Troops, R.C.E.

He joined the Institute in 1920 as a Student, transferring to Associate Member in 1928, becoming a Member in 1940.

A. C. Ross, M.E.I.C.

A. C. Ross, M.E.I.C., president of Ross-Meagher Limited, Ottawa, will represent the Ottawa Branch on the Council of the Institute.

A native of Ottawa, he studied at Ottawa public and normal schools and Ottawa Collegiate. He went to McGill University and graduated with a degree of bachelor of science in electrical engineering in 1911. He worked as an inspector and assistant electrical engineer for National Transcontinental Railway form 1911 to 1914. He took the 1st Reinforcing Company from the 38th Battalion overseas in the spring in 1915. He served in England, France and Belgium with the 12th Reserve Battalion, the 38th Battalion, and the 4th Canadian Entrenching Battalion, as captain, and was promoted to major. He was invalided home in 1918, and after his discharge, became a partner in Ross and Meagher. The firm later became Ross-Meagher Limited, general contractors and engineers.

Mr. Ross was president of the Canadian Construction Association in 1949, and during 1950 was chairman of the Ottawa Branch of the Engineering Institute. He joined the Institute in 1933. He is a member of the Association of Professional Engineers of Ontario, and a past-president of the Ottawa Board of Trade.

M. G. Saunders, M.E.I.C., plant engineer for the Aluminum Company of Canada, Limited, Kingston Works, will represent the Kingston Branch on the Council of the Institute.

Born at Elgin, N.B., Mr. Saunders attended Acadia University. He served overseas from 1915 to 1919 with the C.E. and the R.A.F. He received the degree of B.A. from Acadia in 1916, in absentia. He entered Nova Scotia Technical College on his return and received the degree of B.Sc. in mechanical engineering 1923. He served as assistant professor

M. G. Saunders, M.E.I.C.

of engineering at Acadia University for 4 years and in 1927 received a master of arts degree from that university. He joined the staff of the Aluminum Company of Canada Limited at Arvida that year as a mechanical engineer, becoming mechanical superintendent in 1932. He transferred as plant engineer, in 1945, to the Kingston Works of the Aluminum Company of Canada Limited.

While at Arvida Mr. Saunders was active in the Saguenay Branch of the Institute; he was chairman in 1939-40, and a member of council for that branch in 1941-43. He has represented the Kingston Branch on the Ontario Provincial Division of the Institute since the

E. R. Graydon, M.E.I.C.

formation of the Division. He joined the Institute in 1933 as an Associate Member, transferring to Member in 1940.

E. R. Graydon, M.E.I.C., chief engineer for the Ontario division of the Dominion Bridge Company, Limited, has been elected a councillor to represent the Toronto Branch of the Institute.

Mr. Graydon was born in Toronto, and received his engineering education at the University of Toronto, graduating in 1935 in civil engineering. He was employed by the Toronto Iron Works Ltd., before joining the Dominion Bridge Company Limited, in 1937. He received the appointment as chief engineer in 1947.

Mr. Graydon joined the Institute as a Member in 1942, and has served the Toronto Branch as chairman of the Junior Section and chairman of the Branch. He is a member of the Association of Professional Engineers of the Province of Ontario, and an associate member of the American Society of Civil engineers.

V. A. McKillop, M.E.I.C.

V. A. McKillop, M.E.I.C., has been re-elected councillor of the Institute representing the London Branch.

He was born at West Lorne, and graduated from the University of Toronto with a B.A.Sc. degree in 1924. On graduation Mr. McKillop joined the staff of the Public Utilities Commission, London, Ontario, as assistant engineer, and two years later was promoted to engineer. He later became assistant manager and in 1949 became assistant general manager and secretary of both the Public Utilities Commission and the London Railway Commission.

Mr. McKillop joined the Institute as a Junior in 1926, transferring to Associate Member in 1927, to Member in 1940. He is a past-chairman of the London Branch, and has completed two previous terms as councillor for the London Branch.

G. W. Lusby, M.E.I.C.

G. W. Lusby, M.E.I.C., will represent the Border Cities Branch of the Institute on the Council.

Mr. Lusby was born at Ahmerst, N.S., in 1903. He attended Acadia University, and Nova Scotia Technical College, Halifax, receiving a B.Sc. degree in mechanical engineering in 1925.

He worked for Canadian International Paper Company at Three Rivers, Que., on the resident engineers staff in 1925. With Fraser Brace Engineering Company, Gatineau, Que., the next year, he worked on paper mill construction. He joined Ford Motor Company of Canada Ltd., at Windsor, Ont., in 1927 to work on layout and design of plant equipment. He has remained with the Company, and is engineer to the general superintendent of plant 4, body and final assembly division.

Mr. Lusby joined the Institute as a Student in 1925, transferring to Junior in 1931, to Associate Member in 1937, and to Member in 1940. He has been active in the Border Cities Branch, serving as its secretary-treasurer in 1947, and as its chairman in 1949.

E. R. Eaton, M.E.I.C., of Canadian Johns-Manville Co. Ltd., Sudbury, has been elected Councillor representing the Sudbury Branch for the term 1951-52.

A charter member of the new Sudbury Branch formed last year, Mr. Eaton was its first councillor. He has been a member of the Institute since 1943. He is also a member of the Association of Professional Engineers of Ontario.

Born and educated at Orillia, Ontario, he attended the University of Toronto, graduating with the degree of B.A.Sc. in mechanical engineering in 1936.

E. R. Eaton, M.E.I.C.

Following graduation he joined the Steel Company of Canada Ltd., at Canada Works, in Hamilton, working on the improved performance of cold heading tools. In 1939 Mr. Eaton was appointed plant superintendent of the East Mill, and in 1945 project engineer for Canada Works.

Early in 1947 he joined Canadian Johns-Manville, and since that time has been located in Sudbury as district sales engineer.

S. E. Flook, M.E.I.C., city engineer of Port Arthur, Ont., has been elected councillor to represent the Lakehead Branch of the Institute.

Mr. Flook was born at Willowdale, Ont., and attended Toronto University where he obtained a B.A.Sc. degree in 1912. He received the degree of O.L.S. in 1913.

In 1913 he moved to Port Arthur and practiced surveying and engineering until 1934, at which time he received the appointment as city engineer of Port Arthur.

Mr. Flook was chairman of the Lakehead Branch of the Institute in 1947. He has been a Member since 1936.

E. J. Durnin, M.E.I.C., construction engineer for the Saskatchewan Power Corporation, has been elected to the Council

S. E. Flook, M.E.I.C.

E. J. Durnin, M.E.I.C.

of the Institute to represent the Saskatchewan Branch.

Mr. Durnin was born at Dauphin, Man. He was educated at Melfort, Sask., and at the University of Saskatchewan, graduating as a bachelor of arts in 1924. He was for two years in Royal Canadian Air Force, after which he attended University of Manitoba and graduated with a degree of B.A.Sc. in electrical engineering in 1928. The following year he went to Canadian Westinghouse Company, Hamilton, Ontario, for an apprentice course. He became associated with the Saskatchewan Power Commission in 1930. He was successively assistant engineer and district operating superintendent for the Saskatoon power plant, and commercial superintendent at Regina. From 1940 to 1945 he served in Canada, England and N.W. Europe, with the Royal Canadian Engineers, returning to Saskatchewan Power Corporation in 1946.

He joined the Institute as a Junior in 1930, becoming an Associate Member in 1939 and Member in 1940.

H. W. Tye, M.E.I.C., will represent the Edmonton Branch on the Council of the Institute.

During the past year Mr. Tye has been executive secretary for Alberta Division, Prairie Roadbuilders Section, Canadian Construction Association at Edmonton.

H. W. Tye, M.E.I.C.

Mr. Tye was born at Haysville, Ont., and attended Galt Collegiate Institute. He graduated from the University of Toronto in 1908. He was employed by the construction department of Canadian Pacific Railway until 1922 on various engineering projects in Western Canada. He transferred to the Lacombe North-Western Railway Co. in 1922, and was in charge of engineering and operation until 1928. He joined the Northern Alberta Railway Company then, and was engineer in charge of maintenance and construction until his retirement in 1949.

Mr. Tye served overseas as a battalion works officer attached to the Winnipeg Grenadiers in World War I. He was awarded the Military Cross at Passchendale.

He joined the Institute as a Member in 1944.

A. H. W. Busby, M.E.I.C., has been elected to represent the Kootenay Branch on the Council of the Institute. Mr. Busby is with Consolidated Mining and Smelting Company of Canada Limited at Trail, B.C.

Mr. Busby was born in Birmingham, England. He graduated in mining engineering from University of Birmingham, in 1923. He had completed an apprenticeship with General Electric Company at Birmingham, in 1918, and had served in 1918 and 1919 with the Royal Air Force before entering University.

A. H. W. Busby, M.E.I.C.

He was an electrical research engineer with the Mines Department in England for a time before coming to Canada in 1924 and joining the electrical department of Consolidated Mining and Smelting. He was assistant superintendent of the electrolytic department of the company's zinc plant from 1927 to 1930. Subsequent appointments in the Company were as follows: senior research assistant in the Research Department, 1930; senior research engineer and supervisor of the instrument and physical testing division, 1942; superintendent of physical research, 1945; superintendent of engineering research and development, 1946. Mr. Busby was awarded the Gzowski Medal of the Institute in 1949.

He is a member of the Association of Professional Engineers of British Columbia; of the National Association of Corrosion Engineers, the Instrument Society of America, and the Society of Experimental Stress Analysis. He was chairman of the Kootenay Branch of the Engineering Institute in 1949.

G. W. Allan, M.E.I.C., president of Canadian Sumner Iron Works Limited, has been elected councillor of the Vancouver Branch of the Institute.

Mr. Allan was born in Scotland, and received public and high school education in Vancouver, Canada. He returned to Scotland, where he graduated from the Royal Technical College of Glasgow in mechanical engineering, and served an apprenticeship as an engineer with Mirrlees-Watson Glasgow Co.

Returning to Canada in 1911, he joined the engineering staff of the B.C. Sugar Refining Co., before forming the engineering firm of Allan & McKelvie, later incorporated as the Canadian Sumner Iron Works Limited. In 1918 he was appointed vice-president and he became president in 1928.

G. W. Allan, M.E.I.C.

Mr. Allan was chairman of the Vancouver Branch in 1949. He had joined the Institute as a Member in 1942.

P. B. Stroyan, M.E.I.C., superintendent of the Board of Park Commissioners, Van-

P. B. Stroyan, M.E.I.C.

couver, will be a councillor of the Institute representing the Vancouver Branch.

Mr. Stroyan was born in Derby, England. He studied civil engineering in Canada at the University of British Columbia, graduating in 1924 with a B.A.Sc. degree. In the next 10 years he was employed on design and construction of concrete and structural steel works at the S. E. Junkins & Major Co.; Major J. R. Grant, consulting engineer; John S. Metcalfe Co., Vancouver; and Major W. G. Swan, consulting engineer; and with the Vancouver School Board. In 1935 he worked for Consolidated Mining and Smelting Company on design and details of industrial buildings. In 1936 he was clerk of works on school construction for the Vancouver School Board. He joined the Vancouver Parks Board as assistant superintendent and engineer in 1937.

In 1948 Mr. Stroyan was chairman of the Vancouver Branch of the Institute, and in 1949 he was president of the Association of Professional Engineers of British Columbia. He joined the Institute as an Associate Member in 1938 transferring to Member in 1940.

Personals

News of the Personal Activities of Members of the Institute

Reginald Bowering, M.E.I.C., has been elected councillor for the Victoria Branch of the Institute. Mr. Bowering is in Korea at present on leave of absence from the Department of Health and Welfare of British Columbia.

Mr. Bowering, a sanitary engineer in the Health Department was the only Canadian engineer selected to join the six teams of doctors and engineers sent to Korea.

Mr. Bowering received the degree of B.Sc. from the University of Manitoba in 1938 and graduated with a M.A.Sc. degree in public health training at the University of Toronto in 1939. He joined the British Columbia Health Department in 1940, as public health engineer and chief sanitary inspector. He was later appointed director of the division of public health engineering of the Department of Health & Welfare.

R. Bowering, M.E.I.C.

He has taken active interest in stream pollution control and is a member of the Pacific Northwest Pollution Control Council.

He joined the Institute as a Member in 1942. He was chairman of the Victoria Branch in 1949.

R. W. Diamond, M.E.I.C., vice-president and general manager of The Consolidated Mining and Smelting Company of Canada, Limited, has been awarded the medal of the Institute of Metals of London, England. This medal is the highest award made by the Institute of Metals and is presented for outstanding services to the non-ferrous metal industries. As a recipient of this honour from one of the world's most prominent technical societies, Mr. Diamond joins a company of other very distinguished metallurgists.

R. W. Diamond, M.E.I.C.

Mr. Diamond is a past-president of the Canadian Institute of Mining and Metallurgy. He was the recipient of the Julian C. Smith Medal of the Engineering Institute in 1949.

Major-General C. R. S. Stein, M.E.I.C., has been appointed civil defence co-ordinator for the Province of British Columbia.

The Engineer Sub-committee of the Greater Victoria Civil Defence Board includes **A. S. G. Musgrave,** M.E.I.C., chairman; **H. D. Dawson,** M.E.I.C., and **H. F. Bourne,** M.E.I.C.

The work of the co-ordinator is already under way in its organization, and the education of the public for the civil defence programme is to begin soon.

H. F. Finnemore, M.E.I.C., chief electrical engineer of Canadian National Railways, Montreal, was guest speaker at the regular monthly meeting of the Central Electric Railfans Association at Chicago, in January. Mr. Finnemore described the electrification system of the Canadian National in connection with the Montreal terminal and Montreal suburban lines for which the company recently received three new locomotives, and now has on order 18 multiple-unit suburban motor and trailer coaches.

P. M. Sauder, M.E.I.C., has resigned as general manager of the Western Irrigation District. He was appointed, during 1950, colonization manager of the De-

P. M. Sauder, M.E.I.C.

partment of Water Resources of the Alberta Government, in connection with the St. Mary River Development.

One of the major responsibilities of the government will be colonization of the adjacent lands when that project is completed. Mr. Sauder is manager of the St. Mary River Development. He will transfer to S.M.R.D. the colonization staff of the Lethbridge Northern Irrigation District, whose colonization work is practically completed.

Mr. Sauder directed the Lethbridge Northern Irrigation District, launched in 1919, from 1924-1940. He was then appointed director of water resources for the Province, and since 1944 he has been general manager of the Western Irrigation District at Strathmore, Alta. He will continue to act as a consultant to the Western District.

George W. Rayner, M.E.I.C., president of Rayner Construction Co. Ltd., Toronto, is among those engineers whose names have been given to new projects of the Ontario Hydro-Electric Power Commission. He was recently presented with an illuminated scroll in appreciation of his work in the construction of Ontario Hydro's tunnel development on the Mississagi River, near Thessalon. The development has since been renamed the George W. Rayner Generating Station.

The presentation was made at the annual dinner of the Ontario Road Builder's Association on February 21. Mr. Rayner is a past-president of the Association.

Dr. A. E. Berry, M.E.I.C., director of the sanitary engineering division of the Ontario Health Department, has been elected president of the American Water Works Association.

Dr. Berry is a graduate of Toronto University, where he received a degree in civil engineering with honours in 1917, and in 1921 a degree of M.A.Sc. He has been with the Ontario Department of Health since 1917, returning from service overseas in the First World War to the engineering staff. He was appointed director of the sanitary engineering division in 1926, being made responsible for supervisory control over

Dr. E. A. Berry, M.E.I.C.

all of the public waterworks and sewerage systems in Ontario.

Among his many contributions to professional associations has been service as councillor of the Engineering Institute, representing the Toronto Branch (1941); president of the Federation of Sewage Works Associations (1944); chairman of the Canadian Section of American Water Works Association; and secretary of the Canadian Institute of Sewage and Sanitation.

Bell Telephone Appointments

A. J. Groleau, M.E.I.C., **A. G. Anderson,** M.E.I.C., and **C. L. Dewar,** M.E.I.C., were involved in organization changes an-

A. G. Groleau, M.E.I.C.

nounced recently by The Bell Telephone Company of Canada.

Mr. Groleau, formerly staff assistant, assistant vice-president (engineering),

C. L. Dewar, M.E.I.C.

has been appointed chief engineer, eastern area. A graduate of McGill University, he joined the Bell Company in 1928 as a student engineer. He has held various engineering posts with the company, being successively a traffic assistant, dial equipment engineer, a maintenance and dial equipment engineer and general facilities superintendent. He has been a member of the Engineering Institute since 1928.

Mr. Dewar, formerly assistant vice-president (engineering), has been appointed general manager, eastern area. Following his graduation from McGill University, he joined the Bell Company as a student engineer in 1923. Prior to the Second World War, he held appointments as assistant field engineer,

A. G. Anderson, M.E.I.C.

superintendent of construction and plant, and as a dial equipment engineer and chief engineer, eastern area. During the Second World War he was president of Wartime Shipbuilding Limited at Montreal. He returned to the Bell Telephone in 1945. He has been a member of the Engineering Institute since 1937.

Mr. Anderson, formerly assistant vice-president (operations), has been appointed assistant vice-president (engineering). Also a graduate of McGill, he entered the service of the Bell Telephone in 1921 as a student engineer. He has held various engineering posts with the company as equipment engineer, machine switching equipment engineer, general traffic engineer, plant extension engineer and operating results supervisor. In 1941 he was appointed chief engineer, eastern area. He has been a member of the Engineering Institute since 1944.

Alfred M. Beale, M.E.I.C., has retired from Water & Power Bureau, Department of Mines and Resources, Ottawa, Ont.

Mr. Beale graduated in 1905 from London University, England, with the degree of B.Sc. in engineering. After graduation he worked for Tangyes Ltd., Birmingham, England. Coming to Canada in 1906 he worked in the drawing office of the Dominion Bridge Co. Lachine, Que., and with the American Bridge Co., in Detroit, before going, in 1908, to the Railway Lands Branch of the Department of Interior, Ottawa. He did exploration work in Northern Saskatchewan and Alberta, and worked on the Winnipeg River water power survey, in his early years with the Department. He became a senior assistant engineer in the Water Power Branch in 1920. He has remained associated with the Federal Water and Power Bureau, which later came under the Department of Mines and Resources. He was an engineer Grade 5 before his retirement.

Thomas O. Whillans, M.E.I.C., of Ottawa, has been promoted to the post of assistant commissioner of patents with the Patent and Copyright Office of the Secretary of State Department.

Mr. Whillans joined the patent office in 1921 as an assistant patent examiner and has held progressively higher posts since that time.

A native of Ottawa, Mr. Whillans received his education in that city and at Queen's University, where he graduated with a B.Sc. degree in mechanical engineering in 1917.

B. G. Ballard, M.E.I.C.

B. G. Ballard, M.E.I.C., director of the Radio and Electrical Engineering Division, National Research Council, has been elected chairman of the Ottawa Branch of the Institute.

Mr. Ballard graduated in electrical engineering from Queen's University following which he took the graduate engineering course in the Westinghouse Electric and Manufacturing Company at East Pittsburgh, Pa. He then entered the engineering department of that company, remaining there until 1930. He joined the staff of the National Research Council assuming charge of the Electrical Engineering Laboratory. In 1948 he assumed his present position. He was a recipient of the Institute's Ross Medal for the year 1948.

John M. Hansen, M.E.I.C., is with Defence Construction Limited, at Edmonton, Alta.

Mr. Hansen graduated in civil engineering in 1933 from Royal Technical College, Copenhagen, with a degree of B.Sc. In Europe he did designing and construction engineering and road engineering. He was a superintendent for the firm of civil engineers, Rasmussen and Scholtz, in Copenhagen, before coming to Canada in 1947. He was employed as designer and draughtsman by W. M. Barnes, general contractor, in Edmonton. During 1949 he worked for Sparling & Davis, general contractors, Edmonton, after which he worked for City of Edmonton engineering department, on design and construction.

Arthur H. Hull, M.E.I.C., is retiring from the Hydro-Electric Power Commission of Ontario, after many years of service with the Commission.

Mr. Hull graduated from Toronto University with a degree of B.A.Sc. in 1906, he followed the engineering apprenticeship course of Canadian Westinghouse Co., Hamilton. In 1909 he went to Smith Kerry & Chase, Toronto, as an electrical draughtsman, working with the company until 1913. He then joined the Ontario Hydro as an engineer assistant on field inspection. He was made engineer-in-charge of the station section, Electrical Engineering Department in 1920, and acting chief electrical engineer in 1938. He was appointed head of the electrical engineering department in 1946. Since 1949 he was a consulting electrical engineer in the generating division of the Commission.

H. H. Tripp, M.E.I.C., division engineer, for the Canadian Pacific Railway Company at Fort William, Ont., has retired from the Company.

Mr. Tripp graduated from Cornell University in 1903, and joined the Canadian Pacific Railway in 1909. His work with the Railway has included appointments as transitman at Cranbrook, B.C., and in Northern Alberta; resident engineer at Edmonton; chief clerk at Calgary; resident engineer at Winnipeg terminals; resident engineer at Kenora. He was transferred from Edmonton to Fort William, Ont., as division engineer in 1939.

W. R. Alder, M.E.I.C., London division engineer of the Department of Highways of Ontario for the past 16 years has retired from the Department.

Mr. Alder has been with the department since shortly after the Highways Improvement Act was passed, has seen and supervised much of the tremendous expansion and improvement of Ontario highways.

He graduated from Queen's University, Kingston in 1907. He was assistant engineer of the Highways Department in the Prescott area from 1919 to 1924, when he was moved to Durham to take charge of the Owen Sound division. He was appointed London division chief in 1935.

John A. Murray, M.E.I.C., has announced the formation of his own manufacturers' sales agency with headquarters at Winnipeg, specializing in automotive products and covering Western Canada.

Mr. Murray has been associated as sales manager for the past three years with James B. Carter Limited and Electric Heating and Manufacturing Company Limited, Winnipeg.

Prior to joining the Carter organization he was engaged in manufacturing and engineering work with the Aluminum Co. of Canada Limited and Northern Electric Co. Limited. He is an engineering graduate of the University of Toronto, class of 1940.

C. D. Carruthers, M.E.I.C.

Mr. Carruthers' election as chairman of the Toronto Branch was announced in the March issue.

S. Barkwell, M.E.I.C., has joined the apparatus division of Canadian General Electric Company's Winnipeg district office, from the company's Head Office, after a number of years' experience specializing in the design of power transformers.

He graduated in 1940 from the University of Manitoba with the degree of B.Sc. in electrical engineering.

Peter W. Gow, M.E.I.C., has been appointed manager of manufacturing for Canadian Allis-Chalmers Limited at their plant in Lachine.

Mr. Gow joined the Company as draughtsman in 1920 at their Davenport Works, Toronto. In 1934 he was transferred to the Lachine plant and a year later was appointed chief draughtsman. It was while he was head of the engineering department, the Company was able to secure such contracts as the Aluminum Company's Shipshaw project and the Welland Canal Gate Lifter, among others.

He was appointed works engineer in 1946. When Canadian Allis-Chalmers became a subsidiary of Allis-Chalmers, Milwaukee, Wisc., in February 1951, Mr. Gow was appointed to his new position.

Born in London, England, and educated at Woolwich Polytechnic and Woolwich Arsenal, Mr. Gow graduated there in 1920. The same year he came to Canada.

M. L. Zirul, M.E.I.C.

M. L. Zirul, M.E.I.C., secretary-treasurer of the Central B.C. Branch, of the Institute, has been appointed district engineer at Kamloops, B.C., for the Water Rights Branch of the Department of Lands and Forests, B.C.

A graduate of the University of British Columbia he obtained a B.A.Sc. degree in civil engineering in 1941, after which he worked for the Dominion Water and Power Bureau, Department of Mines and Resources, in the Kootenay District. In 1944 and 1945 he was employed by Powell River Paper Company, Powell River, B.C., on construction of various projects of the Company. He was draughtsman on reinforced concrete and steel design of the new hydraulic barker and chipping plant in 1945-46. He went to the Water Rights Branch in 1946.

Walter E. Burke, M.E.I.C., is assistant design engineer with the New Zealand State Hydro-Electric Department in Wellington, New Zealand.

Mr. Burke graduated from London University, receiving a B.Sc. degree in engineering in 1938, after which he worked with Westinghouse Brake and Signal Co. Ltd., in London, England. From 1941 to 1944 he was an officer in a railway mobile workshop unit, Royal Engineers, in charge of repairs of rolling stock, operating in England and French North Africa. Later he was a workshops officer with a transportation stores unit in Italy. In 1946 he was appointed a staff officer (with rank of major) at Railway Headquarters in British Occupation Zone of Austria.

In Canada in 1949 he joined Canadian Car and Foundry Company as a sales engineer.

A. F. Paget, M.E.I.C., has been appointed chief engineer of the Water Rights Branch of the B.C. Department of Lands and Forests, Victoria, B.C.

Mr. Paget is originally from Saskatchewan, and received his education in Edmonton. From 1923 to 1931 he was with Canadian Pacific Railway. In 1935 he was appointed superintendent and manager for Keremeos Irrigation District where he remained until 1941. For four years he served in the Canadian Army (Active), R.C.E. as a works officer and district engineer officer. During 1946-1947 he was assistant city engineer and building inspector of the City of Vernon. He joined the Water Rights Branch as assistant engineer in 1947, and he was district engineer at Kelowna, B.C., before his recent appointment.

He is vice-chairman of the Central B.C. Branch of the Institute.

W. A. Kerr, M.E.I.C., who was assistant district engineer at Kelowna, for the Water Rights Branch of the B.C. Department of Lands and Forests at Kelowna, B.C., is now district engineer.

Mr. Kerr is a graduate of the University of British Columbia, receiving a B.A.Sc. degree in 1945. Previous to joining the Water Rights Branch in 1946 he was with the Northern Construction Co. & J. W. Stewart Ltd.

G. H. Dunphy, Jr.E.I.C., has recently been appointed by Canadian General Electric Company as its specialist in distribution equipment for utilities, throughout the Maritimes and Newfoundland. He joins the supply division staff in the company's Halifax district office.

Mr. Dunphy graduated in mechanical engineering in 1947 from Nova Scotia Technical College. Since that time he has served with C.G.E. in the east and at its head office in Toronto, specializing in utility and lighting equipment.

L. M. Poitevin, Jr.E.I.C., of the Canadian National Railways staff in Cochrane, Ont., has been appointed a Laurentian division engineer in Quebec City.

A graduate of McGill University he joined the railway as a draughtsman in the research and development department in 1944. In 1948 he was made an instrumentman in the division at Cochrane, Ontario. He served as assistant engineer on the Laurentian division prior to his present appointment.

E. G. F. Sweet, Jr.E.I.C., is with the engineering department of the Brantford Coach and Body Co., Ltd.

Previously he was mechanical engineer with Babcock Wilcox and Goldie McCulloch, Galt, Ont.

R. P. Proctor, Jr.E.I.C., who graduated from Nova Scotia Technical College in mechanical engineering in 1947 is now employed by the Dow Chemical of Canada. He was a steam plant engineer with Canadian Celanese Ltd., in Drummondville, Que., before going to his present position.

H. J. T. Patterson, Jr.E.I.C., is junior design engineer for Dominion Structural Steel Co., Montreal. He was in Trenche, Que., working for the Shawinigan Engineering Co., after graduating from McGill University in 1948 in civil engineering.

Harley K. Larsen, Jr.E.I.C., is now employed by E. G. M. Cape & Co. on the construction of the extension to the Dominion Public Building in Moncton, N.B. Previously he was employed by T. Pringle & Son, working in Montreal and Three Rivers and also by the Fluor Corporation of Los Angeles, and the Dominion Bridge Co., Ltd., of Montreal.

He graduated from University of New Brunswick in civil engineering in 1949.

W. I. Honeyman, Jr.E.I.C., who was previously in Toronto, Ont., working in the technical department of E. F. Drew Co., is now in Montreal employed as a sales engineer for Canada Colors & Chemicals (Dominion) Ltd.

He graduated in chemical engineering from McGill University in 1949.

Murray E. Blanchard, Jr.E.I.C., is a construction enginer on the Peribonka No. 1 Development of the Aluminum Company of Canada, Limited, at Isle Maligne, Que. Previously he was a design engineer for the Saint John Sulphite Co., Fairville, N.B.

J. B. Goodfellow, Jr.E.I.C.

J. B. Goodfellow, Jr.E.I.C., has been transferred to Montreal in the capacity of district TRANSITE pipe manager for the Canadian Johns-Manville Co. Ltd.

Mr. Goodfellow is a graduate of McGill University in mechanical engineering. From 1941 to 1947, he was with the Grinnell Company of Canada, Ltd., as a fire protection engineer. Following this, he was employed by the Canadian Johns-Manville Co. Ltd., as construction superintendent of the applied insulation department and by Stadler-Hurter, consulting engineers, in the capacity of section leader for water, sewerage and fire protection design. In 1949, he rejoined Canadian Johns-Manville in Toronto as technical assistant in the TRANSITE pipe department.

He joined the Engineering Institute of Canada in 1942 and, while in Toronto, assisted on the Paper's Committee for the 64th Annual Meeting.

W. O. Bratina, Jr.E.I.C., will work for the Ontario Research Foundation in Toronto as a metallurgist. Previously he was with Canadian Sugar Factories Ltd., at Taber, Alberta.

J. G. Townsend, S.E.I.C., of Hamilton. Ont., is with Spartan Air Services Ltd., Ottawa, Ont. He operates a helicopter fleet for this company on topographical and geophysical surveys. He graduated in civil engineering from Queen's University in 1950.

W. N. Plumb, S.E.I.C., of Vancouver, B.C., who graduated from the University of British Columbia in 1950, is now employed as a junior mining engineer for Torbrit Silver Mines, Ltd., in Alice Arm, B.C.

F/O A. G. Hoyt, S.E.I.C., is at the R.C.A.F. Station at Edmonton, Alta. He graduated from the University of British Columbia in 1950.

H. D. Adam, S.E.I.C., of Flin Flon, Man., who graduated from the University of Saskatchewan with a degree of B.Sc. in electrical engineering in 1950, is now in Ottawa working in the Department of National Defence, as an electrical engineer.

Visitors to Headquarters

P. A. Voss, Denmark, February 26, 1951.

Leo G. McLaren, M.E.I.C., Rimouski, Que., Feb. 27.

D. W. Hawes, S.E.I.C., Peterborough, Ont., March 6.

A. E. Cameron, M.E.I.C., Halifax, N.S., March 13.

John P. Stirling, M.E.I.C., Pine Portage, Ont., March 27.

F. R. Burfield, M.E.I.C., Edmonton, Alta., March 27.

C. R. Evans, M.E.I.C., Ottawa, Ont., March 27.

G. P. F. Boese, M.E.I.C., Calgary, Alta., March 27.

A. G. S. Musgrave, M.E.I.C., Victoria, B.C., March 29.

W. Thornber, M.E.I.C., Vancouver, B.C., March 29.

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Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

E. S. Mattice, M.E.I.C., of Montreal, died on February 1, 1951.

Born in Cornwall, Ont., in 1870, he was educated at Upper Canada College and McGill University, from which he graduated as a bachelor of applied science in civil engineering in 1890. He went to the Dominion Bridge Company as a draughtsman, and held several positions with the company until 1921. He then went to the Phoenix Bridge & Iron Works, Ltd., Montreal, Que., as managing director. This company was purchased by Canadian Vickers Ltd. in 1923, and Mr. Mattice received the appointment as chief engineer of Canadian Vickers. From 1925 to 1929 he was manager and chief engineer of Steel Gates Company Limited, St. Catharines, Ont., being in charge of construction and erection of the steel gates of the Welland Ship Canal. In 1929 he was appointed vice-president and manager of the National Bridge Company of Canada in Montreal and in 1934 he went to the firm Farand and Delorme. Montreal, as vice-president and general manager.

Mr. Mattice was president of Structural Engineering Co. Ltd.; director of Raymond Construction Co. Ltd., and a director of the Eastern Canada Steel and Iron Works, Ltd.

He was later associated again with Dominion Bridge Company on sales and design work and with the Canadian Institute of Steel Construction. He retired in 1944 from active engineering work.

Mr. Mattice joined the Institute in 1887 as a Student, becoming an Associate Member in 1895, transferring to Member in 1902, and attaining Life Membership in 1932.

W. R. Chisholm, M.E.I.C., retired engineer, and life member of the Institute died June 18, 1950.

Mr. Chisholm was born at Antigonish, Nova Scotia in 1876. He graduated in arts from St. Francis Xavier University in 1896; and in science in 1902. He was for a time professor of mathematics at the University and was later professor of draughting. For a year afterwards he did mechanical work for the Dominion Coal Co., Glace Bay, Nova Scotia. He was then employed for some time by the Halifax and South Western Railway, then under construction. In 1906 he went to the National Transcontinental Railway as resident engineer at Hervey Junction, Que., later becoming division engineer over a section of the railroad. His work included the building of the Batiscon Bridge on that line. Mr. Chisholm's work for the railway was terminated because of failing eyesight.

Returning to South Side Harbour, Antigonish County, Nova Scotia, he purchased a farm and lived there until his death, taking part in movements calculated to advance the social and economic conditions of the district and county.

He joined the Institute as an Associate Member in 1907, transferring to Member in 1940.

Seth W. Crowell, M.E.I.C., civil engineer and land surveyor in private practice died suddenly in January, 1951.

Mr. Crowell was born in Yarmouth, N.S., in 1885. He graduated in arts from Dalhousie University in 1909, and in 1915 he qualified as a Nova Scotia Land Surveyor. Meanwhile he had worked with the Transcontinental Railway, as instrumentman, resident engineer and assistant engineer, transferring in 1912 to the Ottawa headquarters staff. In 1915 he was appointed town engineer for Yarmouth, N.S. He went into private practice in 1923 in Wolfville, N.S. In 1930 he was assistant engineer for the Canadian National Railways at Cape Tormentine, N.B. Later that year he was made assistant engineer of the Nova Scotia Highways Board at Sydney, N.S. He served the Department of Highways for many years at Amherst as resident engineer. He was field engineer for the Department of Transport at Port Mulgrave, Nova Scotia for a time. Mr. Crowell was in private practice in Amherst for several years before his death. He was the chief consultant there in regard to boundary matters.

He joined the Institute as a Junior in 1912 becoming Associate Member in 1918 and transferring to Member in 1940.

C. C. Whittier, M.E.I.C., who retired from Whittier Laboratories, Chicago, Ill., U.S.A., died in December, 1950.

Mr. Whittier was born at Cornville, Maine, in 1876. He graduated from the University of Maine in 1899 with a degree in civil engineering. After graduation he was associated with railway work in Maine and in Mexico. He then joined the Robert W. Hunt engineering organization, working in Chicago and New York. He was general manager of Robert W. Hunt & Co. Limited, in Montreal in 1913. Mr. Whittier became president of Standard Chemical and Mineral Corporation in Chicago, Illinois. He was later associated with Nutrition Research Laboratories, in that city, and with Whittier Laboratories there. He had retired from Whittier Laboratories about 1946.

Mr. Whittier joined the Institute in 1915 as a Member, attaining life membership in 1947.

David B. Carswell, M.E.I.C., of Montreal, a consultant for the shipbuilding industry across Canada for many years died on February 28, 1951.

Prior to his illness last December, Mr. Carswell had been supervising the construction of the large ore-carrier programme at Welland, Ont.

Born in Scotland in 1884, he attended the Paisley & Glasgow Technical Colleges and the Manchester Technical College, graduating in 1912. While in Scotland he served an apprenticeship as mechanical engineer and draughtsman and a marine engineer. He was works manager in Manchester, England for the firm of Sir Henry Simons in 1909 to 1913.

During the first World War he was assistant general superintendent for the Detroit Shipbuilding Co.; and in 1919-1921 he was assistant general manager of McDougall Duluth Shipbuilding Co., Duluth. He came to Canada to work for the Canadian National Steamships, as superintendent. In 1927 he was appointed general manager of the Montreal Dry Docks. He was managing director for Canadian Vickers from 1929 to 1933. That year he associated himself with the Dominion government as marine superintendent. At the outbreak of World War II he was made director general of shipbuilding. He was appointed controller on ship repairs and salvage in 1941 to 1945, serving also in his capacity of director general of shipbuilding in 1944 and 1945. He was made president of the Wartime Shipbuilding Company in 1945. He went into private practice as marine consultant in 1946. In recognition of his work, Mr. Carswell was decorated in 1943 as an Officer of the Order of the British Empire, and at the end of the war was made a Fellow of the Society of Consulting Marine Engineers and Ship Surveyors of London, England.

He joined the Institute as a Member in 1946.

C. A. G. Snelling, JR.E.I.C., of Windsor, Ontario, died accidentally December 30, 1950.

Mr. Snelling was born in Quetta, India, in 1922. He studied at Wellington College, Essex, England, and at The Hill School at Pottstown, Pa. He received B.A.Sc. degree in civil engineering from University of Toronto in 1949. He served with the R.C.A.F. for four years and received the British Empire Medal for bravery.

Joining the Institute in 1949 as a Student he transferred to Junior this year.

News of the Branches

Activities of the Thirty-three Branches of the Institute and abstracts of papers presented at their meetings

Belleville

S. Sillitoe, m.e.i.c.
Secretary-Treasurer

The fourth meeting of the Belleville Branch of the Engineering Institute of Canada was held March 12th at the Kiwanis Centre with fifty members present. Mr. F. F. Fulton, in the chair, called upon Mr. F. Adsett to describe the proceedings at the annual meeting of the Peterborough Branch at which he represented Belleville. Following Mr. Adsett's interesting description of the Peterborough treatment of the birth of the Belleville Chapter, Mr. Fulton called upon Mr. A. L. Killaly to introduce the speaker of the evening, Mr. J. G. G. Kerry, m.e.i.c.

The subject of Mr. Kerry's talk was **Ice on the St. Lawrence Seaway** and was illustrated by lantern slides.

Mr. Kerry took his audience on a trip up the St. Lawrence, beginning at the Gulf and ending at Lake Ontario, describing in some detail the important physical features of the St. Lawrence system, with particular reference to ice formation, water temperature, and salinity. The importance of the St. Lawrence seaway to Canadian economy was emphasized throughout the talk by reference to the development of the Labrador Iron Mines and the general principle that those places which make most rapid and permanent development are those which are served the cheapest form of transportation — by steamer. An interesting aspect of the problem to an engineering society is the fact that once the Government of the country is in a position to decide that the economics of the situation justify enormous expenditures necessary for its development, the establishment of a year round ship channel is in Mr. Kerry's judgment only an engineering problem capable of satisfactory solution. In order to determine the methods by which a solution can be achieved, Mr. Kerry described the process whereby ice was formed on the river and in the gulf and dwelt upon the sources of the currents which carry the ice into the ship channel during the winter months of the year.

Mr. Kerry explained that the St. Lawrence Gulf and Estuary have an extremely deep channel extending from the Cabot Straits up to the mouth of the Saguenay River and thence up that river. In this channel and in the whole Gulf of St. Lawrence, there are most interesting currents which carry the ice into the shipping lanes. The general sources of ice in the ship channel are icebergs which are carried into the straits from the Grand Banks region by the Laurentian current, as well as smaller bergs which come through the Straits of Belle Isle brought down by the Labrador current and vast amounts of river ice in the spring of the year brought down by the Gaspe current from the upper reaches of the river.

The engineering solution to the ice conditions in the Gulf involve the erection of a barrage or rock fill across the Straits of Belle Isle which are relatively shallow. The river ice which is troublesome, particularly below the Island of Orleans just below Quebec, would be taken care of by a diversion dam between the Island of Orleans and the southern shore at the eastern end and a number of diversion dams located at the lower end of the Island and at the Ile aux Coudres which would result in the provision of a ship channel down which the main river current would flow. The resulting dead water except in the main channel would develop a solid ice pack during the winter months which would not get into the ship lane. The ice which is brought into the gulf and estuary by the Laurentian current is mainly in the form of icebergs which are easily located by the Government Navigation Services who give adequate protection to all ships that follow their instructions.

The remainder of the problem is an interesting study of the relationship of water temperature and salinity at various parts of the year. More information is required on this phase of the problem, particularly in the winter time. The formation of a thin sheet of ice which is often broken by the tides is no serious problem but an interesting factor in the improvement of navigation in the St. Lawrence seaway on a year round basis is that by correct design of the channel in the upper reaches of the river, the current might be increased to a rate of an average three miles per hour which would result in the temperature of the water brought down from Lake Ontario being maintained high enough throughout the full course of the river in the ship channel so that the formation of ice would not be a serious problem even in the winter months. Navigation would then be possible throughout the year and very low cost transportation would inevitably result.

It was agreed that the possibilities of such a plan really stimulate the imagination of all who are interested in the building of Canada and it was pointed out that the provision of a seaway would enable ships to ply their way into Lake Ontario which remains free of ice throughout the year. The sheet ice which forms in harbours at Kingston and Toronto would in reality present no problem which could not be surmounted by the use of ice breakers.

Mr. O. H. Scott in moving a vote of thanks to the speaker recounted the association of Mr. Kerry with the early power developments in the area surrounding Belleville and reminisced on his association with Mr. Kerry when he was a professor at McGill University and later as a member of the firm of consulting engineers — Kerry and Chase of Port Hope, which had been responsible for the development of many engineering works along the Trent and St. Lawrence system. Those in attendance confirmed the appreciation of Mr. Kerry's talk with a hearty applause.

Cornwall

John A. Sarjeant, jr.e.i.c.
Secretary-Treasurer

A. A. B. McMath, m.e.i.c.
Branch News Editor

February 26 was "local night" for the Cornwall Branch. Twenty-one members met in the King George Hotel and heard three branch members give papers on the work with which they are connected.

G. B. Stidwill, assistant to the division manager of Howard Smith Paper

Mills Limited, described his company's \$7,500,000 expansion programme which started in 1947. It should be completed in 1952. To illustrate the magnitude of this mill's operations, Mr. Stidwill pointed out that it now uses 35 million gallons of water per day, or seven times as much as the whole city uses in hot weather. When a new boiler plant is completed, the mill's total coal consumption will be the equivalent of the fuel required to heat all the homes in Cornwall.

E. G. Myers, shift operator at the City pumphouse, outlined some of the problems encountered there. Normally the canal provides a 30-foot head for two water wheels which are the main source of power for driving the pumps. However, ice can block the intake to these wheels, so that steam driven pumps have to be pressed into service. City water consumption rises to 5½ million gallons per day in midsummer. A new filtration plant has been proposed, to which water would flow by gravity if the seaway project goes through. In the meantime, the water would be pumped.

A. S. Holder, works engineer at the Cornwall C.I.L. plant, gave a report on his visit to the second annual Plant Maintenance Conference and Show, held at Cleveland, in January. Mr. Holder described how proper lubrication can cut costs. He also told how colour can be used to reduce eye strain, and to indicate danger or safety areas. A brief description of various gadgets that have been invented to meet different problems, completed this paper.

The speakers were introduced by P. H. Nasmyth, and were thanked by Chairman, H. W. Nickerson.

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Misfortune appears to have blocked attempts to plan for the annual visit of the President this year. In January his illness, and his heavy schedule for February set back the event, until March 15th appeared to be all clear. Then on that day, word came that he was held up by a train wreck. However the branch had to proceed with their dinner and dance at the Cornwallis Hotel. Welcome guests were J. B. Stirling, vice-president elect of the Quebec zone, and W. D. Laird, assistant general secretary. These gentlemen and their wives helped to swell the attendance to 77, including wives and friends of the branch members. This was the Branch's fourth annual presidential dinner meeting.

Mr. Stirling and Mr. Laird, with very little advance notice, proved to be most entertaining speakers, and were much appreciated by their audience. Mr. Stirling referred to the decreasing number of engineers now graduating, and pointed out that an effort should be made to interest more high school pupils in the profession. Unless this is done, the increasing number of job openings will lead to a serious shortage of engineers within three or four years. He also referred to the Institute's efforts to have Tariff Item 180E imposed again. This tariff would protect Canadian engineers from a flood of American plans and specifications which can now come in.

Mr. Laird carried the discussion on this latter project farther and described a register of Canadian consulting engineers, which has been compiled by the Institute. This register is now available.

At the Cornwall Branch Dance

Left to right, Mrs. J. B. Stirling; R. H. Wallace, past chairman of the branch; Mrs. W. D. Laird; J. B. Stirling, vice-president elect of Quebec Zone; H. W. Nickerson; Mrs. Nickerson; Mrs. Donald Ross-Ross.

Clockwise around the table from left, Mrs. Vernon MacDonald, Mr. MacDonald, Tom Webster, Miss E. O'Neil, Mrs. Allan Toole, Mr. Toole, Miss B. Palmer, Roy Zurbrigg.

Left to right, Fred Winterburn, Mrs. Winterburn, D. Ross-Ross, Mrs. F. R. Warner, Mrs. Ross-Ross, Mrs. G. B. Stidwill, F. R. Warner, Mrs. C. I. Bacon, G. B. Stidwill (standing) and C. I. Bacon.

He also referred to the size of *The Engineering Journal,* which is now a bigger business than the Institute itself.

R. H. Wallace, past-chairman of the branch, thanked the speakers. Chairman H. W. Nickerson presided. During the dinner, young Edward Fagan sang two solos. His father, William Fagan, led community singing. During the after-dinner intermission, this reporter learned that Mr. Stirling is an accomplished musician on different instruments, on top of his busy engineering career with the E. G. M. Cape Co.

Most of the guests remained to enjoy the dance which followed, with Bob Eadie's group providing the music. W. D. Laird made several passes with his camera, leaving his victims wondering how they looked. Dancing continued until midnight.

Halifax

W. E. Jefferson, M.E.I.C.
Secretary-Treasurer

M. F. Dean, M.E.I.C.
Branch News, Editor

On January 30, the joint annual dinner of the Halifax Branch of the Institute and the Association of Professional Engineers of Nova Scotia was held at the Lord Nelson Hotel, and was attended by 300 members and guests of both organizations. Air Vice-Marshal C. R. Slemon spoke to the meeting on **Your R.C.A.F.** after the dinner. The annual dinner is a function looked forward to by many engineers of the area, and the committee this year produced an evening as enjoyable as any of the past. W. A. Devereaux was the committee chairman.

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On February 21 the Branch members were privileged to hear Mr. Marvin W. Maxwell, chief of development, Department of Research and Development, Canadian National Railways. Mr. Maxwell's talk suggested a need for more emphasis in schools on the natural facilities and resources of Canada, which if applied should result in less movement of Canada's young people to "greener fields." Engineers and their associations could do invaluable work in pointing out Canada's assets to youths, and in promoting their interests at home.

This February Meeting took a new form as an experiment. A light lunch was served at 5.30 p.m., before the lecture. The meeting was adjourned at 7.45, allowing Members to attend without conflict with later engagements. It is hoped that the result will be wider attendance at the monthly meetings.

Of general interest is the fact that three Branch members have been selected to serve on the Halifax Civil Defence Control Committee: Dr. Ira P. MacNab, W. W. Downie, and H. W. L. Doane. N. T. Smith is a member of the Planning Committee of the same organization.

Dr. Ira P. MacNab will receive another recognition for his untiring efforts. The American Water Works Association announced recently that Dr. MacNab will receive the George Warren Fuller Memorial Award for distinguished service in the water supply field. Dr. MacNab, manager of the Public Service Commission of Halifax, is also the president-elect of the Engineering Institute.

Hamilton

Geo. L. Schneider, M.E.I.C.
Secretary-Treasurer

Bernard A. Warren, S.E.I.C.
Branch News Editor

"Man is a heat engine requiring fuel, but he defies all the laws of efficiency," Dean K. F. Tupper, O.B.E., told the Hamilton Branch of the E.I.C. at the regular monthly meeting Feb. 15.

Dean Tupper, of the faculty of applied science and engineering at the University of Toronto was introduced by a former classmate from S.P.S., C. C. Parker, prominent local structural consultant.

Dean Tupper prefaced his remarks by describing the typical breakfast of a surveyor working in the mountains—fruit course, hot cereal, 6 strips of bacon, 2 eggs, fried potatoes, pancakes, coffee, toast and marmalade, and apple or blueberry pie.

Man in converting this fuel into energy, is said to attain efficiencies of 35 per cent—close to that of the ideal thermal cycle—and an unusual characteristic is that he will work when the atmospheric temperature is greater than his own. Man's standby loss, using Joule's Equivalent, is 400 B.t.u.'s per hour. Walking, he uses 800 B.t.u.s per hour, sawing wood (not sleeping) 1900 B.t.u.'s per hour and walking upstairs, 4400 B.t.u.'s per hour.

By means of these and comparable figures, the extent of the proposed morning's activities should determine the breakfast menu.

A man can generate one fifth hp for one hour. A man can walk thirty miles a day and be able to repeat the performance the following day. On a bicycle, he might do 90 miles per day.

Man can easily get rid of waste heat in cold weather in the process of converting fuel into work. In temperatures of 98 degrees he can dissipate heat by perspiring; but with humidity hovering near 100 per cent, if he continues to work, he will pass out.

Man has developed Thermal Power over some 200 years. He has increased efficiencies from ½ per cent in the Newcomen Engine to 35-40 per cent in the engines of today. Man's body temperature of 37 deg. C. or 98.6 deg. F. is retained by the most efficient thermostat—much more efficient than that in a large house whose northern rooms are cold while the room containing the thermostat is just right. We help the body to retain its temperature by desiring comfort.

Man's desire to be comfortable has over-ridden his concern about the cost. Over one half of the fuel burned to-day is used to heat our buildings. When we consider that the U.S. steel production is one hundred million tons per year, requiring an average of one ton of coal per ton (and this is coming close to one ton per capita), the fuel used to heat buildings must also be in astronomical figures. The nation's economic graph is tied very closely to the fuel consumption graph.

Where can we get our fuel when coal supplies run out? or when oil supplies become depleted?

Dean Tupper then turned to nuclear physics a field in which he is well qualified.

From the formula $E = MC^2$, where E is in ergs, M is the mass of matter destroyed, and C a constant in the order of the speed of light; one pound weight of matter destroyed to produce energy could raise a half mile cube of rock three miles vertically.

"All very well," said the Dean. "But how do we destroy this matter?"

The first eight elements constitute 98 per cent of the earth's crust. No energy can be gained from these stable elements as far as we now know. Uranium constitutes about .008 per cent of the earth's crust, but the necessarily unstable Uranium 235 is available only as one part in 139 of regular Uranium. To equal the power output of Queenston's 9×10^{15} foot pounds per yard, ¾ of a pound of Uranium must be totally destroyed. Actually, only 1 per cent can be annihilated.

Thus we must supply now 300 pounds and at an expected efficiency of 10 per cent for power output, 3000 pounds of Uranium 235 will be required. Since there exists only one part Uranium 235 in 139 parts of common uranium, 210 tons of common Uranium must be supplied. At the present rate of refining this ore, power production by this method is impractical.

Where do we then turn?

Casting aside the 2×10^{29} foot pounds of work done daily by the tides as being impractical to harness, Dean Tupper suggested the sun's radiation as the last currently known real hope.

Physicists tell us that by fusion of hydrogen into helium, the temperature of the centre of the sun is in the order of 31,000,000 degrees F. and, at its present rate of radiation, in 10^9 years it will have dissipated only 1 per cent of its mass. The daily heat flow from the sun intercepted by one square mile of earth's surface is equivalent to 5,000,000 hp., with each square foot getting 500 B.t.u.'s per hour. For example, with 50,000,000 people in Java whose area is only 50,000 square miles, one tenth of 1 per cent of the solar energy per square mile is presented to each resident, or 5,000 hp. per native per day.

Man can do little by himself; with fuel he can do miracles. Because we must dig coal, we shall probably run out of oil reserves faster, but with the present rapid exploitation of fuel, reserves are being rapidly depleted. This age will probably be termed the 'Hydrocarbon age'; and next we shall look to the physicist to save us from extinction.

Offering hope to all present, Dean Tupper concluded with the consoling thought that when earthly days are done we may find perfection where no one need worry about weather conditions—or elsewhere—a plenteous supply of heat is assured.

After a round of questions, Mr. W. L. Hutchison thanked the speaker and led the large group in attendance to donuts and coffee.

Kingston

J. T. Provan, Jr.E.I.C.
Secretary-Treasurer

S. H. Rochester, M.E.I.C.
Assistant Secretary

The Kingston Branch E.I.C. and the Engineering Society of Queen's University attended a joint meeting on February 27th, 1951, in the old Arts Building, Queen's University. This was the occasion for the annual presentation of "Student Papers Night" conducted by Queen's Engineering students. Awards for the prize-winning papers were divided into two groups, Class I competing for three prizes donated by the Engineering Institute of Canada valued at $25, $15, and $10, and Class II competing for two prizes donated by the Ontario General Contractors Association valued at $30 and $20. Class II competition is open only to civil engineering students.

Mr. Arthur Lee of Queen's Engineering Society presided over the meeting, at which local industry, R.M.C., and Queen's University were well represented. Mr. Lee announced the nomination of Judges Dr. R. D. Bennett, Professor Hugh Conn and Major A. L. MacLean.

Competing in Class I were the following speakers in order of merit as ruled by the judges: *First prize*—$25 went to E. Candy for his paper on **Mechanical Octanes**; *second prize*—$15, to D. K. Venus, who spoke on **Hard Chrome Plating**; and *third prize*—$10, to A. H. Ruddell for a paper on **Some Problems in Ventilating a Passenger Vessel.**

In Class II the prizes were awarded as follows: *First prize*—$30, to N. W. Martola speaking on the **Maggot River Culvert**; *second prize*—$20, to J. H. Bleany for his paper on **Pile-driving in Permafrost.**

These papers were all well presented, dealing with a wide range of technical subjects and much interest was shown by members present. The meeting adjourned to the Players Lounge for luncheon, where prizes were presented by Major A. L. MacLean on behalf of the Engineering Institute of Canada, and by Mr. Charles Smith on behalf of the Ontario General Contractors Association, who expressed the belief that next year's Class II awards would be increased to a total of $75.

Kitchener

J. F. Runge, Jr.E.I.C.
Secretary-Treasurer

A. H. Todd
Branch News Editor

The February meeting of the Kitchener Branch was honoured by a visit from President James A. Vance. The meeting was held at the Officers' Mess of the Royal Canadian Engineers and was presided over by the new chairman, A. C. Macnab of Hespeler. Mr. Vance was introduced by Councillor Frank Midgley of Galt. Mr. Vance made some observations about his recent trip across Canada in the interests of Canadian engineers. From Newfoundland to British Columbia he has found the demand for engineers still very great, and he regrets to see enrolment in Universities falling off.

Industries such as pulp and paper, mining and petroleum industry, which are fundamental to the Canadian economy, are employing engineers at an ever increasing rate. Consolidated Mining & Smelting at Trail, B.C., in the middle of the Rockies is employing 300 engineers in every phase of the business.

Oil developments in Alberta have been a boom to Canada. So greatly has production increased, the present 1000-mile pipe line cannot handle the output of the wells and a second line is under consideration. Pumping at all wells has been curtailed until this transportation problem is solved. Canada's oil production is soon expected to equal the country's consumption.

There is a surplus of natural gas from the oil fields which could be piped to the United States and sold there. However, it is felt that expanding industry and population in the west may soon need all oil available.

Mr. Vance also mentioned water conservation programmes and power developments and the important part they will play in Canada's future development.

Niagara Peninsula

J. J. Miller, M.E.I.C.
Secretary-Treasurer

Geoffrey W. Ince, Jr.E.I.C.
Branch News Editor

At a very well attended dinner meeting at St. Catharines, February 15, the branch was joined by members of the Canadian Comstock Engineers' Association and the Niagara International Section of the A.I.E.E. The large audience heard one of the best papers presented before the branch for some time. The speaker was Dr. Otto Holden, assistant general manager of engineering, of the H.E.P.C. of Ontario, and his subject was **Ottawa and Niagara River Power Developments.**

Dr. Holden started with a brief review of treaties between Canada and the U.S. over the Niagara River. The old treaty of 1910, states the amount of water that may be diverted for power generation, while the one ratified last October stipulates the minimum quantity that must go over Niagara Falls. This is to be 100,000 c.f.s. by day, 50,000 c.f.s. at night from April to November, and 50,000 during the winter months. The daily flow of 100,000 c.f.s. is considered sufficient water to produce the green appearance that contributes to the beauty of the Falls.

Remedial works will be carried out by the International Joint Commission to preserve the natural beauty of the Falls. Work will have to be carried out on the Canadian or Horseshoe Falls to prevent the rapid erosion of the centre, about 5 ft. per year, and to spread the flow evenly over the whole horseshoe.

The H.E.P.C. is considering directly utilizing the extra flow of water available at night during the summer, rather than ponding it for use during the day. To do this, it plans to pond water on the Ottawa River at night, as ponding facilities are presently available there, and transfer Niagara power to take the load dropped by the Ottawa River generating stations.

By using slides, Dr. Holden pointed out the route and construction of the new waterway to feed the new plant at Queenston. It will have a capacity of 20,000 c.f.s., and will consist of a 5½-mile tunnel and a 3-mile canal, entering the existing headwaters of the Queenston plants. The tunnel will be concrete lined, 45 ft. in diameter, and will require about a 50 ft. diameter excavation of some 2 million cubic yards of rock. Its roof will be supported with a steel framework using about 15,000-18,000 tons of steel. It will be the largest diameter tunnel in the world.

The new generating station will have an initial installation of 6 generators of 105,000 hp. each, and provision for a further 6 units. Utmost consideration was given to the generator design to ensure maximum efficiency, as the water driving them is a rather valuable commodity, since it has travelled some 8½ miles in a costly waterway since leaving the river. The first unit is scheduled to go into operation in June 1954.

Ottawa

W. R. Meredith, M.E.I.C.
Secretary-Treasurer

A. J. Bernard, M.E.I.C.
Branch News Editor

Shipbuilding in Canada was the subject of a talk to Ottawa members at a luncheon meeting on October 26, 1950. Mr. Richard Lowery, naval architect with Canadian Vickers Limited, was the speaker.

Mr. Lowery briefly outlined the history of shipbuilding in Canada. Wooden-ship days found Canada one of the leaders. Ships can still be produced in Canada in fewer man-hours, but labour costs make it difficult to compete with nations having lower wage-rates. We depend largely on the export trade for our work. Recent devaluations of the pound and the heavy demand for U.S. dollars have hit the shipbuilding industry.

Defence requirements are now helping the industry somewhat, but Mr. Lowery expressed the opinion that only the formation of a large overseas merchant marine would permanently benefit the industry. The lack of facilities for manufacture of ship's equipment in Canada has been a handicap sometimes.

Mr. Keith Gordon, vice-chairman of the Junior Section, thanked Mr. Lowery.

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Robert F. Legget, director of the division of building research, National Research Council, addressed Ottawa members on November 7, 1950.

Mr. Legget explained the functions and aims of Building Research in Canada, where considerable effort is being given to the co-ordination of such research. Various government departments have carried out studies on materials and construction methods, which studies will be co-ordinated. Liaison with research in other countries will be kept. No study will be made on problems which do not effect building in Canada and on which research can better be carried out in other countries.

Two major factors govern building in Canada, geology and climate. In view of this the lines of research in Canada should be concerned with: Building in the North of Canada, fire research, snow and ice research, soil mechanics and foundation research, and the whole question of the enclosure of buildings to guard against the Canadian climate.

In addition to building research, necessary service work for the National Building Code of Canada and for the Canadian Government Specification Board is carried out by the Division.

The speaker gave brief details of the various studies being made across Canada on existing structures and on experimental building.

Mr. J. H. Irvine thanked the speaker.

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"A bright future for young Engineers in Canada" was the keynote of a talk given to Ottawa Engineers and their wives by James A. Vance, president of the Engineering Institute of Canada, at a luncheon meeting on November 23, 1950.

The development of a broad engineering knowledge, while not ruling out certain specialization, seems to be a requirement of the modern engineer. Mr. Vance heartily agreed with this trend.

The president indicated that particularly in these critical times the Engineering Institute should show greater interest in the Military Engineers. He personally complimented Maj.-Gen. G. R. Turner, a member of the Ottawa Branch, on his recent election as president of the Military Engineering Association of Canada.

Provincialism has no place in Canadian engineering. The speaker advocated closer relationship between various Canadian engineering groups.

Mr. Vance stated that very cordial relations exist with British and United States engineering groups and that the groundwork was complete for closer ties with other Western Hemisphere groups.

The Ottawa Chairman, Mr. Allan C. Ross, introduced Mr. Vance and Mrs. Vance to the meeting. Lt.-Col. M. C. S. Brown, chairman of the proceedings committee, thanked the speaker.

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Ottawa members were fortunate to hear, at the luncheon meeting of December 7, 1950, an address by the Minister of Resources and Development, Hon. R. H. Winters.

Whether the "Cow Herd" or not the members did hear from Mr. Winters of the bountiful resources of our country and the opportunity it offers to engineers.

Various phases of Canada's development, hydro, mining, highways and research were touched on by the speaker. The National Research Council were particularly complimented on their work during World War II.

The speaker was introduced by Brigadier J. W. Bishop, Vice Adjutant General, Canadian Army. Mr. Harold McLeod, chairman of the Ottawa Branch of the Canadian Institute of Mining and Metallurgy, thanked Mr. Winters.

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The annual meeting and election of officers of the Ottawa Branch was held at the Chateau Laurier on the evening of January 11, 1951. Officers elected were as follows: chairman, B. G. Ballard; secretary-treasurer, W. R. Meredith; management committee, R. E. Hayes, John S. Watt and J. D. Whittaker.

Reports on finances by the treasurer and various reports by heads of committees were presented. The financial report indicated a very active year for the Branch.

The retiring chairman, Mr. A. C. Ross, personally and on behalf of the Branch, thanked Lt.-Col. M. C. S. Brown (in absentia) for his very energetic work during the past year as chairman of the proceedings committee. (Lt.-Col. Brown has left the Branch for a period of staff studies in England.)

Votes of thanks were tendered to various groups and to the local newspapers for their splendid coverage of Branch activities.

Mr. Drummond Giles, zone vice-president, addressed the members. His remarks gave approval of Branch activities and of the splendid attendance record of members.

Mr. Giles further directed his remarks to the young engineer. He quoted as follows from a message by Sir W. A. Stanier, prominent British engineer, "In my opinion there is an ever increasing need for well trained engineers. We regard the training as incomplete if it does not include at least two years as

The executive of the Ottawa Branch. Seated, A. C. Ross, past chairman; B. G. Ballard, chairman; W. R. Meredith, secretary. Standing, Major J. D. Whittaker, chairman of proceedings committee; J. S. Watt; A. A. Swinnerton; R. E. Hayes, and G. R. Davis, chairman of the membership committee.

an apprentice in the workshop. As in any other profession there are times when one passes through a period of drudgery, but I have found that where there is real interest there is no drudgery and I commend that thought to your engineers".

Two interesting films, one on municipal traffic problems, the other on the conservation of natural streams, lakes, etc. were shown.

The new chairman, Mr. Ballard, voiced his appreciation to members for his appointment and expressed a desire to keep up the good work done by the retiring Branch officers.

The meeting was climaxed by an excellent buffet luncheon and suitable refreshments.

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On February 8, 1951, Mr. Kenneth S. Harris, director of the Steel Division, Department of Trade and Commerce, addressed a luncheon meeting.

Mr. Harris outlined briefly plans to control steel allocation and production to best meet requirements during the present emergency. This problem not only includes Canadian requirements but also Canada's contribution to the Atlantic Pact and other agreements.

Defence needs are of course to receive first priority but other projects already under way would receive fair consideration.

Mr. Allan C. Ross, acting chairman, in the absence of Mr. Ballard, introduced the speaker. Mr. R. E. Hayes thanked Mr. Harris.

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Mrs. C. S. Parsons and other energetic members of the engineers' wives organization really went all out in staging the engineers' wives dance at Lansdowne Park, Ottawa. The occasion was made successful by the graciousness and hospitality of all wives and in particular by the committee in charge. Such a "do" required work by all the ladies but particular mention might be made of: president, Mrs. C. S. Parsons; vice-president, Mrs. Alec Ignatief; social convener, Mrs. D. B. Rees; ticket convener, Mrs. J. F. Lyons. Other officers of the ladies' group are Mrs. T. L. Hughson, Mrs. R. R. Rogers, Mrs. G. H. Desbarats, Mrs. L. J. Lichty, Mrs. G. E. Smith, Mrs. P. Bresset-des-Nos, and Mrs. L. M. Christmas, past president.

There is complete agreement with appreciation to Mrs. K. M. Cameron who founded this up and coming organization.

Saguenay

F. E. Hogg, M.E.I.C.
Secretary-Treasurer

A meeting of the Saguenay Branch was held on February 21st at the Aluminium Laboratories' auditorium. Mr. L. E. Marion gave a talk on a-c/d-c conversion. The speaker was introduced by Mr. F. G. Barker, M.E.I.C., vice-chairman and an audience of 30 enjoyed the address.

Mr. Marion related that he had that afternoon watched a meter which showed over 1,200,000 horsepower entering a consumer's plant. He mentioned that Arvida Works was probably the only place in the world where this could be seen, and remarked on the fact that most of the alternating current was being converted to direct current for aluminum production. About 20 per cent of all power produced in Canada is converted to d-c. Other uses, besides aluminum production, are refining of copper and lead, production of zinc, operation of trolleys and cranes and continuous rolling mill drives, electroplating and anodizing. The mercury arc rectifier is the most important method of changing from a-c to d-c although motor generator sets, synchronous converters and copper oxide and selenium rectifiers were also described.

Three members were elected by the meeting to the Nominating Committee and will arrange the election of Branch officers for the next year. They are: B. E. Bauman, M.E.I.C., J. Mercier, M.E.I.C., W. Fraser, M.E.I.C.

Junior Section

R. H. Singleton, M.E.I.C.
Secretary-Treasurer

A very successful smoker was held by the Junior Section of the Saguenay Branch in the Saguenay Inn, Tuesday evening, February 27. Messrs. T. A. Wootton and C.R. Fox presented individual talks describing their experiences while held captive by the Germans during the recent World War. Mr. Wootton was captured while serving as an Army officer in Sicily in 1944 and described his capture and the slow and intermittent trip to Germany as a captive. Mr. Fox was shot and captured in a flight over occupied Europe in 1942 while serving as an Air Force officer. His talk dealt in more detail with P.O.W. camp life.

The excellent style of both speakers combined with the seemingly unlimited volume of subject material, assured the success of the meeting and the keen interest of the members was reflected in the lengthy question period. The refreshments were enjoyed in the usual fashion.

The speakers were introduced by the chairman, Mr. H. V. Page and Mr. W. F. Patterson, expressed the thanks of the audience.

Saint John

W. M. Brenan, M.E.I.C.
Secretary-Treasurer

J. Arthur Flood, M.E.I.C.
Branch News Editor

Members and guests of the Saint John Branch gathered at a dinner meeting at the N.B. Scottish Officers Mess on February 22, to hear Dr. P. L. Pratley, M.E.I.C., consulting engineer, give an illustrated lecture on the theories and ideas embodied in his design of the piers for the proposed Canso Bridge to span from Cape Breton county to the mainland of Nova Scotia.

Dr. Pratley was introduced by the branch chairman, W. R. Godfrey, who gave a brief history of the speaker's career as a designing engineer and cited a few of the many now famous structures of Dr. Pratley's design.

Dr. Pratley, presently making a tour of Maritime Branches, cited several instances where his design of piers for the Canso project has been publicly questioned by the press and quoted remarks made by absolutely unqualified and biased sources generally called "reliable" but "undisclosed". In his remarks the speaker illustrated how ridiculous some of these statements were, but in their influence on public opinion created a "psychology of fear" among responsible parties who were ignorant of the facts. This same fear, difficult to dispell could involve a design far in excess of that demanded by the elements.

"A design such as this," Dr. Pratley stated, "is an assembling of experience." Every part of the construction, has been done before in some part of the world. It remains for the designer to gather the knowledge and experience of others and assemble it to his own advantage".

The main problems encountered in designing the Canso project were: navigation, ice, scour, and deep water.

In designing for navigation the ideas of shipping companies and Royal Canadian Naval authorities were incorporated in locating the best position for the lift span.

Ice, although sometimes a most important consideration is not in this case too serious a condition. Icebergs, as such, Dr. Pratley stated, do not appear in the Strait of Canso, despite reports to the contrary. The piers presently designed will withstand a force of some 365,000 tons of ice — a field 3,000 feet square, 12 feet thick moving at a rate of 12 feet per second.

In addition to the moment that the piers are capable of resisting, their design is such that they will cut any ordinary ice field encountered.

The element of scour does not enter the picture to any extent in this location. Test borings of the Strait bottom indicate a conglomerate rock beneath a gravel surface, the rate of water flow is small and the water carries very little, if any, sand or silt, a combination far from conducive to scouring. In any case, the danger of scour is overcome by limiting the relationship between width and spacing of piers.

The deep water problem is the most important factor of design and involved the greatest amount of engineering skill in the design of the piers. With the aid of slides, Dr. Pratley illustrated his proposed design of the cage structure and his methods of pouring concrete in the deep water. He said that the use of intrusion pre-packed concrete was the greatest single factor in solving the problem of concrete placement.

After a short question period, Mr. John Reid tendered his sincere thanks to the speaker on behalf of the branch for a very informative and most enjoyable evening.

Sudbury

D. W. McKinty, Jr.E.I.C.
Secretary-Treasurer

The Sudbury branch joined with the Association of Professional Engineers at the dinner meeting February 9th. There were 102 in attendance.

A short sing-song was held after dinner with Russ Eaton leading a most spirited effort by the members.

The guest speaker for the evening, Col. Tom Medland, was introduced by the Chairman C. O. Maddock.

Col. Medland gave a most enlightening talk on the functions of the Association of Professional Engineers. He discussed the highlights of the past year, dwelling to some lengths on the public relations programme which is now in full swing.

In speaking of the new headquarters building in Toronto, Col. Medland mentioned how it was the hope of the association that all engineering groups would keep their records there. He pointed out that the field secretary of the Institute already has an office in the building.

In conclusion, Col. Medland spoke most optimistically of the demand for engineers in Canada during the next few years. Col. Medland was thanked by Mr. Gill on behalf of the group.

A discussion period followed the talk and the questions asked indicated the interest of the group in the various laws governing the engineering profession.

Victoria

W. A. Bowman, Jr.E.I.C.
Secretary-Treasurer

G. J. A. Kidd, S.E.I.C.
Branch News Editor

The proposed power project and aluminum smelting plant being planned by the Aluminum Co. of Canada in British Columbia will cost about $550,000,000 and will see the birth of a city of 50,000 at the Kitimat Bay site.

This was predicted February 16 by John S. Kendrick, resident engineer for the company, in an address to Victoria Branch.

Mr. Kendrick's talk, entitled **Search for Power,** outlined the preliminary survey work already done in the Kitimat Valley area and along the proposed route of an 85-mile transmission line from the power plant to the smelter.

Analysis of costs showed that the power project would cost $200,000,000 and the smelter plant at Kitimat, $350,000,000.

It is not definite, Mr. Kendrick told the engineers, "but we know now what we want and how much it will cost."

The company's plant at Arvida, Ont., is now the world's largest and the proposed plant will be very much larger, he said.

If the project gets under way, it will take three years to begin production. The power source will provide 800,000 horsepower, and within five years this will be stepped up to 1,600,000 horsepower.

The smelter will turn out about 500,000 metric tons of aluminum ingots per year, as compared with the present Arvida output of 230,000 metric tons.

Mr. Kendrick outlined the discovery and development of aluminum.

Although the metal is the most plentiful ore on the earth crust and the third most plentiful element, it is very difficult to isolate. In 1880, 30 years after its discovery, Louis Napoleon served dinner on aluminum dishes. Only the head table got the aluminum, said Mr. Kendrick. "The ordinary guests had to be content with solid gold."

Reason for the development of tremendous quantities of electric power for processing the raw ore, he said, was that ten kilowatt hours of electric energy was needed to produce one pound of metal.

The raw material is bauxite, which is obtained from British Guiana and which usually is broken down to aluminum oxide at the source. The latter compound is shipped to the smelters for the electrolytic refining process.

Mr. Kendrick said that, although there was a temporary recession in world markets for aluminum after the war, the increased cost of other metals has boosted the demand for aluminum more than ever.

"Peace or war, good times or bad, come what might, the aluminum output has doubled every ten years for the past 60 years," he said.

He said that if the company decides to go ahead with the project, it will be very soon so it can take advantage of the 1951 building season.

The company has spent several millions on preparatory work, said Mr. Kendrick, but this has been only for surveys and tests.

He showed coloured slides taken on a trip to the area last summer. One of the subjects was a test length of power line strung between two aluminum towers for testing icing conditions throughout last winter.

The test ground was more than 5,000 feet up on a wind-swept plateau that could be reached only by helicopter.

J. T. Thwaites, M.E.I.C. (left), guest speaker at the meeting of February 28, and L. A. Bateman (right) chairman of the Electrical Section of the Winnipeg Branch.

Winnipeg

G. W. Moule, M.E.I.C.
Secretary-Treasurer

Electrical Section

J. C. Pratt, M.E.I.C.
News Editor

The History and Development of the Circuit Breaker formed the subject of Mr. J. T. Thwaites' address to the Electrical Section of the E.I.C. in Winnipeg, February 28th. Mr. Thwaites is section engineer, Electronic Section, Canadian Westinghouse Co., Ltd.

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L. A. Bateman, operating engineer, Winnipeg Hydro, has been elected recently to the chairmanship of the Engineering Institute's Electrical Section, in Winnipeg. R. A. Marvin, Northern Electric Company, is past chairman; E. A. Scott, Winnipeg Electric Company, vice-chairman; S. H. Eggertson, Winnipeg Electric Company, executive member; and K. Hallson, Winnipeg Hydro, secretary.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CHEMICAL

GRADUATE CHEMICAL ENGINEER required for district sales office of large organization in Montreal. Promotional sales work in Province of Quebec of product line of water conditioning and steam treating apparatus. Age 24 up with preferably some sales experience. Not necessarily bilingual. Apply to File No. 2087-V.

CHEMICAL ENGINEER required to head department of chemical technology in the Indian Institute of Science, Bangalore. Candidate should possess high academic qualifications in chemicial technology, together with considerable research and teaching experience. Should have knowledge of design and operation of chemical pilot plants. No age limit is prescribed. Duties will involve instruction of personnel. This is the foremost research institute in India and has well established post-graduate departments of aeronautical engineering, electrical communication engineering, metallurgical engineering, internal combustion engineering, power engineering and electrical technology and chemical engineering and chemical technology. Post of head of chemical technology has been vacant for sometime. Apply to File No. 2077-V.

CHEMICAL ENGINEER, 1950 graduate with an interest in process development and design work. Location Ontario. Apply to File No. 2093-V.

PRODUCTION ENGINEER

As an assistant to the Production Manager of a company manufacturing electrical switchgear and allied products in British Columbia. Graduate Engineer preferred with some experience in production work. Reply in writing with particulars of qualifications to File No. 3000-V.

CIVIL

CIVIL ENGINEERS required by large hydro-electric utility company located in Montreal. Two required with approximately 3 years experience in concrete and others with field experience. Apply to File No. 2078-V.

CIVIL ENGINEER with at least ten years experience in design and detail of steel and reinforced concrete structures for Montreal office of consulting engineering firm. Salary open and possibility of association to right man. Apply to File No. 2091-V.

ELECTRICAL

LARGE POWER COMPANY in Eastern Canada has an opening for a young electrical engineer. Some experience preferable but not essential. To work on power systems engineering. Excellent working conditions. Apply to File No. 2031-V.

ELECTRICAL ENGINEER with at least five years professional experience, a substantial part of which should have been in hydro-electric central station and substation design. Salary $325.00 to $400.00 per month depending on qualifications and experience. Location Victoria, B.C. Apply to File No. 2073-V.

ELECTRICAL ENGINEER required by large organization in Montreal with about five years experience in general electrical engineering, preferably in the transportation field. Salary range $350.00 to $400.00 per month. Apply to File No. 2074-V.

YOUNG ELECTRICAL ENGINEER with about three years experience required by manufacturer located in Montreal. Applicant would be obliged to do some mechanical work in general plant engineering. Apply to File No. 2075-V.

TWO ELECTRICAL ENGINEERS required by firm located in Toronto. Applicants should have one to four years experience preferably in communications or power. Apply to File No. 2076-V.

ELECTRICAL ENGINEER required to head the departments of power engineering and electrical technology in the Indian Institute of Science, Bangalore. Candidate should have a doctorate or master's degree in electrical engineering from a recognized university, 15 years' experience in a responsible position in large power project, experience in guiding research and in the execution of large power projects. No age limit is prescribed. Duties will involve instruction of personnel. This is the foremost research institution in India, and has well established post graduate departments of aeronautical engineering, electrical communication engineering, metallurgical engineering, internal combustion engineering, power engineering, and electrical technology and chemical engineering and chemical technology. Post of head of the power engineering and electrical technology departments has been vacant for some time. Apply to File No. 2077-V.

TWO ELECTRICAL ENGINEERS required by large hydro-electric utility company located in Montreal. Applicants should have two to three years experience. Apply to File No. 2078-V.

ELECTRICAL ENGINEER, who is familiar with and particularly interested in the application of control equipment and the producing of wiring diagrams, required by manufacturer of conveying machinery located in Ontario. Apply to File No. 2082-V.

EXPERIENCED ELECTRICAL ENGINEER, preferably between 28 and 35 years of age required by paper industry located in Ontario. Not absolutely necessary, but preferably with design and practical experience in pulp and paper mill. Apply to File No. 2083-V.

ELECTRICAL ENGINEER with two to four years' broad experience in the selection, installation and maintenance of electrical equipment in either industrial plant or public utility. Location Ontario. Apply to File No. 2093-V.

ELECTRICAL ENGINEER, with at least 4 years experience in electrical field, preferably on substation layout and installation, required by P.U.C. with a total load of about 250,000 H.P. and operate their own generating stations. Location about 100 miles north of Toronto. State wages expected, age etc. Apply to File No. 2096-V.

MECHANICAL

CHIEF MECHANICAL ENGINEER or assistant chief mechanical engineer required by large firm of consultants in Toronto. Salary open. Apply to File No. 2033-V.

MECHANICAL ENGINEERS with experience in process layout, design of steam plants, water supply systems and sewage and industrial waste treatment facilities. Salaries commensurate with experience. Apply to File No. 2068-V.

MECHANICAL ENGINEER with at least two to three years' experience in the design and job fabrication of A.S.M.C. pressure vessels and heat exchangers required for design, estimate and inspection work by engineering company located in Montreal. Salary commensurate with ability. Apply to File No. 2070-V.

MASTER MECHANIC required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidate should have considerable experience as a mechanic and have held responsible positions in the field of mechanical engineering. Age, about 45 years. Duties will involve supervision of the operation and maintenance of machines employed on river valley projects, such as the construction of large concrete, earth and other types of dams, large power houses and transmission systems and the excavation of canals. He will also be required to train Indian personnel working under him. Apply to File No. 2077-V.

MECHANICAL ENGINEER required by engineering college, Guindy, India, to organize new department of production engineering and to train students for their master's degree in production en-engineering. Candidate should have a basic degree in mechanical engineering, a doctor's degree in production and industrial engineering, five years experience in a production workshop, five years experience in an engineering institution, preparing students for a standard degree and five years experience in directing research, leading to a master's degree in a recognized university. No age limit. Apply to File No. 2077-V.

MECHANICAL ENGINEER for field job required by large hydro electric utility company located in Montreal. Applicant should have approximately two years experience on mechanical equipment. Apply to File No. 2078-V.

SEVERAL 1951 mechanical engineering graduates required by pulp and paper industry located in the Province of Quebec. Apply to File No. 2081-V.

MECHANICAL ENGINEER required by firm in Ontario to act as furnace supervisor. Applicant should have preferably some experience and also in combustion of both oil and gas, high and low pressure and who has a knowledge of refractories. Also willing to train young interested mechanical engineer. Apply to File No. 2088-V.

YOUNG MECHANICAL ENGINEER required by manufacturer of various types of machinery located in Montreal, for extensive design. Good opportunity to right man interested in this type of work. Apply to File No. 2092-V.

MISCELLANEOUS

GRADUATE ENGINEER with three to four years welding experience in metal fabricating plant is required by a firm manufacturing gases and welding equipment. Position involves technical assistances to firms in the correct application of various welding processes. Salary commensurates with experience and qualifications. Apply to File No. 2071-V.

GEOLOGISTS: Two required by the engineering, geology and ground water division of the geological survey of India. One should be a specialist in ground water and the other in the investigation of dam sites. Duties will involve geological studies and investigations, assisting the director in coping with the large amount of work this division is called upon to perform. Ages, between 35 and 50. Apply to File No. 2077-V.

TWO LECTURERS IN MARINE ENGINEERING required for proposed residential marine engineering college for period of three years from August, 1952, to train engineer officers for Indian Mercantile Marine. Should possess certificate of extra first class engineer, of the United Kingdom Board of Trade or equivalent and have at least five years' experience as teacher in marine engineering. Age between 35 and 45 years. Duties will involve instruction of students with workshop experience, for examination for certificates of competency as engineers. Salary and allowances will be fixed to bear relation to what candidate can normally expect in his own country and will be paid by lending country. Place of residence Calcutta or Bombay. Wife and dependent children will be provided with free first class transportation to and from India once during contract period, provided they remain for not less than one year. Apply to File No. 2077-V.

CAPTAIN SUPERINTENDENT required by the director-general of shipping to teach and train personnel for service in the Indian Mercantile Marine. Should possess a Master's foreign-going certificate and five years' experience in training seamen ratings for the mercantile marine, three of which must have been spent in charge of such a training establishment. Age between 35 and 50 years. It is proposed to establish two training ships at Visakhapatnam with other training ships and/or ship training establishments on the west coast of India. Period 3 years. Apply to File No. 2077-V.

POWERHOUSE FOREMAN required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidate should have considerable experience in the erection and maintenance of large hydro electric power plants. Age, about 45 years. Duties will involve erection and maintenance of diesel power houses for the supply of power on river valley projects, together with the erection and maintenance of large power houses, in connection with hydro electric projects. He will also be required to train Indian personnel working with him. Apply to File No. 2077-V.

WORKSHOP FOREMAN required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidate should have considerable experience in the management of large workshops, in the manufacture of gates for dams, spillways, canals, sluices, and in the manufacture of electrical transmission towers. Age, about 45 years. Duties will involve supervision of large workshops required during construction of river valley projects and the instruction of Indian personnel working under him. Apply to File No. 2077-V.

MASTER ELECTRICIAN required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidate should have considerable experience as an electrician and have held responsible positions in the field of electrical engineering. Age about 45 years. Duties will involve supervision of the operation and maintenance of electrical machinery employed on river valley projects, such as construction of large concrete, earth and other types of dams, large power houses and transmission systems. He will also be required to train Indian personnel working under him. Apply to File No. 2077-V.

CHIEF TECHNICAL ADVISER to Director General of Civil Aviation required for research and development of existing organization. Candidate should possess high academic qualifications and several years' experience in aeronautical design, particularly relating to airworthiness of prototype aircraft. Age between 40 and 50. Duties will involve the provision of advice and direction of aeronautical development. Appointment for three years, subject to period of probation of six months. Apply to File No. 2077-V.

MECHANICAL ENGINEER AND FUEL TECHNOLOGIST required by central electricity commission, Simla, India. Candidate should have 15 years' experience in design, construction and operation of steam power stations, with steam pressure of 600 lbs. per square inch and above and with units ranging from 30,000 K.W. Age above 45 years. Although there are several large power systems, both thermal and hydro-electric, in operation in India, there are no facilities for training Indian personnel in the design of power plants and ancillary equipment. Duties will involve instruction of personnel to meet demands of large power development program. Apply to File No. 2077-V.

DESIGNING ENGINEER required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidates should have considerable experience in the design of high tension transmission lines and tower structures. Age 45 to 50 years. Duties will involve design of high tension transmission lines and tower structures, in connection with large hydro-electric projects. He will also be required to act in an advisory capacity on the design of transmission lines, and to train Indian engineers working with him. Apply to File No. 2077-V.

INDUSTRIAL ENGINEER required by firm of management consultants. Should be experienced in plant layout, production control, time studies, wage incentives, cost and budget controls. Age 35 to 60. Free to travel. Apply to File No. 2079-V.

ENGINEERS required in the manufacturing department of large electrical organization located in Ontario. Duties include the line up of operations and tooling, to initiate cost reduction programs, to lay-out departments, etc., on various products. Limited number of openings in production control, foundry work and in test work. Apply to File No. 2080-V.

PLANT ENGINEERS are required to do engineering work in connection with plant expansion and with plant maintenance, particularly along electrical lines. Location Ontario. Apply to File No. 2080-V.

DESIGN ENGINEERS required by large electrical organization in Ontario. Engineers are required to do both mechanical and electrical design but principally the latter on all types of electrical equipment. Specific experience is desired but not absolutely necessary. Apply to File No. 2080-V.

CIVIL OR MECHANICAL ENGINEER required by paper industry located in Ontario. Applicant should have design and practical experience, preferably five or six years in pulp and paper mill. Apply to File No. 2083-V.

GRADUATE ENGINEER required by firm located in Toronto. The work involved will be supervision of installation of marine radar, servicing marine radars installed on ships and some sales and/or office work. Considerable travelling involved. Interviews can be arranged in Ottawa, Toronto or Montreal. Apply to File No. 2034-V.

MECHANICAL AND CHEMICAL ENGINEERS required in the control department of paper mill located in Newfoundland. Applicants must be interested in control and process work. Salaries open. Apply to File No. 2085-V.

RESIDENT ENGINEERS AND INSTRUMENTMEN required for work on the construction of the Quebec North Shore and Labrador Railway. Applicants should have some experience on highway work. Good working conditions. Salaries open. Apply to File No. 2086-V.

MECHANICAL EQUIPMENT SUPERINTENDENT required by woods department of pulp and paper company. Should have degree in mechanical engineering or equivalent. Capable of initiating and supervising preventive maintenance programme and repair work to all mechanical and power equipment. This is a senior position for an active man with a proven record of success in this type of work. Candidate for opening must be bilingual. The salary will be commensurate to experience and qualifications. Apply to File No. 2089-V.

MECHANICAL DRAUGHTSMAN with at least three to five years experience in equipment tool and jig work for Montreal office. Supply full details in first letter. Apply to File No. 2091-V.

STRUCTURAL STEEL AND REINFORCED CONCRETE DETAILERS for Montreal office with a minimum of five years experience in either field. State full particulars in first letter. Salary open. Apply to File No. 2091-V.

CHEMICAL OR MECHANICAL ENGINEER to act as design engineer, with two or more years' experience in the chemical or allied industry. Location Ontario. Apply to File No. 2093-V.

TOOL ENGINEERS and patent lawyer required by large automotive industry in Ontario. Apply to File No. 2094-V.

ELECTRICAL DRAUGHTSMAN, with at least 6 years experience required by P.U.C. of about 25,000 H.P. State wages expected, age, etc. Apply to File No. 2096-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMICAL ENGINEER required to take charge of process development group. Applicant should have at least five years development and production experience in chemical industry. Position in Ontario. Salary open. Apply to File No. 1335-V.

TWO JUNIOR OR INTERMEDIATE CHEMICAL ENGINEERS for the control department of pulp and paper industry in the Maritimes. Duties would be in connection with control and process work. Apply to File No. 1650-V.

CHEMICAL ENGINEERS with production ability, to operate chemical equipment such as filter presses, evaporators, vacuum jets, solvent recovery etc. Location Valleyfield, Quebec. Excellent opportunity offered. Salary open. Apply to File No. 2053-V.

YOUNG CHEMICAL ENGINEER required in plant located in Province of Quebec. Applicant would be obliged after completing training period to take charge of analytical laboratory and to coordinate production with control both in alcohol distillery and in magnesia insulation plants. Preferably under 30 years of age with 1 or more years industrial experience. Apply to File No. 2054-V.

CHEMICAL ENGINEER 1949 or 1950 graduate required by large pulp and paper industry located in Province of Quebec. Apply to File No. 2059-V.

CIVIL

CIVIL ENGINEER required by large firm in Ontario, with about 10 years structural experience. Applicant must be experienced and able to assume responsibility. Apply to File No. 1644-V.

CIVIL ENGINEER for design work on hydro-electric structures. Prefer at least four years' experience in this field. A knowledge of power house and dam foundations is desirable. Good opportunity with large Canadian company. File No. 137. Apply to File No. 2017-V.

CIVIL ENGINEER required by large Canadian company with experience in structural steel design, preferably on hydro-electric structures such as gates and outdoor switching yards. Apply to File No. 2017-V.

CIVIL ENGINEERS required by large construction company in Montreal. Applicants should have 2 or 3 years experience in field and general construction. Apply to File No. 2034-V.

YOUNG CIVIL ENGINEER with knowledge of reinforced concrete structures. Duties include supervision of concrete construction in Quebec, measurements on the work, drawings, reports and process estimates. Applicant must be bilingual. Reply in writing, giving full particulars as to experience, qualifications and salary expected to File No. 2060-V.

CIVIL ENGINEER required by engineering department of construction company. Duties include estimating, laying out construction work and engineering supervision. Salary dependent upon ability. Reply giving complete details of background and experience. Apply to File No. 2064-V.

ELECTRICAL

FULLY EXPERIENCED ELECTRICAL ENGINEER required by textile industry located outside Montreal. Applicant must have some real practical experience, about 15 years in a manufacturing plant, preferably textile mill. Excellent opportunity offered. Apply to File No. 1418-V.

GRADUATE ELECTRICAL ENGINEER required in the Province of Quebec as sales engineer for established wire and cable company. Experience in power field desirable. Salary open. Apply to File No. 1570-V.

ELECTRICAL ENGINEERS with experience in electronics and radar for positions in Ottawa. Salaries open. Apply to File No. 1588-V.

THE PUBLIC SERVICE OF CANADA requires Electrical Engineers (electronics and communications). Appointments at Ottawa, Toronto and Montreal. Salaries up to $4,740.00 per annum. Details and application forms may be obtained by writing Civil Service Commission, Ottawa. Competition No. 50-158-B. Apply to File No. 2016-V.

ELECTRICAL ENGINEER required by large Canadian company, with hydro electric operations in Brazil with several years experience with industry on public utility. Duties will include: specification writing, analyzing bids, checking manufacturer's drawings, inspection of heavy electrical equipment, supervision of freight tests and technical correspondence. Prefer a minimum of three years experience. Location Toronto File No. 13741. Apply to File No. 2017-V.

ELECTRICAL ENGINEER required by university in Montreal. Duties include design and construction of electronic equipment and finally extensive research. Apply to File No. 2022-V.

ELECTRICAL ENGINEERS required by large public utility in Montreal. Applicants with or without experience desired. Apply to File No. 2046-V.

MECHANICAL

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for ordinary colliery plants screening equipment. Hoists, simple steel structures, etc. Salary open. Apply to File No. 1332-V.

MECHANICAL DESIGN ENGINEERS required by west coast pulp and paper mill. Previous pulp and paper experience desirable but not necessary and consideration will be given to all applicants with industrial experience. Salaries from $3,600.00 upwards commensurate with experience. These are permanent appointments in a well established mill. Apply to File No. 1582-V.

MECHANICAL ENGINEER required by large firm in Montreal to act as railroad car engineer. Applicant should have 2 or 3 years (or more) of experience in the design of tank cars, as defined by the Association of American Railroads. Familiarity with the requirements of the A.A.R., the I.C.C., the Bureau of explosives and the Board of Transport Commissioners is essential. Salary open. Apply to File No. 1600-V.

MECHANICAL ENGINEER required by large firm in Montreal. Applicants should have experience in the pulp and paper industry, particularly in the design and for operation of paper making machinery. One or two years experience desired. Salaries open. Apply to File No. 1600-V.

MECHANICAL ENGINEERS with design experience and ingenuity required for an aggressive Canadian firm manufacturing electronic and mechanical controls and instruments. Project engineers and junior engineers required. Salaries open. Apply to File No. 1609-V.

MECHANICAL ENGINEER required immediately for sales department. Large company requires the immediate services of a mechanical engineer, for its sales department, preferably bilingual. This is a permanent salaried position, with well established company. State age, education and outline all experience. All replies treated in confidence. Apply to File No. 1620-V.

MECHANICAL ENGINEERS required by large manufacturing firm located one hundred miles from Montreal. Excellent opportunities for experience and promotion in time study standards department eventually leading to shop management. Apply to File No. 1621-V.

MECHANICAL ENGINEER required in Province of Quebec with some plant experience. Duties include design and plant layout work. Apply to File No. 1648-V.

MECHANICAL ENGINEER with knowledge of industrial steam power plant design, heating system and application of steam, air and hydraulics as applied to processes, required by large established company, 5 years or more experience, desirable location Montreal. Salary open. Apply to File No. 1655-V.

MECHANICAL ENGINEER 25 to 30 years of age required for manufacture of spun synthetic textile yarns at Granby, Quebec. The plant superintendent is a graduate mechanical engineer and the position is that of assistant superintendent. Duties will include planning production, the maintenance of the machines, planning and installation of a new machinery and daily contact with all levels of personnel. Salary will be dependent on the experience of successful applicant. Minimum $300.00 per month. Apply to File No. 1700-V.

MECHANICAL ENGINEER required by a large manufacturer in Montreal of heavy mechanical equipment. Applicant should have several years industrial experience which should include a background of welding knowledge. Apply to File No. 2001-V.

MECHANICAL ENGINEER with several years experience on design and layout of mechanical equipment for hydro-electric construction, location Southern Ontario. When replying please quote File No. 137-8. Apply to File No. 2005-V.

MECHANICAL ENGINEERING GRADUATE or equivalent with three or more years experience in design and manufacture of light alloy structures required by large Montreal firm manufacturing radio communication equipment and radar. Apply to File No. 2011-V.

MECHANICAL ENGINEER recent graduate up to three years employment interested in obtaining drawing office experience in plant production of heavy armament work. Forty minutes by tramways from Phillips Square, Montreal. Apply to File No. 2014-V.

MECHANICAL ENGINEER wanted, with designing experience and mechanical ability, plus a desire to become sales engineer, by manufacturer of road building machinery located in the Province of Quebec. Good speaking knowledge of French is necessary. Apply to File No. 2037-V.

MECHANICAL ENGINEER required as assistant to chief inspection of large oil company in Montreal. Applicant should have at least three years experience in plant maintenance, involving shop fabricating methods and inspection. Knowledge of metallurgy and familiarity with corrosion problems an asset. Salary open. Apply to File No. 2052-V.

MECHANICAL ENGINEER REQUIRED for engineering office of large oil company. Applicant should have minimum of two years' experience in design and layout of mechanical equipment. Working knowledge of pressure vessel design an asset. Location Montreal. Salary open. Apply to File No. 2052-V.

MECHANICAL ENGINEER with 3 to 5 years experience in maintenance engineering. An asset if bilingual but not necessary. Location: Valleyfield, Quebec. Excellent opportunity offered. Salary open. Apply to File No. 2053-V.

MECHANICAL ENGINEER, recent graduate, to act as plant superintendent in large bakery in Montreal. Apply to File No. 2055-V.

MECHANICAL ENGINEER of about 35 to 40 years of age to assist mechanical superintendent of plant located in Eastern Canada. Work will involve assisting supervision of construction, installation and maintenance of plant equipment including pumps, boilers, refrigeration, air-conditioning equipment, etc. Salary about $5,000.00. Apply to File No. 2056-V.

MECHANICAL ENGINEER required for large construction quarry and concrete company. Must have some experience in layout and design of plants. Salary commensurate with ability. Reply giving complete details of background and experience. Apply to File No. 2064-V.

METALLURGICAL

FOUNDRY METALLURGIST required in British Columbia. Applicant should have broad experience in research work. Apply to File No. 1118-V.

METALLURGIST, recent graduate required for cast iron foundry located in Province of Quebec. Apply to File No. 2050-V.

MISCELLANEOUS

EXPERIENCED DESIGN ENGINEER required by a large Western Canadian steel fabricating shop. Must be experienced in design of boiler and pressure vessels. Material handling equipment, structural steel. Apply to File No. 1502-V.

SENIOR DESIGN ENGINEER required in Ottawa, with a degree in mechanical or chemical engineering. Applicant should have a minimum of 5 years experience in mechanical design particularly with reference to chemical plant equipment and process. Apply to File No. 1507-V.

ASSISTANT PRODUCTION SUPERINTENDENT. Press operations required in Ontario. Applicant should be familiar with die equipment and be able to assume responsibility of a production shift consisting of two foremen and approximately eighty men. He must have a thorough knowledge of standards, production control, cost control, labour relations, etc. Apply to File No. 1559-V.

ASSISTANT PRODUCTION SUPERINTENDENT finishing operations, required by firm in Ontario. Applicant must be familiar with the following finishing operations on various types of steel; polishing, electro plating (copper, nickel and chromium) and buffing and be in a position to assume responsibility of a production shift consisting of four foremen and approximately one hundred men. He therefore must have a thorough knowledge of standards, production control, cost control, labour relations, etc. Apply to File No. 1559-V.

TECHNICAL DIRECTOR wanted for paper company producing from 100% rag to 100% sulfite papers. Applicant should be a graduate chemist or chemical engineer and must be bilingual. Surroundings are ideal and living conditions very good. Mills located near Montreal in the Laurentian Mountains. Apply to File No. 1586-V.

DEVELOPMENT ENGINEER by nuclear engineering branch to do experimental and development work in the field of mechanical engineering related to the design of atomic energy reactors and associated equipment. Applicants should have an engineering degree with high academic standing and five or more years engineering development experience. Apply to File No. 1602-V.

SENIOR PETROLEUM ENGINEER required by independent Canadian Oil Company with headquarters in Calgary. Applicant should be particularly experienced in reservoir engineering and production practices. No one with less than 7 years experience in the industry need apply. Give synopsis of education, training and experience and supply recent photo. Apply to File No. 1675-V.

GRADUATE ENGINEERS AND DRAUGHTSMEN, mechanical, civil, electrical required for projects in Ontario and Quebec. Preference to those with 3 years practical experience. Apply to File No. 1697-V.

SCIENTIFIC OFFICERS wanted. Applicants should be Canadian citizens who are graduates in science, preferably with post graduate training. Research or general experience in some particular scientific field is desirable in certain positions. War service will be considered an additional qualification in some positions and a requirement in others. The main duties will pertain to the co-ordination, control and dissemination of scientific information in most of the major fields of science and technology. Salary $2,700.00-$3,800.00 depending upon qualifications and experience. Apply to Box 1274, Station B, Ottawa, Ontario. Apply to File No. 1707-V.

DESIGN ENGINEER approximately ten years experience in structural material handling and mechanical design. Boiler design experience an asset but not essential. Location Western Canada. Apply to File No. 2000-V.

HYDRAULIC ENGINEER with several years' experience on reinforced concrete design and hydraulic structures, location Southern Ontario. Please quote File No. 13709. Apply to File No. 2005-V.

ELECTRONIC ENGINEERS required by large Montreal firm for development work on radio communication equipment and radar. Applicants should have three or more years of practical design experience in this field. Apply to File No. 2011-V.

FULLY QUALIFIED TEXTILE TECHNOLOGIST, graduate of textile institute, required in Montreal by industrial consultant. Applicant should have industrial engineering experience. Give full details as to experience and education to File No. 2012-V.

MECHANICAL DRAUGHTSMEN, detailers, checkers, all grades from 2 years experience and up for plant in production of heavy armament work. Forty minutes by tramways from Phillips Square, Montreal. Apply to File No. 2014-V.

SUPERVISOR OF UNDERGROUND DISTRIBUTION. Large Canadian organization requires well qualified electrical engineer for its Brazilian operations, duties will include long range planning of all underground distribution systems and of allied substations, review of the present underground distribution practices and reducing operating cost, making such studies as required by the chief of system planning or the chief electrical engineer. Apply to File No. 2017-V.

ASSISTANT PRODUCTION SUPERINTENDENT required by large firm of long standing manufacturing men's shirts, pajamas, etc., for plant near Three Rivers, Quebec. Experience in manufacturing these lines or similar necessary. Applicant would be required to plan for high production, improve methods, lower costs, etc. Good position to right party. Apply to File No. 2018-V.

RESEARCH CHEMIST required by chemical firm in Ontario for laboratory research under supervision. Minimum age 23 years, bachelor's or master's degree in chemistry or chemical engineering. Two or three years technical experience or Ph.D. in lieu of experience. Apply to File No. 2019-V.

CHEMIST required by chemical firm in Ontario for the development of textile chemicals. Minimum age 27 years, degree in chemistry or chemical engineering with 5-10 years technical (laboratory or production) and sales experience. Position requires both research and sales abilities combined with practical knowledge of textile industry. Apply to File No. 2019-V.

SALES ENGINEER, recent graduate, preferably mechanical or electrical required by well established supply house with nation wide representation. Experience in equipment sales, of value but not essential. Training period to be spent in Montreal. Good opportunity for advancement to party interested in making career of this work. Apply to File No. 2020-V.

ARCHITECTURAL DRAUGHTSMAN required by large pulp and paper manufacturer in Eastern Canada for general architectural designs covering building changes on existing buildings and new buildings etc. Apply to File No. 2021-V.

ENGINEERING DRAUGHTSMAN required by paper industry located in Montreal. Must be fully qualified. Apply to File No. 2023-V.

THREE FULLY QUALIFIED ENGINEERS required by a firm of management consultants located in Montreal. Salary open. Apply to File No. 2024-V.

MECHANICAL OR CIVIL ENGINEER required by national beverage company to act as plant superintendent in plant situated outside of Montreal. Applicant should be between 25 to 35 years of age. Salary open. Apply to File No. 2025-V.

ELECTRONIC ENGINEER required in Montreal with some experience with radar. Apply to File No. 2026-V.

TOP FLIGHT MAN for methods and time study work on all operations incidental to manufacturing of light and heavy sheet metal products. Excellent opportunity for man of proven ability and experience to establish himself with a sound company employing 200 people. Salary open. Applicants to apply in writing giving complete facts on education, experience and personal history. Enclose recent photograph. Apply to File No. 2029-V.

HYDRAULICS ENGINEER for the water rights branch, department of lands, B.C. Provincial Government. Salaries: hydraulic engineer Victoria and assistant district engineer, Kamloops, $3696.00 to $4295.00, assistant hydraulic engineer, Victoria $3336.00 to $3576.00. Positions permanent; superannuation plan. Candidates must be British subjects, preferably under 45 years of age; graduates in civil engineering or equivalent; eligible for full registration in Association of Professional Engineers of B.C. (in case of the last position, eligible for registration as engineer in training) knowledge of survey methods, photogrammetry hydraulics and hydrology of river discharge, dam design, soil mechanics and samplings; field and office experience on engineering work in hydro electricity, or irrigation and water supply or hydrology. Apply to File No. 2032-V.

HYDRAULIC ENGINEER fully qualified required by large industrial organization in Montreal. Applicant should be familiar with the design of hydroelectric power stations and water storage. Apply to File No. 2038-V.

TWO SALES ENGINEERS required by firm in Montreal manufacturing welding and cutting apparatus. Applicants should be 1949 or 1950 graduates in engineering with definite sales ability. Apply to File No. 2041-V.

GRADUATE ENGINEER required in the development and engineering department of firm located in Montreal. Applicant must have a minimum of 4 years experience in a steel manufacturing plant. Position involves technical assistance to the steel industry in use of our products and work on problems related to this field. The territory will be mainly in Quebec and Ontario with headquarters in Montreal. This is an excellent opportunity along technico administrative lines for the suitable person. Apply to File No. 2042-V.

SALES ENGINEER, preferably mechanical, required by organization in Montreal. Applicants should be around 33 to 37 years. Duties would include designing and selling under supervision of specialty machinery used in pulp and paper mills for handling pulp wood and newsprint. Starting salary $4,000.00. Apply to File No. 2043-V.

REPRESENTATIVE required by firm in Toronto manufacturing tarred felt and pitch used in roof construction, tar distillers, etc. Applicant would be obliged to call on architects, consulting engineers and general contractors. Apply to File No. 2047-V.

MECHANICAL AND STRUCTURAL ENGINEERS to act as project engineers to undertake the study and necessary design and drawing work in connection with a combination bar and strip mill located in Ontario. Salaries open. Apply to File No. 2048-V.

PROJECT ENGINEER graduate with at least ten years experience in design, construction and operation of petroleum chemical plants on petroleum refineries, required to supervise project division of company engaged in engineering and construction of gas processing plants located in Montreal, Canada. Salary commensurate with ability and experience. Apply to File No. 2051-V.

ENGINEER, age 35 to 45 years as maintenance superintendent and chief engineer for large Montreal property, approximately 750 rooms. Must be certified for large boiler plant, and be experienced in controlling cost of maintenance trades, including plumbers, carpenters, painters, etc. Bilingual preferred. Attractive opportunity to become established in permanent congenial situation. Apply to File No. 2057-V.

DESIGN AND DETAIL ENGINEERS required by a package handling conveyer concern located in Ontario. Promotion to responsible positions is offered to applicants having the necessary ability and qualifications. Apply to File No. 2058-V.

DRAUGHTSMAN, Senior layout man, required for the engineering department of new plant in Western Ontario. Must be capable of making complicated layouts from specifications, drawings, sketches or notes furnished by engineers and have considerable knowledge of manufacturing processes and their limitations. Should be capable of doing some designing. Experience in structural work and piping. University degree would be helpful not necessarily required. Apply to File No. 2062-V.

TWO RECENT GRADUATES required immediately for new Canadian plant of well known American company. Prefer men with interest in industrial piping for chemical and other industries. Excellent opportunities for advancement. Salary commensurate with ability and experience. Company located in Hamilton. Apply to File No. 2063-V.

CIVIL, ELECTRICAL AND MECHANICAL ENGINEERS, required by Vancouver, B.C., firm for office design on large hydro-electric development. Desire only working engineers with three or more years hydro or related experience. Applications should include complete record of experience, salaries received, salary expected and time required to make a transfer to Vancouver. Salaries commensurate with qualifications. Apply to File No. 2065-V.

WE REQUIRE QUALIFIED ENGINEERS experienced in construction work on reinforced concrete, structural steel and frame buildings, as well as incidental services. Administrative ability and technical knowledge are essential. Employee benefits include three weeks annual vacation, sick leave allowance and a liberal plan for life insurance, hospitalization, and surgical benefits for the employee and his family. Replies are to contain details concerning education, experience, salary requirements, age, marital status and date available. Apply to File No. 2066-V.

MANAGING ENGINEER for Canadian owned company manufacturing electrical equipment in Toronto. Professional engineer with electrical mechanical background required, preferably with experience in switch gear cubicle and street lighting design. This position requires both administrative and engineering ability. Age range 30 to 40 years. Excellent future, good salary, plus bonus and pension. Give full details of education and experience. Our employees know of this advertisement. All replies will be held in strictest confidence. Apply to File No. 2067-V.

Situations Wanted

GRADUATE CIVIL ENGINEER AND LAND SURVEYOR with proven ability to carry out responsibilities. Available on short notice. Over 23 years of wide experience on four continents. Experience includes design layout and field supervision of: roads, dams, buildings, drainage, irrigation works. Veteran C.R.E. and E.A.E., married, bilingual. Situations held in Canada: Chief of survey parties, resident engineer. Abroad: as district and assistant chief engineer for over 19 years in the British, Turkish, Iraqui, Government Services. Apply to File No. 489-W.

ELECTRICAL ENGINEER, S.E.I.C. graduate Nova Scotia Technical College 1950, married, veteran, 34, presently employed by large cable manufacturing company in Montreal as a junior development engineer in their electrical laboratory, desires position in Nova Scotia preferably Halifax area. Previous experience in surveying, communications, d.c. machinery. Willing to accept position in any branch of electrical engineering including sales. Available for interview in Montreal anytime and in Nova Scotia in July, 1951. Apply to File No. 1325-W.

CIVIL ENGINEER, Jr.E.I.C., P.Eng. (Ontario), B.Sc. (Hons.) Birmingham, England, 1948. Age 28. Single. Ex-Sapper, Field Engineers of Union Defence Force (South Africa). Presently employed in temporary position in Toronto. Seeks permanent employment where hard work and initiative will lead to advancement. Fifteen months experience in municipal roads and drainage work in South Africa, including surveying, design and supervision. Also eleven months with waterworks in Canada on design of steel and reinforced concrete structures and writing of specifications. Willing to work anywhere. Apply to File No. 1463-W.

MECHANICAL ENGINEER S.E.I.C., 1950 graduate, University of Toronto. Age 24, single. Experience in machine shop and repair and maintenance work. Presently employed in structural steel, foundry and machine tool industry as plant layout and maintenance engineer. Interested in permanent position leading to responsibility. Willing to work and learn. Available on short notice. Apply to File No. 1505-W.

MECHANICAL ENGINEER, M.E.I.C., U.B.C. 1936. Age 37, married. 3 years experience as designer in paper machinery department of large manufacturer. 5 years as senior officer in the A.I.D. of the R.C.A.F. engaged on technical and administrative duties. 6 years as engineer in the paper and saw milling industry on the west coast, engaged on the layout, design and installation of wood-handling plant and equipment, including considerable experience in the design and erection of timber, steel and concrete structures. Desires position as resident engineer or senior engineering position covering industrial planning and development. Apply to File No. 1965-W.

WORKS MANAGER and administrator with experience in mechanical, electrical and civil engineering work open for appointment. Apply to File No. 2429-W.

GRADUATE MECHANICAL ENGINEER, M.E.I.C., P.Eng. (Ontario), age 31, married. Presently employed in Toronto. Desires responsible position with manufacturing firm. Nine years experience in mechanical and structural design, inspection, shop liaison, and sales and service. Apply to File No. 2586-W.

CIVIL ENGINEER, B.Sc. 1947, Jr.E.I.C., P.Eng. (Quebec). Age 26, married, with car, 3½ years varied structural experience with architects, fabricators and contractors, covering design, detailing and estimating of structural steel and concrete as well as liaison work, desires position with responsibility. Must include outside work in design and supervision, and/or liaison work, or sales promotion. Available on one months' notice to present employer. Ontario or Alberta preferred. Apply to File No. 3340-W.

GRADUATE MECHANICAL ENGINEER, M.E.I.C., with extensive experience at draughting, designing and estimating of all types of plate, structural and machine work, now fully employed, desires part time work for evenings and week-ends. Apply to File No. 3367-W.

ELECTRICAL ENGINEER, M.E.I.C., P.Eng. Six years experience in design, manufacturing, sales and application engineering, including electronic test equipment design, manufacture of public address equipment; preparation of sales information and technical writing, application of motors, controls, transformers, switchgear, etc. Desires permanent position in power field, in design, operating or application engineering, not sales. Aims to advance into management or advisory engineering. Location preferred, Southern Ontario or British Columbia. Apply to File No. 3326-W.

CIVIL ENGINEER, M.Sc., M.E.I.C., P.Eng., age 39. Practical experience since 1934 in design of reinforced concrete and steel structures (warehouses, factory buildings, power station, boiler houses, heavy foundations, hydraulic structures, oil refinery plants, gas plants, jetties) estimate and surveying. Seeks position in Ontario or Quebec. Apply to File No. 3369-W.

MECHANICAL ENGINEER, M.E.I.C., graduate McGill, 1943, veteran, age 30, seeks position as project or plant engineer. Broad experience in plant layout, design, construction, alteration and maintenance work. Employed during past 3 years on design and construction of large mill now nearing completion. Would consider alternative position as executive assistant or sales engineer. Apply to File No. 3405-W.

CONSTRUCTION COST ENGINEER, Queen's 1948, R.C.A.F. Veteran, with experience in all phases of estimating, scheduling, cost control, material requisitioning and expediting, for both large and small industrial projects, desires an executive or supervisory position where hard work and initiative will lead to advancement. Other assets include wife, two children and own car. Location unimportant. Apply to File No. 3406-W.

WELDING ENGINEER, M.E.I.C., P.Eng., B.A., B.Sc., Queen's 1941. Age 34, married. 7 years production and development experience in the fabrication of heavy industrial equipment with particular reference to welded pressure vessels. Desires continued experience in this or related fields. Available on short notice. Apply to File No. 3407-W.

1950 GRADUATE, University of Saskatchewan, distinction in Engineering Physics. 26 years, family of 2, currently mastering in physics. Have background as resident engineer on municipal engineering project; ex-navigation instructor in R.C.A.F. Desire work in applied research or in general engineering. Available May, 1951. Apply to File No. 3414-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.Eng., B.Eng., McGill 1949. Age 28. Single. Good health. Experience: two summers as junior draughtsman in pulp and paper mill, two summers as helper in foundry and boiler shop of firm manufacturing heavy machinery, spring 1949 to date as engineer with major oil company. Desires to obtain plant engineering experience with a firm located in the Toronto area. Apply to File No. 3415-W.

TWO PROFESSIONAL ELECTRICAL ENGINEERS, Jr.E.I.C. Honors graduates of Canadian Universities, having completed two years training with a leading Canadian Electrical Manufacturer, seek to better their positions. Professional employment with any progressive Canadian company will be considered. Apply to File No. 3416-W.

ELECTRICAL ENGINEER, S.E.I.C., B.A.Sc., U.B.C. 1950. Age 27, single. Experience: Radar mechanic R.C.A.F. One summer each as coal mine car repairer, tipple machinery operator, and electricians' helper in coal mine. Will work anywhere. Available immediately. Apply to File No. 3417-W.

MECHANICAL ENGINEER, S.E.I.C. graduate, University of Saskatchewan, 1950. Age 31, married. 4 years overseas with R.C.A.F. as wireless mechanic. Some boiler shop and pipe fitting experience. Would like to specialize in heating and air conditioning or in power house work. Willing to undertake any required training. Apply to File No. 3422-W.

ELECTRICAL ENGINEER, Jr.E.I.C., Assoc. A.I.E.E., B.Sc., University of New Brunswick, 1949. Age 25, single. One year experience in the manufacture and design of polyphase and single pnase motors. Seeks position in design or production engineering in power field preferably in Montreal area. Available immediately. Apply to File No. 3423-W.

CHEMICAL ENGINEER, Laval 1949. Single, bilingual, with summer experience in shipbuilding, galvanizing of steel and making of aluminum. Nearly two years experience in food industry in Montreal. Desires a position in industrial, sales or plant engineering with opportunity for advancement. Available on short notice. Apply to File No. 3432-W.

CIVIL ENGINEER, S.E.I.C. Will graduate from N.S.T.C., May, 1951. Age 31. Married. Experience on the following projects. 1 summer: rodman on municipal street layout. 1 summer: instrument man on topographic survey. 1 summer: instrument man with Department of Highways. 1 summer: resident engineer on marshland reclaimation project. Desires position preferably in municipal engineering or in Maritimes with construction company. Apply to File No. 3438-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C., Sask., 1950. At present taking masters degree at University of Toronto. R.C.A.F. veteran, 5 years practical engineering experience. Willing to work hard and accept responsibility. References and detailed experience on request. Available May, 1951. Apply to File No. 3439-W.

MECHANICAL ENGINEER, Sask., 1949 (with distinction), Jr.E.I.C., P.Eng. Age 32, married, vetrean, desires position in Hamilton area. Since graduation experience includes employment with contractor in refrigeration, air conditioning and ventilation, including design of systems and installation. Desires a change with a firm which will give more chances of using my engineering qualificaitons as present position does not allow a large enough scope for engineering work. Available on one month's notice to present employer. Apply to File No. 3442-W.

ELECTRICAL ENGINEER, Higher National Diploma, 1949 (Power Course), Dundee Technical College, Scotland. P.Eng., Ont. One year experience as field engineer on design and reconstruction transmission and distribution lines in Scotland. Six years as technical officer in R.E.M.E. Four years as apprentice technician with power company in Poland. Experience in diesel-electric and hydro-electric plants in planning office and line surveying. Wishes to find employment in power field or design, would like to learn from the start the Canadian way of work. Apply to File No. 3443-W.

CHEMICAL ENGINEER, Jr.E.I.C. (B.Sc., Queens 1948). Age 29, married, one child. Two years experience production supervision and development engineering in chlorine-alkali industry. Some experience in coal tar refining. At present employed. Desires position in Ontario or Quebec. Apply to File No. 3452-W.

SALES AND TECHNICAL SERVICE engineering employment desired by young engineer (24 years, single), expecting to graduate in Metallurgical Engineering (McGill) in May, 1951, S.E.I.C. Many summer months experience in the making, shaping and inspection of steel. Location is practically immaterial and applicant is willing to travel. Willing to start on training programme if necessary. Available June 1st, 1951. Apply to File No. 3453-W.

CHEMICAL ENGINEER, S.E.I.C., Alberta, 1946. Age 29, married, one child. Background of successful experience in production control, cost reduction studies and process design in petroleum refining and synthetic rubber manufacturing fields. Capable of assuming responsibility. Available after graduation in business administration (U.W.O.) in May. Apply to File No. 3456-W.

METALLURGICAL ENGINEERING, Jr. E.I.C., Toronto, 1948. Business Administration, University of Western Ontario, 1951. Desires position in production engineering or as technical salesman for a manufacturer of durable producers' and consumers' goods. Age 28, married. Naval veteran. Over two years' experience with a large Canadian manufacturing firm chiefly as a production supervisor. Conversant with French. Available in May. Apply to File No. 3457-W.

CIVIL ENGINEER, Jr.E.I.C., P.Eng. (Ont.), B.Sc., University of Alberta, 1945. Age 27, married. 1 year in highway location, design, estimates and construction; 5 years field and office experience in surveys, designs, layout and construction supervision in transmission lines, tower footings, reinf. conc. and pile foundations, also some knowledge of municipal engineering. Presently employed in Ontario. Desire position in Alberta with consulting engineers, construction company, or other company with own engineering staff. Available after September, 1951. Apply to File No. 3458-W.

BRITISH SUBJECT, chartered electrical engineer, apprenticeship trained, presently holding technical and commercial managerial appointment in branch works of one of the premier manufacturing electrical companies in England, wishes to contact Canadian principals with view to ultimate emigration to Canada or with Canadian subsidiaries overseas. Three years wartime experience of Canada. Canadian references. Six years commissioned Naval service. Age 37. Married. Apply to File No. 3463-W.

ELECTRICAL ENGINEER, Sask., 1950, S.E. I.C., P.Eng. Age 30, married, veteran. Desires permanent employment anywhere in Canada. Experience includes 4 years radar mechanic, one summer sales, several months practical experience on wiring and installation of transformer banks switch gear, motors, etc. Apply to File No. 3464-W.

AERONAUTICAL ENGINEER, Jr.E.I.C., graduate Mass. Institute of Tech. Age 28, married, good health. Seven years experience with major airline on aircraft specifications and negotiations, mock-up, stress analysis, performance calculation, aircraft evaluation, detailed design, testing, report writing, correspondence, administration. Hard worker, willing to take responsibilities. Apply to File No. 3470-W.

GRADUATE ENGINEER, Jr.E.I.C., University of Saskatchewan, 1948. Age 25, single and in good health. Three years experience in farm implement design. Seeks employment in design or production engineering. Willing to undertake any required training. Presently employed but desires position leading to responsibility. Available on short notice. Apply to File No. 3472-W.

PLANT ENGINEER of medium sized company, Mechanical, McGill, 1948, Jr.E.I.C. Veteran, single, 27 years, desires affiliation with medium or large concern. Undertook and completed movement of two plants. Designed, costed and implemented major changes and installations of boiler house, air compressor house, air exhausting systems, electrical mains, instruments, heating and steam process mains. Staff of approx. 100, 20% licensed tradesmen. Collection of basic production machine data for time loading, scheduling, etc. Other studies and training courses. Excellent references. One month's notice. Apply to File No. 3476-W.

CIVIL ENGINEER, S.E.I.C., B.Sc., U.N.B., 1950, navy veteran. Age 26, married with one child. Have considerable experience in highway construction in N.B. References on request. Apply to File No. 3477-W.

AGRICULTURAL ENGINEER, S.E.I.C., graduated from U.B.C. in May, 1950. Age 24, single and in good health. Farm background and experience in the operation, repair and maintenance of most types of farm equipment. Would like design, development, or research work in farm power and machinery, rural electrification, or irrigation and drainage anywhere in Canada. Willing to work for a moderate salary to gain experience. Available on short notice. Apply to File No. 3478-W.

CIVIL ENGINEER, Jr.E.I.C., B.Eng., McGill, 1949. Age 26, married, presently employed by construction firm in Montreal, would offer services for part-time employment in designing, estimating, etc., related to varied fields of building construction, especially reinforced concrete, steel or timber structures and foundations. Apply to File No. 3480-W.

ELECTRICAL ENGINEER, Jr.E.I.C., 1949, graduate of the University of Manitoba, about to complete two year apprenticeship in England, seeks employment in Canada, as from August, 1951. Experience includes testing of instrument transformers, testing of A.C. and D.C. motors and generators, 6 months in D.C. machine design engineers office, 3 months in electronic development laboratory, 6 months erection of steel mill rolling equipment. Undergraduate experience includes summer employment as student engineer in steel plant. Apply to File No. 3481-W.

GRADUATE ENGINEER, Jr.E.I.C., honors graduate, McGill, 1949, married, overseas R.C.A.F. veteran. Varied experience in the field of production control and planning, methods analysis, time study quality control and allied engineering subjects. Desirous of obtaining a position in the management sphere. Location Toronto area. Available immediately. Apply to File No. 3482-W.

CIVIL ENGINEER, B.Eng., McGill, 1944, M.E.I.C., P.Eng. Married with two children, veteran R.C.E. Have had about ten years experience in construction, maintenance and industry including long-range planning, design and economic studies; also supervision and inspection as resident engineer. Familiar with general office routine and accounting procedures. Proven ability to handle labour, direct staff work and meet the public. Now enrolled in course on Modern Business with Alexander Hamilton Institute. Present employment highly responsible but wish to locate in Montreal area. Ambitious toward executive position requiring engineering and business training. Apply to File No. 3486-W.

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BOOK REVIEW

OIL FIELD EXPLORATION AND DEVELOPMENT, 2 Volumes. Volume 1: OIL FIELD PRINCIPLES; Volume 2: OIL FIELD PRACTICE.

A. Beeby Thompson. London, Technical press, 1950. 546 pp., 630 pp., illus., $10.50.

This 1950 revision of an already widely accepted source book on oil field exploration and development serves a two-fold purpose.

In addition to all the basic information contained in the 1925 edition, appendices, with original chapter references, describe and outline new developments and discoveries in information and technique over the past 25 years.

A brief survey of appendices contents shows these discoveries and developments geographically subdivided; U.S.A. petroleum productions since 1859; and world petroleum production since 1880.

Closer study, however, reveals discussion and reports on the work of skilled geophysicists with magnetometers, gravimeters, seismographs and electrical contrivances, and developments in the location of concealed oil structures through soil analysis.

Correlation of strata by their heavy mineral content, or the assemblage of micro fauna remains have proved invaluable when breaks or macro fossils are confused or unidentifiable: and knowledge of regional geology has been immeasurably improved due to the high degree of perfection developed in flying techniques and aerial photography apparatus.

Numerous illustrations, both plate and black and white, and an excellent index to both volumes, in each volume add further to the usefulness of this 2-volume work.

E.K.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Airplane aerodynamics:
D. O. Dommash. New York, Pitman, 1951. 520 pp., illus., cloth, $6.50.

Aménagements Hydro-électriques:
I. Leviant, Paris, Dunod, 1951. 148 pp., illus., 640 fr.

Automatic control of industrial plant and processes:
J. W. Ashley. London, Emmott, 1950. 65 pp., illus., 3s. (Mechanical World Monograph No. 60).

Bibliography of statistical quality control; supplement:
Grant I. Butterbaugh. Seattle, Univ. of Washington Press, 1951. 141 pp., $2.00.

Cams and springs for poppet valves:
W. H. Lee. London, Emmott, 1950. 42 pp., illus., 2/6. (Mechanical World Monograph No. 61).

Die design and diemaking practice; 3rd ed.:
Franklin D. Jones ed. New York, Industrial Press, 1951. 1,083 pp., illus., $7.00.

Electric illumination; 2nd ed.:
J. O. Kraehenbuehl. New York, Wiley, 1951. 446 pp., illus., $8.00.

Electrical code:
London, Institute of petroleum, 1950. 99 pp., 26s. (Being part 1 of the Institute of petroleum Model code of safety practice in the petroleum industry).

Electrical year book 1951:
London, Emmott, 1951. 360 pp., illus. 3/–.

Elements of ore dressing:
A. F. Taggart. New York, Wiley, 1951 595 pp., illus., $10.00.

Exposés d'économique; introduction générale. L'apport des ingénieurs français aux sciences économiques:
F. Divisia. Paris, Dunod, 1951. 158 pp. illus., 650 fr.

Handbook of correctional institution design and construction:
United States Bureau of prisons, Washington, 1949. 317 pp., illus., $6.00.

Ingenious mechanisms for designers and inventors, Volume 3:
Holbrook, L. Horton ed. New York, Industrial Press, 1951. 536 pp., illus., $6.00.

Methods of operations research:
P. M. Morse, and G. E. Kimball. New York, Wiley, 1951. 158 pp., $4.00.

Natural gas economics:
Joseph A. Kornfeld. Dallas, Texas, Transportation Press, 1951. 260 pp., illus., $5.00.

Physics in chemical industry:
R. C. L. Bosworth. Toronto, Macmillan, 1951. 928 pp., illus., $13.35.

Pressure vessels:
William Buchan Ritchie. London, Emmott, 1950. 71 pp., illus., 3s.

Prestressed concrete:
Gustave Magnel. London, Concrete Pub. Ltd., 1951. 300 pp., illus., $3.50.

Process engineering:
W. H. Schutt. New York, McGraw-Hill, 1948. 309 pp., illus., $5.85.

Report preparation:
Frank Kerekes. Ames, Iowa State College Press, 1951 .449 pp., illus., $6.90.

Soil mechanics for civil engineers:
Knight, B. H. Toronto, Longmans, Green, 1951. 255 pp., illus., $4.20.

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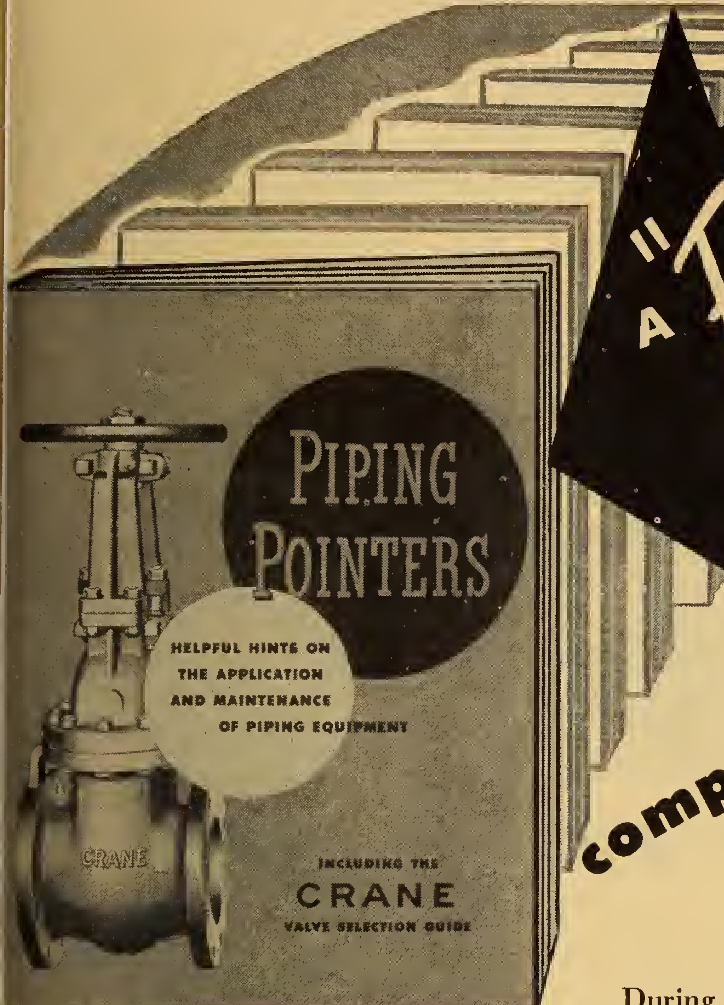

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Le fascicule "Notions de tuyauterie", imprimé en français, comprend un dictionnaire de 16 pages, anglais-français et français-anglais, où se trouvent tous les termes employés en tuyauterie. Ce fascicule est donc d'une utilité considérable pour les plombiers, les acheteurs et, en général, toutes les personnes intéressées à l'installation et à l'entretien des tuyauteries.

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Standard metal directory, 12th ed., 1950:
New York, Atlas Pub. Co., 1950. 818 pp., $15.00.

Technical drafting essentials, for vocational and technical students:
Warren J. Luzadder and William S. Hornung. New York, Prentice-Hall, 1950. 326 pp., illus., $3.00.

Thermostats and temperature regulating instruments; 3rd ed.:
Roosevelt Griffiths. London, Griffin, 1951. 217 pp., illus., 20s.

Transformer engineering, 2d ed.:
L. F. Blume. New York, Wiley, 1951. 500 pp., illus., $7.50.

Travelling waves on transmission systems, 2nd ed.:
L. V. Bewley. New York, Wiley, 1951. 543 pp., illus., $12.00.

TV master antenna systems:
Ira Kamen and Richard H. Dorf. New York, Rider, 1951. 368 pp., illus., $5.00.

World geography of petroleum:
Ed. by Wallace E. Pratt and Dorothy Good. Princeton, Princeton University Press, 1950. 464 pp., illus., $11.25.

TECHNICAL BULLETINS, PAMPHLETS, ETC.

British electrical and allied industries research association. Technical Reports:
No. L/T210—The sequence and location of internal discharges in dielectrics, by J. H. Mason. No. L/T212—Rheological study of the creep of dielectrics over short times and its relation to dynamic properties, W. Lethersich. No. L/T233—Compressibility and absorption frequency of ionic crystals, B. Szigeti. No. L/T235—The sequence and location of internal discharges in dielectrics (second report), by J. H. Mason. No. L/T236—A note on the mean free path of slow electrons in ionic crystals, by S. Zienau. No. L/T241—The deterioration and breakdown of dielectrics resulting from internal discharges—1, by J. H. Mason.

Canada. National Research Council. Laboratory notes:
No. ST-1-50—A note on vibration isolation from a non-rigid base, by J. P. Uffen.

Canadian standards association. Lists of publications:
List of publications, 1951.

Council for codes of practice for buildings construction and engineering services (London). Reports:
Fourth report, 1st January to 31st December 1949.

Engineering societies library. Bibliographies:
No. 8—Bibliography on management of construction jobs.

Institute of metals. Reprints:
No. 1273—Shearing of metal bars, by T. M. Chang and H. W. Swift. No. 1277—Stress-ageing treatment and its effects on the physical properties of copper-, iron-, and aluminium-base alloys, by R. F. Gill and others. No. 1278—The influence of alloy constitution on the mode of solidification and sand castings, by R. W. Ruddle and A. L. Mincher. No. 1279—Some observations on the alpha-beta transformation in titanium, by A. D. McQuillan. No. 1280—Review of published information on the oxydation and scaling of copper and copper-base alloys, by R. F. Tylecote.

Institution of civil engineers. Civil engineering codes of practice:
No. 4 (1950)—Foundations. Draft for comment.

International civil aviation organisation (ICAO). Indexes of ICAO documents:
Cumulated edition April 1947 to December 1948. Cumulated edition January to December 1949. Cumulated edition January to July 1950. Special issue PICAO and ICAO assembly documentation 1946 to 1950.

...Serials received in ICAO library:
December 1950.

Princeton university. Industrial relations section. Research reports:
No. 83—Maximum utilization of employed manpower. A check list of company practice.

RCAF experimental and proving establishments. Development reports:
No. D1-1—Propeller blade angle meter.

U.S. Highway research board. Bulletins:
No. 32—One-way streets.

...Research reports:
No. 11-B—Surface drainage.

BOOK NOTES

Prepared by the Library of The Engineering Institute of Canada

BRITISH STANDARDS:

British Standard Institution, 24/28 Victoria St., London, S.W.1.

B.S. 231: 1950—Pressboard for electrical purposes, 3/–.

This reedition of the 1936 standard includes tests for ageing in oil and resistance to compression and de-formation. Amendments have been made to the definitions.

B.S. 781: 1950—Wrought iron chain slings, 6/–.

This standard deals with iron chain slings and rings, links alternative to rings, egg links and intermediate links. It provides a specification for materials, form and dimensions of components, and tests for wrought iron chain slings from 3/8 in. to 1½ in. nominal size.

B.S. 1134: 1950—The assessment of surface texture (centre-line-average height method), 6/–.

The present work refers to the measurement of the irregularities of metal surfaces machine-finished by various methods. It covers terminology, instruments and methods to be employed in assessing B. S index numbers for surface textures, preferred limits for the grading of textures, and symbols to be employed on drawings.

B.S. 1507/1508: 1950—Steel (ferrous) pipes and tubes for pressure vessels for use in the chemical and allied industries, 10/6.

This document contains a comprehensive range of specifications for pipes and tubes manufactured from twelve types of steel, including mild steel, alloy steel and austenitic steel. Full details are given of chemical compositions, mechanical properties, methods of test and tolerances in finished pipes and tubes.

B.S. 1646: 1950—Graphical symbols for instrumentation, 2/6.

The system of instrument symbols described is suitable for use in engineering and industrial reports and in plant arrangement and layout drawings. It enables any combination of instruments to be shown in relation to the units of the plant with which they are associated.

B.S. 1663: 1950—Higher tensile steel chain (electrically welded), 2/6.

In addition to short link chain, the standard provides for pitched or calibrated load chain for use with pocketed sheaves, and the range of sizes covered (in terms of the diameter of bar which the chain is made) is from ¼ in. to 2 in. Also given are specifications of quality of material, heat treatment, dimensions and tolerances of bar and links, workmanship, breaking strength and safe working loads.

B.S. 1692: 1950—Gin blocks, 2/–.

Specifications are given in this standard for fibre rope gin blocks used in building or similar work for hoisting materials, by direct hand manipulation or by means of small portable hand winches. Four sizes of blocks are specified: 4, 8, 12 and 16 inches.

B.S. 1693: 1950—X-Ray diffraction powder cameras, 2/–.

This standard deals with standardization in the design of 1) Cameras having a nominal diameter of 9 cm., which are intended for use at room temperatures where the film is mounted by the Van Arkel or by the Bradley-Jay method. 2) Cameras having a nominal diameter of 19cm., with fixed or removable film holder, in which the type is mounted on a fibre of small diameter with provisions for rotation or oscillation.

B.S. 1698: 1950—Mercury-arc rectifier equipments, 5/–.

Application of this standard can be made to mercury arc rectifier equipments comprising half-wave rectifiers of any type having mercury pool cathodes, rated at 50 kw and above, having not less than 6 phases, for D.C. voltages not exceeding 4,000 and for service in non-explosive atmospheres.

B.S. 1700: 1950—Typical ship's derrick rigs, 7/6.

This British Standard is intended to serve as a useful informatory guide for those directly concerned with the working of cargo, and provides information on the various components of ship's cargo lifting tackle. Four typical derrick rigs are shown by drawings which also give methods of estimating graphically resultant loads on the gear.

B.S. 814: 1950—Mild steel drums, light duty-fixed ends. (Packaging standard), 2/–.

B.S. 1702: 1950—Mild steel drums, heavy duty-fixed ends. (Packaging standard), 2/–.

These two standards include specifications for the 44 Imperial gallon petrol drum. They specify the quality and gauge of metal and give details of construction, dimensions, closures, testing and marking.

B.S. 1133 Section 8: 1950—Wooden containers. (Packaging standard), 10/6.

This lengthy standard (137 pages) covers all types of sawn wood and plywood cases and boxes, casks, barrels and crates; it also includes a section on closures for returnable cases. An exceptionally useful feature is the inclusion of a chart to assist in calculating various details of skids for large frames cases; a chart for sizes of nails to be used is also included

B.S. 1133 Section 14: 1950—Adhesive and sealing tapes. (Packaging standard), 3/–.

This publication includes sub-sections describing gummed paper tapes and gummed cambric tapes, as well as the various types of self-adhesive tapes. For the latter, detailed specifications are given as well as the usual descriptive matter and a number of tests related to these specifications are included in the appendices.

BASIC REFRACTORIES. THEIR CHEMISTRY AND THEIR PERFORMANCE:

J. R. Rait. London, Iliffe, 1950. 408 pp., illus., 60s.

The present work contains a review of our fundamental knowledge relating to basic refractories, including dolomite, magnesite, chrome-magnesite and forsterite. The establishment of the complex phase diagram CaO-MgO-SiO_2-Al_2O_3-Fe_3O_2 and the derivation of the constitution of numerous commercial basic refractories from various countries are described. Chrome ores have also received detailed attention. Basic refractories under various service conditions have been subjected to detailed examination.

CHIMIE ORGANIQUE. Tome 3, FONCTIONS COMPLEXES:

A. Kirrmann. Paris, Armand Colin, 1950. 183 pp., 180 fr.

This book on complex organic compounds is the third of a series on organic chemistry, by this author. Throughout the book, emphasis is put on the mutual influence of two functions in the same molecule, and on the new resulting properties. The nomenclature of this small manual follows the best French traditions, and would not be readily understood by readers with an English speaking background.

ELECTRICITY IN THE HOME AND ON THE FARM, 3rd ed.:

F. B. Wright. New York, Wiley 1950. 380 pp., illus., $3.96.

This book is written for those who wish to gain a practical knowledge of electricity and its applications in the home and on the farm. It is the aim of the author to present here such fundamentals and practical jobs as will aid the reader to think for himself in terms of electricity and to acquire some of the more common skills in its use. The book is divided in two parts, the first dealing with fundamentals and their application to home and farm, the second being a series of practical jobs ranging from the simple to the more difficult.

FINISHING HANDBOOK AND DIRECTORY, 1951:

London, Sawell Pub. Co., 1951. 246 pp., illus., 15/–.

A study of this first edition of FINISHING HANDBOOK AND DIRECTORY, leads one to hope that it will become a regular publication.

The first 5 sections of the book are devoted to preparation treatments, each one the work of a specialist in the particular finish concerned.

Notes, tables and data of interest to the finishing shop follow this, and directions of Brand and trade names, equipment, supplies and services, names and addresses, and trade associations and organisations connected with finishing, complete this handy reference volume.

HEAVYSIDE CENTENARY VOLUME:

London, Institution of Electrical Engineers, 1950. 98 pp., illus., 5/–.

Celebrating the centenary of the birth of Oliver Heaviside, this volume published by the Institution of Electrical Engineers, is both a technical and a personal appreciation of Oliver Heaviside, the scientific genius and the man.

Papers on his unpublished notes, contributions to electromagnetic theory, operational calculus, telegraph transmissions, and pure mathematics are included. The volume opens with a description of Oliver Heaviside — the man, by Sir George Lee O.B.E., M.C., based on his personal correspondence, and accounts by his friends.

Oliver Heaviside: A personal sketch, by G. F. C. Searle, Sc.D., F.R.S., complete with personal anecdotes, brings the volume to a close — A fitting tribute to a great scientist.

INDUSTRIAL HIGH FREQUENCY ELECTRIC POWER:

E. May. New York, Wiley, 1950. 355 pp., illus., $5.00.

This book has been written around the notes prepared for a course of lectures on "industrial high-frequency technology", given in 1944 at the Birmingham Central Technical College. The book includes chapters on arc and spark oscillators, high frequency alternators, the triode valve, class B and class C operation of power amplifiers with tuned loads, induction and dielectric heating. There are preliminary and complementary chapters on the basic circuit theory, auxiliary equipment and H. F. measurements, industrial applications and operating problems.

MECHANICAL WORLD YEAR BOOK 1951:

Manchester, Emmott, 1951. 268 pp., illus., 3/6.

The 1951 issue of this yearbook contains, as usual, mathematical and mechanical tables, a clssified buyers directory, much advertising, a list of these advertisers, and the useful section on gas turbines. The publishers have chosen the subject "Engineering aspects of productivity", for authoritative treatment. Treatment of this subject includes chapters on the continuous flow gas turbine, belt conveyors and elevators, fuel and lubricating oils, machine tools, steam boilers, gearing, etc.

NUCLEAR PHYSICS:

Francis Bitter. Cambridge, Mass., Addison-Wesley, 1950. 216 pp., illus., $5.50.

This book is intended for students who have had a course in atomic theory in addition to the usual introductory physics courses. Since it is often impossible to give separate instruction to students intending to continue the study of nuclear science and to those intending to specialize in some other field, the author has attempted to write a book suitable for both groups. Some of the problems and exercises at the ends of the chapters have been chosen with the intention of interesting students who may wish to think somewhat more deeply about matters discussed in the text.

PRIVATE COMPANIES SPECIAL TAX ON UNDISTRIBUTED INCOME:

CCH Canadian Ltd. Toronto and Montreal, 1950. $2.00.

In this publication, tax-saving features permitted under recent amendments and regulations covering private and controlling companies are discussed at length by CCH consulting legal and accounting editors. Every "private company"—seventy-five shareholders or less—and certain conolling companies may take advantage of ie savings permitted and indicated, de- ending upon the facts of their particular ıse. The procedure is set out in detail ith examples.

ROCEEDING OF THE UNITED NA- IONS SCIENTIFIC CONFERENCE N THE CONSERVATION AND UTI- IZATION OF RESOURCES, 17 AU- UST - 6 SEPTEMBER, LAKE SUC- ESS, NEW YORK. Volume 1, PLE- IARY MEETINGS:

New York, United Nations, 1950. 431 pp., $4.50.

With the need for a reasoned and scien- fic conservation of world resources be- oming more and more evident these Pro- eedings are a means to a mobilization and rganization of that knowledge.

In addition to that however, they con- titute a definite milestone in the history f the U.N., in that they mark the first ccasion on which the U.N. invited the cientists of the world to meet together for he presentation and exchange of views.

The papers are grouped under broad ubject headings, and contributors are isted at the back with page references. Most papers include bibliographies.

PROPERTIES OF LUBRICATING OILS AND ENGINE DEPOSITS:

C. A. Bouman. Toronto, Macmillan, 1950. 170 pp., illus., $2.85.

The purpose of this book is to deal with he most important principles and prob- ems underlying the lubrication and foul- ng of internal combustion engines. The eader is assumed to be acquainted with he principles and the construction of in- ernal combustion engines as well as with ome fundamental physical and chemical acts. The author discusses the classifica- ion and manufacture of lubricating oils, ests for fresh oils, forms of contamination, ractical tests for lubricating oils, etc. The ook contains much tabulated material, ncluding conversion tables for kinematic viscosity to Redwood No. 1 viscosity, Saybolt universal viscosity and Engler viscosity.

STRUCTURAL PLASTICS:

H. C. Engels and others. Toronto, McGraw-Hill, 1950. 301 pp., illus., $5.85.

"Structural plastics" presents a factual, realistic and analytical coverage of the structural characteristics of plastics, and may be useful to the chemist, the struc- tural engineer, the architect, the aircraft designer, etc. The scope of the book is re- stricted to structural considerations and is not intended as a treatment of the en- tire plastics field. The reader will find here a sound treatment of low-pressure lami- nates and laminating techniques, porous plastics, honeycomb constructions, sand- wich materials, and structural adhesives, as well as a separate chapter on radome design and fabrication.

TABLES FOR CONVERSION OF X-RAY DIFFRACTION ANGLES TO INTERPLANAR SPACING:

Washington, U.S. Dept. of Commerce, 1950. 159 pp., $1.75. (National Bureau of Standards, Applied mathematics series No. 10).

The following tables give spacing values δ in angstrom units corresponding to the angles θ which are usually measured when diffraction patterns are used for chemical identification and crystal structure deter- mination. The first six tables give the spacing values for the angles θ from 0° to 90° at intervals of 0.01°. These tables were calculated by using the $K\alpha_1$ wavelengths for X-Ray targets of molybdenum, copper, nickel, cobalt, iron and chromium, re- spectively. The last two tables contain a rearrangement of the data for copper and iron.

THEORIE, FONCTIONNEMENT ET CALCUL DES MACHINES ELECTRI- QUES. Tome 1, CIRCUIT MAGNE- TIQUE. MACHINES A COURANT CONTINU:

A. Guilbert. Paris, Dunod, 1951. 608 pp., illus., 2,760 fr.

The present work is intended both as a manual for students of scientific schools and as a vade mecum for engineers build- ing or using electrical machines. This first volume studies machines either generating or using direct current. Throughout the book, graphics are used, whenever they can successfully take the place of alge- braic calculations and demonstrations. It is claimed that less formulae are employed than in most publications of similar coverage.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

AIRPLANE DESIGN MANUAL:

By F. K. Teichmann, 3rd ed. New York, Pitman, 1950. 382 pp., illus., $7.50.

Written for the student, young engineer, and draughtsman, this book outlines an orderly procedure for the design of air- planes. It considers airfoil selection, preliminary weight estimation, the balance diagram, the various parts of the plane, instruments and equipment, preliminary performance calculations, elementary long- itudinal stability calculations, and ma- terials of construction. The appendix contains much valuable data. The edition has been revised and the bibliography omitted.

CHEMICAL FORMULARY, Vol. IX:

Edited by H. Bennett. Chemical Publishing Co., Brooklyn, 1951. 648 pp., illus., $7.00.

This volume of the Chemical Formulary contains a collection of new, up-to-date formulae for a wide variety of products. Only the introductory material which is repeated in all volumes is retained. The list of chemicals and their suppliers has been enlarged with new trade-mark chemicals.

CIRCUIT ANALYSIS OF A-C POWER SYSTEMS, Volume II:

E. Clarke. New York, Wiley, 1950. 396 pp., illus., $8.50.

Continuing the treatment started in Volume I, this book presents methods for determining the performance of a-c power systems under normal and abnormal operating conditions. The electrical characteristics of insulated cables, various types of transformers and autotransformers, synchronous machines and induction motors are determined, with special attention to the development of equivalent circuits for use in the component networks. As in Volume I, circuits are analyzed by means of components.

DE RE METALLICA:

By Georgius Agricola, translated from the First Latin Edition of 1556 by H. C. Hoover and L. H. Hoover. New York, Dover, 1950. 638 pp., illus., $10.00.

This early classic on mining and metallurgical practice, originally published in Latin, was translated into English by Herbert Hoover and his wife, Lou Henry Hoover, and published in 1912. Long out of print, the Hoover translation has now been reprinted in complete form: text, footnotes, original illustrations, and three documentary appendices provided by the translator.

ELECTRIC CIRCUIT THEORY:

By H. Tropper. Toronto, Longmans, Green 1949. 164 pp., illus., $3.00.

Intended as a text for senior electrical engineering students, this book provides a unified account of some of the fundamental aspects of circuit theory. It shows how the solution of many network problems may often be simplified by the application of a few specific theorems. The treatments of steady-state and transient theory are based on the "superposition principle". A knowledge of elementary A.C. theory is assumed.

ENCYCLOPEDIA ON CATHODE-RAY OSCILLOSCOPES AND THEIR USES:

J. F. Rider and S. D. Uslan. New York, Rider, 1950. 982 pp., illus., $9.00.

This book covers the theory and uses of all types of cathode-ray oscilloscopes and synchroscopes manufactured from 1940 to 1950. It is divided roughly into four categories: the first dealing with theory and operation; the second, with applications; the third, with commercial oscilloscopes and related equipment; and the last is a compilation of 1600 complex waveform patterns. Three appendices on the characteristics of cathode-ray tubes, RMA cathode-ray bases, and photography, and a bibliography complete the book.

FUNDAMENTALS OF ACOUSTICS:

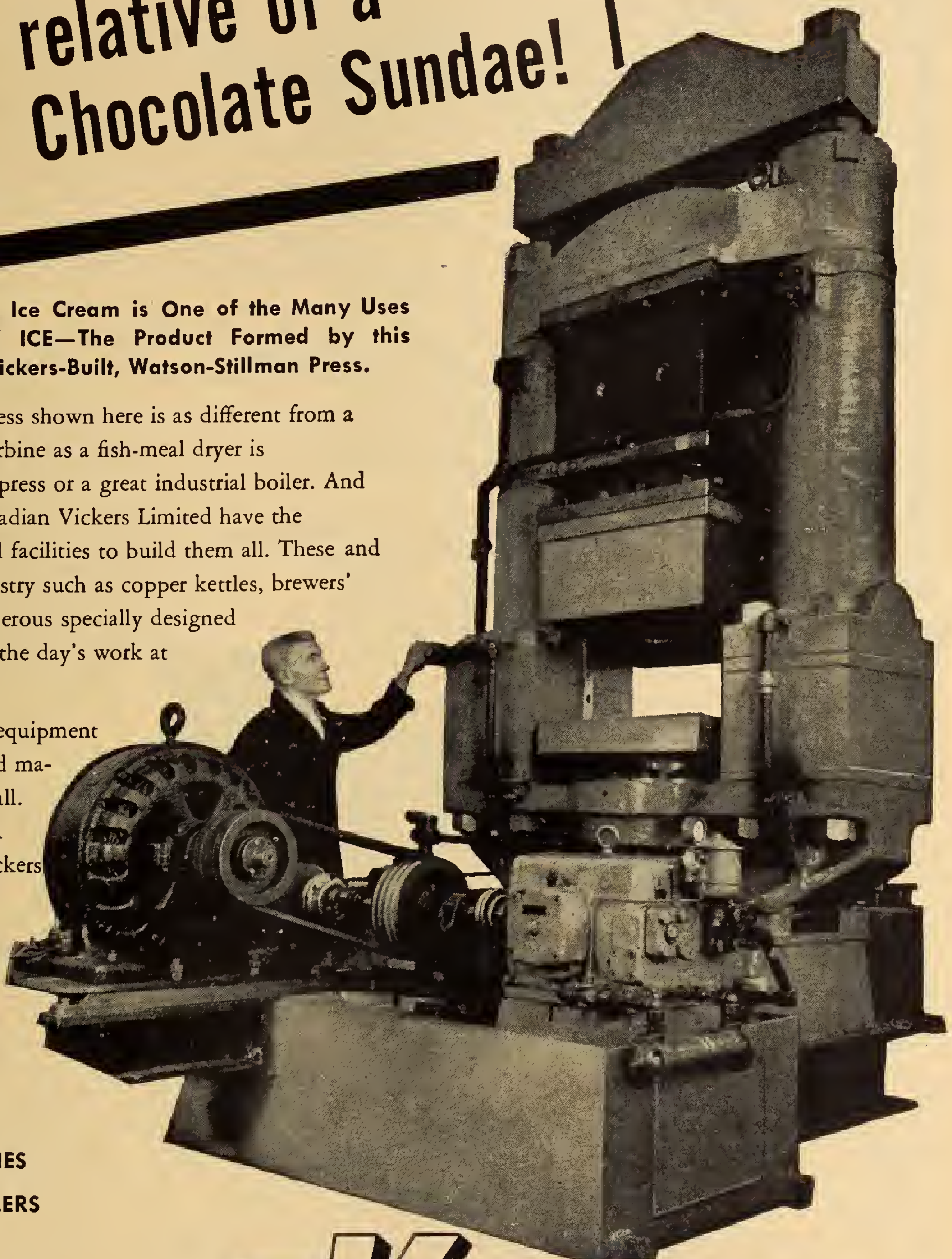
L. E. Kinsler and A. R. Frey. New York, Wiley, 1950. 516 pp., illus., $6.00.

This book presents the fundamental principles underlying the generation, transmission and reception of acoustic waves. The first nine chapters provide an analysis of the various types of vibration of solid bodies and of the propagation of sound waves through fluid media. The remaining seven chapters are concerned with a limited number of applications of acoustics. A knowledge of the fundamental principles of mechanics, electricity and calculus, including partial derivatives, is assumed. Problems for student solution are included.

FUNDAMENTALS OF QUANTUM MECHANICS:

E. Persico, translated and edited by G. M. Temmer. New York, Prentice-Hall, 1950. 484 pp., illus., $8.00.

In this book are presented the fundamental laws and principles of quantum mechanics, together with some applications. The first part provides an historical, overall view of the evolution of quantum mechanics using an intuitive and elementary approach. The second part, preceded by a mathematical introduction, considers the principles of the wave mechanics of a particle. In the third and last part, the transformation theory is developed, more advanced mathematical meth-



ods are used, and applications are considered.

GAS PRODUCERS AND BLAST FURNACES, Theory and Methods of Calculation:

W. Gumz. New York, Wiley, 1950. 316 pp., illus., $7.00.

Theory and calculation methods for gasification processes are developed in detail. In part one, gasification reactions, gas composition at equilibrium and at incomplete equilibrium, and gas-producer performance are treated mathematically. Part two deals with blast-furnace gas and computations. Reactive kinetics are considered in part three. The appendix contains valuable tabulated data.

LAPLACE TRANSFORMATION, Theory and Engineering Applications:

W. T. Thomson. New York, Prentice-Hall, 1950. 230 pp., illus., $5.00.

Following introductory material, the properties and dynamical and structural applications of the Laplace transformation are discussed. The theory of complex variables is reviewed to aid in the understanding of applications involving partial differential equations and difference equations. A variety of such applications including the field of closed-loop systems are considered. The closing chapter discusses two types of mechanical-electrical analogies frequently used in analysis.

NEUE THEORIE des STAHLBETONS:

R. Saliger, 2 ed. Franz Deuticke, Wien (Vienna), Austria, 1947. 110 pp., illus., $3.00 (obtainable from Stechert-Hafner, 31 East 10th St., New York).

The author presents a "new theory of reinforced concrete on the basis of plasticity in the fracture state." The several chapters discuss fundamental strength characteristics of concrete and steel, and analyze various compression and tension members, including a brief section on indeterminate structures. Some 200 broadly classified references are given.

POWER SYSTEM STABILITY, Volume II, Power Circuit Breakers and Protective Relays:

By E. W. Kimbark. New York, Wiley, 1950. 288 pp., illus., $8.00.

This is the second book of a three-volume work intended for use by power-system engineers and by graduate students. The present volume covers power circuit-breakers and protective relays, including material on rapid reclosure of circuit breakers and on the performance of protective relays during swings and out-of-step conditions. Both three-pole and selective-pole tripping and reclosure are discussed. Numerous references and a set of problems are included at the end of each chapter.

REVIEWS OF PETROLEUM TECHNOLOGY, Volume 9 (covering 1947), 340 pp:

Edited by F. H. Carner, E. B. Evans and G. Sell, published by Institute of Petroleum, Manson House, London, 1949-1950. Tables, 27s. 6d.

The 9th volume of this series deals with a review of developments in petroleum technology for the year 1947. In the 8th volume, the subjects of gasoline and light distillates, furnace fuel oils, and lubricants and lubrication, omitted in the 7th volume, are included and cover the years 1941-1946. In the 9th volume, two articles, "Refinery Plant and Engineering" and "Plant Instrumentation", are the last of the series dealing with the war period. "Aircraft engines" constitutes a new chapter heading in this volume.

THEORY OF THE INTERIOR BALLISTICS OF GUNS:

J. Corner. New York, Wiley, 1950. 443 pp., illus., $8.00.

This book is devoted to theoretical techniques used in the study of the phenomena that occur inside a gun or that are closely associated with it. Gun propellants, and simple and advanced ballistic methods are discussed. Similarity relations and optimum problems, the interior ballistics of leaking guns, some special types of guns, the hydronamic problems of interior ballistics, and heat transfer to gun barrels are among the special topics considered.

TV AND OTHER RECEIVING ANTENNAS (Theory and Practice):

A. B. Bailey. New York, Rider, 1950. 595 pp., illus., $6.00.

Of value both to the student and to the communications engineer, this practical book begins with a review of definitions and terminology, an analysis of the television signal, and discussion of the conditions that determine signal levels at the receiver. Succeeding chapters take up in turn the major types of receiving antennas, including discussion of their advantages and disadvantages and practical suggestions as to which are best for certain areas. Condensed data sheets are included for approximately 50 different antenna types.

UMLAUFRADERGETRIEBE:

H. Strauch. Carl Hanser Verlag, Munich, Germany, 1950. 122 pp., illus., 9 D.M.

This book provides a detailed discussion of planetary gear drives. Mathematical and tabular methods are used to describe the characteristics of the various types of gear drives. Many sketches as well as a bibliography are included.

FOR FLAT OR LOW-PITCHED ROOF DECKS

Fiberglas* Roof Insulation is designed for use on flat or low-pitched roof decks that are to be surfaced with a built-up bitumen-bonded roof. It may be laid over any type of roof deck, i.e., wood, steel, concrete, or precast slabs. It will not rot, swell, shrink or decay. It is a highly efficient insulation, and is installed by standard methods.

No significant dead load is imposed by Fiberglas Roof Insulation upon the roof structure yet its compression strength is great enough to permit normal traffic during application and subsequent maintenance.

Under the most severe conditions, on any type of steel, concrete, wood, or precast slab roof, Fiberglas Roof Insulation offers the most durable and satisfactory insulation for a built-up roof. *"Fiberglas Design Data Sheet RW6.A.2." contains further information and is available on request.*

FIBERGLAS*

*is a registered trade mark which identifies exclusively products of

FIBERGLAS CANADA LIMITED

RECOMMENDED USES

FOR ALL FLAT OR LOW-PITCHED ROOFS

PRODUCT DATA
FIBERGLAS ROOF INSULATION
Standard Size—24" x 48"

AVAILABLE THICKNESS (Inches)	HEAT CONDUCTANCE at 75°F. Mean Temp. (Btu/hr./sq.ft./°F.)
½	.50
¾	.33
1	.25
1¼	.20
1½	.17
2	.13

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BUSINESS & INDUSTRIAL BRIEFS

A Digest of Information received by The Editor

Appointments and Transfers

New Sheet-metal Working Firm.—A new company, Milbro Metal Products Ltd., has been incorporated to specialize in the manufacture and production of light gauge sheet metal work. George A. Davis has been elected President. The company's plant is located at 56 Abell Street, Toronto.

George A. Davis

Brick Company Address Change.—The Cooksville Co. Ltd., and the Interprovincial Brick Co. Ltd. are now located at 1055 Yonge Street, Toronto. The telephone No. is Midway 8466.

●

New Manufacturing Company.—Richardson-Allen Corporation, manufacturers of low voltage selenium rectifiers for the plating industry and high voltage rectifiers for other industrial uses, have incorporated a Canadian company under Dominion charter. The Company will manufacture many of the products now being manufactured in the United States. The new Company will be known as Richardson-Allen of Canada Limited. The address is 370 Victoria Street, Toronto. Wesley S. Block, Jr. is the president and C. E. Brigham is vice-president of the Canadian organization. The operations of the Canadian company will be under the direction of the secretary, Kergan Wells.

●

Ivan McDonald.—Ivan McDonald has been appointed sales manager, eastern region, Minneapolis-Honeywell Regulator Co. Ltd. He will continue to serve in the capacity of Montreal branch manager.

In his new capacity, Mr. McDonald will have supervision of sales of all Company divisions in Quebec, the Maritimes, and Newfoundland.

Mr. McDonald joined Minneapolis-Honeywell in 1931 and was transferred to the sales office in 1934. In 1936 he opened the Company's Winnipeg branch

Ivan McDonald

office. During the war he served as adjutant of the Winnipeg Grenadiers with the rank of captain. He rejoined the firm in Montreal in 1946.

●

H. J. Sissons.—Henry J. Sissons has been appointed director of the priorities division in the Department of Trade and Commerce.

While no formal priority system is in force in Canada, the existence of various systems such as the "Defence Order" arrangements in the United States, make the establishment of a priorities division necessary here. In addition to its work in connection with the U.S. sources of supply, the new division will deal with various problems of ensuring supply for defence orders in Canada in fields that are not covered by separate divisions, such as the steel and non-ferrous metals divisions.

Mr. Sissons is on loan from the Ontario Hydro-Electric Power Commission.

●

T. L. Chown

T. L. Chown.—George A. Davis, president of Plate and Structural Steel Ltd., and Plate and Structural Steel Sales Ltd., has announced the appointment of T. L. Chown to the board of directors of both companies. Mr. Chown is also the vice-president and assistant general manager of T. C. Chown Ltd., of Montreal.

●

Hugh D. Cameron.—Hugh D. Cameron has been appointed president of Air Reduction Canada Limited. Mr. Cameron will also continue as President of Ohio Chemical Canada Limited. He succeeds Hugh Chambers who is now chairman of the board of Air Reduction Canada Limited.

●

New Westinghouse Division.—To meet rapidly increasing demands for electronic equipment, Canadian Westing-

AT TRENCHE

At the great new Trenche Development of The Shawinigan Water and Power Company Dominion Bridge Co., Ltd. was privileged to supply:—

- ***All hydraulic regulating gates and hoisting machinery.***
- ***Head block travelling gantry crane: 40 tons capacity.***
- ***Power house crane: 250 tons capacity.***
- ***Penstocks and other platework.***
- ***Structural steelwork for power house.***

DOMINION BRIDGE

house Company, Limited, will immediately expand its production under a newly-formed division.

It is estimated that about 1,000 employees will be added to the electronics division within a year. This will increase the company's payroll by \$2½ million annually. The division will occupy approximately 180,000 square feet of floor space.

In addition to a rapid step-up in production, the projected electronics programme calls for extension of what is considered the largest research laboratory in the Canadian electrical industry.

The head of the division will be John D. Campbell, who has been connected with the firm since 1934. John D. Houlding has been appointed manager of the electronics marketing department.

•

Johns-Manville Appointments.—Leslie M. Cassidy has been elected chairman of the Board and Adrian R. Fisher has been elected president of the Canadian Johns-Manville Company Limited.

Mr. Cassidy succeeds the late Lewis H. Brown who was chairman and chief executive officer of Johns-Manville since 1929. Mr. Fisher, who succeeds Mr. Cassidy in the office of president, was previously vice-president for production and general manager of the Company's Asbestos Fibre Division.

•

Spectrographic Laboratory Amalgamation.—Expansion and development of Canada's only independent commercial spectrographic laboratory has just been announced by Technical Service Laboratories. Under a recent agreement, equipment of T.S.L. has been moved to the more spacious premises of the Canadian Research Institute at 46 St. George Street, Toronto, Ont.

Autonomy of both companies remains unchanged. Present policies place at the disposal of each firm the facilities of the other.

•

Fan Manufacturers' Officers.—At the Annual Meeting of the Canadian Fan Manufacturers' Association held on February 22nd at Hamilton, Ontario, J. H. Gregory was re-elected president for the coming year. W. E. Caldwell was re-elected vice-president and L. O. Monroe was re-elected secretary-treasurer.

Mr. Gregory is the sales manager of the Canadian Blower and Forge Company and Mr. Caldwell is the sales manager of Sheldons Engineering Ltd.

•

Note!

ANNUAL MEETING

May 9-10-11

New Equipment and Developments

Industrial Lamps.—Two high-wattage industrial lamps with built-in reflectors for use in the lighting of high-bay factories are available from Canadian General Electric Company. The new light sources are seen as a timely contribution to the nation's accelerated programme of defence and civilian production.

Because almost no dirt collects on the bottom of the bulbs, the new lamps are said to be especially desirable for use in such places as foundries, welding shops, and in other locations where dirt collection normally causes severe reductions in light levels. They are recommended particularly for use in high-bay areas where lamps can be reached for maintenance only at high cost or interference with production.

Produced in both 500 and 750-watt sizes, the lamps employ a new bulb design, the R-52 having a special contour to distribute the light downward for effective use in the working areas, and a cutoff to give reasonably comfortable brightness down to 35 degrees below the horizontal. The lamps measure six and one-half inches across the face, and eleven and three-quarter inches in length. The base is of the mogul screw type. The lamps are designed to be burned base-up, or within 25 degrees of that position. For complete details apply to any C.G.E. office.

●

New Automatic Controls.—Three types of controls, new to Canadian manufacture, were displayed recently by Minneapolis-Honeywell Regulator Co. Ltd. The display was in conjunction with the formal opening of a new addition to the Company's Leaside plant.

Commenting on the new controls W. H. Evans, vice-president and general manager, of the Company, said, "all three reflect expanding industrial activity in Canada and the growing acceptance of automatic devices which increase safety and efficiency in manufacturing processes, and economy and comfort in the field of home heating."

It was explained that production has been started on a line of industrial controls for use in all types of plants where it is necessary to measure or control temperature or pressure. On process applications they provide economies and greater uniformity of product than is otherwise obtainable through manually operated controls. Mr. Evans explained that the first instruments to go into production in the new plant are an industrial recording thermometer and a recording pressure gauge; electrically operated devices which not only indicate and maintain chart records, but which also can regulate industrial processing temperatures and pressures within extremely close limits. The line of industrial instruments will be expanded as tooling is completed.

The third type of control announced was a delayed opening oil valve, which can be installed on most existing and all new pressure type oil burners. This device will eliminate most of the causes of sooting. In operation, the new valve prevents the flow of fuel oil to the burner nozzle for approximately four seconds after the burner motor starts in order that the motor may come up to speed and deliver an adequate volume of air for proper combustion.

●

X-Ray Industrial Inspection.—Canadian General Electric Company claims a revolutionary discovery that promises to make possible for the first time the high-speed automatic X-ray inspection of thousands of industrial products. It may also be used to improve the performance of medical diagnostic and therapeutic X-ray apparatus.

The "heart" of the new inspection system is a tiny crystal, known as a "semi-conductor" which can be grown in size from a fraction of a millimeter to several millimeters in cubic size. When excited with X-radiation, it acts as an amplifier tube, releasing torrents of electrons that can be used to operate various types of mechanisms.

Complete information on this new crystal may be obtained from General Electric X-Ray Corporation Ltd., 212 King St. W., Toronto.

●

Civil Servants Visiting Britain.—Britain's Institute of Public Administration, at 76A New Cavendish Street, London, W.1, is anxious to get in touch with Canadian public servants, who will be visiting Britain this year for the Festival of Britain. The Institute has members throughout the Civil Service, in local government, the public corporations and the health services, all over Britain, and would like to arrange for introduction of Canadians to their members in those branches of the public services in which they may be interested.

●

Quebec Water Resources. — Quebec contains over 30 per cent of the total recorded water resources of Canada and ranks highest in developed power. Present installation is more than 6,000,000 hp., or over 37 per cent of the currently recorded resources of the Province.

●

British Instrument Display.—The first exhibition to be devoted exclusively to the British instrument industry, will take place at the National Hall, Olympia, from July 4th to 14th. Over 150 of the leading manufacturers engaged in the industry will be displaying their products with the purpose of acquainting instrument users in industry, medicine, and education throughout the world with the latest trends and advances in British manufacture in this particular field. Every exhibit will be of entirely British manufacture. The organizers, Messrs. F. W. Bridges and Sons Ltd., of Grand Buildings, Trafalgar Square, London W.C.2. are making elaborate preparations for the comfort of visitors from overseas. They will send, on request, a copy of the official catalogue which will be distributed when the exhibition opens.

●

New Degreaser.—A new non-inflammable and non-caustic aluminum degreaser, is being manufactured by Jenolite Limited, 433 Piazza Chambers, Covent Garden, London, England. It is claimed that this degreaser is non-injurious to rubber and quite harmless even to the surface of polished aluminum. It has been specially designed to clean and degrease aircraft wings, fuselages and cowlings, both inside and out.

The degreaser is manufactured in powder form for dilution in a ratio of 1 lb. to one gallon of water. It can be applied cold with an ordinary brush, or articles can be dipped in a mixture heated to a temperature not above 50 degrees Centigrade.

●

Electric Hammer Drill.—Victor Products Ltd., Wallsend-on-Tyne, Northumberland, England, claims to have developed an electric hammer drill which overcomes the technical problem of converting rotary motion to reciprocating motion. The Victor hammer drill has no connected parts, no possibility of stalling or overloading the motor, and generally approximates the approved design of the compressed air tool. Weighing only 16 lbs. it is available for brick, stone, wood or metal and can be used as a powerful chisel with a variety of tools. Complete details may be obtained from the manufacturer.

●

British Hand Tools.—The Federation of British Hand Tool Manufacturers, which along with the National Federation of Engineers' Tool Manufacturers and the Machine Tool Trades Association, is sponsoring the record 30,000 square foot joint British Machine Tool Section display at the 1951 Canadian International Trade Fair in Toronto, from May 28 to June 8, was formed in 1945.

The present membership totals approximately 400 firms, and membership is divided almost equally between "full members" and "associate members". The former comprise firms that are members through membership in one of nine affiliated associations. Associate members are firms whose products are not covered by any of the affiliated associations and which joined the federation individually.

President of the Federation is Thomas L. Elliott, chairman of Elliott-Lucas Ltd.

●

New Inhibitor.—Development of an inhibitor to protect shellac and other non-aqueous liquids from metal contamination has been announced by Monsanto Chemical Company.

H. J. Heffernan, Merrimac division general sales manager, said that the new product, is particularly valuable in view of the National (U.S.) Production Authority restrictions on shellac containers.

He said "the new inhibitor prevents iron pick-up" by forming a thin coating of a complex iron phosphate on the inner wall of the container. The reaction prevents the metal from becoming soluble in the shellac".

For complete details communicate with Monsanto (Canada) Ltd., 425 St Patrick Street, Montreal.

●

Large Quarry Plant.—A 90-foot long, 50-ton quarry plant which crushes rock into pebbles and loads them into lorries at the rate of 40 tons an hour is now being tested in Manchester, England.

●

British Cable in Canada. — Enfield Cables of Britain have won contracts totalling over $1,000,000 for the supply and installation of a pipeline compression cable for Ontario Hydro, and for the supply of 100,000 feet of self-contained compression cable for Quebec Hydro.

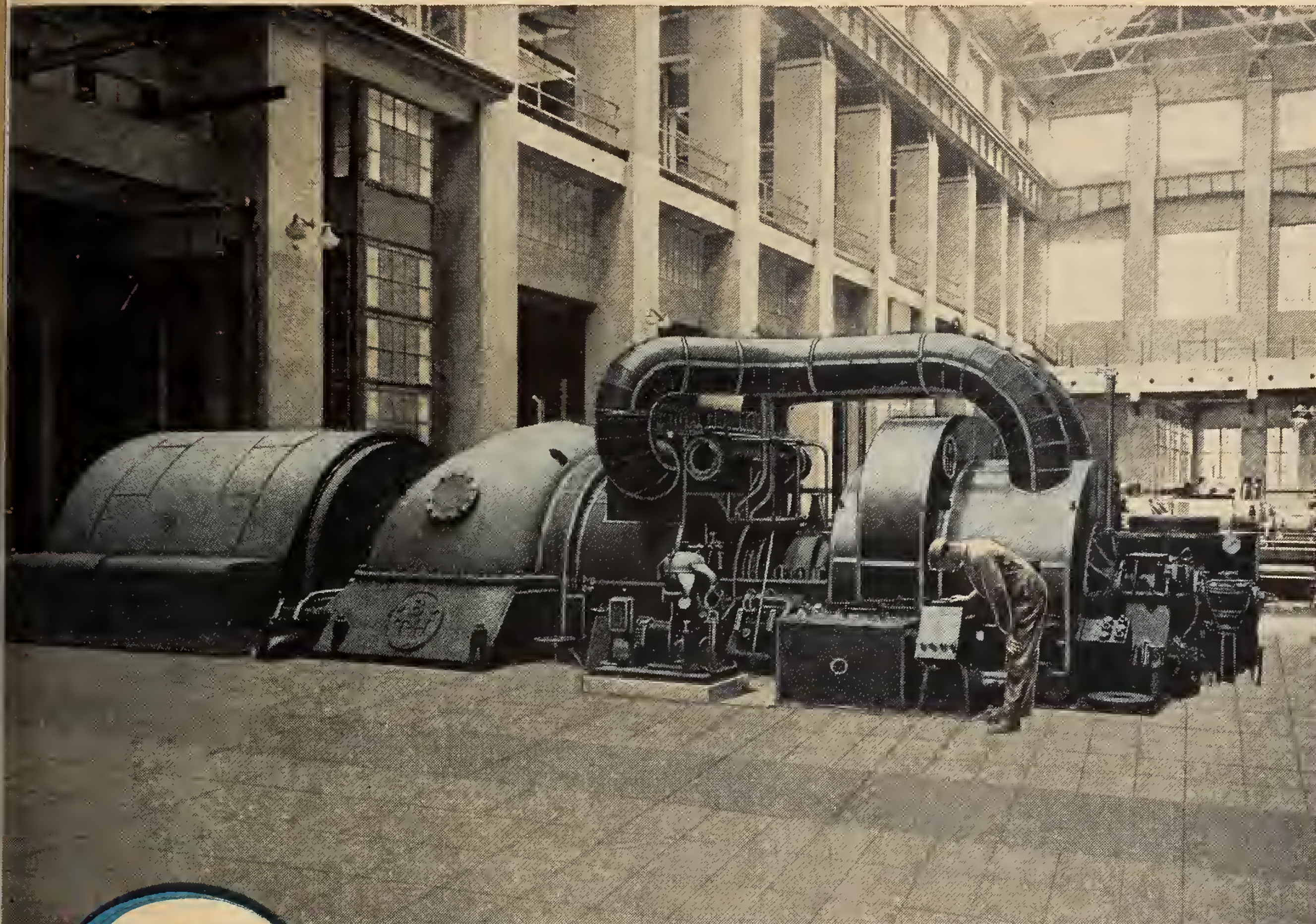
●

"Hevimet".—"Hevimet"—a non-cutting metal even heavier than cemented carbide and with 50 per cent greater density than lead — is available from the chemical division of Canadian General Electric Company. Important uses of this special metal, aside from its ability to resist the penetration of radioactive rays, are for balance weights on crankshafts, gyroscopes, variable-pitch propellers, centrifugal clutches and other similar moving parts. For static and dynamic balancing of such parts, as well as for balancing of aircraft control surfaces, etc., it has the advantage of maximum weight with minimum size. Its use for containers for radioactive materials will make it an important wartime product.

●

Nickel Statistics.—During 1950, International Nickel delivered 256,410,543 pounds of nickel in all forms. Its deliveries of special rolling mill products produced in the United States and Great Britain likewise established a new high record. In addition to increasing deliveries of nickel over 1949 by 22 per cent and delivering 267,316 ounces of platinum metals, an increase of 24 per cent over 1949, it delivered 212,947,394 pounds of refined copper, and also gold, silver, selenium, tellurium, and cobalt.

To provide this expanded supply of nickel, the Company brought into oper-



ation an additional blast furnace at its Coniston Smelter and an additional reverberatory furnace at its Copper Cliff Smelter.

During 1950 the Company spent over \$18,683,000 on capital improvements. The total length of underground development in the operating mines was brought, during the year, to more than 283 miles. Capital expenditures for 1951 are estimated at \$20,000,000.

To ensure continuity of nickel supplies, the Company accelerated and intensified its search for ore. In 1950 some 24,000 square miles of area were prospected chiefly by air, and detailed surveys made of 3,215 square miles. The depth of exploration drilling during the year was 260,127 feet.

●

Oil-burner Control.—A new electronic combustion safeguard system for commercial oil burners, which provides immediate cut-off of fuel in case of failure is available from Canadian General Electric's control division.

According to G-E engineers, the system assures positive protection against combustion failure because (1) if the gas pilot does not ignite, the oil valve cannot open and (2) if the oil flame does not ignite, the supply of fuel is cut off. After the cut-off the motor continues to operate for 30 seconds to purge the nozzle or cup of unburned fuel to prevent carbonizing and reduce field servicing. The system is then locked against further operation until manually reset. An oil-temperature thermostat can be used with the circuit to assure satisfactory fuel-oil temperature before the starting cycle begins. Upon resumption of service following a power failure, low water cut-off or limit-control operation during the starting cycle, the oil valve cannot open until the programme switch recycles.

When continued operation of the burner is prevented by ignition failure, a positive lock-out mechanism is actuated and a light on the cabinet cover indicates that the equipment has gone to lock-out. Operation cannot then be resumed until the reset button is pushed. Complete details may be obtained from any C.G.E. office.

●

Some Trade-fair Exhibitors.—Upton Bradeen & James Limited are distributors for machine tools and mill supplies, representing some 125 principals. They have branches in Montreal, Toronto, Windsor, Winnipeg, Vancouver, Moncton, Ottawa, and Hamilton.

Among the principals of this Company who will have exhibits at the Canadian International Trade Fair are—Projectile & Engineering Co. Ltd., London, England; S. A. des Forges, Charleroi, Belgium; Thompson Grinder Co., Sprinfield, Ohio; Racine Tool & Machine Co., Willow Grove, Pa.; Interwood Limited, London, England; The Auto-Nailer Co., Atlanta, Ga.; Cushman Chuck Co., Hartford, Conn.; Lion Grinding Wheels Ltd., Brockville, Ont.; Precision Welder & Machine Co., Cincinnati, Ohio; Paul Ford, Peddinghaus, Gevelsberg, Germany; Wilson Mechanical Instrument Co. Inc., New York, N.Y.; Baker Bros. Inc., Toledo 10, Ohio; S. A. Jos. Peterman, Moutier, Switzerland; R. McDougall Co. Ltd., Galt, Ont.; Smart Turner Machine Co. Ltd., Hamilton, Ont.

●

Lamp Pressure Latch.—Canadian Line Materials Ltd., Toronto 13, Ont., has announced a new automatic pressure latch for use with "Spherolite" luminaires. Described as "the first truly automatic pressure latch", it consists of a flexible band which is clamped around the glassware and fastened to the reflector by means of a spring latch and hinge. The glassware edge is smooth-surfaced and uniform and is held tightly against the machined reflector edge by a minimum of 40 lb. pressure.

Company engineers claim that the new latch cuts maintenance costs because it can be serviced from the ground. The spring latch can be released by means of a U-shaped attachment that fits the reverse end of regular lamp sticks. The U-shaped metal end fits under the latch. Tilting the stick outward slightly releases the latch, and the glassware swings down supported by the hinge on the opposite side. Glassware is easily replaced when servicing has been completed and an upward push closes the unit.

•

Corrosion Prevention. — In Britain, where prevention of corrosion must be reckoned as equivalent to saving tens of thousands of tons of metal annually, the subject is being closely studied, particularly in the laboratories of the Department of Scientific and Industrial Research.

Perhaps one of the most surprising of recent discoveries is that microbes of a certain type are able to eat their way through iron structures in the course of a few weeks. Water supply engineers, in particular, have found that iron pipes laid through water-logged clay soils fail rapidly. Examination of the damaged pipe shows that it is eaten through at various points and the surrounding soil is almost black in colour. It has been proved that this is due to the action of what is called sulphate-reducing bacteria — microbes which have the power of converting certain salts in the soil to sulphuretted hydrogen.

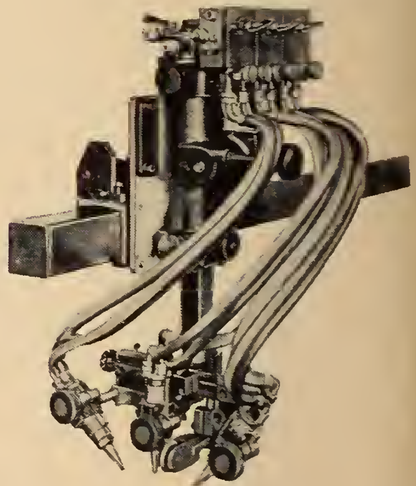
Various corrective measures have been proposed including the laying of pipes in this type of soil in a trench lined with gravel. Another is to protect the pipes with a coating of bitumen and concrete. In addition, twenty types of protective coating applied to buried sections of pipe, are being tested at premises of the Metropolitan Water Board near London.

In other research it has been found that a cheap and easily obtainable salt, sodium benzoate, has valuable properties for preventing corrosion. It has also been found that rubber latex containing a little sodium benzoate is an excellent material for protecting machine-steel surfaces and cast iron. Paper impregnated with sodium benzoate is also recommended as an effective anti-corrosion wrapping for steel objects.

•

Plate Edging.—Airco Company International, a division of Air Reduction Co. Inc., has announced the availability of a new plate-edge preparation device.

This device has been designed to increase production and insure clean-cut, accurate preparation of plate edges. Its ability to cut a single or double bevel accurately, with or without a land, recommends it especially for use in shops or factories which do any amount of steel fabrication work.



The Airco plate-edge preparation device employs a spring-balanced, free-floating carriage and caster-wheel assembly to permit bevel cutting over plate undulations while maintaining a constant tip-to-work distance. It may be mounted on any gas cutting machine equipped with a 3-in. square torch bar.

Torches may be individually positioned, vertically or laterally, without changing the bevel angle. Fuel and preheat pressures are initially set with individual torch valves and, once set, the master valve controls the turning-on and

(*Continued on page 431*)

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 412*)

shutting-off of gas supply without disturbing settings of the individual torch valves.

For further information on this new device communicate with Canadian Liquid Air Co. Ltd., 1111 Beaver Hall Hill, Montreal, Que.

●

Construction Activity. — According to information released recently, current expansion in Montreal is greater than that in Toronto.

From 1946 to 1950 inclusive, construction contracts in Montreal totalled $528,352,100 compared with $649,404,500 in Toronto.

New housing construction in the Montreal area accounted for 51,894 contracts amounting to $421,000,000. In Toronto there were 42,099 similar contracts amounting to $305,000,000.

Toronto is leading Montreal in the number of industrial construction awards of which there were 1,504 in that city as compared with 1,193 in Montreal. However, the aggregate dollar value of the Montreal post-war industrial construction totalled $122,000,000. This figure is 60 per cent greater than the $77,000,000 represented by the value of industrial construction in the Toronto area.

Business construction, other than industrial, amounted to $226,000,000 in Montreal and $174,000,000 in Toronto. Of this amount Montreal showed a value of $49,000,000 in office building construction compared with Toronto's $39,000,000 and a value of $36,000,000 in store construction compared with $25,000,000 in Toronto.

In the Toronto district, engineering construction was far in excess of the comparable Montreal outlay. Of Toronto's total of $92,000,000 some $41,000,000 is represented by new hydro-electric power and communications installations. Of Montreal's $57,000,000 outlay in engineering contracts, about $2,000,000 was represented by power and communications engineering projects. However, Montreal led Toronto in marine construction with $15,000,000 as compared with $2,000,000. In miscellaneous engineering projects, Montreal's construction figures were $22,000,000 as against $24,000,000 in the Ontario City.

●

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

British Electrical Manufacturing. — British General Electric Co. (Canadian) 1411 Crescent St., Montreal, has recently received from Great Britain a supply of a booklet entitled "G.E.C. Can Do It". General Electric Co. is the largest British electrical manufacturing organization. The publication describes the various plants operated by the Company and the different types of electrical equipment produced in those plants. This 28-page publication will be of great interest to electrical engineers. Copies are available; write to the address given above.

●

"Alcan Ingot".—In the March issue of the "Alcan Ingot" there is an interesting article entitled "Engineering Studies Continue for Proposed B.C. Project". This article is based on the text of a statement presented by R. E. Powell, president of the Aluminum Co. of Canada Ltd., to the Special Subcommittee on the study of Monopoly Power of the Committee on the Judiciary, House of Representatives, in Washington, D.C., on January 30th. For copies of this and other issues of the "Ingot" write to the Editor, the Alcan Ingot, c/o Department of Information, Aluminum Co. of Canada Ltd., 1700 Sun Life Bldg., Montreal, Que.

●

Finishing Aluminum. — Aluminium News is the title of a semi-technical publication issued monthly by the Aluminum Co. of Canada Ltd. In the February issue, under the heading Technical Notes, there is an interesting article "The Finishing of Aluminum". It describes a variety of results produced by different processes. To be placed on the mailing list of this publication write to Aluminium News, Box 6090, Montreal, Que.

●

Fire Brick.—Canadian Johns-Manville Co. Ltd., 199 Bay St., Toronto 1, Ont., have recently issued a 4-page illustrated folder on "JM-3000 Insulating Fire Brick". It presents the economic advantages, industrial applications and refractory properties of this product which, it is claimed, is the first insulating fire brick for sustained use at 3000F. Physical and thermal characteristics are given in table form. The folder also contains summarized information on accessory materials and other insulating brick made by Johns-Manville. Ask for copies of publication IN-126A.

●

Imperial Oil Limited.—Imperial Oilways is the title of an excellent semitechnical publication issued by Imperial Oil Ltd., 56 Church Street, Toronto. Ont. In the January-February 1951 issue, the articles are:— "He Made Rails Safer"—a tribute to I. C. Mackie of Dosco's Metallurgical Department; "Steel From Under the Sea", which describes steel manufacture in Nova Scotia; "Canadian Woods Operations", which describes the mechanical equipment at Kapuskasing, Ont., for the cutting and transportation of pulp wood.

A final article is "The Basic Principles of Lubrication". To be placed on the mailing list for regular receipt of this publication, please communicate with the editor at the above address.

●

Industrial Health.—The February issue of the "Industrial Health Bulletin" carries two interesting articles, one "Color Blindness in Industry" and the other "What Makes Successful and Unsuccessful Executives".

This publication is issued monthly by the Industrial Health Division of the Department of National Health and Welfare, Ottawa. It will be mailed to you on request to the Department.

●

Airline Communications.—The International Civil Aviation Organization, Montreal, Quebec, has issued a most interesting bulletin "The Language Problem in Radiotelephony Communications.

This article deals with the language difficulties in air-ground communications, and outlines the recommendations and decisions reached by the organization on this subject. The bulletin also contains a most interesting article by George A. Miller, Psycho-Acoustic Laboratory, Harvard University, entitled "Language Engineer".

For copies of the bulletin apply to ICAO Building, Dorchester Street, West, Montreal.

●

Canadian Johns-Manville. — "The Power Specialist" is published at regular intervals by Canadian Johns-Manville Co. Ltd., 119 Bay Street, Toronto 1, Ontario. In the January-February 1951 issue there is an interesting semi-technical article on the construction of the S.S. Independence and the S.S. Constitution by the Bethlehem Steel Company. The issue also contains an interesting description of the Brewing Process. Write to the Company for a copy of this and other issues of the publication.

●

Canadian Government Specifications. —The Canadian Government Specifications Board has issued two publications which should be of interest to those who do business with the government.

The first of these publications is a list of specifications for a great variety of materials and articles, ranging from anti-freeze liquids to zinc oxide. It also covers foods, liquid fuels, lubricants, paints and brushes, cloth, soaps, etc.

The second publication is a list of committees, including the names and affiliations of the members.

Both publications may be obtained by writing to — The Secretary, The Canadian Government Specifications Board, National Research Council, Ottawa.

●

Stainless Steel Publication. — "Atlas Steel News" is the title of a publication issued at regular intervals by Atlas Steels Ltd., Welland, Ontario. This publication should be of interest to all engineers who are interested in the manufacture and application of stainless steel of various types. For copies communicate with the company at the address given above.

●

Chamber of Commerce News.—The March issue of "News Letter" issued by the Department of Economic Development, The Canadian Chamber of Commerce, 530 Board of Trade Building, Montreal, contains an interesting analysis under the heading "Controls".

The article is a summary of the efforts which are being made to induce Federal Members of Parliament to take action to control prices. It outlines the remarks of Graham F. Towers, in the 1950 Report of the Bank of Canada, on this subject, and quotes a statement made by the Ministry of Finance.

After dealing with the average weekly wages over the past few years, the article turns to a description of what is now going on in Britain under the Labour Government. Copies of the bulletin may be obtained by applying to the Chamber at the address given above.

●

Civil Defence.—The following publications and films are available to those who are interested in civil defence.

"Organization for Civil Defence" is a pamphlet which may be obtained from the King's Printer, Ottawa, Ontario. The price is 20c. "Can You Survive" is issued by the Canadian Federation of Mayors and Municipalities and may be obtained for 10c per copy from the Federation office in the Mount Royal Hotel, Montreal 2, Que.

The United States Government Printing Office, Washington, D.C., offers the booklet "United States Civil Defense" for 25c. The Chamber of Commerce of the United States, Washington 6, D.C., has available at 20c each, copies of a publication "Civil Defense in Your Community".

A film offered for sale is "Pattern for Survival" (black and white—20 minutes) produced by Marsak Films, New York City. Write to the company for prices.

McGraw-Hill Co. of Canada Ltd., 50 York Street, Toronto, Ontario, offer a film, "You Can Beat the Atom Bomb". It is also in black and white and runs for 20 minutes. The price is $90.00.

●

Hand Operated Floor Sweeper.—Service Steel & Engineering Ltd., 4668 St. Catherine St. W., Montreal, announces a new hand-operated floor sweeper which cleans floors in plants, warehouses, stations, etc. in what is claimed to be less than one-third of the time required for hand methods. The machine is described in a 4-page folder which may be obtained from the Company.

●

Santocel "C" Booklet. — Monsanto (Canada) Limited, 425 St. Patrick St., Montreal, can supply copies of a 14-page booklet in which are described approved applications of Santocel C, a microscopically-divided silica aerogel, as a flatting agent.

The booklet terms Santocel "the most efficient flatting agent yet developed". Efficiency, oil absorption and the product's advantages in improving the resistance of clear films to weather, humidity and cold-check are covered fully in the literature.

The use of Santocel C for flat and semi-gloss varnish, including blending principles, additive screening test and typical grinding and reducing procedure for oleo-resinous and alkyd flat coatings, is explained. The booklet also gives details on the use of the product in lacquers, plastisols, organosols, and free film.

●

New Armco Publication. — Armco Drainage & Metal Products of Canada Limited, Guelph, Ont., have copies of a publication "Why Hire a Wrecking Crew to Install Underground Structures" which describes how underground work may be carried out by tunnelling with Armco liner plate.

The folder points out how these lightweight plates can be installed easily with a minimum of excavation and how their design insures ample strength for a wide variety of uses. Their physical properties are listed in a table, and photographs show their use as water and utility line tunnels, relining for highway and railroad tunnels, and underpasses. Copies are available.

●

Recorder Units.—Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Penn., have issued a revised catalogue covering new recorder units and tachometers.

Ask for catalogue N-27.

●

Cutting & Grinding.—Sun Oil Co., Toronto, Ont., have available copies of an 80-page publication entitled "Cutting and Grinding Facts".

The publication contains data on more than fifty typical metalworking jobs.

Much of the operational data contained in the publication is based on information supplied by leading builders of automatics, grinders, lathes, millers, etc. The booklet also presents descriptions of Sun's straight and emulsifiable cutting oils. Of practical use to the shop man is a chart showing the correct Sun cutting fluids for many of the most frequently used metals and metalworking machines.

●

Industrial Brushes.—The Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio, has issued a 76-page, three-colour catalogue in which are described hundreds of brushes for doing many different types of jobs for industry.

For copies write to Mr. R. R. Schultz at the address given above.

●

New Caterpillar Booklet.—Caterpillar Products is the title of a new 40-page booklet recently issued by the Caterpillar Tractor Co., Peoria, Ill.

This publication, which is published annually, contains a complete listing, with illustrations and brief specifications, of all but two of the current line of Caterpillar products. Eleven new models were announced during 1950 and nine are included in the new booklet. Copies may be obtained by writing to the Caterpillar Tractor Co., Peoria 8, Ill. Ask for publication No. 30081.

●

Hole-punching Unit. — Wales-Strippit of Canada Ltd., 344 Sherman Ave. N., Hamilton, Ont., have recently released a 4-page bulletin in which is described the new extra-heavy-duty type "G" hole punching unit for punching holes in ½-in mild steel.

These new units are equipped with unique "split punches" which eliminate the tremendous stripping pressures and oversize stripping springs that have always been associated with stripping punches out of punched holes. Copies of the brochure are available. Ask for bulletin G.

●

Concrete Pump.—A revised bulletin on Rex pumpcrete has just been released by the Chain Belt Co. of Milwaukee, Wis.

Pumpcrete is a pump that pumps concrete through a pipeline. The publication describes the machine itself and the method of pumping concrete through a pipeline. It indicates on which type of jobs the equipment will work to advantage, what types of mixes it will handle, and the height and distance requirements of a placing job.

For copies of the publication ask for bulletin No. 51-31. The address is Chain Belt Co., 1600 W. Bruce St., Milwaukee 4, Wis.

●

Industrial Cooling Water. — A new product to control the formation of slime in industrial cooling waters is available in experimental quantities from Monsanto (Canada) Limited.

The product is known as Santophen 45. It is a technical grade of sodium trichlorophenate. Laboratory tests and field trials in large cooling water systems have shown it to be highly effective against bacteria and algae.

The trichlorophenols liberated by Santophen 45 are soluble in acid waters, and capable of maintaining the necessary activity against slime-producing microorganisms while some control agents are not. A bulletin on the product may be obtained by applying to the Canadian Company. Request technical bulletin O-76. The address is 425 St. Patrick St., Montreal.

●

Chain Drive Data.—Hamilton Gear and Machine Co. Ltd., 950 Dupont St., Toronto 4, have issued a new technical data sheet on silent chain drives. Copies of this bulletin, and of others issued by the Company, may be obtained on application.

●

Materials Handling.—A recent issue of the "Dominion Engineer" issued by Dominion Engineering Co. Ltd., P.O. Box 220, Montreal, is devoted to a description of the excavating and materials handling equipment manufactured in Canada by the Dominion Hoist & Shovel Co. It is a most interesting publication and copies will be forwarded on request. Ask for No. 3 of volume 18 the "Dominion Engineer".

●

Link-Belt Folder.—A new 4-page illustrated folder, No. 2363, has been issued by Link-Belt Limited, Eastern Avenue at Leslie and Keating Streets, Toronto. In the publication are described "RC" roller chain flexible shaft couplings.

Engineering information for proper application includes dimensions, weights, service factors, and horsepower ratings. Detailed data are also given on two types of protective grease-retaining casings—Style R (spun metal revolving type) and Style P (plastic, revolving type). Copies are available.

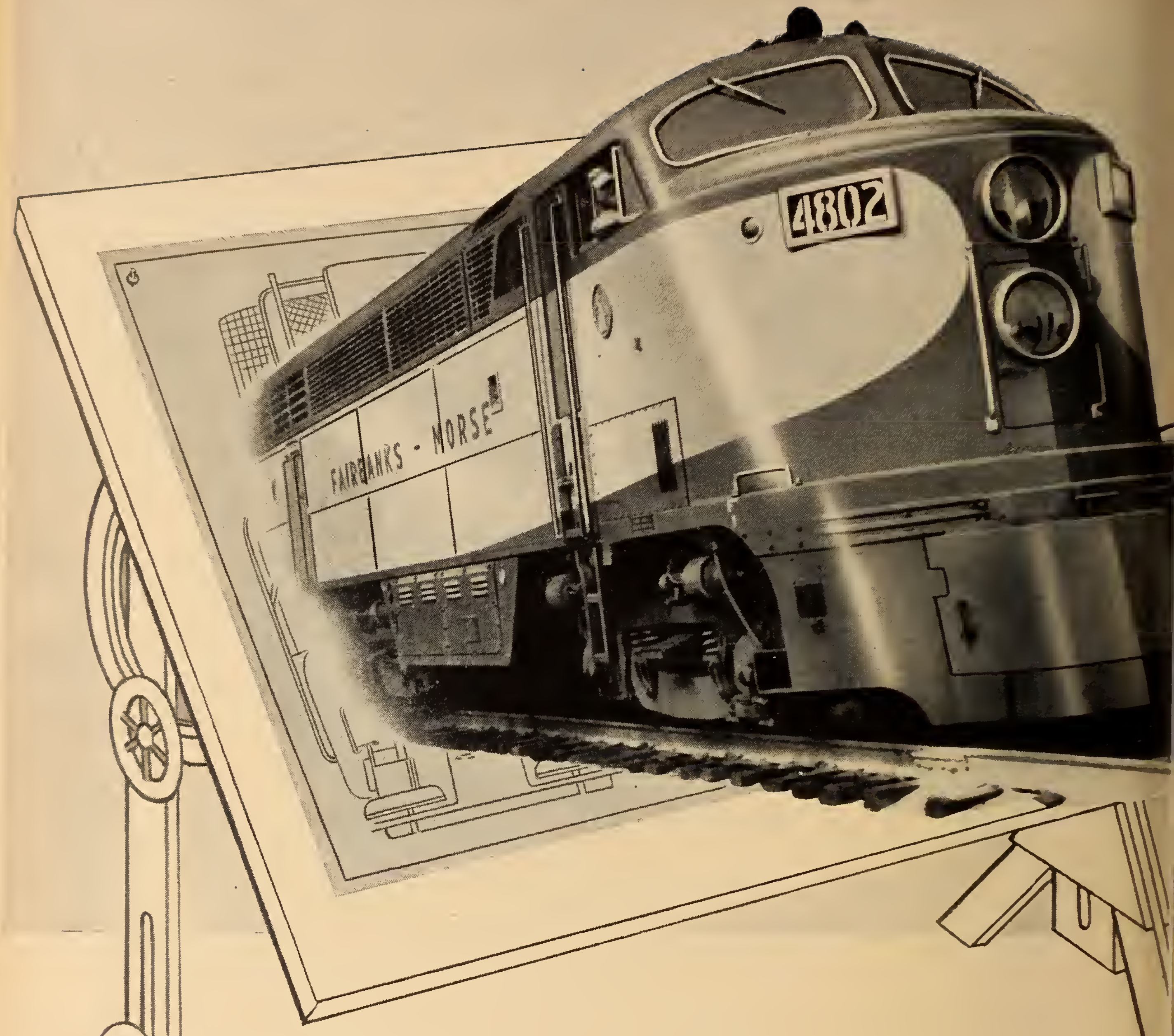
●

Thermobloc Units. — Substantial improvements in plant working conditions during the cold weather are reported by the Seaboard Foundry of Providence, R.I., because of five 550,000 btu Thermobloc units installed last year. Designed and manufactured by the Thermobloc division of Prat-Daniel Corporation, thermoblocs are made in five capacities from 100,000 to 1,000,000 btu output, and are self-contained, direct-firing units that circulate heated air down at working levels. Thermoblocs are also being widely used for tempering make-up air, for high temperature recirculating ducts in drying systems, and as heat curtains for doorways. A technical bulletin to aid in estimating heat losses and requirements may be obtained from the Company's Canadian representative T. C Chown Ltd., 1440 St. Catherine St. W., Montreal.

●

Motor Folder.—English Electric Company of Canada Limited, St. Catharines, Ont., have issued a four-page, three-colour folder on small induction motors. The copy and illustrations describe squirrel cage and wound rotor induction motors made to N.E.M.A. and C.E.M.A. standardized dimensions. Copies are available. Apply to the Company.

●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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."

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A Message from The President

On September the 10th, 1901, I took my first step towards becoming an engineer. That step was to start serving my apprenticeship as a machinist with the Robb Engineering Company of Amherst, building what in those days were called high speed steam engines.

The half century that has passed since that time has witnessed an almost unbelievable growth in the science and art of engineering. This may justly be termed the engineering era.

During this period the impact of the work of the engineer on our civilization and on our modern way of life has been very great. Because of this development in engineering the members of our profession face a grave responsibility not only as engineers but as citizens in a complicated and complex world. It is with a feeling of real humility that, as your president, I address this message to you, the members of the Engineering Institute of Canada.

During the years of the first half of the 20th Century the profession of engineering has changed from being one of the least known to one whose influence can hardly be measured. The field of professional activity has been expanded until today our membership embraces specialists in every phase of applied scientific endeavour.

It was to meet these changing conditions that, in 1918, the name of the Canadian Society of Civil Engineers (founded in 1887) was changed to *The Engineering Institute of Canada*. At that time also, the constitution was set up to permit the formation of branches throughout Canada with the governing council of the Institute composed of representatives from each branch. Under this form of organization we have a truly all-Canadian society with the members from coast to coast having a definite voice in the control of its affairs and including all classes of qualified engineers in the membership.

You will agree that we are fortunate to belong to such an organization—but the benefit which will accrue to the individual member will depend in large measure on the effort which that member puts into supporting the Institute.

Due to the increasing importance of the engineer in our present day economy, more young men each year are undertaking the study of engineering. Members who are established in the profession, can and should give their counsel and guidance to the younger men. Members must show by their own example that they are not only good technicians, but good citizens, living to fulfil the spirit of that code of ethics to which all subscribe.

These are troubled times—the world is out of balance. In our urge to keep pace with the growth of scientific knowledge and changing conditions, some of the spiritual values of life have been lost sight of. As engineers we must consider not only the purely technical aspects of our profession but must accept some of the responsibility for bringing back a realization of the great truth—man cannot live by bread alone.

If, during my term of office, I am able in any way to further the realization of these aims and the enhancement of our profession, I shall be happy.

I hope during the year to have the privilege of visiting each branch of the Institute and look forward to meeting many of you personally.

President.

Maintaining Engineering Services Under Bombing

by

N. M. Brydon, M.E.I.C.

President, Brydon Construction Company Limited, Glasgow, Scotland.

A paper to be presented before the 65th Annual General and Professional Meeting of The Engineering Institute of Canada at Montreal, May, 1951

The author, who commanded a company of Royal Engineers in Southeast London during the Blitz for maintaining vital engineering services, here describes the unit, its composition, organization and functions. Various types of raids are enumerated and the services affected by each are listed, as well as the priority each type of service takes for repairs. He relates many of the problems dealt with. No amount of planning and preparation for maintaining vital services, he warns, will be of avail without a philosophical outlook and a sense of humour, a sense of proportion, and a realization of urgency.

It is a sad reflection of the times that a paper of this nature should be of interest. It is sincerely hoped that, while information given may be of value from the point of view of preparedness, there will never be any need to put such preparedness to actual test. The paper, as its title implies, deals solely with the engineering side of vital services. Only items of personal experience are dealt with at any length. Engineering repairs and reconstruction not experienced however, present added problems of detail only, and not of principle. The paper makes no reference to the effects of atomic bombs except in comparing the effect of blast with that of penetration.

Maintenance to an engineer usually means something very different to that with which we are concerned here. This paper deals with repairs and reconstruction, and therefore the title specifically uses the word "maintaining" in preference to "maintenance".

The author, in preparing this paper has referred to the address of Sir T. Pierson Frank at his inauguration as president of the Institution of Civil Engineers in November, 1945. He commanded one of the Royal Engineer Companies mentioned in that paper, and is much indebted to Sir Pierson, and herewith acknowledges such indebtedness.

Bombing Raids

To form a plan for counteracting the effects of bombing it is necessary to understand the types of bombing raids and their various effects. These are listed in Table I. A combination of these raids may occur of course. For example, a type 4 raid may occur on two adjoining communities the same night, negativing prepared plans for mutual assistance. It is the author's opinion that effort much needed in other directions would be wasted in making special preparations for work within the scope of this paper, for any type of raid other than (5), (6), (8), (9), (10) in Table I. It will be noted that these types of raids may be expected to occur only on centres of highly strategic importance.

Types of Bombs

Various types of bombs have varying effects on vital services as shown in Table II.

It must be realized that the type of ground and the type of surface can very materially influence the effects of a bomb. For example, a medium-size bomb landing on a lightly surfaced road built on fill may cause far more subsurface damage than a heavy bomb falling on a hard surface with a hard subgrade.

It will be appreciated also that

TABLE I

Bombing Raids and Their Effects

Type of Raid	*Planes Involved*	*Time Intervals*	*Target Intention*	*Remarks*
1. Light	1–5	Once during war	Accidental or diversion.	No strain on normal peacetime resources.
2. Light	1–5	Weekly	Hit and run raids.	Requires slight increase in normal peacetime resources.
3. Light	1–5	Continuous	Not experienced	
4. Medium	5–50	Once during war	Spot Target	Aid from adjoining areas needed and sufficient.
5. Medium	5–50	Weekly	Slow down massed manufacture and decrease morale	Large increase required in normal peacetime resources but without special executive.
6. Medium	5–50	Continuous	As (5) but possibly on combined manufacturing and strategic area.	As (5) but requiring special executive.
7. Heavy	50 plus	Once during war	Reprisal or target	Special aid needed for say 2 weeks, no special executive.
8. Heavy	50 plus	Continuous	As (6)	Special aid and executive needed continuously.
9. Very heavy	200 plus	Continuous	As (6) (Hamburg Berlin)	
10. V1 and V2		Continuous	As (6)	As (6)

Figs. 1 and 2. Bomb damage at Cliveden Place (left) and South Harrow (right) in London. Note damaged sewers, water and gas mains, and electric utility lines.

the time taken for repairs of subgrade services is much greater than for overhead services, and therefore that the penetrating type of bomb is much more of a problem to the engineer than the blast type of bomb, though from a personal point of view we know only too well which is the lesser of the two evils.

Services Directly Affected by Bombing

Table III shows vital services affected, and the varying degrees of importance of damage, depending on the character of the service. As a general principle, those services which are duplicated or have alternative routings are of a lower priority. It should be noted that certain services can be given rapid "first aid" to enable them to function, which affects their priority for full repair.

. In general it must be assumed that further raids will occur within twenty-four hours, and priorities are *only* established when (as is usually the case) materials, labour and plant are restricted in supply.

Engineering works needed because of indirect threats to vital services would include demolitions mentioned above. In addition, work such as first aid repair to key offices, factories, and of course houses of workers would be required. Certain work not vitally necessary in itself is necessary from the point of view of morale.

Organization

This is fully dealt with in Sir Pierson Frank's paper, and flows from Governmental channels, through regions, to groups. Greater London was constituted a region in itself, and was subdivided originally into nine groups. A certain amount of exchange of plant, and personnel took place between regions and a much larger exchange between groups.

With the exception of certain exchanges between regions, organization for engineering repair starts at group level. The type of engineering labour, available, including designing and executive staff, comes from:

(1) municipally controlled public utilities' expanded maintenance squads,

(2) privately owned public utilities' expanded maintenance squads,

(3) contractors to (1) and (2),

(4) special assistance.

If types (1), (2), and (3) are self-sufficient, then there is little work for a group engineer, other than to co-ordinate work and establish priorities. It has been my experience that in raids of type (7) and (8), privately owned public utilities' expanded maintenance squads could not cope with repairs, and contractors organizations seemed to be overburdened with other work. In raids of type (7) the municipal organizations were also unable to cope with work.

Speaking as a strong supporter of private enterprise, the above observations simply emphasize that municipal organizations are generally overstaffed, and in addition have pools of labour, such as street cleansing personnel, which can in emergency be diverted to other work. It will be seen, therefore, that in a plan for maintaining vital services in areas thought subject to raids of type (8), special labour must be available. In addition special labour must be available and extremely mobile in the event of raids of type (7). It is of this type of repair unit that the author has special knowledge.

Material and plant pools must be available for all repairs. Specialized materials and plant required by public utilities will be held by these undertakings. Some general materials will be on hand at group level, but to avoid wasteful reserves, material and plant pools must be maintained (and dispersed) at regional level. Trans-

TABLE II

Types of Bombs and Their Effects

Type of Bomb	*General effect*	*Engineering services affected*
Up to 500 kilo.	No major subsurface damage except by direct hit. No major overhead damage.	Transportation.
Above 500 kilo.	Can cause serious underground damage, no serious overhead.	Sewers, water, gas and power mains. Possibly overhead wires. Transportation.
Land mines V1, V2	Surprisingly little underground damage. Heavy overhead destruction.	Transportation. All overhead services in wide radius.
U.X.B. and DA	Nuisance. Very heavy underground damage if it explodes.	Transportation.
Incendiary	Small.	Transportation indirectly. Flood control.

TABLE III

Priority for Repair of Vital Services

Service	*Character*	*Priority*
Roads including street car and bus depots and ancillaries.	Main routes for fire service.	High
	Street car and trolley bus routes.	High
	Strategic routes (including important factory, or food distribution entrances).	High
	Bus routes and main auto routes.	Medium
	Other routes.	Low
Railways including stations, signal systems, and ancillaries.	Main lines.	High
	Sidings (or approaches) of strategic importance.	High
	Heavily travelled workers lines.	High
	Other lines.	Medium
Bridges and tunnels.	As for roads and railways.	
Sewers.	Main soil at capacity.	High
	Main storm water capacity.	Medium
	Main soil and storm water under capacity.	Medium
	Main soil and storm water with cross connections to under capacity channels.	Low
	All branches.	High
Water	Main fire services.	High
	Non cross-connected main.	High
	Loop main already damaged.	High
	Cross-connected main.	Medium
	Branches.	Low
Flood control.	If threat to other high priorities.	High
Demolition.	If structures menace high priority roads.	High
	If damaged structures affect morale.	Medium
	Other demolition.	Low
Burial Grounds.	For mass burial.	High
	Disturbance of existing graves.	Medium
D.A. and U.X.B. bomb removal.	(Subject to military labour available).	As for services affected
Resurfacing roads.		One priority lower than roads.
Power supply.	With no alternative route.	High
	Other.	Medium
Telephone & Telegraph.	Underground (because of time taken in repair).	High
	All other (assuming alternative routes available).	Medium

port and tools *must* be held at group level, and in addition special assistance units must all have adequate transport and tools. A regional pool is of course necessary as well.

Special Assistance Units

Public utility and contractors organizations are much the same in an expanded form in War as they are in Peace, with the following exceptions:

(1) Staffs are not so easily disciplined under bombing.

(2) Full employment exists for labour and contractors.

(3) The homes and families of employees are subject to disturbance.

(4) Traffic routes are disorganized.

(5) A job in an area not subject to attack has a very real and understandable attraction.

Under these circumstances, it was therefore found necessary in London to have special assistance in the form of Construction Companies, Royal Engineers.

These units had none of the disadvantages mentioned above and, since they were recruited from construction workers, were well suited to the task. If there is one criticism I have of Sir Pierson Frank's address it is that this special assistance is stated to have been only a fraction of the total personnel engaged. From experience in South East London, special assistance would be estimated from 10 per cent to 20 per cent of the available force, and the work output as from 20 per cent to 3½ per cent of the total. These units proved invaluable in filling the gap between work to be done and skilled labour available.

The unit which the author had the honour and privilege to command was typical of other units in establishment, but he considers (like all military commanders) that it did more work, better and speedier than its fellow units. It was of course much smarter, in military bearing and training, administration, and morale. The following statistics are from memory, but are approximately correct:

(a) *Man Power* (available for work 7 days per week). See Table IV.

A unit consisted of approximately 280, of all ranks, but administration,

Figs. 3 and 4. (Left). Debris in Balham tube station under bomb crater. (Right). Repairs to brickwork of Euston Square — Kings Cross tunnel after bomb damage.

(cooking, office, etc.) sickness, and one rest day in ten reduced the available force to the numbers shown in Table IV. Hours worked were dawn till dusk.

(b) *Other labour*—One company of Royal Engineers could use the services of from one to two companies of the Pioneer Corps (approximately 180 available per company) for ordinary labour. While rendering valuable aid, it should be pointed out that these men were recruited from all walks of life, and were *not* construction workers.

(c) *Transport*—6 flat-bodied 5-ton trucks and 6 dump trucks plus occasional vehicles from a central pool were used to capacity, but proved generally sufficient for all tasks allotted.

(d) *Tools*—With the exception of certain tradesmen's tools, all were drawn from a group pool. This was a constant source of trouble, and could easily lead to inefficiency.

(e) *Plant*—All plant was drawn from a group pool.

(f) *Accommodation* — Units were housed in empty houses, reasonably close (400 yds.) to a central point, but efforts were made to concentrate no more than 20 men in one house.

Fig. 5. Surface damage over Balham tube station (see figure 3.)

Ideal Special Service Unit

In size the unit was ideal for the type of work to be controlled by what amounted to 1 man (O C). In its make up it would be much better as follows.

(a) *Man Power*—One officer, 2 sergeants should be mechanical engineers or electrical engineers in proportion 2 to 1 to maintain plant and supervise assistance on electrical work. One officer should be office trained. 8 sappers should be electricians. 16 sappers should be pipe jointers instead of 8.

(b) *Tools* — Simple tradesmen's tools, picks, shovels, bars, rubber boots, barrows, concrete carts, and general contractors' tools should be in ample (though not extravagant) supply and unit controlled.

(c) *Plant* — Certain concrete mixers, pumps, small cranes, and accessories should be unit controlled.

In six months the unit under the author's command carried out

Fig. 6. Approximately 90 thousand separate wire joints were required to re-establish telephone services after a bomb hit near St. Paul's Cathedral.

TABLE IV

Composition of Typical R. E. Construction Company

Category	*No.*	*Military Rank*	*Civilian Equivalent*
O.C.	1	Major	Chief Engineer. General Superintendent.
2 i/c	1	Captain	Office Manager.
Officer	1	Lieutenant	Design, quantities, technical reports.
Officers	5	Lieutenants	Superintendents.
N.C.O.'s	8	Sergeants	Foremen
N.C.O.'s	12	Corporals	Subforemen
Drivers	12	Drivers i/c	Truck drivers
Sappers	32	Sapper tradesmen	Carpenters
Sappers	24	Sapper tradesmen	Bricklayers
Sappers	8	Sapper tradesmen	Pipe jointers.
Sappers	..	Sapper tradesmen	Electricians.
Sappers	8	Engine fitters	Mechanics.
Sappers	80	Sappers (pioneer)	Semi-skilled labour.

work as shown in Table V, which would amount to approximately 20 per cent of the work done on vital services in a heavily populated and heavily bombed area of approximately 9 square miles.

Summary

With a maintenance gang supplemented to 50 per cent by public utilities plus a construction labour force subject to military discipline (or equal) amounting to 20 per cent of the above, vital engineering services will not break down under a heavy and continuous bombing attack using weapons such as were used by Germany in World War II.

It is the writer's opinion however, that such an organization would not be sufficient to cope with vital engineering services under very heavy and continuous bombing attacks, using weapons such as were used by the Allies on German cities in 1944-45.

Incidental Construction Problems Met With

(a) *Attitude of mind* — Under bombing one must have a sense of urgency and of proportion, and a sense of humour. Without these or any one of these the best man in the office or field will lose efficiency. Without the inborn sense of humour of the Cockney all the repairs to vital services would have been impossible or at least valueless. Again, one must always have in mind that "there will be another raid tonight", and no labour may be available tomorrow for the task we have not completed today. One must remember that although repairs must be made in good fashion there is no time to work to peacetime standards of finish.

(b) *Communications* — Reliance on telephonic communication in planning work must be ruled out and even with courageous and conscientious dispatch riders communication is sometimes difficult.

TABLE V

Repair Work Completed by the Author's Construction Unit in a Six-month Period

Type of Work	*Description*	*Approximate Value in dollars*
Main sewers	6′ diam. soil sewer (3 breaks)	$ 30,000
	6′ x 4′ egg shaped sewer	5,000
	13′ dia. soil sewer (2 breaks)	100,000
	6′ dia. twin storm sewer with tidal flaps damaged	15,000
	8′ dia. concrete outfall sewer	15,000
Branch sewers	Over 50 of miscellaneous nature (average 12″ dia.)	25,000
Watermains		
12″ to 36″	Over 30	15,000
Under 12″	Over 50	2,500
Gas Mains		
12″ to 36″ and over	Over 20	5,000
Under 12″	Over 400	50,000
Flood Control	Over 2000 lin. ft. of frontage	30,000
Road craters	Over 50 reinstated	25,000
Sewage plant	Out of action and restored	75,000
Pumping station	Out of action and restored	20,000
Demolition, General works, assistance to others.		100,000
	Total	$512,500

(c) *Guides* — Particularly when units are drafted from outside a group it is a great advantage to have guides with a first hand knowledge of every nook and cranny in the district. Maps must be available, but when an obvious map route is blocked with debris, a not too intelligent driver can easily waste many hours of a squad's time.

(d) *Blackout*—"No lights" practically precludes night work and dawn till dusk must be the time of working. In mid summer in Britain two intensive shifts can therefore be worked, but at other times a 10-hour day continuously is the practical limit of work. Anyone who has sincerely worked all out day after day for 10 hours will appreciate this.

(e) *Marshalling men for work*—Jobs change from night to night,

Fig. 7. Broken water mains and sewers on Bayswater Road, London.

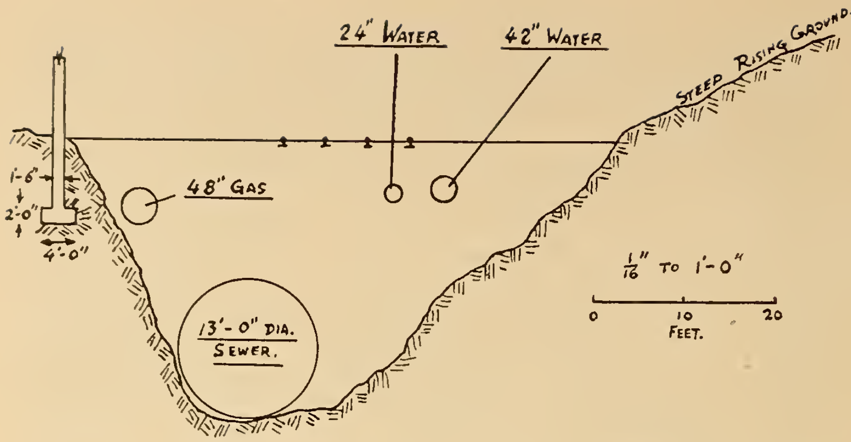

Fig. 8. Cross section of a typical bomb crater in a street in London.

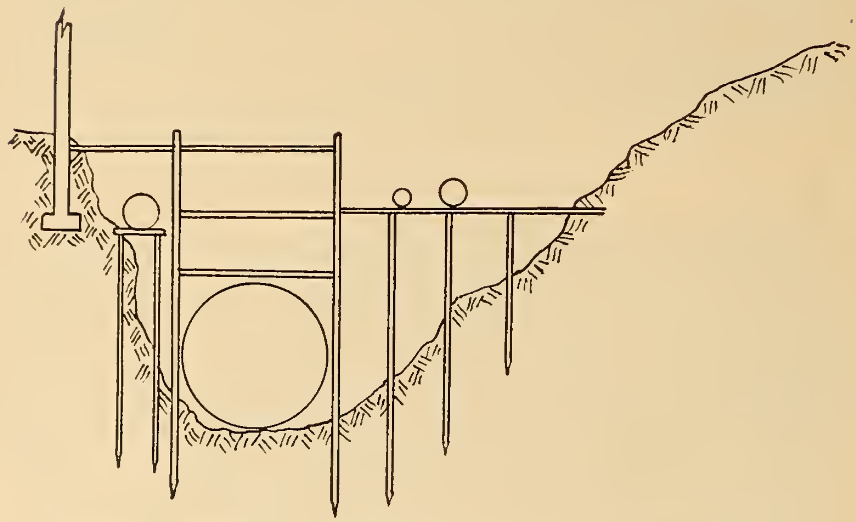

Fig. 9. Cross section of bracing and timbering for reconstruction after bomb damage.

and a job half completed one day may be completely abandoned on the next. It is necessary therefore for workers to be marshalled each morning in a central locality, and from there transported in various groups to the site of incidents. Information regarding incidents and priority from a group headquarters should generally be in the hands of the executive in charge of construction by 06.00 hours in winter, and earlier dependent on daybreak, so that jobs can be planned as to men, tools, materials and transport, for marshalling time.

(f) *Continuous working* — It is necessary to work seven days per week, though a man should have a complete day off every tenth day. This policy is not dictated so much by the need for urgency in repairs as by the danger to morale if civilians see no action on repairs which to them are of supreme importance.

(g) *Leave* — Even with all the work requiring attention, it is essential that workers from out of town get regular leave. Their wives and families may be suffering bombing too. Compassionate leave is essential for the man whose family has been "bombed out".

(h) *Morale* — It is essential to keep up morale in construction crews. Nothing is better for this than well planned hard work followed by complete freedom. Excitable foremen or supervisors, ill-planned and muddled work will very quickly get men down. It is in this connection that military assistance is very useful. Entertainment can be planned, and meals and services are of course assured.

(i) *Dispersal* — Offices, accommodation for men, material, plant and tool dumps, and transport *must* be dispersed. In one raid on a large British city all vital bomb disposal equipment for a complete and widely spread region was lost.

In cases of heavy raids of short duration (perhaps on two consecutive nights) and completely unexpected, such as occurred in the "Baedeker" raids, labour *must* be imported. The writer's unit handled one such case, with the assistance of a maximum of 1,500 troops under his command, as officer-in-charge of military assistance. In this case 90 per cent of services were functioning in two weeks and 100 per cent in four weeks.

A sketchy report by the official responsible to his region in listing services affected failed to make any mention of sewers, despite the fact that *all* sewage outlets from the city were completely destroyed. Work which had to be handled here in addition to services previously mentioned included mass burials; rescue work; setting up of public kitchens; water cartage; demolitions; and first aid repairs to service buildings, and to "bottleneck" factory.

Conclusion

Bombing is a nuisance, is noisy, and the author neither likes it nor approves of it. If, however, practical planning has been prepared, all concerned are freed from worry regarding the safety of their loved ones, and the job in hand is treated in a completely detached manner, the maintenance of vital engineering services under bombing, such as was experienced in South East London, is an engineering task well within human capabilities and giving all concerned in its accomplishment a very real sense of satisfaction.

Appendix A.

Specific Incidents

Incident 1

Here a (possibly) 1,000 kilo bomb dropped on a main roadway, penetrated through the chalky subsoil to a depth of 30 feet and exploded. A crater some 100 ft. in length, 25 ft. deep, to the full width of the roadway including sidewalks, was formed. (See Fig. 8)

Damage caused to vital services included destruction of roadway and sidewalks; street car rails and underground collectors; two 24-in. water mains; one 48-in. gas main, all over length of crater; one 400-pr. telephone cable; two main power cables; and one 13-ft. diameter brick sewer, including a large ength of invert. Little serious above-ground damage was caused.

Problems affecting restoration of services were:

(a) The width of the crater (caused partly by scouring from the water mains) left no room for temporary restoration of services.

(b) The depth of the crater, coupled with the necessity of allowing working space for restoration of the large sewer, made the work of supporting restored services on temporary shoring difficult.

(c) Some 1,500 cubic yards of earth and debris had been scoured downstream in the sewer.

To effect restoration the following sequence was followed. The upstream end of sewer (completely blocked) was cleared, and during this operation sewage was pumped from the nearest upstream manhole into the crater past the stoppage. At the same time sheeting with necessary bracing was placed along each side of the sewer. Timbers were placed to give temporary support to temporary water mains, and a temporary footway, for construction use only, was erected. (See Fig. 9)

Debris from downstream of sewer was hauled out by light railway and backfilled behind the sheeting. Light piling was then driven to give support to permanent water and gas mains. This proceeded simultaneously with backfilling. The sewer repair was effected by replacing the damaged portion by 9 ft. concrete pipe, the reduction in diameter being possible since the original sewer was over capacity.

It was not necessary to continue to pump sewage nor to by-pass it once the blockage was cleared, since because of overcapacity a 10-ft. removable dam upstream enabled at least four hours sewage to be stored. All services, exclusive of street cars were partially functioning in two weeks, and complete restoration was effected in six weeks.

Incident 2

The only major engineering repair the author experienced which was necessitated by the action of incendiaries was the replacement in concrete of a two-foot high dwarf retaining wall, built of 12 x 12 timbers around Surrey Commercial Docks. Some 12 miles of this had been completely burned away, and the high spring tide ebbed and flowed through the dock area. The work of replacement was of course of the simplest, but the incident is mentioned in view of the fact that there were, and may still be, some important timber engineering structures in Canada.

In connection with the gas industry, many hundreds of incendiaries penetrated the roofs of gasholders. Indeed one of the most lively nights was spent on the roof of a gasometer, plugging with clay the openings burned by incendiaries. One felt extremely naked in the light of the gas flaring through the openings, with enemy bombers booming away overhead.

Incident 3

In the City of Bath the large cross on top of a high spired church had become detached, due to some freak of blast, and dangled in the wind supported only by the lightning conductor cable. The situation was one which threatened a vital roadway. The highest fire ladder in the city was some 20 ft. short of the dangling cross, but a subaltern cast a very nice line across it with his fly rod from the top of the ladder, and the rest of course was routine.

Appendix B.

Statistics Regarding London "Blitz".

	Occasions
Water services:	
Reservoirs, filters, etc., hit	192
Mains damaged:	
Over 12 in.	942
Other	6,760
Gas services:	
Mains damaged:	
Over 12 in.	831
Other	11,171
Tele Communications:	
Main cables severed	1,695
Minor cables severed	7,334
Electricity:	
Power stations damaged . .	56
Transformer stations, etc., damaged	544
Main cables damaged	1,393
Distribution cables damaged	8,590
Drainage:	
Main sewers damaged	425
Branch sewers damaged . .	8,000
Highways:	
Damaged	9,862
Bridges:	
Damaged	140

Londoners Under Bombing

In an effort to gauge how severe London bombing raids were, I asked a man on my first evening in London to give me an idea as to the severity of the raid then in progress. Bombs were dropping at almost minute intervals, and every fifteen minutes a loud crash, near at hand, and the tinkle of broken glass, indicated a near miss. The hand of the steward shook badly in handing me my drink, and I took this to mean the raid was severe. My friend indicated the raid was only slightly more severe than average, and that to his certain knowledge the barman's hand had shaken for the last twenty-five years.

No one during a raid really bothered much unless machine gun fire was heard indicating that flares were overhead and that we were the specific target area. Indeed, an elderly lady living in a target area described bombing to me as "such a nuisance, so noisy and impossible to cope with the dust in the house"; this a day or two after her ceilings had fallen. My driver (a Cockney) picking me up on return from leave told me that it had been very dull during the past week. "A land mine in Tunnel Avenue, another on Shooters 'ill Road, two or three dozen H.E. in odd spots, but not a single bleedin' worthwhile sewer or water main 'it".

Shops immediately opposite a fresh incident whose whole front had been blown in would simply change the sign "Open as usual" to one reading "More open than usual". A lady running a tiny cigarette and candy shop in a slum area was deeply indignant that I had come to buy a packet of cigarettes and not to remove the daddy of all bombs the fins of which were sticking out of the ground ten feet from her back door. She insisted that it was the Government's duty to have me (a soldier) remove the bomb immediately and not talk silly nonsense about evacuating her. "Wot do the perishers think I'm paying taxes for?"

I mention these experiences to try to show the effect bombing had on the Londoners, and to try to put over to you that all the planning, all the préparations and all the organization put into force for maintaining vital services, will be of little avail without a philosophical outlook and a sense of humour.

THE AUTHOR.√

Atmospheric Pollution in Canada

The report and proposed model ordinance of a joint committee established in April, 1949

Report of the Committee

During the past decade the citizens of Canada, in common with those of other countries, have become increasingly aware of the damage, both human and material, caused by smoke and other forms of atmospheric pollution. Many papers have been read and conferences held on this matter but, in this Dominion, piecemeal and sporadic attempts only have been made to deal with the problem. Such attempts as were made took the form of smoke abatement by-laws which were adopted by several municipalities. Admittedly, these were better than nothing and resulted in some degree of amelioration, but they fell far short of being cures for the disease because pollution recognizes no municipal boundaries, because smoke is only one form of pollution and because there was little uniformity in the treatment prescribed by the various cities concerned. Some by-laws, moreover, were honoured more in the breach than in the observance and tended to become entangled with local politics.

Formation of the Committee

Recognizing the need for concerted action in this matter, several national organizations decided that the time had come to attack the general problem of atmospheric pollution on a Dominion-wide basis. Accordingly, a preliminary meeting of representatives was held in Toronto on April 20, 1949, at which were discussed the desirability and possibility of forming a committee to prepare a model by-law or ordinance that could be adopted and used, with suitable local modifications, in any part of Canada. The following representatives were appointed to form that committee:

Prof. E. A. Allcut
Mr. C. E. Baltzer
Mr. Robt. Broad
Mr. G. P. Cooper
Mr. E. Davis
Mr. John G. Hall
Dr. Morris Katz
Mr. W. J. Longeway
Dr. D. Y. Solandt
Mr. F. D. M. Williams

The following organizations through their appointed representatives participated in the deliberations of the Committee:

The Engineering Institute of Canada
Department of Mines and Technical Surveys
Stoker Institute of Canada
Canadian Manufacturers' Association
Canadian Steel Boiler Institute
Defence Research Board
Institute of Power Engineers
School of Hygiene, University of Toronto
American Society of Mechanical Engineers

Recommendations

At the first meeting, held on October 12, 1949, Professor E. A. Allcut was elected Chairman and Mr. W. J. Longeway, Secretary of the Committee. Mr. John G. Hall was appointed to represent the Committee on the corresponding body sponsored by the American Society of Mechanical Engineers, so that liaison might be maintained between the two groups. Subsequently, eight meetings were held to consider the form and details of the proposed ordinance concerning atmospheric pollution and the result of the Committee's deliberations is appended hereto. It is recognized that various factors have different degrees of importance in different localities and, therefore, some modifications of, or additions to, this model ordinance may be desirable. It is strongly recommended that the problem should be dealt with on a regional basis by means of appropriate control areas to be set up by the various provincial governments, because only those governments have the power to take such action. Cases where the control area must necessarily cross provincial boundaries (and such cases will be few in number) could be dealt with by joint boards set up by the two governments concerned. This procedure has been adopted in dealing with other problems and can be made to work satisfactorily, given good will on both sides. A skeleton type of organization has been suggested for operating the ordinance after the appropriate control boards have been set up.

While the general pattern characteristic of existing ordinances has been adhered to, an attempt has been made to rectify weaknesses in organization or procedure that have been discovered in practice. For instance, few reliable standards or standard methods are available for making measurements of atmospheric pollution in the field and the figures and proedures here recommended are, in he opinion of the Committee, the est available at this time. The veaknesses of the Ringelmann Chart as a means of measuring moke density were recognized but, o far, no reasonable alternative xists and the use of this method s, therefore, recommended. Definitions of such things as odours and nuisances are necessarily tentative and nebulous, and those recommended herein were based on he advice of the best available uthorities.

It is realized that the height of a stack, together with peculiarities of local topography and meteorological conditions, will affect the listribution of pollutants and, in some cases, may vary considerably he concentrations at ground level. These comments apply specifically o the tables contained in Section III, Clauses C (1) and C (3), and hese factors may justify local nodifications in the maximum quantities of pollutant which may be emitted.

The permit system that is frequently a feature of existing bylaws, has been deliberately omitted, though it could be included if desired, as one of the local modifications mentioned above. Nevertheless, the general feeling of the Committee is that it is ineffective and should not be included.

The penalties suggested are considered to be both reasonable and representative, but could be modified up or down if desired.

It is recognized that no man can be "legislated into heaven" and that the usefulness of an ordinance such as is suggested here will depend almost entirely on public support. Education and persuasion rather than coercion should be stressed in administering ordinances of this kind and, therefore, the publication and dissemination of information (Section VII C) form an important part of their administration. The objective throughout is to uphold the common right of all citizens to have the air that they must breathe come to them in a reasonably uncontaminated state. However, in establishing a permissible value for atmospheric pollution in any community, that which is possible must be distinguished from that which is ideal, and the responsible authorities must not forget that our civilization depends for its very existence on industrial activity.

Some thought was given to the best method of initiating a movement of this kind and it is suggested that, after the necessary legal steps have been taken, the responsibility for drafting and operating the ordinance should be vested in the most appropriate departments of the governments concerned. Those departments would then proceed to designate suitable control areas and would set up the necessary organizations to administer the ordinance within those areas.

The assistance of Professors J. Finkelman and J. Willis of the Faculty of Law (University of Toronto) in advising the Committee on various legal points in this report is gratefully acknowledged.

All of which is respectfully submitted.

E. A. Allcut, M.E.I.C.,
Chairman

Recommendations of the Committee

I. Title

It is recommended that this ordinance be designated "An Ordinance Concerning the Control of Atmospheric Pollution" (hereinafter referred to as the Ordinance).

II. Definitions

It is recommended that the following definitions be adopted for the various terms used in this ordinance:

Smoke means the exhalations, whether visible or not, resulting from oxidation or other chemical action, and containing either liquid or solid particles less than 1/10 micron in mean diameter;

Soot means the aggregated particles of carbon, produced by incomplete combustion, frequently intercharged with adherent tarry or sulphurous liquids;

Fumes means gaseous mixtures containing solid particles between approximately 1/10 and one micron in mean diameter. These may result from distillation, complete and incomplete oxidation, or other chemical reaction;

Mist means that atmospheric condition in which water-droplets of a size larger than 50.0 microns in diameter are suspended in the air. These droplets may be formed by condensation from the gaseous state or dispersion from larger liquid masses by splashing, foaming, or spraying.

Fog means an atmospheric phenomenon similar to that defined above as mist, but with a droplet diameter below 50.0 microns. Fog droplets commonly have a solid nucleus about which the fluid has collected and when this particulate centre is large, the fog droplet size may exceed that found in many mists.

Smog means an atmospheric state resulting from a mixture of smoke, fumes, gases, and fog, originating either from human or natural action;

Dust means gas-borne and air-borne particles larger than one micron in mean diameter;

Fly-ash means all solid particles not less than one micron (and usually not less than ten microns) in mean diameter, that are entrained in, and carried by, the gaseous, products of combustion. These may include both combustible and incombustible materials, such as fine ash particles, coke (partly burned fuel), cinders, dust, grit, and soot;

Dust-separating equipment means an apparatus or device for separating solid matter from the gas medium in which it is carried;

Nuisance means a condition deemed to interfere with common rights or to be materially disadvantageous or to cause physical or mental damage in the opinion of a reasonable person of goodwill supported by fellow citizens of like mind;

Unpleasant odour means any annoying, objectionable, or undesirable stimulation of the sense of smell in a reasonable person with normal olfactory responses, when exposed to one or more atmospheric pollutants;

Person includes a partnership, association, syndicate, trust, corporation, department, bureau, agency, or any other entity recognized by law as the subject of rights and duties;

Regulations means any resolution passed by the authority having jurisdiction;

Board means any committee set up by the authority having jurisdiction to administer the provisions of the ordinance;

Ringelmann Smoke Chart means the Ringelmann Smoke Chart as published by the United States Bureau of Mines in the current edition of their information circular No. 6888 when the same is used in accordance with the instructions published by the said Bureau;

Stack, chimney, or exhaust pipe includes a flue, conduit, or other opening arranged for emitting gases into the open air;

Fuel-burning equipment means a furnace, incinerator, engine, refuse-burning equipment, boiler, chimney, flue, stack, or any other apparatus, device, mechanism, or structure, used in or in connection with the process of burning fuel or other combustible material;

Internal combustion engine means an engine or turbine in which combustion of a gaseous, liquid, or pulverized solid fuel takes place within one or more cylinders or combustion chambers;

Vehicle includes a roller, derrick, crane, pile driver, trencher, portable hoisting engine, tar kettle or other apparatus which is not ordinarily permanently installed in one location but is used at various places.

III. Discharge of Smoke, Fumes, etc.

It is recommended that:

(A) The discharge or emission to the atmosphere, within the limits of the designated area, of smoke, dust, fly-ash, soot, fumes, or other solid or gaseous product, the shade or appearance of which is equal to or greater than No. 3 on the Ringelmann Smoke Chart, for a period of or periods aggregating six (6) minutes or more in any one hour, be prohibited.

The discharge or emission to the atmosphere, within the limits of the designated area, of smoke, dust, fly-ash, soot, fumes, or other solid or gaseous product, the shade or appearance of which is equal to or greater than No. 2 on the Ringelmann Smoke Chart, for a period of or periods aggregating ten (10) minutes or more in any one hour, be prohibited.

(B) No person should, in the designated area, cause, suffer, or allow to be discharged or emitted from any fuel-burning equipment, internal combustion engine, vehicle, outside open fire, or premises, any smoke, dust, fly-ash, soot or fumes or other solid or gaseous product of combustion in violation of paragraphs (A) or (C) of this section or to an extent which, in the considered opinion of the authority having jurisdiction, is detrimental to the property or health of any other person or is a nuisance to any person not being therein or thereupon engaged.

(C) The emission of pollutants to the atmosphere from any fuel-burning or other equipment should not exceed the amounts stated hereunder in sub-sections 1, 2, 3, 4, respectively.

1. *Combustion Processes Used for Steam Production.*

Steam generated (Pounds per hour)	Maximum emission of solid matter (Pounds per hour)
10,000	22
20,000	45
30,000	67
40,000	90
50,000	112
60,000	134
80,000	180
100,000	224
150,000	284
200,000	334
300,000	419
400,000	489
500,000	552
600,000	609
800,000	709
1,000,000	798
1,500,000	1200
2,000,000	1600
3,000,000	2400
4,000,000	3200

Note: For weights of steam generated between those tabulated, the corresponding values of solids emission may be found by linear interpolation.

In the above Table, steam generated is considered to be the average hourly output of all units connected to a chimney, for that continuous four-hour period during which the average output is the greatest, expressed as the equivalent of steam containing 1,000 British thermal units per pound.

The emission of quantities of solid matter as shown in the above Table may be exceeded for a period of, or periods aggregating, not more than two hours in any continuous twenty-four hours, during which time the gas swept passages of the boiler are being cleaned.

The quantity of solids being emitted from a chimney should be determined at any suitable sampling point in accordance with the procedures of a recognized established chimney dust test method.

2. *Combustion Processes for Purposes other than Steam Production.*

(a) *Combustion processes not used for steam generation, in which the solid pollutants are emitted through stacks or flues so that measurements of quantities can be made by standard methods.* The weight of dust, ashes, charred paper, soot, grime, or other particulate matter discharged into the atmosphere should not exceed, at the point of discharge, 0.40 grains per cubic foot (at 68° F. and 30″ of mercury).

(b) *Combustion processes not used for steam generation, in which the quantities of solid pollutants cannot be measured conveniently, as in the case of emission through windows, monitors, vents, and other similar openings.* In cases such as these, the emission into the atmosphere of dust, soot, cinders, fly-ash, or other solid pollutants in quantities sufficient to cause a nuisance should be prohibited.

3. *Processes which Emit Gases and/or Fumes of a Toxic Nature.*

(a) *Combustion processes involving carbonaceous fuels.* The emission of sulphur dioxide from a stack or chimney should not exceed 0.20 per cent by volume of the gases present, calculated to 68° F. and 30″ of mercury and with CO_2 content of 12 per cent. It is further recommended that the height of the stack be such that the maximum concentration of sulphur dioxide at ground level for one hour does not exceed 0.5 parts per million by volume.

(b) *Other chemical and metallurgical processes.*

The concentration of gases and or fumes in the atmosphere surrounding the plant should not be so great as to constitute a nuisance, be detrimental to health, or injurious to vegetation. Experience has shown that the following stack concentrations should not be exceeded:

ılphur dioxide	—4.0 grains per cubic foot, calculated as sulphur trioxide.
ydrochloric acid	—0.2 grains per cubic foot.
ydrofluoric acid	—0.2 grains per cubic foot, calculated as the sulphur trioxide equivalent of hydrofluosilicic acid.
hlorine	—0.2 per cent by volume.
luorine and fluorine-containing compounds	—should be removed by gas washing and scrubbing equipment (wherever feasible) before emission into the atmosphere.
itric acid and oxides of nitrogen	—sufficient gas washing and scrubbing equipment should be used to avoid the emission of coloured fume.
ydrogen sulphide and mercaptans	—should be not sufficient in quantity to constitute a nuisance, in accordance with the nuisance clause as stated above.

ead	Approximate process weight per week in tons	Max. permissible Stack discharge*	Max. total quantity discharged from a single plant
mall works	up to 15	0.10 grains per cu. ft.	200 lbs. per week
ledium works....	16-100	0.05 grains per cu. ft.	400 lbs. per week
arge works	101-850	0.01 grains per cu. ft.	1000 lbs. per week

inc and arsenic —the emission should not exceed 0.035 grains per cubic foot.

Note: All above references to volume in this clause are based on 68° F. and 30 inches of mercury.

*"The maximum permissible stack discharge of lead fumes for small, medium, nd large works, respectively, is based on the collection efficiency of dust recovery quipment which would normally be used in works of these respective sizes."

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4. *Processes which Emit Solid Pollutants of a Non-Toxic Nature.*

For processes in which the quantities of dust or other solid pollutants emitted cannot be measured readily, as in the case of emission through windows, monitors, vents, and other similar openings or from piles of material, the emission into the atmosphere of such pollutants in quantities sufficient to cause a nuisance should be prohibited.

IV. Smoke Indicators

It is recommended that:

(A) Each stack or chimney of every plant that burns or is intended or designed to burn any fuel and has more than 500 square feet of boiler heating surface (50 H.P.) be equipped with an approved smoke indicator or recorder.

For the purpose of this section, "smoke indicator" is considered to include, in the case of a boiler room having a fireman in constant attendance, a mirror or other device that enables the fireman to see the conditions at the top of the stack or chimney from within the boiler room at all times. In the case of a boiler room not having a fireman in constant attendance, it is considered to mean a smoke indicator of a type which will sound an alarm or flash a signal to attract the attention of the fireman.

This section should not apply to a stack or chimney that is readily visible to the fireman from inside the boiler room without the aid or use of a smoke indicator if a fireman is in constant attendance in such boiler room.

V. Increasing Height of Existing Stacks and Chimneys

It is recommended that:

(A) Where any prior existing chimney or stack is so located that the emissions or discharges therefrom are a nuisance to the occupants of any building or structure subsequently erected, or where any building or structure subsequently erected adversely affects the draft of any such chimney or stack, such nuisance be abated, or the adverse effect upon such draft be corrected as the case may be, either by increasing the height of the chimney or stack, or by making such other provision as may be deemed effective by the designated authority.

VI. Control Area or Region

It is recommended that:

(A) As atmospheric pollution is a regional rather than a municipal or local government problem, appropriate control areas should be set up, preferably around the larger cities or industrial areas, to which this ordinance will then apply.

VII. Administering Body

It is recommended that:

(A) The duty of designating pollution control areas be vested in the provincial government or governments concerned, who may each appoint a person or persons to do the necessary planning in this regard.

(B) Each pollution control area be administered by a board or commission appointed by the provincial government or governments concerned.

It is strongly recommended that each board be composed of residents of the area affected.

(C) A competent technical director, experienced in the field of atmospheric pollution, be appointed by each board for the purpose of administering the provisions of the ordinance for the area under its jurisdiction.

He should have the assistance of an adequate and competent staff. His duties should be:

1. To investigate complaints, make observations of the extent of atmospheric pollution, and take the necessary and proper action under the ordinance to abate nuisances therefrom.
2. To issue permits, certificates and/or notices (if provision is made for these in the ordinance) and to keep records thereof.
3. To act in a liaison capacity with the local constituted authorities for the purpose of assuring, as far as possible, that new buildings and/or alterations to old buildings are designed and erected in such a way as to make it possible to carry out the provisions of the ordinance.
4. To publish and disseminate information on methods of reducing atmospheric pollution.
5. Provision should also be made to invest the director with discretionary powers which may permit deviation or exemption from the requirements of the ordinance to cover emergencies or special cases.

VIII. Powers

It is recommended that:

(A) The director and every person appointed to assist him in carrying out his duties under the ordinance should, at all reasonable hours, be empowered to enter upon any property in order to ascertain whether or not the provisions of the ordinance are being complied with.

(B) The director should be given power to require the owner, occupant, manager, or agent of any property to make such tests of, or alterations in, equipment thereon, or the manner of operating the same, as may be necessary to prevent or lessen the emission or discharge to the atmosphere of pollutants in violation of the ordinance.

(C) No person should be allowed in any manner to obstruct, hinder, delay, resist, prevent, or in any way interfere or attempt to interfere with the director or any person appointed to assist him in the carrying out of his duties under the ordinance or refuse them or any of them entry upon any property or premises at any reasonable time in the course of duty.

IX. Control Board

It is recommended that:

(A) A board, named the Atmospheric Pollution Control Board, consisting of from three to five members (hereinafter referred to as the Board) be appointed by the Provincial Government or governments having jurisdiction over the control area concerned, for the purpose of administering the ordinance. An advisory committee consisting of technically trained personnel should also be established to advise the Board on technical matters.

(B) The members of the Board should hold office for the term of four years and until their respective successors are appointed; and should be eligible for re-appointment. Their respective periods of appointment should be staggered so that continuity of policy may be maintained.

(C) Upon the death or resignation of any member of the Board, his successor should be appointed by the Provincial Government concerned for the balance of his term of office.

(D) A quorum should consist of a majority of the members of the Board.

(E) The Board should, at the first meeting in each year, appoint one of its members to be chairman.

(F) The Board may meet and adjourn from time to time at pleasure, or may be summoned at any time by its chairman or at the request in writing of a majority of the members of the Board.

(G) The Board should be empowered to hear and determine appeals from decisions and orders of the director, and to confirm, vary or reverse any such decision or order.

(H) The Board should take adequate measures to keep itself informed regarding developments in the control of atmospheric pollution and, if it be considered advisable, the Board should have power to recommend to the Provincial Government or governments concerned, amendments to the Ordinance.

(I) Suitable provision should be made for receiving and hearing appeals arising from any order or decision by the director including:

1. Method of notifying the Board regarding intention to appeal and the address to which notices should be sent by the Board.
2. The maximum time interval between the date when the decision is made and the date when the appeal is received by the Board. It is suggested that fifteen days is an appropriate period.
3. The maximum time interval between the receipt of the appeal and the day when the appeal is heard. It is suggested that fifteen days is an appropriate period.
4. The maximum time interval between the hearing of the appeal and the communication of the decision of the Board to the appellant. It is suggested that thirty days is an appropriate period.

X. Persons Liable

It is recommended that:

(A) All persons owning, operating, or in charge or control of any equipment, process, or property who violate or cause, suffer, or allow any violation of the Ordinance be jointly and/or severally liable (as may be determined by the courts) to the penalties imposed by the Ordinance.

XI. Penalties

It is recommended that:

(A) Every person who, after due warning, contravenes any of the provisions of the Ordinance, any decision or order of the Director pursuant to the Ordinance, or any decision of the Board should, upon conviction thereof, forfeit and pay, at the discretion of the convicting magistrate, appropriate penalties which may increase in severity for successive infractions of the same provision of the Ordinance. It is suggested that these might be a penalty not exceeding (exclusive of costs) fifty dollars ($50) for the first offence, one hundred dollars ($100) for the second offence, and two hundred dollars ($200) for the third offence.

(B) For offences subsequent to the third it is suggested that an injunction be sought by the Board to terminate the operation of the equipment, process, or property until the cause or causes of the pollution complained of have been ascertained and eliminated.

XII. Effective Date

(A) The provisions of the Ordinance should become effective at a date to be determined by the Board having jurisdiction over the control area concerned.

Anti-icing of Jet Compressor Blades

An electrically-heated blade has been developed at A. V. Roe Canada Limited for dealing with the problem of ice formation on the compressor blades of aircraft gas turbines.

Under certain atmospheric conditions an ice deposit tends to form on the initial stages of compressor blades. This ice deposit seriously obstructs the flow of air into the engine and reduces the aerodynamic efficiency of the blades. Moreover, should some of the ice break loose and be carried downstream into the moving blading it may result in serious damage to the engine. The Avro Canada blade is designed to overcome these difficulties by providing internal heating of the blade surface to prevent ice formation.

The heating element of the blade is built up on a mica form which is first wound with an electrical resistance ribbon and then insulated with helical windings of glass thread. The whole assembly is impregnated with ceramic material to form a core around which the blade form is cast.

Further details of the system are available from Avro Canada or from Canadian Patents and Development Limited of Ottawa to whom the patent rights have been assigned.

Law and the Engineer

by

Gordon R. Munnoch, K.C.

Toronto, Ont.

An address presented to the Toronto Branch of The Engineering Institute of Canada, on October 17, 1950

Editor's Note:

In the April and May issues of 1950, the *Journal* published, in two instalments, a paper by Dr. C. R. Young, entitled "The Legal Position of the Engineer", which dealt with the duties, rights, and privileges of engineers under the law.

Mr. Munnoch's paper supplements this earlier paper. Commenting on the responsibilities of engineers, he offers some valuable advice for the expert engineering witness on court procedure. The difference between engineer's certificates and arbitrations is explained. Procedure for arbitration under the Ontario Arbitration Act is discussed and the jurisdiction, powers, and limitations of an arbitrator are defined.

My earliest experience with Enneering relates to a group of rile young men who enjoyed nging in somewhat raucous tones:

"We are, we are, we are the
Engineers
We can, we can demolish forty
beers."

ut Engineers are really modest llows, and I shall proceed to rove that point. In recent years, have observed the erection of any great buildings in Toronto quiring the utmost of service om Engineers, Architects and ontractors. When the hoardings ave been put around the site, a acious sign board usually apears on which you can read in rge letters the names of the Conactor and the Architect, both rominently displayed. If any refrence whatever is made to the ngineers concerned, it is done in mall letters, but often it does not ppear at all.

Engineering is an exact science; aw is sometimes exact but is ften a speculative science, either ecause of its relation to a concept f the material facts, or because f differences of opinion in both he judicial and advisory fields. n speaking to you on the subject Law and the Engineer", I hope our professional exactitude of nind will not lead you to resent ome qualified statements as I eek to make contact between the wo professions.

Any one who offers professional ervices to the public, or services hich are known to require paricular knowledge, skill and exerience, represents by implicaion that he has such knowledge, kill and experience as will enable im to perform the services reuired. This principle is of broad application, and applies even to a skilled labourer or artisan.

It follows that any one practising an art or profession must be qualified for the task he undertakes. He is also bound to act with reasonable care and diligence in rendering services to those who employ him. If he does not possess a reasonable degree of skill, or if he does not display reasonable care and diligence in rendering services, he may be held liable for the omission.

The question whether a person has exercised reasonable and proper care, skill and judgment is one of fact. The test is whether or not any other persons exercising the same profession or calling, and being men of experience and skill therein, would or would not have come to the same conclusion or followed the same practices. When a person undertakes a task that obviously requires special skill, and in particular professional skill, there is an implied warranty on his part that he has the skill required for the task he undertakes.

However, if you are practising your profession as an engineer, it is not enough to make you liable that some engineer of far greater experience or ability might have used a greater degree of skill, nor is it enough that you might possibly have used some greater degree of care. The question is whether there was a want of competent care and skill to such an extent as to lead to an unfortunate result.

The law does not require you to rise to the level of genius. Supposing, however, that you are instructed to use new methods, either of construction or in any other department of engineering skill, the failure of such methods, if applied under your care, will not necessarily establish that you did not have the ordinary degree of skill and knowledge required. You are not bound to do more than keep abreast of the times, and to be knowledgeable in the established and accepted practice of the science which you practise.

If your professional duties are such that you must employ assistants, you must use every care to select proper and qualified employees. It is you that is retained, and if you entrust the work or part of the work to an employee you are taken to represent that the qualifications of that employee are sufficient. By using an employee to assist you in matters requiring professional skill and experience, you must remember that he who retains you for the task did not select the employee. That is your responsibility.

The Engineer in The Court Room

An engineer finds his way into the court room either as an expert witness, or because of his participation in some task that has gone wrong, whether or not he is in any way responsible for the failure. It may be because of his professional knowledge of particular facts that are material to a claim against some one else.

It is a tribute to your profession that engineers rarely find their way into the court room. This is mostly because you practise an exact science, and partly because many contracts which involve the services of an engineer stipulate for arbitration, certification or other voluntary procedures of reference.

It is always a challenge to a lawyer when a *professional witness* is called against his client. He usually anticipates that this will happen because of the nature of the case, and because he has himself sought the advice of an expert in the same field. He then proceeds with the help of his own expert to test the skill of the expert called against him. It is often a duel of wits, in which the lawyer adds his own ingenuity to that of the expert he has hired to help him.

For the purposes of an action, it was once my duty to sweat up a lot of special knowledge concerning an electrolytic process of refining ores in which nickel and copper are both present. The Mining Engineer whom I cross-examined was a man of experience and learning. But he was timid, and showed far too much respect for the smattering of knowledge that I had picked up.

You, too, may someday be called as a professional witness, and may find that you are being badgered by some lawyer whose objective is to win his case (and not necessarily to add to the sum of human knowledge on the subject of engineering). If so, always remember that you are really his master. If you are prepared to give evidence, you have real knowledge and skill, while he has only acquired some little knowledge for this particular show. You need only watch your step and retain your self-assurance, and you will soon have that lawyer bending over to whisper in the ear of the expert he has hired to hold his hand.

The atmosphere of a court room is usually artificial. The microscopic attention given to detail often distorts the picture. Remember, however, that behind it all is the judicial search for truth. Counsel for the plaintiff colours the picture to suit his client, and counsel for the defendant does likewise. Sometimes both do it unreasonably. But even this over-emphasis usually assists the truth to emerge.

When you are giving professional evidence, never develop the feeling that you are on trial. Counsel may probe your mind, your skill and your experience, and sometimes may not take time for the anaesthesia of courtesy. If he grows nasty, keep murder out of your heart and your knowledge in your head and you will always be top dog.

These remarks are also abundantly true if you are present as a witness in a case in which you are personally concerned as plaintiff or defendant. If you are called as an expert witness, counsel on both sides will make a study of you. You must also make a study of them. You have this advantage over the medical doctors; usually cases which involve a study of engineering skill are in the hands of counsel of experience, who are willing and anxious to show every courtesy to a member of another learned profession.

When it comes to cross-examination, a great judge once reminded counsel that cross-examination does not mean 'to examine crossly'. Counsel has the right to probe your experience, knowledge and ability, and your general qualifications. You should not take umbrage at this. The Court is entitled to know. No matter how high your professional standing may be, never hesitate to say "I don't know" if that should be the case. You should be responsive to the question, though it is wise not to volunteer information until asked. Trust the Counsel on your side of the case and let him take the responsibility of developing matters further when he exercises his right to re-examine.

If you are called as a purely professional witness, stick to your professional knowledge. Above all, do not become a mere advocate for the side that has retained you. If you do so, you will lose prestige with the judge, and he will discount your professional evidence. I do not think that engineers would be so prone to fall into this error, which is a common one among medical doctors. Insofar as you can, avoid the use of highly technical language. You are in the witness box to assist the judge. He is not an engineer, but he will do his best to understand your evidence. A parade of learning does not impress a judge. He is far too accustomed to the bombast of his own profession to fall into that error.

Perhaps it is elementary for me to say that as a witness you should show every respect to the Court. Do not think it is mere claptrap when a Justice of the Supreme Court is addressed as "My Lord". In our British tradition, the King is constructively present in all his Courts of Justice. The form of address "My Lord" really means and extends to "My Lord the King". I mention this because of the modern trend away from titles and formal courtesies.

Sometimes, as the wheels of justice grind, your scientific ear may detect some clashing of gears. You may think that the whole machine needs overhauling and a bath of oil. Yet our system of justice, with all its admitted failures, is perhaps the best yet devised by man. The great Edmund Burke once put it this way:

> "The science of jurisprudence is the pride of the human intellect—a science which, with all its defects, redundancies, and errors, is the collective reason of all ages, combining the principles of eternal justice with the infinite variety of human concerns."

Engineer's Certificates and Arbitrations

In substantial contracts relating to construction, it is quite usual to find a provision which confers important powers on the engineer or architect. Roughly speaking, these powers are divided into two separate classes, the one relating to the certification of facts, the other relating to the determination of matters in question or even in dispute. The certificate or decision given is usually intended to bind the parties concerned conclusively and so the responsibility is a serious one.

At common law, an agreement that deprived one or more parties of recourse to His Majesty's

Courts of Justice was considered to be contrary to public policy. Before the passing of legislation to which I shall later refer, the device used was to agree that no action be brought until the specified event had happened, namely, the giving of a certificate or the making of an award. Thus the jurisdiction of the Courts was not ousted, but the certificate or award was made a condition precedent to any recourse to the Courts.

It is important to distinguish between arbitrations on the one hand and appraisals, valuations and certificates on the other. Prima facie, persons who are appointed because of their skill, knowledge and experience of the particular subject to decide any questions, whether of fact or value or anything else, by the use of their own skill and knowledge, and without taking any evidence or hearing the parties concerned, are not arbitrators. Such a person is not acting judicially. He is using his own skill, and is not performing the functions of a judge.

A study of the decided cases shows that it is sometimes very difficult to determine when the engineer may be acting as an arbitrator and when he is not. Sometimes indeed contracts are drawn in which the engineer might be an arbitrator in respect of some of the matters submitted to him, and not in respect of others. When a contract raises doubts as to the precise legal jurisdiction of the engineer, it would be well to take competent legal advice as to the construction of the contract.

To illustrate, a construction contract provided that, upon certain defaults occurring, the builder would pay the employer such sums "as the engineer for the time being of the employer shall, in his opinion, *adjudge* to be reasonable and proper to be paid for such default." This was held to require an appraisal and not an award.

In another case, it was provided by the contract that the engineer "shall be the exclusive judge upon all matters relating to the construction, incidence and consequences of the contract and to the tender, specifications, schedule and drawings of the contract, and in regard to the execution of the works or otherwise arising out of or in connection with the contract, and also as regards all matters of account including the final balance payable to the contractor and the certificate of the engineer for the time being given under his hand shall be binding and conclusive on both parties."

It was held that this clause was not an arbitration clause, because the duties of the engineer were administrative and not judicial. They were related to his particular skill, knowledge and experience.

Generally speaking, when it is necessary to decide value or performance only, or matters relating to the administration of the contract, the engineer is not acting as an arbitrator. To constitute the engineer or architect an arbitrator, it must appear from the agreement that it was the intention of the parties that he should hold an inquiry in the nature of a judicial inquiry, hear the representations of the parties and decide upon the evidence presented.

When it comes to ARBITRATION it should be remembered that the arbitrator is clothed with the qualities of a judge. He is a judge selected by the parties to decide their controversies. There is this difference, however, between an arbitrator and a judge; that an arbitrator is not bound to observe strict formalities of law.

There is no basic disability on the part of any person to act as an arbitrator. If an incompetent appointment be made, that is the fault of the parties. There are, however, basic disabilities which the Court will recognize, and the books mention deafness, dumbness, blindness, idiocy, outlawry and conviction for perjury. I am not so sure of deafness, dumbness or blindness under modern conditions. I have been present at arbitrations where deafness might have been a distinct advantage; dumbness might have shortened the hearing and as to *blindness*—the classic representation of the Goddess of Justice shows her with bandaged eyes and holding the scales of even judgment in her hand.

The parties to an arbitration are entitled to expect from an arbitrator complete impartiality and indifference, both as between themselves and as regards all matters left to the arbitrator to decide. They are entitled to expect a faithful, honest and disinterested decision. However, there are exceptions to the precise application of this statement. For instance, if they agree to accept the judgment of the engineer who acts for or is employed by one of the parties, they will be taken to run the risk of some conflict between his loyalty and his professional ethics.

An arbitrator may have his decision disqualified, however, if he has a personal and pecuniary interest in the result. This is certainly so if that interest is concealed by him from the parties concerned. In order to be disqualified by interest, the interest must be so connected with his duties as an arbitrator as to render it inequitable that the parties should be held bound by their agreement to accept his decision.

Arbitration

In Ontario, it is usual to appoint either one arbitrator or three arbitrators. It is comparatively rare to appoint two arbitrators and an umpire. Strictly speaking, where two arbitrators and an umpire are appointed, the arbitrators may proceed independently of the umpire. They only have recourse to his aid should they fail to agree. If lawyers are employed to present the evidence in such cases, this practice has much to commend it, because they get paid for wrangling before the arbitrators and then for enjoying the same wrangle before the Umpire. Usually, it is the practice here to have three arbitrators sit together from the beginning of the arbitration, even though one of them is virtually an umpire.

Arbitration is given legal sanction in Ontario by the provisions of The Arbitration Act. Where the intention is to arbitrate, this Act applies whether or not specific reference is made to it in the contract. This Act is of general application, and a submission to arbitration cannot be revoked except by leave of the Court, unless it contains an express provision to that effect. Furthermore, a submission to arbitration includes the provisions set out in Schedule "A" to the Act, unless a contrary intention is expressed in the submission.

It would not be possible in the time at my disposal to take you through the various provisions of the Act and of the Schedule. I do say this, however, that no one should undertake the duties of an arbitrator without carefully considering the provisions of the Act and the obligations which it imposes. A particularly interesting feature is that it restricts the fees to be charged by an arbitrator to not less than $20 nor more than $40 for each day's sitting of not less than six hours, unless there be an agreement by the parties to pay more.

If you are asked to act as an arbitrator, you would be well advised to examine the submission to arbitration before agreeing to do so. There are a number of cases that fall near the border line of the judicial function of arbitration, and the administrative or valuing functions that are sometimes expected of engineers.

If you are satisfied that the parties intend you to use your own professional observation and skill in addition to any inquiries you may make, then there is much to be said for having the submission exclude the provisions of the Arbitration Act. It is quite competent to do this. I have more than once followed this course myself in arbitrations having to do with the broad field of labour relations. It is often well nigh impossible to conduct such an arbitration with a trade union on the one side and an employer on the other, and to follow all the rules strictly. If, on the other hand, a formal arbitration is really desired, you should pay strict attention to the provisions of the Act, or you may find some Court interfering with the Award.

The Act does not leave you to the mercy of the lawyer on questions of law. An arbitrator may at any stage of the proceedings, and shall if so directed by the Court, state a special case for the opinion of the Court on any question of law arising in the course of the reference. He may also state his whole award in the form of a special case to have the attention of the Court. While the power to state a case is discretionary, the Courts have held that it is a controlled discretion, in that the arbitrator must respect the right of either party to apply to the Court for an Order directing him to state in the form of a special case any question of law that may arise in the course of the reference.

The Courts will not tolerate the refusal to state a case and the making of an award, without giving either party an opportunity to apply to the Court to give directions to the arbitrator. It is seldom indeed that a whole award is presented in the form of a special case for the opinion of the Court. This may be done, however, if the conclusion of the arbitrators turns on a question of law and neither party has sought a stated case.

Where there is a full-dress arbitration with three arbitrators, with counsel appearing for each party and one or more applications for stated cases, it is my experience that an arbitration is frequently of greater expense to the parties than an action in Court. Arbitration has its chief value where arbitrators are appointed because of their special knowledge of the subject matter of the arbitration. If, in connection with a building or construction contract, any one should propose using lawyers as arbitrators, the parties would be well advised to get along to the Courts and have their difficulties settled there. Sometimes, however, a lawyer makes a good and useful umpire in a case of this kind as one of three arbitrators, the other two being professional engineers or architects, depending on the nature of the dispute.

I should add that when any question arises as to the jurisdiction of arbitrators, they are not permitted to determine the extent of their own jurisdiction. This usually involves the interpretation of the contract and is a matter for the Courts. There is one exception to this rule in the field of labour relations. The Labour Relations Act of 1950 (Ontario) provides for arbitration of labour disputes, and permits the arbitrators to determine whether or not a matter is arbitrable. This I regard as an unfortunate departure from good law and good sense.

Conclusion

During these remarks, I have only been able to deal generally with a very broad subject. I have endeavoured to touch the high spots where the lines of your profession cross those of mine. I have not touched on the legal aspect of the field of labour relations, though I believe the duties of many engineers require them to develop skills along those lines. However the law relating to labour relations is not very edifying. Most of it involves ready departure from tried legal principles; it is intermingled with political expediency and sometimes borrows from the law of the jungle.

You may all feel at this moment a little like the young man who had just graduated from University and agreed to hold the fort in his Uncle's law office while his Uncle went on a holiday. Meantime, he was to read some books and decide whether or not he would like to study law. When the Uncle returned, he asked the young man how he liked practising law and received the curt reply: "I don't like it at all, I am sorry I learned it!"

New Device Saves Man Power and Reduces Hazard on Headworks Gantries

The accompanying photograph shows a 25-ton electric gantry crane on the headworks of the Des Joachims development of The Hydro-Electric Power Commission of Ontario. It is used for handling trash racks, emergency stop logs and head gates, and incorporates an auxiliary high-speed hoist for lifting the trash rack cleaners.

As may be seen from the photograph, trash rack sections and emergency gate logs are lifted by a follower, which hangs on the main hook. The follower is provided with hooks or latches at each end which automatically engage when lowered into the gate or other item to be lifted. This arrangement eliminates the necessity of having a man walk along with the crane on the deck of the dam, close to the gate slots to retrieve the rope which was formerly required to operate these hooks.

The new automatic latching arrangement consists of a torque motor drive connected to the latch system in such a way that the rope is at all times kept taut. During hoisting operations the motor keeps a light tension on the rope so that it is automatically retrieved. When the time comes to release the latches, however, the crane operator has only to press a button in his cabin so that the full operating pull can be applied and the latches released.

Wartime Marine Structures

Their Influence on Post-war Construction

Condensation of an article "Survey of Marine Structures and their Influence on Post-war Construction", by Maunsell, Posford & Pavry, which appeared in the August, 1950, issue of "The Consulting Engineer".

The consulting engineer, as an ndependent authority, is always ound to come up against many ifficulties and very varied prob-ms in the solution of which there the opportunity to break fresh round, and this has, of course, een more than usually the case uring the past eleven years of ar and post-war conditions.

During the late war, there were nany instances where this was emonstated and the British con-ulting engineer was able to bring riginality of thought and concep-ion to the assistance of the Allies. The dangerous situation of Great Britain also served in the emer-ency of the times to encourage hose responsible to approve the xecution of novel engineering chemes that they would not nor-nally have ventured upon in peace ime. The experience so gained in dvanced design and methods of onstruction can now be, and has lready been, applied to peace-ime needs.

The Maunsell Forts

During the bombing of London n 1940, enemy planes had a com-paratively easy passage until close o the target, as they were able o approach up the Thames Estu-ry outside the effective range, at hat time, of shore batteries and ircraft detection apparatus. The uthorities spent many months considering various ways of com-bating the menace before even-ually agreeing to the construction of the Maunsell Forts, as they were referred to in Service Orders. They were of two types, the Naval Forts, manned by the Navy, and the Army Forts manned by A.A. Command.

The delay in embarking upon the project was largely occasioned by a natural reluctance to approve a scheme which embodied some original features, one of which was the "crash-diving" of a 4,000-ton reinforced concrete structure, loaded with delicate equipment, on to a completely unprepared sea bottom many miles off the English coast in an area often frequented by enemy E-boats and in a position only about 10 minutes' flying time from the enemy-held shore of the Continent. This, of course, preceded by some few years the Mulberry Harbour project, in which the dumping of the breakwater caissons on an unprepared sea bottom was again carried out.

The Naval Forts, of which there were four, were self-contained units, which were built at Gravesend, on the River Thames, partly in a dry dock and partly at a floating berth. Each fort was waterborne on its own pontoon, which was constructed of reinforced concrete, specially designed so that the eventual sinking of the fort at its action station out at sea by flooding of the hull should be automatically controlled by the manner in which its subdivisions and chambers allowed the water to enter. From the top of the pontoon, two hollow reinforced concrete cylindrical towers were raised. These were 24 feet outside diameter, 12 inches thick and 60 feet high.

The crew of 110 men, and the ammunition, water tanks, stores and electrical generators, were accommodated in eight decks within each tower. In the design, allowance had to be made not only for the simple hydrostatic pressures but also for the effect of waves 20 feet from crest to trough beating the fort when in its destined position miles out in the open sea. The towers were surmounted by a steel deck 110 feet by 32 feet, in the centre of which the officers' accommodation, galley, washrooms and control rooms, etc., were provided for in steelwork rising to a series of smaller decks. The fort, while still at Gravesend, was equipped with full electrical, plumbing, heating, ventilating, cooking and other services and the armament and other apparatus was fitted on the upper steel decks. Next the crew came aboard, and the fort was commissioned ready for action. Then the fort was towed to sea.

The First Fort

On the occasion of the first fort to be towed out, the distance was 70 miles. On reaching the grounding site previously selected and buoyed, the leading tug tied up to an anchored lighter with the fort lying downstream of the anchor and exactly over her grounding position. A 12-inch diameter sea-cock was then opened, admitting water to the forward compartments of the pontoon. After about 15 minutes the bow of the pontoon

Fig. 1. On this and the facing page is a panoramic view of a fertilizer factory adjacent to Immingham Dock, Lincolnshire. Raw materials enter at the right via quayside grabbing cranes, reception hoppers and the conveyor in the lower elevated gallery. The finished product is exported to ship by conveyor in the upper elevated gallery.

dipped under the water and sank, the forefoot striking bottom first. The centre and stern compartments filled in their turn and the pontoon settled down flat on the sea-bottom about 1½ minutes after the bow had dipped beneath the surface. The fort was then ready for action immediately, and one of them did in fact go into action against enemy aircraft within 20 minutes of being grounded.

These forts were built for about one-sixth of the cost which the authorities had anticipated and in less than one-third of the time. This was partly due to the technique evolved whereby large sections of the reinforced concrete work were prefabricated and then hoisted into position as soon as required in the building of the structure. This technique was extended a little further in the later series of forts—the Army forts—which were also prefabricated to the point of full availability for action in comparative safety away from their ultimate destination and then towed out to sea and sunk at their action stations. This second type consisted of groups each of seven separate towers linked together by light tubular steel bridges. They were placed less far out at sea than the previous type described and were not therefore quite so vulnerable to surprise attack. These ones, therefore, were not unceremoniously plunged down to the sea-bed, but were more sedately lowered from twin camels mounted with eight winches from which the forts were slung on steel ropes.

Fig. 2. Maunsell Sea Fort, ready for action, plunging to the sea bed.

Reinforced Concrete Tower Bases

The bases of the towers were constructed in reinforced concrete and were cruciform in shape, each limb being 82 feet long, 6 feet 9 inches high, and about 5 feet 6 inches wide, slightly tapered from top to bottom. They were hollow, the walls, bottom and top being 5 inches thick. They were built in a dry dock at Gravesend and were so designed that they would float, their displacement being 300 tons. The bases were built in pairs, each pair taking a fortnight to construct. They were then floated, at high tide, to specially constructed berths in the tidal river. As the tide receded, they settled on these berths and the hollow interior was flooded with water so as to prevent re-flotation on the next rising tide. Four hollow reinforced concrete legs, each precast in three sections, were then built up on the base. The legs were 3 feet external diameter, 6 inches thick and 65 ft. high. They were surmounted by a 4-ft. deep reinforced concrete cap in which the main steel beams supporting the "house" were embedded. The "house" was built of steel and contained two storeys.

A group of seven towers was fitted out with sleeping rooms, galleys, washrooms, control room, store rooms, workshops, power house, magazines, etc., etc., together with all the electrical, plumbing, heating, cooking and other services necessary for the

crew of 120. The armament and other apparatus was accommodated chiefly on the roof. Armour protection was provided where necessary. The work on the berths was scheduled to occupy eight weeks, but the time was later reduced to as little as five and a half weeks.

As the towers were successively completed, two camels were floated over the outer arms of the bases at high tide, and, as the tide receded, they settled on these arms. At low tide, the hollow base was emptied of water and special hooks, hung on wire ropes operated from winches on the decks of the camels, were engaged with heavy lugs incorporated in the base. As the tide rose again, flotation of the whole tower was obtained by means of the displacement of the camels and the hollow air-filled base. Four tugs towed the unit — camels and tower — to its action station in the sea, where, by manipulation of the winches on the camels, the tower was lowered on to the sea bed.

The camels were then cast adrift from the base of the tower and returned to the building site ready for the next unit. After the tower was grounded, the base was again flooded in order to apply the weight necessary to maintain it in position. The tubular steel bridges were towed out to the action station on a barge, and lifted into position between the towers. They were supported on sliding seatings having a 10-ft. travel. This was so as to allow for the presupposed margin of error in placing neighbouring towers accurately. In practice, it was found that towers could be and were placed within 12 inches of their ideal position.

It is gratifying to be able to record that all these forts proved in practice amply to fulfil their allotted role in the war effort, being responsible for putting a stop to enemy activity, both airborne and seaborne, in the Thames Estuary. General Sir Frederick Pile, Chief of Anti-Aircraft Command, after the war, in 1946, publicly stated that "if we had had them in the winter of 1940 the docks in London and the docks at Merseyside would not have suffered anything like the damage they did".

Reinforced Concrete Floating Docks

The heavy precast concrete slab technique was then taken a long step forward in the construction of reinforced concrete floating docks, of which five different types were built. They compared favourably as regards cost with steel docks, but their greatest advantage was in constructional time. These docks were required to lift tank landing craft up to the largest size, minesweepers, trawlers and similar naval craft, and the need for them was urgent. A steel dock would have taken some nine months to build and all of this time it would be occupying valuable dry dock space.

The first type of these reinforced concrete docks was design-

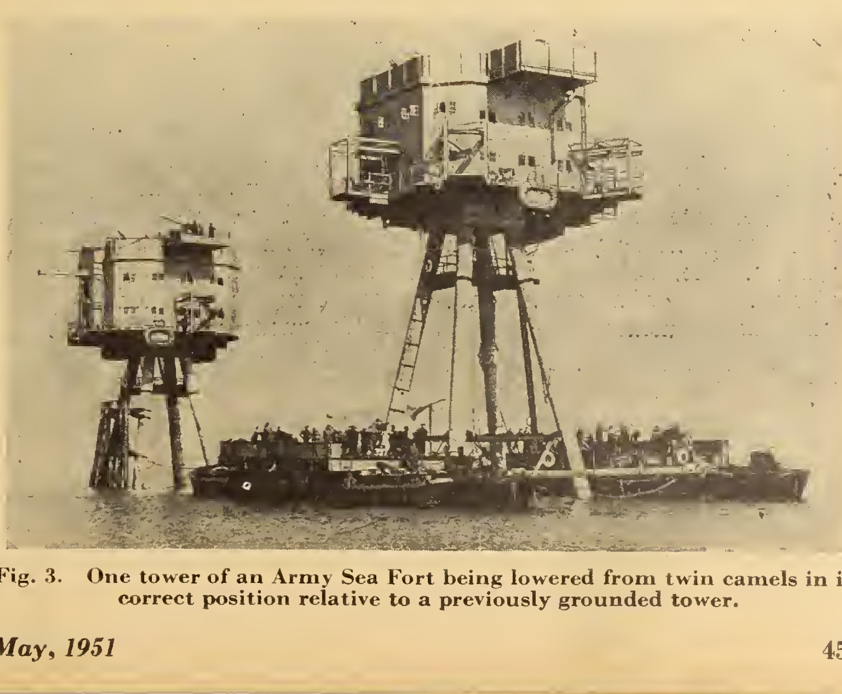


Fig. 3. One tower of an Army Sea Fort being lowered from twin camels in its correct position relative to a previously grounded tower.

Fig. 4. Storage and transit bunker, erected at Liverpool Docks for ship-to-truck movement of granite. All the wall panels and the supporting piers were precast.

ed and the contracts for construction were let within a fortnight of the problem being posed and the first one was floated out of its building basin only three months later. Thereafter, they issued from the same basin at four-week intervals. Two other sites in the United Kingdom were later opened up for construction of these docks, and as the war in the Far East developed, a site in India and one in Australia were added. Fifty-five docks in all were ordered to be built, of which about half were actually completed before the dropping of the atom bomb rendered the need for the remainder unnecessary.

These docks varied in size from 132 feet long by 54 feet wide to 270 feet long by 67 feet wide. The side walls were between 24 and 35 feet high. Some were fitted with "pound walls" at each end of the pontoon deck. This resulted in extra lifting capacity as it enabled the water level outside the dock to be above the level of the pontoon deck when the latter was dry, so providing the necessary additional displacement.

Elimination of In-situ Beams

The main principle in the design was the elimination of in-situ beams and also the virtual elimination of shuttering to vertical walls. The whole of the ribs of the dock and the vertical walls were precast in sections each about 4 inches thick and six or seven tons in weight, these precast slabs being cast flat one on top of another. They were then lifted into the vertical position and assembled in the dry dock basin like a house of cards, the bars projecting from the edges of a slab interlacing with those projecting from the neighbouring ones. A small shutter attached to the slabs at their meeting points was then quickly fixed and the splice joint so formed concreted up from bottom to top in one lift. The bottom floor of the dock and the decks were cast in-situ.

The docks proved very successful in use, some being used in England, Scotland and Normandy, while others were towed from England to Malta, Colombo and even as far as Singapore without showing any signs of leakage or other trouble. The Americans, who had already previously sent observers to watch the building of the Sea Forts, were keenly interested in the docks, two of which were handed over to them for their use. They found them to be an improvement on their own design and an article in the January, 1945 issue of "The Proceedings of the American Concrete Institute" officially confirmed this view.

Storage Bunker

This type of design was used on one or two other war-time jobs, but its first use in post-war work was in Liverpool in a storage bunker sub-divided into a numbe of bins to receive crushed an sized granite. The granite was t be unloaded from ship into th bunker and then loaded into lorry Considerable economy in cost an constructional time was achieve by the acceptance of a simply designed bunker, based on the precast flat slab principle with n conveyors at all and with th travelling grabbing crane for unloading the ship mounted on to of the bunker. The capacity o the bunker is 10,000 tons of granite and this whole compact depo is run by just three men. Th whole bunker is supported on pre cast concrete piers so as to allov the lorries to drive in beneath i for loading. All the bin walls wer precast flat in stacks, one sla upon another, and the slabs wer then lifted into their vertical posi tion. The joints between them wer then concreted in-situ, as also wa the floor. The overall size is 20 feet by 60 feet in plan, and th bins are 21 feet deep.

Fertilizer Factory

Another application of the sam flat slab principle was instanced i the bin walls of the various store required in a large fertilizer fac tory, adjacent to the deep wate dock. The several different mater ials that have to be stored in bul are imported from the Quaysid and distributed from there to th storage buildings by conveyo belt. The method of extractio from the stores varies for proces reasons from building to buildin and is in some instances by Chase side shovel, necessitating an ope side to the bin, in others by ove head travelling grabbing cran and so into hoppers served by con veyor belt, and in others again b drag scraper equipment to a sub floor hopper served by conveyo belt and elevator.

The properties of the store materials are such that in som circumstances it may be necessar to explode a small charge in th mass to loosen it before extractin from the store. This involved th segregation of the 15 ft. high stor age bin walls from the main struc ture of the building, so tha should the walls be shaken by th explosion, the effect would not b transmitted to the building fram carrying the cladding material an the overhead cranes and con veyors. The relative costs were c course dependent largely upon the quantity stored — the larger the quantity the smaller the unit cost —but also they were much influenced by the method of extraction. The least expensive method was by drag scraper, as this arrangement facilitated the erection on an A-frame building which conformed closely with the shape of the heap of stored material, so avoiding waste space internally and reducing wind loads externally. The bottom 8 ft. of the sides of this building were also constructed in thin precast reinforced concrete slabs, each weighing 6 or 7 tons.

Shellhaven Oil Refinery

The precast concrete slabs and sections to which reference has so far been made, both in the war-time and the post-war projects have been between 5 and 7 tons in weight. They were kept down to that weight largely so as to enable the contractors to use derrick cranes that were readily available, as the obtaining of other than reasonably standard contractors' equipment was practically impossible in war-time and immediate post-war conditions. However, more recently precast sections up to 14 tons in weight have been specified. An instance is provided in the cooling water culverts for another industrial project, the Shell oil refinery under construction at Shellhaven on the Thames.

Due to the presence of extensive mud banks which are exposed at low tide, the intake and outfall culverts, which are designed to carry 350 cusecs, had to be taken out to deep water. The internal dimensions of each of the twin rectangular outfall culverts are 8 feet by 6 feet, and the thickness of the concrete is 5 inches. They are precast in 14-ft. lengths, each section weighing 14 tons. A double row of piles are first driven, each pile being provided with a shoulder near its head. Precast concrete beams are next lowered on, to these shoulders, and the 14-ton sections of culvert are then placed upon the beams.

In the application of the use of heavy precast concrete sections, and particularly where they are associated with marine structures, it is necessary to specify to a greater extent than usual the plant and method of assembly which the contactor is to employ if the best advantage in economy is to be obtained. If this is not done, the contractor may lose the advantage by burdening the work with unsuitable or excessive plant due to his natural dislike of taking risks in a field of construction with which he may be unfamiliar.

Departures from Recognized Practice

Emergency conditions in the late war often enforced upon contractors and those commissioning new works a departure from recognized practice and as a result it is undoubtedly true that the new designs and methods of construction then tried out and proved have contributed to the speed and economy with which much post-war work has been carried out. In this connection it is interesting to note that a development of a special marine structure for deep sea oil drilling is a direct combination of the Army type Sea Fort design and the reinforced concrete floating dock design, both described above, neither of which would probably have ever been brought to reality but for the exigencies of the war. This oil drilling structure has, however, to date, only reached the model stage and is not yet under full-scale construction.

The Consulting Engineers responsible for design and supervision of construction of all the projects described in this article were Messrs. Maunsell, Posford & Pavry. Unfortunately, it is not possible to mention the names of the very many sub-contractors and suppliers of equipment who also contributed to the projects described in this article, but their assistance and co-operation with the Consulting Engineers is acknowledged. √

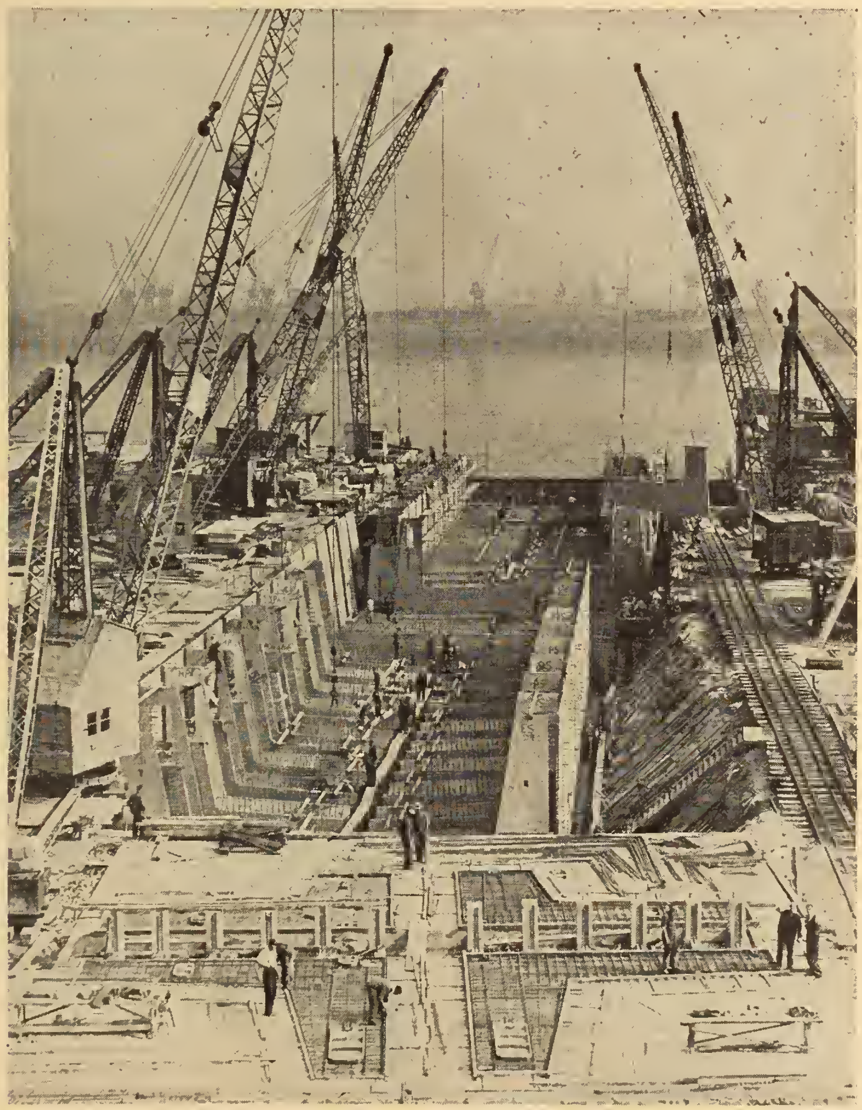


Fig. 5. Two reinforced concrete floating docks under construction. The 4-inch thick ribs are being precast in the foreground and one rib is being lifted into position (centre right).

Hot Shipment of Large Steel Ingots

Note from the Technical Staff,
Dominion Steel & Coal Corporation, Sydney, N.S.

Canada's largest steel ingots, 130,000 pounds, are now being shipped hot for the first time. The method now successfully developed marks the first known occasion when red-hot ingots were transported such distances by any means. The co-operation of the Canadian National Railways has been a key factor in this development.

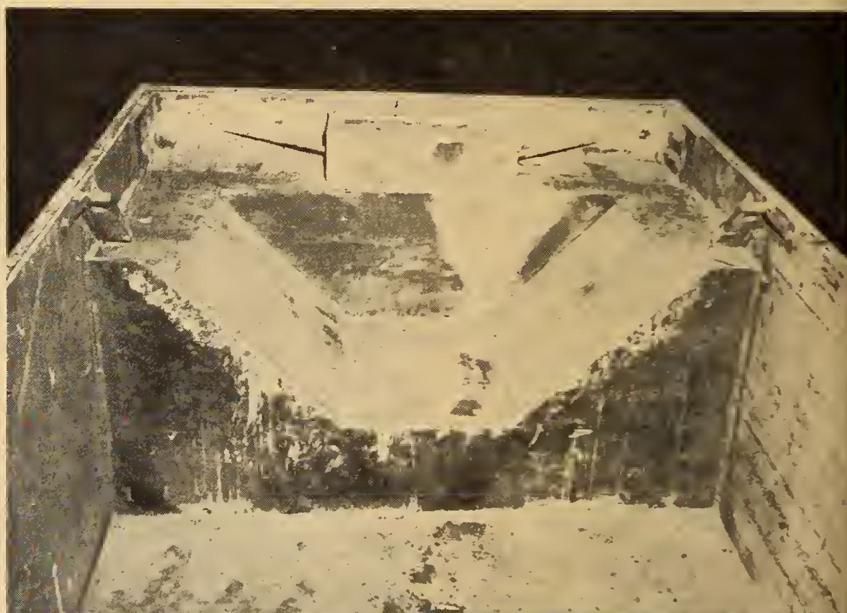
The ingots, one per car, leave the Dominion Iron & Steel Company's plant at Sydney, N.S., and arrive red hot at the Trenton Steel Works, Trenton, N.S., some twenty hours later. These two plants, both subsidiaries of Dominion Steel and Coal Corp. Ltd., are some 185 rail miles apart. The first hot ingot of this size was landed at Trenton on December 21st, 1950. Shipment of hot ingots from Sydney to Trenton was first undertaken some two months previously, but none of the ingots shipped hot prior to December 20th exceeded 15 tons.

After the steel is poured into the ingot mould it is allowed to solidify, and the ingot is removed from the mould while it is still at a high temperature. The ingot is placed in a special insulated steel box, carefully fitted and anchored to a flat car. This box is of a considerable size, because the ingot is approximately 15 ft. long and has a body nearly 6 ft. in diameter. The ingot is held in place by pre-moulded supports. The remaining space is filled with loose vermiculite and a steel cover, fastened on, after which the car is ready for dispatching.

The method of insulation is so efficient that the outside of the steel container is never noticeably above existing temperatures, despite the temperature of the ingot which may be 1600°F. Sixteen to twenty hours later, when the ingot reaches Trenton by C.N.R., its temperature is approximately 1500°F. It is charged directly into a heating furnace and brought up to forging temperature, about 2100°F. The accompanying photographs serve to illustrate the methods used.

Previously, all such special or alloy steel ingots were allowed to cool slowly at controlled rates at Sydney, shipped cold, and reheated very slowly at Trenton. The innovation eliminates the slow cooling and slow reheating at this stage, thus greatly speeding delivery of the finished product. Reheating fuel costs are also reduced, but there are extra freighting charges partially offsetting these savings. Danger of crack formation during cooling is reduced, hence it is expected that average product quality will be somewhat enhanced.

Trenton Steel Works Ltd. makes shafting and other components for Canada's shipbuilders, special shafting for large turbines and general hydro-electric work, and many other lines of heavy equipment, all from steel made at Dosco's primary steel producing plant at Sydney.



The upper photo shows the pre-moulded insulating supports in the box before putting in the ingot and loose insulation.

Lower photo. After being turned on its side, the red-hot steel ingot is lowered gently into the insulated steel box mounted on a C.N.R. freight car.

From Month to Month

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

"UPADI"

A new word has been added to the vocabulary of many nations. It was approved and put into use at Havana, Cuba on Saturday, April 21st, 1951.

The word is "Upadi". It is the sign of international understanding and engineering good sense. In Spanish it stands for Union Pan-Americana de Asociaciones de Ingenieros and in the English version The Union of Pan American Associations of Engineers.

It is a pleasing and encouraging experience in these troublesome times to find that many men from many countries consider their professional obligations, their common problems, and their usefulness to their fellow men of more importance than political differences, geographic divisions, and national prejudices.

At Havana, representatives from fifteen countries gathered for four days to work out a basis for collaboration and a constitution that would assure its continuity. It is doubtful if ever before in the history of the engineering profession there has been so remarkable a conference. In some instances citizens from countries whose governments are at great odds one with the other, worked together in close harmony and splendid unselfishness to bring about an international understanding that might well be an inspiration to the governments themselves.

The difficulties of language barriers were not allowed to divert these people from their purposes. Three languages were in constant use — Spanish, Portuguese, and English. Fortunately many delegates were able to speak more than one, so that with thoughtfulness, forbearance, and patience on the part of everyone there was complete understanding.

Surely the successful outcome of a conference of this kind must be of some significance to nations everywhere. It must mean something to troubled peoples all over the world, that men of fifteen nations can come together of their own free will and reach unanimous accord on terms for continuous co-operation.

The profession of engineering may well be proud of this achievement. It is further proof of the universality of engineering—if further proof were needed. It is a glowing example of the good that can come from the application of engineering thinking and engineering methods. As well, it is a demonstration of the fraternalism that is so important to the profession.

Great credit for this accomplishment must go to F. Saturnino de Brito of Brazil. It was his imagination, his intelligence, and his persistence over many years, that led the profession to this happy conclusion. In recognition of these things the Conference made him its Honorary President.

To the Cuban hosts headed by Manuel Puente, chairman of the Conference, much credit is due. Individually and collectively they have given strong support to the proposal and their part in the Conference was an influential factor in its successful achievement. Their abundant kindness to their guests from east, west, north and south will long be remembered.

The Engineering Institute of Canada was represented by its president, James A. Vance and its general secretary L. Austin Wright. Both had important committee duties assigned to them. In particular the Institute officers were associated with the ten delegates from the United States which in itself was a happy and helpful association. There was a complete unanimity of opinion at all times between these two delegations.

The complete list of participating nations in alphabetical order is Argentine, Bolivia, Brazil, Canada, Chile, Columbia, Cuba, Honduras, Panama, Peru, Porto Rico, Salvador, San Domingo, United States and Uruguay.

The United States delegates

Cover Picture

The sketch on the front cover shows a distillate drum, made of monel-clad material, being fabricated for the oil industry in the plate shop of Dominion Bridge Co. Ltd., at Lachine, Quebec.

This work is typical of a large range of pressure vessels and other equipment which "Dominion Bridge" manufactures for the oil industry.

The original sketch is by John S. Walsh, M.E.I.C., eastern sales development manager of Dominion Bridge Co. Ltd.

were representative of the senior professional societies including the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Institute of Mining and Metallurgical Engineers and the American Institute of Chemical Engineers. This representation was joined through the agency of the Engineers Joint Council (E.J.C.). In their delegation were included the president of the Civils, the president of the Electricals, and the president of E.J.C. itself, as well as the secretaries and the assistant secretaries of the Civils, Mechanicals and Chemicals.

The constitution of UPADI provides for one membership only from each country, consisting of national engineering bodies or groups of such bodies where there is more than one in a country. The conference is to meet every three years and, for 1954, New Orleans has been selected upon the invitation of the United States delegation.

The Board of Directors is made up of representatives of nine nations and is to be elected every three years. Canada is to be represented during the first three-year period.

The purposes of the Union are very wide. They include such things as the expansion of the usefulness of the profession to the public, the improvement in the status of the engineer, the development of rules of practice and professional ethics, the exchange of teachers, lecturers, and students; the interchange of technical, professional, economic, and social matters; the promotion of closer ties between societies and between countries, the study of technical problems that are common to two or more countries, as well as inter-American public works and economic problems, and strengthening the cause of peace by strengthening the ties between nations.

Engineering knows no boundaries but those of the laws of nature. It is an inspirational experience to see groups of earnest men working diligently and unselfishly to prove the truth of this statement and to build a structure that forever will be a sign of hope to many people and a material aid to the realization of much that is best in man.

News of Other Societies

The **Chemical Institute of Canada** (18 Rideau St., Ottawa, Ont.) announces the 34th annual conference in Winnipeg, Man., June 18 to 20, 1951.

Seventy-six technical papers will be presented, in the fields of chemical, engineering, chemical education, agricultural, biological, and organic chemistry.

Programme details may be obtained from C.I.C. headquarters.

Managing Director B. C. Fairchild, of the **Canadian Electrical Association** (Room 704, Tramways Building, Montreal 1, Que.) has advised of the Annual Convention of C.E.A., to be held at St. Andrews, N.B., June 18 to 21, 1951.

The Institute of the Aeronautical Sciences (2 East 64th Street, New York 21, N.Y.) announces the following meetings scheduled for the remainder of this year: the 1951 annual summer meeting at I.A.S. Western Headquarters, Los Angeles, Cal., June 27, 28; The Third International Aeronautical Conference arranged jointly with the Royal Aeronautical Society, Brighton, Sussex, England, September 3 to 7; and the fifteenth Wright Brothers Lecture, December 17, in Washington, D.C.

The programme has been announced for the 54th annual meeting of the **American Society for Testing Materials** (1916 Race Street, Philadelphia 3, Pa.), at Atlantic City, N.J., June 18 to 22, 1951.

The semi-annual meeting of the **American Society of Mechanical Engineers** (29 West 39th Street, New York, 18) is scheduled for June 11 to 15, 1951, at the Royal York Hotel, in Toronto, Ont.

The fourth annual meeting of the **Heat Transfer and Fluid Mechanics Institute** will be held at Stanford University, Stanford, California, on June 20, 21, 22, 1951.

The May issue of "Mechanical Engineering" includes the complete programme of the meeting.

The Applied Mechanics Division of the **American Society of Mechanical Engineers** (29 West 39th Street, N.Y.) announces that immediately following the aforementioned meeting, there will take place an applied mechanics conference, also at Stanford University, June 22, 23, 1951.

The summer general meeting of the **American Institute of Electrical Engineers** will take place in Toronto, Ont., June 25 to 29, 1951, at the Royal York Hotel.

O. W. Titus, M.E.I.C., of Canada Wire & Cable Co., Toronto Ont., is chairman of the general committee.

The Building Research Congress 1951, centred in the Institution of Civil Engineers and organized by the Department of Scientific and Industrial Research, will convene in London, England, on September 11th, 1951, for nine days, to review the progress made in research in relation to architecture, building and associated branches of civil engineering.

The organizing secretary of the Congress is at the Building Research Station, Watford, Herts, England.

The **British Standards Institution** (24/28 Victoria Street, Westminster, London, S.W. 1) announces the exhibition entitled "British Standards—the measure of industrial progress", which will take place June 18 to 28, at the Science Museum, South Kensington, England.

The first exhibition devoted to industrial standardization marks the Golden Jubilee of the British Standards movement.

The International Welding Conference will take place at London and Oxford, England, from July 14 to 21, 1951. The congress will include the annual meeting of the **International Institute of Welding,** and its various commissions and is being sponsored by British member societies in the Institute.

Information may be obtained from the organizing committee, (2 Buckingham Palace Gardens, Buckingham Palace Road, London, S.W. 1).

The American Society of Civil Engineers has announced the nomination as president of A.S.C.E., for 1952, Carlton S. Proctor, New York City consultant of the firm Moran, Proctor, Freeman & Mueser. A member of the Society since 1925, Mr. Proctor has served with distinction in several important posts.

Carlton S. Proctor

The **Joint Engineering Conference,** to be held by the Institutions of Civil, Mechanical and Electrical Engineers, in London, England, from June 4 to June 15, 1951, will record the contributions of engineers and scientists to the advance of civilization.

The Conference will be attended by members of the three Institutions, Commonwealth engineering organizations, European and American associations, and will include varied technical sessions, a full programme of social events, and visits to engineering industries and places of interest.

The programme of the 9th **International Management Congress,** Brussels, Belgium, July 5 to 11, 1951, has been released. The International Committee of Scientific Management (C.I.O.S.) and the Belgian national committee have announced subject matter, travel arrangements, etc.

Canada is collaborating in the presentation of several subjects. For further information, Canadians should contact the Canadian Management Council 549 Burnside Place, Montreal 25, Quebec.

Sessions of the **International Conference of Naval Architects and Marine Engineers** are scheduled as follows: London, England, June 25 to 30, 1951; Glasgow, Scotland, July 2 to 4, 1951; Newcastle, England, July 4 to 6, 1951.

The secretary of the conference is at 10 Upper Belgrave Street, London, S.W. 1.

Correspondence

Agricultural Engineering

Dear Mr. Vance:

As a follow-up to your very interesting talk to the E.I.C. branch meeting at Kitchener recently, may I send you this comment about agricultural engineering in Canada. I happen to be the agricultural engineer who mentioned, at that meeting, that he had helped supply the ventilation equipment for Mr. Schell's potato storage at Woodstock in 1950.

You spoke for a while about the need for water conservation in the world and what you had seen at the Milk River project of the P.F.R.A. in Alberta. When I worked in the Saskatoon office of P.F.R.A. in the summer of 1949, I came in contact with some of the investigational work, chiefly soil mechanics, on that project, and also for the projected dam on the South Saskatchewan River at Elbow. Those projects are giving employment to civil engineers on the actual design and construction, and when the water is led away to the irrigation ditches, agricultural engineers should be needed to orientate the farmers who are brought in from the 'dry' areas to farm 'under the ditch.'

Almost every time one sees a newsreel at the local cinema one is shown pictures of floods and the accompanying devastation. Right here in Ontario we have the Grand River Conservation Board which is trying to plan for a more even flow of that important river. Though we have had civil engineers working on such projects as the Shand and Conestoga Dams, and supervising dam and dyke building before and after the floods have passed, is there not a need for agriculture engineers to work farther back in the upper valleys advising and helping the farmers to hold the moisture in the Spring in their woodlots and in small dugouts? There is also a river basin east of Toronto which has been surveyed and found wanting in erosion control.

Where does the Agricultural Engineer fit in, in the Provincial departments of Agriculture?

As Agriculture is a provincial affair and often hemmed by regional bias, we have a situation that unless an agricultural engineer has been born and educated in the province there is often very little chance that he will be employed at the work he has been trained for. Up until recently Professor Hardy in Saskatoon has been running the only true agricultural engineering course in Canada. Ontario Agricultural College has been turning out very competent agricultural mechanics. (For an explanation of the difference between agricultural engineers and mechanics I would like to refer you to a letter in the Engineering Journal, April, 1950, page 294, by Norman Flaten.) Thus how is the province of Ontario going to hire agricultural engineers if it does not bring them in from outside the province? Thus there are agricultural engineers at O.A.C. in teaching and extension work, but there does not seem to be any in the departmental headquarters in Toronto.

The A.S.A.E. and the A.I.C.

Many agricultural engineers belong to the American Society of Agricultural Engineers, St. Joseph, Mich., U.S.A. I have just been elected to the Associate Membership grade of that Society. I am also a Jr.E.I.C., and a graduate engineer-in-training in the Assoc. of Prof. Eng. of Ontario. I can also join the Agricultural Institute of Canada (the old Canadian Soc. of Tech. Agriculturalists'). Though the A.I.C. has been operating for over 25 years, it is only within the past few years that an agricultural engineering group has been formed within its membership.

Recently at an A.S.A.E. student branch meeting at O.A.C. I heard a talk by a biologist employed by a manufacturer of aluminum pipe for irrigation work. Everything went well until he needed to explain the problem of pipe friction. Not being an engineer he had a hard time explaining the situation to an agricultural mechanics student who has not had much book-work in hydraulics. I would have thought that the company would have employed an engineer who has an agricultural background.

Farm machinery manufacturing organizations like the Massey-Harris Co., International Harvester Co., etc., employ agricultural engineers in their design and development departments, but prefer mechanical engineers and tool designers in their production departments. These organizations also employ agricultural engineers and graduates from agricultural colleges in their sales and service departments.

Another Field is Farm Structures. Farmers and growers need buildings for special purposes and. with the changes in supply and new developments in building materials, they are at a loss to know where to go for help. In the old days the farmer held a 'barn-raising bee' and put up a building like the other local farmers. Now that the old carpenters are dying out, the grower has to go to contractors to get advice on insulation, vapor-seals, ventilation, etc. The agricultural college can give him some help but they often have not the funds or the necessary staff.

Take the subject of *Common Storage Ventilation:* This is a method of using the natural cool air in the Fall months to cool down apple and vegetable crops so that they can be marketed more slowly and not dumped on the market in large volumes in October, and thus depress prices. The system was discovered by two horticulturists at O.A.C. Dr. J. H. L. Truscott and Prof E. W. Franklin. Mr. W. C. Wood of the W. C. Wood Co., for whom I am now working, assisted by supplying the materials for building the fans, control panel, and stirring units. It looks as if the horticulturists moved over the line separating them from engineers, instead of the opposite. Architects design large commercial and government buildings, etc., but there is a demand from growers for assistance in changing over storages to this work by using better insulation, vapor-seals, 'false-floors', etc. The growers have to make these changes before the ventilation equipment will operate properly. I have had requests for plans for 20,000 bushel storages twice recently, but as the company and the local college do not have them, I could only advise that the grower consult a particular engineer in Hamilton.

Every day we hear that the United Nations is hoping to rehabilitate certain areas of the world whose agricultural production and methods are not as far advanced as those in North America and Western Europe. President Truman's 'Point Four' programme is along this line too. If agricultural engineers are needed and desired in this work, the lack of advertisements in agricultural and engineering journals is an illustration that the problem and possible solution are unorganized as yet.

I trust that this letter has given you an insight into some of the conditions in the agricultural engineering field in Canada, and particularly in Ontario. The Engineering Institute of Canada, I trust, can give leadership to the young agricultural engineering graduates, many of us veterans of World War II, so that we can serve Canada to the full extent of our training.

This letter is written without prejudice to any person or organization mentioned above.

HUGH A. TEMPLETON, JR.E.I.C.

Airblast Circuit Breaker Interrupts 11-million k.v.a.

In tests carried out recently at Grand Coulee Dam a 220-kv., Brown-Boveri airblast circuit breaker successfully interrupted faults up to 11-million k.v.a., 3-phase equivalent.

Four line-dropping and one line-charging tests were made on 100, 200, and 300 miles of single phase conductor on March 14. Single-phase line-to-ground interruptions for a series of arcing faults and solid faults, with and without reclosing were made on March 18. The last three of these interruptions were made with the maximum short circuit capacity of the Grand Coulee plant and the Northwest Power Pool, which is believed to be the largest concentration of power anywhere in the world.

The breaker interrupted the currents in each case within $2\frac{1}{2}$ cycles after tripcoil energization without visible distress. Although there were signs of severe arcing in the eight sets of fixed and movable contacts, there was no damage which would have obviously interfered with further successful operation.

Several Canadian engineers, representing Canadian Power companies were present at the tests.

Elections and Transfers

At the meeting of Council held at Headquarters on Friday, April 6th, 1951, a number of applications were presented for consideration and on the recommendation of the Admissions Committee the following elections and transfers were effected:

Members:

L. Balsys, *Montreal, Que.*
S. D. Ford, *Vancouver, B.C.*
H. L. Hewitt, *Toronto, Ont.*
J. L. Orr, *Ottawa, Ont.*
A. D. Sierzputowski, *Sault Ste. Marie, Ont.*
A. B. Steiner, *Vancouver, B.C.*
S. W. Woods, *Dundas, Ont.*

Juniors:

M. E. Bailey, *Kitchener, Ont.*
B. W. Henkin, *Montreal, Que.*
C. P. Layard, *Hamilton, Ont.*
R. F. Turner, *Winnipeg, Man.*
M. Wieckowski, *Coleman, Alta.*

Transferred from the class of Junior to that of Member:

W. J. Blackstock, *Calgary, Alta.*
W. F. Dawson, *Lakeside, Ont.*
W. S. Gerrie, *Toronto, Ont.*
D. D. Livingstone, *Sarnia, Ont.*
H. C. Palmer, *Windsor, Ont.*
D. R. Webster, *Three Rivers, Que.*

The following Students were admitted:

D. M. Baker	S. McCombie
A. Beaudry	K. A. Millions
F. J. Berto	J. F. Molloy
K. W. J. Butler	C. F. Moore
F. J. Canzi	B. L. Moreau
A. F. Collings	G. N. Neary
W. J. Cooper	R. O. Olsen
D. H. Cullen	A. M. Ottolenghi
M. de Atucha	S. H. Phillips
C. L. Dodge	G. F. Pierce
L. E. Downes	J. E. Prosper
A. Dubnie	D. E. Quail
H. B. Elhorn	J. D. Riddle
L. M. Etchegary	W. J. Romaniwicz
R. W. Evans	H. E. Sears
C. B. Fairn	A. Shaw
E. W. Fee	G. A. Skinner
A. G. Ford	K. G. Smith
D. H. Franklin	R. G. Smith
D. L. French	K. E. Sommer
E. H. Gilliatt	J. L. Stepan
G. Gracie	R. K. Sylvester
D. G. Hubley	H. D. Tanner
W. L. Inglis	C. T. Taylor
K. F. Jenkins	P. G. Temple
A. P. Johnsen	R. C. Trussler
V. W. E. Johnston	R. B. Turner
M. O. Jones	A. T. Wason
K. R. Langille	G. M. Wood
N. E. Laviolette	S. D. Wood
A. A. MacDonald	P. I. Woodruff
E. E. MacEacheron	G. W. Zelt
R. R. MacKean	

Applications Through Associations

By virtue of the co-operative agreements between the Institute and the Associations of Professional Engineers, the following elections and transfers have become effective:

ALBERTA

Members:

R. S. Nixon, *Nanton, Alta.*
D. B. Wood, *Edmonton, Alta.*

Junior to Member:

J. S. Barton, *Edmonton, Alta.*
E. J. Crowther, *Calgary, Alta.*

SASKATCHEWAN

Junior to Member:

K. E. Bell, *Estevan, Sask.*
D. A. Buhr, *Swift Current, Sask.*
H. C. Moulding, *Regina, Sask.*
M. B. Pierce, *Regina, Sask.*
P. G. Sundeen, *Regina, Sask.*

Student to Junior:

A. W. Kaeding, *Regina, Sask.*
D. J. Kelly, *Saskatoon, Sask.*
S. Kotyk, *Regina, Sask.*
S. F. Lee, *Regina, Sask.*
S. I. Stothers, *Prince Albert, Sask.*
R. C. King, *Regina, Sask.*

MANITOBA

Member:

C. E. Gossling, *Winnipeg, Man.*

NEW BRUNSWICK

Member:

W. J. Edington, *Moncton, N.B.*

Junior to Member:

M. E. Mersereau, *Juniper, N.B.*

Halifax Shipyards Builds Three Motorships for Argentina

The Argentine government's decision to embark on a programme of opening up Southern Argentina has brought about the building of three cargo passenger vessels of 3,100-ton deadweight each capable

of carrying 40 first and 60 tourist class passengers, as well as 800 troops or immigrants when required.

Designed by Milne, Gilmore and German, Naval Architects of Montreal, these ships have been built by Halifax Shipyards Limited, and equipped to the requirements of Lloyd's classification +100 A.1, and Canadian Steamship Inspection requirements for International Regulations for Safety of Life at Sea.

Constructed with cruiser sterns, semi-balanced streamlined rudders, three bladed, manganese bronze propellers of 10 ft. diameter and 7.28 mean pitch, the features of the fore end lines are a straight well raked stem and flared bow sections. Cargo barges are carried for loading and unloading in shallow estuaries and rivers, where port facilities are not available.

The overall length is 336 feet, breadth moulded 47 feet, depth moulded to upper deck 26 ft., gross tonnage 3828 tons, and displacement 5225 tons. Load draft with summer freeboard is 18½ ft., cargo capacity for grain 171,757 cubic feet, speed in service, —15 knots. The vessels are of long bridge superstructure design, with lower deck extending right fore and aft.

above the upperdeck is a forward mast house, bridge superstructure with promenade boat and bridge decks. Two masts and an elliptical funnel, appropriately raked, add to their appearance.

The ship structure conforms to requirements for a long bridge superstructure vessel with two complete decks. Electric welding of high quality has been employed. Vessels are framed transversely without web frames or side stringers except for machinery spaces and deep tanks. Cellular double bottoms, from collision bulkhead to tunnel recess, are divided into six sections, with solid floors fitted every third frame, except in engine room. All decks are of steel.

Accommodation is of a high standard. Decoration and furnishing was designed in co-operation with the T. Eaton Co. Ltd. Cabins and public rooms are painted in pastel shades, predominantly green with darker trim. All cabin and public room bulkheads are of steel to prevent and confine fire. The outfit of anchors, cables, hawsers and warps is one size above Lloyds requirements. Ships are each equipped with two 5-ton, two 10-ton, one 20-ton, and two 3-ton booms for cargo handling, of length to effect a 15-foot reach over shipside when topped at 30°. Vessels are equipped with combined heating and ventilating thermotank systems, as well as with combined smoke detecting and fire extinguishing systems. Emergency life rafts of 40-person capacity are carried. Each ship has 4 life boats and 2 jolly boats.

The propelling equipment consists of two sets of Nordberg type two-cycle, five-cylinder, direct reversing trunked piston diesel engines, developing a total of 3750 B.hp. continuously at 225 r.p.m. Electric power is supplied by two 192-kw., 220-volt d-c. generators and one 106-kw., 220-volt d-c. A 20-kw., 230-volt-d-c. emergency generator is added. Steam is supplied by a Foster Wheeler "D" type oil fired boiler rated at 3835 lb. per hour and a waste heat boiler rated 1540 lb. per hour both at 50 lb. pressure.

These handsome well equipped vessels are excellent proof of Canada's shipbuilding ability, and will help to establish this country's position in the world shipbuilding field.

Personals

News of the Personal Activities of Members of the Institute

John E. Armstrong, chief engineer of the Canadian Pacific Railway, and past-president of the E.I.C., was further honoured recently by election to honorary membership in the American Railway Engineering Association. The award, of which there are only ten among the group's approximately 3,100 members, was "in recognition of outstanding service to the railway industry, the engineering profession and the A.R.E.A."

Mr. Armstrong has served the Association as a director and a vice-president. He was elected to the presidency in 1934.

John E. Armstrong, M.E.I.C.

J. B. Stirling, M.E.I.C., president of E.G.M. Cape and Company, Montreal, received the honorary degree of Doctor of Laws at the recent science and commerce convocation of Queen's University in Kingston.

Mr. Stirling, past-president of the Corporation of Professional Engineers of the Province of Quebec, is vice-president of The Engineering Institute, representing the Quebec Zone.

John H. Parkin, C.B.E., M.E.I.C., of Ottawa, was appointed earlier this year, director of the newly-created National Aeronautical Establishment. Mr. Parkin was director of the Division of Mechanical Engineering of National Research Council, and a pioneer in Canadian aeronautical research and development. The National Aeronautical Establishment is designed to meet the need for improving aeronautical research and development facilities.

Policy direction for the N.A.E. will come from the National Aeronautical Research Committee, members of which are the Chief of Air Staff, the chairman of the Defence Research Board, the president of the Defence Resarch Board, the president of the National Research Council, and the chairman of the Air Transport Board. The new establishment will be administered by the N.R.C. on behalf of the Committee.

Mr. Parkin is a past councillor of the Engineering Institute.

J. A. H. Henderson, M.E.I.C., of Canadian International Paper Company, was elected president of the Dominion Council of Professional Engineers for 1951 at the meeting of the Dominion Council in April. Mr. Henderson is past-president of the Quebec Corporation of Professional Engineers.

His career started in 1912, at which time he worked with the Geodetic Survey of Canada in Ontario, Quebec, and British Columbia. Following war service overseas, he attended Queen's University, and graduated in 1922, as a civil engineer. In 1923 he joined the Riordon Pulp Corporation which was

J. A. H. Henderson, M.E.I.C.

aken over by the Canadian International Paper Company in 1925.

Mr. Henderson's many and varied activities have included investigation of pulp and paper mill sites in Ontario, Quebec and New Brunswick, planning housing facilities for new mill areas, co-operating with government power development projects. In 1941 he began his supervision of purchasing and supply for the Canadian International Paper Company, during that complex period of wartime restrictions. He has continued in this phase of the company's operations ever since.

Thomas H. Hogg, M.E.I.C.

Thomas H. Hogg, M.E.I.C., prominent consulting engineer, has been elected to the board of directors of John Inglis Co. Limited.

Dr. Hogg was for many years chief hydraulic engineer of the Hydro-Electric Power Commission of Ontario. He is a director of the Chartered Trust and Executor Company and also of Corporate Investors Limited.

Dr. Hogg was president of the Institute in 1940.

F. X. T. Berlinguet, M.E.I.C., of Three Rivers, Que., was tendered the Institute's congratulations on the occasion of his 96th birthday, March 14th last. Mr. Berlinguet is the oldest practising engineer in Canada.

Mr. Berlinguet studied civil engineering and land surveying at Laval University and was connected for a number of years with the development of the harbours at Quebec and Three Rivers. He retired from the Department of Public Works of Canada after 46 years of service with the government. Since then he has been actively engaged in private practice at Three Rivers.

A Life Member of the Institute, he joined as an Associate Member upon its foundation as the Canadian Society of Civil Engineers, in 1887, and was transferred to Member in 1890.

C O. Maddock, M.E.I.C., construction engineer of International Nickel Co. of Canada Ltd., is chairman of the Sudbury Branch of the Institute.

Mr. Maddock was born at Inwood, Ontario, and graduated from University of Toronto with a B.A.Sc. in 1918. His early work was with the Toronto & York Roads Commission as assistant to the chief engineer, and as foreman on bridge construction with McNiven Bros., Toronto. For two years he was detailer and designer with Kerry & Chace Ltd., consulting engineers, Toronto, on hydro-electric power development. As a partner in the firm of Scott & Maddock, contractors, he worked in reinforced concrete construction. For a time he was a building appraisal engineer with Sterling Appraisal Co. Ltd., Toronto. He joined the International Nickel Co. Ltd., in Copper Cliff, Ont., as a draughtsman in 1926.

A. B. Olson, M.E.I.C., superintendent for the Saskatchewan Power Corporation, Saskatoon, has been elected chairman of the Saskatchewan Branch of the Institute.

Mr. Olson was born in Minnesota. He graduated from the University of Saskatchewan in 1931, receiving a B.Sc. degree in mechanical engineering. He joined the Saskatoon power plant of the Saskatchewan Power Commission at Regina, as an assistant engineer and a records and test engineer in 1930. He was appointed plant engineer in 1937, and received the appointment to his present position in 1947.

A. C. Macnab, M.E.I.C., mechanical engineer, for Dominion Woollens & Worsteds Ltd., Hespeler, Ont., has been elected chairman of the Kitchener Branch of the Institute.

A. C. Macnab, M.E.I.C.

Mr. Macnab is a graduate of the University of Toronto where he received a B.A.Sc. degree in 1932 and that of M.E. in 1944. He joined the Dominion Woollens & Worsteds Ltd., in 1941, coming from Hamilton, Ont., where he was an engineer for Donald Ropes & Wire Cloth Co.

H. P. Hamilton, M.E.I.C., of Consolidated Mining and Smelting Co. Ltd., has been elected chairman of the Kootenay Branch of the Institute.

Originally from Regina, Mr. Hamilton, after graduating from University of Toronto in electrical engineering in 1934, worked with the Water Development Committee at Swift Current, Sask. He worked in 1936 to 1938 with the Churchill River Power Co. at Island Falls, Sask. In 1939 he went to the engineering department of the Hudson Bay Mining and Smelting Co. in Flin Flon, Man., as a designer and draughtsman. He joined the Consolidated Mining & Smelting Company in 1946 to work on design engineering.

H. P. Hamilton, M.E.I.C.

Jean Saint-Jacques, M.E.I.C., is the chairman of the Quebec Branch of the Institute.

Born in Montreal, Mr. Saint-Jacques studied at Mount St.-Louis College. He graduated in civil engineering from Ecole Polytechnique in 1929 and in electrical engineering from McGill in 1931. He started his career in engineering with The Shawinigan Water & Power Company. He has been continuously employed by Quebec Power Company since 1932. At present he is director of sales and contracts with Quebec Power Company, directing the power and gas contract department, the power and gas sales promotion department, the advertising department, and property and tax department and rate studies.

Has been a member of the Engineering Institute since graduation and has been a director and the secretary of the Quebec Branch of the Institute in the past. He is a registered professional engineer, and is active in Sea Cadet and Navy League work.

Jean Saint-Jacques, M.E.I.C.

H. R. Hayes, M.E.I.C., general supervisor of Standards for Burns & Company, Limited, Calgary, Alta., has been elected chairman of the Calgary Branch of the Institute.

Mr. Hayes is from Gleichen, Alberta, and a graduate of the University of

H. R. Hayes, M.E.I.C.

Alberta, where he received a B.Sc. degree in civil engineering in 1934. Upon graduation he was a transitman with the C.P.R. In 1937 he went to Burns & Co. Ltd., as time study engineer. He was appointed a supervisor of standards later that year and, in 1940, general supervisor of standards.

Col. H. W. Love, O.B.E., M.E.I.C., has been appointed commander of the North West Highway System, in Whitehorse, Y.T. Colonel Love was stationed previously at the Department of National Defence, Ottawa, with the appointment of chief engineer, Canadian Army.

Graduating as a B.Sc. from Queen's University in 1936, he joined the R.C.E. as a lieutenant, going overseas in 1940. He rose to the rank of Colonel, and received the appointment O.B.E., while still overseas. Returning in 1946, he was appointed the director of works and construction, in the Q.M.G. Branch of D.N.D.

E. R. Williams, M.E.I.C., of Shawinigan Chemicals Ltd., has been elected a director of the Company and vice-president in charge of manufacture. Mr Williams joined the Shawinigan organization in 1915, and has held a number of posts, including that of works manager at Shawinigan Falls.

He graduated in chemical engineering as a B.A.Sc. from the University of Toronto in 1912.

W. J. McAdam, M.E.I.C., has resigned from his position as chief engineer of J. L. E. Price and Company Limited, to form a partnership, with Mr. D. F. Wood, M.E.I.C., to be known as Wood and McAdam, consulting engineers, Montreal.

Lt.-Colonel H. D. Berry, R.C.E., M.E.I.C., has been posted to the office of the chief engineer (P. & T.) Army Headquarters, Department of National Defence, in Ottawa.

Lt.-Colonel Berry, as a major, went in 1949 to Fort Belvoir, Va., as Canadian liaison officer, at the Engineer Research and Development Laboratories.

Lorne P. Baker, M.E.I.C., has returned to Canadian General Electric Co. Ltd., Davenport Works, in Toronto, Ontario.

Mr. Baker, who graduated from University of Toronto in 1935, followed a practical electrical course with C.G.E. for ten months. The following years he worked on design and production with the company. During World War II he served with the Canadian Army (overseas). After retiring as officer commanding the Ottawa workshop, R.C.E.M.E., he was appointed assistant trade and industrial commissioner in London, England. In 1950 he joined the Anglo-Canadian Purchasers Ltd. in Toronto.

Major Leonard Martin, M.B.E., M.E.I.C., of Montreal, has been promoted to the rank of lieutenant-colonel and named to command No. 2 Technical Regiment, R.C.E.M.E., a Montreal Reserve Force unit. He is the managing director of H. L. Peiler & Co., Montreal.

Lt.-Col. Martin served at the start of the war with the 2nd Battalion, Canadian Grenadier Guards. An engineer by profession, he was appointed in 1942 to the Royal Canadian Ordnance Corps and later to the Royal Canadian Electrical Mechanical Engineers. He served with the latter corps in the United Kingdom, Italy and Northwest Europe.

Maj. L. Martin, M.E.I.C.

Lt.-Col. Martin received the M.B.E. for his war services and was mentioned in despatches. Since the war he has served in the R.C.E.M.E., Reserve Force.

Lt.-Col. Martin is a graduate of Clarkson College of Technology, Potsdam, N.Y., where he received a B.Sc. in mechanical engineering in 1934. Upon graduation he joined H. L. Peiler & Co. Limited.

Rolf Lockeberg, M.E.I.C., has been appointed controller of Canadian Ingersoll-Rand Co. Ltd.

He graduated from Queen's University receiving the degree of B.Sc. in mechanical engineering in 1940. He served with the R.C.A.F. for 5 years and then attended the Harvard Graduate School of Business Administration, where he received the degree of Master of Business Administration in 1947. Since that time he has been associated with Canadian Ingersoll-Rand Co. Ltd.

R. G. Johnstone, M.E.I.C., is vice-president and general manager of the St. Raymond Paper Limited, Montreal. Mr. Johnstone has been associated with the industry for many years. After graduating from N.S.T.C. in 1924, he joined the Newfoundland Pulp and Paper Co. Later he was with the Harland Engineering Company in Montreal, and he went to the E. B. Eddy Co., Hull, Que., as production manager in 1934. In 1949 he joined the Brompton Pulp and Paper Co., at East Angus, Que.

Raymond A. Frigon, M.E.I.C., is an assistant research officer in the Division of Building Research, National Research Council. He is also secretary, in association with Mr. R. S. Ferguson, of the Associate Committee on the National Building Code, and secretary of five of the technical sections of the committee on Civil Defence.

He went to Washington, D.C., in 1947, as scientific liaison officer between the Canadian and American Research Councils. He returned to Ottawa early in 1951.

A. C. Northover, M.E.I.C., has been appointed manager of the Leamington Public Utilities Commission. The Commission operates the municipal hydro water and gas services. Mr. Northover was formerly resident engineer for McKim Township, Sudbury, Ont.

Mr. Northover is a graduate of University of Toronto where he received a B.A.Sc. in 1934 and a C.E. in 1947.

Stewart Troop, M.E.I.C., is managing director of MacDonald Mines and Candego Mines with headquarters in Montreal.

Mr. Troop has been in the mining industry for many years, most recently as consulting mining engineer and manager for Chibougamau Properties, Ltd., and Cache Lake Chibougamau Lines Ltd.

P. G. W. Walker, M.E.I.C., has been appointed city engineer for Penticton, B.C. Previously he was the townsite manager with the Longlac Pulp and Paper Company at Terrace Bay, Ont.

C. O. P. Klotz, M.E.I.C., of Aluminum Company of Canada, Montreal, has been appointed production manager for the building industry. He has been with the Company since 1942, and has worked at Kingston, Ont., and at Arvida, Que., coming to Montreal in 1946 as a development engineer.

C. O. P. Klotz, M.E.I.C.

A. Scott, M.E.I.C., is now senior staff engineer, Defence Construction Ltd., Maritime Region, with headquarters at Halifax. He was previously division engineer for Canadian National Railways, Halifax, N.S., and a member of the staff of C. A. Fowler & Co. on the construction of Mount St. Vincent College, various schools and hospitals and on the preliminary surveys for the Halifax-Dartmouth Suspension Bridge.

R. E. McMillan, M.E.I.C., formerly electrical engineer for R. A. Hanright in St. Catharines, Ont., is now with H. G. Acres and Company at Niagara Falls.
He graduated from McGill University in electrical engineering in 1926. He was with the Saguenay Power Co. Ltd., and Aluminum Company from 1940 to 1944, when he joined the Canadian International Paper Company at Three Rivers, Que. He went to St. Catharines in 1949.

Lawrence MacIsaac, M.E.I.C., of New Glasgow, N.S., has been appointed industrial engineer, Atlantic Region, Canadian National Railways, Moncton. He is a graduate of Nova Scotia Technical College. He joined the engineering department of the C.N.R. in 1946.

W. M. Kellett, M.E.I.C., is industrial engineer with Coleman Stove & Lamp Co. Ltd., in Toronto, Ont. He was previously production engineer, for general Products Mfg. Corporation Ltd., in London, Ont.

Lorne C. Lambert, M.E.I.C., is now associated with John T. Hepburn and Sons Limited.
Mr. Lambert was on a research fellowship at the Ontario Research Foundation in Toronto since 1949. He was associated previously with the Aluminum Company of Canada.

G. P. Fielding, M.E.I.C., is a senior civil engineer with the Aluminum Company of Canada, at Arvida, Que. Formerly he was structural designer for the Department of Highways & Public Works, at Halifax, N.S. He graduated from Nova Scotia Technical College in 1945 in civil engineering.

T. A. G. Beeching, M.E.I.C., of Vancouver, B.C., is with the Indian Affair's Branch of the Department of Citizenship and Immigration at Vancover. He was previously an electrical engineer in the Dominion Water & Power Bureau at Vancouver.
Mr. Beeching is a graduate of the University of British Columbia, where he received a B.A.Sc. degree in electrical engineering in 1939.

Lt.-Col. W. Alton, M.E.I.C., has been promoted from the rank of major and officer commanding the Central Command H.Q., Signal Squadron, at Oakville, Ontario. His new appointment is that of general staff officer Grade I, in the Directorate of Signals, at Army Headquarters in Ottawa.

D. Collis, M.E.I.C., has been transferred from Dominion Atlantic Railway, headquarters at Kentville, N.S., to Canadian Pacific Railway Company, North Bay, as assistant district engineer, Algoma District.
Mr. Collis served with C.P.R. in Saint John, N.B., before going to Kentville.

Steve Dembicki, M.E.I.C., is with the engineering department of Canadian Industries Limited in Montreal. He was previously sales engineer for Dominion Electrohome Industries Limited in Kitchener, Ont.
Mr. Dembicki graduated from University of Alberta in Mining in 1940 and in mechanical engineering from McGill University in 1941.

C. H. Vatcher, M.E.I.C.

C. H. Vatcher, M.E.I.C., has joined the Toronto office of English Electric Company of Canada Limited. Mr. Vatcher was for four years in industrial sales and for three years in the engineering branch of the R.C.N.

W. O. Rowan, M.E.I.C., is associated with Canadian Brazilian Services, Ltd., Toronto, in the engineering procurement division, electrical section. He was formerly a sales representative for the Canadian General Electric Co. Ltd., in Fort William, Ont.

E. L. Paterson, M.E.I.C., of Imperial Oil Ltd., has been transferred from Vancouver, B.C., to Toronto, Ont., as assistant manager in the asphalt sales department.

W. L. Noble, M.E.I.C., is now vice-president of L. McGill Allan Limited, general contractors, Windsor, Ont.
Mr. Noble is a graduate of the University of Saskatchewan, having received the degree of B.Sc. in civil engineering in 1941. Prior to joining L. McGill Allan Limited, he was with the contracting department of the Canadian Bridge Company Limited, Walkerville, Ontario.

J. D. P. McPherson, M.E.I.C., previously assistant chief engineer for the Highway Paving Co. Ltd., Montreal, Que., has joined the Construction Equipment Co. Ltd., Montreal. He graduated from University of Alberta in 1943 with the degree of B.Sc. in civil engineering.
Mr. McPherson is a past-chairman of the Junior Section of the Montreal Branch of the Institute.

A. A. Johns, M.E.I.C., who was with the Department of Mines and Technical Surveys at Ottawa, is now associated with the Foundation Co. of Ontario, at Sault Ste. Marie, Ont.

E. A. Thompson, M.E.I.C., is with Mount Enterprise Ltd., at Morin Heights, Que. He was previously town manager of the Town of Sackville, N.B. He has also served as town engineer of Bridgewater, N.S.

E. A. Sprenger, M.E.I.C., has resigned his position as works manager at the gun division of Canadian Arsenals, Longueuil, P.Q., and has joined Sorel Industries Ltd. as production manager.

Will Smith, M.E.I.C., is now division manager with Newfoundland Light & Power Co. Ltd., at Corner Brook, Nfld.
Mr. Smith has worked previously with the National Light & Power Company, Moose Jaw, Sask., and with the Yellowknife Electric and Power Company at Yellowknife.

Malcolm Frank Wilding, M.E.I.C., is employed by the Aluminum Company of Canada Limited, Montreal.
Mr. Wilding, who graduated in 1944 from University of British Columbia went to the Northern Electric Company soon after as a sales engineer. He worked for Northern Electric in Montreal, Vancouver, and Calgary, as a power apparatus specialist.

F. D. Wolever, M.E.I.C., is with Ross & Greig. Reg'd., the engineers' supplies division of Upton Bradeen & James Limited, Montreal. He will have jurisdiction over engineering and sales of engine and pumping equipment. Previously he was a sales engineer for Canadian Fairbanks Morse Co. Ltd., Montreal.

John A. Fuller, JR.E.I.C., has been appointed manager of the Vancouver district office of John Inglis Co. Limited.
Mr. Fuller is a mechanical engineering graduate of the University of Toronto. He has been with the Company since graduation and during that time has completed a course of instruction with the Worthington Pump & Machinery Corporation of Harrison, N.J.

John A. Fuller, Jr.E.I.C.

Conrad Goldman, JR.E.I.C., is now employed with National Analine, in Buffalo, N.Y. Previously he was with Ross Productions Company in Montreal.

D. B. Kilpatrick, JR.E.I.C., of Montreal. has been elected George F. Baker Scholar at the Harvard Graduate School of Business Administration.
Mr. Kilpatrick received the degree B.Eng., from McGill University in 1949 Entering the Royal Canadian Artillery in 1942 as a private, he served in Sicily, Italy, Belgium and Holland and received his discharge in 1945 as a first lieutenant.

D. W. Blair, JR.E.I.C., is division engineer for the Montreal Terminals and St. Jerome divisions of Canadian National Railways, Montreal.

Mr. Blair graduated from the University of New Brunswick as a B.Sc. in civil engineering. He entered the railway service in 1946, as a junior assistant engineer in the Department of Research and Development, Montreal, and was appointed in 1948 assistant engineer at Levis, Que., and later in the year, division engineer, Laurentian division Quebec, Que. From 1940 to 1945 he was on naval service with the R.C.N.V.R., on loan to the R.N., rising from ordinary seaman to Lieutenant, and being awarded the M.B.E., in January, 1943.

Fernand R. Boucher, JR.E.I.C. formerly with the Aluminum Co. of Canada Ltd., Montreal, is now a sales engineer for Canada Creosoting Company, Montreal, Que.

R. R. Cheyne, JR.E.I.C., has accepted a position with the Alminum Company of Canada and for the next two years will be working for The Demerara Bauxite Co., Ltd., in British Guiana.

Mr. Cheyne is a graduate of the University of Saskatchewan, where he received a B.Sc. in mechanical engineering in 1949, he was formerly with General Steel Wares Ltd., London, Ont.

John C. Martin, JR.E.I.C., previously assistant engineer for Canadian National Railways, in Toronto, is now working for the Quebec North Shore & Labrador Railway, at Seven Islands, Que.

L. B. Murphy, JR.E.I.C., has been transferred from Canadian General Electric Co., in Toronto, Ont., to the Western Nova Scotia Electric Co. Ltd., Yarmouth, N.S.

A graduate of Nova Scotia Technical College, Mr. Murphy received a B.Eng. in electrical engineering in 1949.

R. A. Pollard, JR.E.I.C., is with Northern Construction Co., at Bridal Falls, B.C.

A graduate of the University of British Columbia, he received a B.A.Sc. in civil engineering in 1949.

John L. Pulford, JR.E.I.C., has been appointed district product manager, communications equipment and overhead and underground, for the new Alberta district of the Northern Electric Company Limited, with headquarters at Edmonton. Mr. Pulford commenced his career with the Northern Electric Company Limited in the installation department Western area in 1937 and after four years as a wireless electrical mechanic in the R.C.A.F. returned to university and graduated from the University of Toronto with the degree of B.A.Sc. engineering and business, 1950.

Upon graduation he rejoined the Northern Electric Company Limited at Montreal and in October, 1950 was appointed district telephone sales engineer for the Alberta-British Columbia District. With the division of that district into two separate districts he was appointed to his present position.

Richard A. Quance, JR.E.I.C., who was with Shell Oil Co. at Montreal East, Que., is now with the engineering department of Canadian Synthetic Rubber Ltd., Sarnia, Ont. He is a graduate in physics from Queen's University, class of 1946.

Arthur J. Robinson, JR.E.I.C., who was with Canadian Industries Limited, has joined Canadian Salt Company Limited, as an engineer at the plant at Windsor, Ont.

R. R. Scott, JR.E.I.C., is engineer for Bathurst Power & Paper, Bathurst, N.B. He had worked with the electrical engineering division of the National Research Council in Ottawa, Ont.

Andre St. Arnaud, JR.E.I.C., is with the provincial Department of Roads, at Mont-Joli, Que. Previously he was with Theresa Gold Mines, Longlac, Ont.

C. A. Groom, JR.E.I.C., is sales engineer for Creamery Package Mfg. Co. of Canada Ltd., in Toronto. He was previously associated with John Inglis Co. Ltd., Toronto, as refrigeration sales engineer.

Jean Bourassa, JR.E.I.C., is employed as junior electrical engineer for Montreal Tramways Co., in the power department in Montreal.

Douglas K. Campbell, JR.E.I.C., is a junior engineer at North Bay, Ont., and assistant to the line maintenance engineer, of the Hydro-Electric Power Commission of Ontario.

B. B. Denyes, JR.E.I.C., is employed by the Federal Department of Public Works at Ottawa. Prior to joining the Department he was mechanical engineer for The Steel Company of Canada, Ltd., at Gananoque, Ont.

Myer Dimentberg, JR.E.I.C., who was formerly with H. G. Acres & Co., in Niagara Falls, Ont., is now with C. D. Howe Co. Ltd., on an assignment in Montreal.

W. H. Garland, JR.E.I.C., is resident engineer for Defence Construction Limited at Wainwright, Alberta.

Jean-Louis Gregoire, JR.E.I.C., of Montreal, is with Shawinigan Water & Power Co., central maintenance department at Shawinigan Falls, Que.

E. W. Groves, JR.E.I.C., has joined the service department of General Motors Diesel Ltd., London, Ont. He is an operating instructor, travelling on deliveries of new locomotives.

B. T. Kerr, JR.E.I.C., who was working with The Shawinigan Engineering Co. Ltd., at Shawinigan Falls and at Trenche, Que., is now in Montreal associated with Purdy & Henderson Co. Ltd., as managing director.

A. H. Mallette, JR.E.I.C., is employed as a mechanical engineer with Donnacona Paper Co., Donnacona, Que. Previously he was plant superintendent for Coca Cola Ltd., at Quebec City.

W. D. Martin, JR.E.I.C., is with Brompton Pulp and Paper Co. Ltd., at Red Rock, Ont. He has worked previously in the paper industry, with Price Bros. Co Ltd., at Riverbend, Que., and in British Columbia.

Murdo Murchison, JR.E.I.C., is with the Montreal Engineering Co. Ltd., Montreal, Que. He was previously with Calgary Power Ltd., as a junior engineer.

J. W. McCarthy, JR.E.I.C., is a construction engineer with the Steel Co. of Canada, Hamilton, Ontario.

L. S. Thompson, JR.E.I.C., is employed by the Horton Steel Works Limited in the erection department, in Fort Erie, Ontario.

M. E. Thompson, JR.E.I.C., is with the National Defence Department in the inspection services (electronics and electrical engineering).

Lucien Trudel, JR.E.I.C., who has been with the Quebec Department of Mines for several years has been transferred from Noranda, Que., to Quebec City.

Dan F. Williamson, JR.E.I.C., is a field engineer representing Sandwell and Company Limited, consulting engineers of Vancouver, B.C. He is at the Howe Sound Pulp Company Limited Mill, Port Mellon, B.C.

Wm. N. Venables, JR.E.I.C., who was town engineer for Flin Flon, Manitoba, is now with the Wells Construction Co. in Flin Flon.

James C. Akerley, S.E.I.C., formerly of North Sydney, N.S., is working in Windsor, N.S., as resident engineer for J. Price on permanent building construction.

Mr. Akerley is a graduate of the University of New Brunswick, where he received a B.Sc. degree in civil engineering in 1950.

Joseph Badzioch, S.E.I.C., is taking a two-year post-graduate training course with A. Reyrolle & Co. Ltd., electrical manufacturers, in Durham, England. The course includes approximately nine months factory work, three months outside erection, and the rest of the time is spent in the contracts and engineering offices. He also intends to spend about six months with C. A. Parsons Co. Ltd., turbine manufacturers, after which he will return to Canada.

Mr. Badzioch received a B.Sc. degree from the University of Alberta in 1950.

Marc Bergeron, S.E.I.C., is with Concrete Repairs and Waterproofing Co. Ltd., Quebec, Que. He was formerly with Lalonde & Valois, consulting engineers in Montreal.

Mr. Bergeron graduated from McGill University, receiving a B.Eng. degree in civil engineering in 1950.

W. R. K. Coulthard, S.E.I.C., is presently employed as general construction engineer for Defence Construction Ltd., at Brandon, Man.

Mr. Coulthard graduated from the University of Man. with a degree of B.Sc., in civil engineering in 1950.

Charles E. Day, S.E.I.C. (University of New Brunswick, civil, 1950), is now employed as building inspector for the City of Halifax, N.S.

H. D. DeBeck, S.E.I.C. (the University of B.C., B.A.Sc., civil, 1950), is with the Water Rights Branch, at Kamloops, B.C.

Lino Dotto, S.E.I.C., is draughtsman with Sandwell & Company, consulting engineers in Vancouver, B.C.

Mr. Dotto graduated from the University of British Columbia, in 1950.

Charles A. Goldbloom, S.E.I.C., television engineer, representing Electrical Products Mfg. Co., Ltd., has spent the past month with the television department of National Co., Inc. On his return he will be associated with Fleetwood Television of Montreal.

Mr. Goldbloom graduated from McGill University in 1950. He was for four years in radar with the R.C.A.F.

J. G. Hamel, S.E.I.C., (McGill University B.Eng., civil, 1950) is at Lac St. Jean Que., as assistant resident engineer for Harold Doran, architects and engineers. Previously he was field engineer for Foundation Co. in Ottawa, Ont.

Iurray V. Harris, S.E.I.C., (University {ew Brunswick, B.Sc., civil, 1950) is a ivil engineer with the Bell Telephone 'o., Montreal, Que.

itanley Hodgson, S.E.I.C., (University of British Columbia, B.A.Sc., mining, 1950) s a junior engineer with Consolidated Iining and Smelting Company Ltd., at he Sullivan Mine in Kimberley, B.C.

Keith Jamieson, S.E.I.C., of Rossland, B.C., third year student in civil engineering at the University of British Columbia, has been awarded the Road Builders' and Heavy Construction Association scholarship.

var Johnsson, S.E.I.C., (Queen's University, B.Sc., mechanical, 1950) is now in Saint John, N.B., working for T. McAvity and Sons, Ltd., in the engineering lepartment.

M. J. Larose, S.E.I.C., (McGill University, civil, 1950) is now with Pentagon Construction Co., Parent, Que. After graduation he was with McColl Frontenac Oil Co., Montreal, Que.

G. S. Mander, S.E.I.C., is in charge of mechanical design for the firm of J. E. L. Walker, Consulting Engineers Ltd., of Hamilton, Ontario, working in the Toronto Office. During the summer of 1950 he was assistant engineer for Moody & Moore, architects, in Winnipeg, Man.

P. A. Monaghan, S.E.I.C., who was previously with the Geodetic Survey of Canada, Department of Mines and Technical Surveys, is now with the Photographic Survey Corp. of Canada Ltd., Toronto, Ont.

Joseph Y. McCarther, S.E.I.C., (Nova Scotia Technical College, B.Eng., mechanical, 1950) is a mechanical engineer in gas turbine engine development for A. V. Roe (Canada) Ltd., Toronto.

Gordon M. McKay, S.E.I.C., (University of Manitoba, B.Sc., electrical, 1950) from Winnipeg, Man., is now working for the Saskatchewan Power Corp. in Regina, Sask.

Robert Rice, S.E.I.C., University of Manitoba, B.Sc., electrical, 1950) is now working for the International Business Machines in Montreal.

Geo. A. Robinson, S.E.I.C., who was junior development engineer with Photographic Survey Corporation in Toronto, is now with The Central Mortgage and Housing Corporation at Ajax, Ontario.

D. M. Ryan, S.E.IC., (University of Manitoba, B.Sc., civil, 1950) is in Montreal working for C. D. Howe Co. Ltd.

S. B. Smith, S.E.I.C., (University of Manitoba, B.Sc., electrical, 1950) is a design engineer with A. V. Roe Canada Ltd., at Malton, Ont.

K. M. G. Tambon, S.E.I.C., (McGill University, mechanical, 1950) is a service engineer for Bailey Meter Co. Ltd., Halifax, N.S.

K. Toftdahl, S.E.I.C., is now with the Columbia Cellulose Co., at Terrace, B.C. He was previously at the Nanaimo River Camp of the Victoria Lumber Company.

John A. R. Cann, S.E.I.C., is assistant general manager for Canadian Aviation Electronics, Montreal, Que.

Mr. Cann is a graduate of McGill University, having received a B.Sc. degree in 1948.

F. H. Gardner, S.E.I.C., (University of Toronto, B.A.Sc., civil, 1950) is field engineer for Proctor, Redfern & Laughlin, consulting engineers in Toronto.

Ralph Karle, S.E.I.C., who has been working in England for one of the companies of Brush-Associated British Oil Engines, on a post-graduate training scheme, will return to Canada in June, 1951.

He will work in a new office of the Brush A.B.E.O. group of companies in Montreal.

He graduated from University of Manitoba in 1949, with a degree of B.Sc. in electrical engineering.

John P. Miller, S.E.I.C., of St. Thomas, Ont., who will graduate this year as a civil engineer from the University of Manitoba, has been appointed municipal engineer for Atikokan, Ont.

R. B. Welch, S.E.I.C., (Nova Scotia Technical College, civil, 1950) of Noranda, Que., is now working as junior engineer for Brian R. Perry, consulting engineer, Montreal.

J. W. Withrow, S.E.I.C., (University of New Brunswick, B.Sc., electrical, 1950) is in St. Catharines, Ont., employed with McKinnon Industries Ltd., as an electrical engineer.

Visitors To Headquarters

E. C. Thorne, M.E.I.C., Ottawa, Ont., April 2, 1951.

C. S. Landon, M.E.I.C., Winnipeg, Man., April 3.

Dean R. M. Hardy, M.E.I.C., Edmonton, Alta., April 3.

C. W. Gilchrist, Ontario Good Roads Association, Ottawa, Ont., April 3.

J. W. D. Farell, M.E.I.C., Regina, Sask., April 9.

J. F. Hole, S.E.I.C., Edmonton, Alta., April 11.

J. A. Van den Broek, M.E.I.C., Ann Arbor, Mich., April 11.

Krishna Swarup, Lucknow, India, April 11.

G. E. Cole, M.E.I.C., Winnipeg, Man., April 12.

J. F. MacLaren, M.E.I.C., Toronto, Ont., April 16.

J. E. B. Sawyer, JR.E.I.C., La Tuque, Que.

H. R. Hayes, M.E.I.C., Calgary, Alta., April 23.

F. W. Gray, M.E.I.C., Victoria, B.C., May 1.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

H. L. Bucke, M.E.I.C., who was prominently associated with the building of the transcontinental railway and with development of hydro in Ontario, died at his home in London, Ont., on March 2, 1951.

Mr. Bucke was born at London, Ont., in 1879. He graduated from the Royal Military College in civil engineering in 1900. He was employed for 17 years by Canadian railways. With the Grand Trunk Pacific railway he was resident engineer on construction of the road for 250 miles east of Sioux Lookout. He was associated with the Hydro-Electric Power Commission of Ontario for 33 years. Most of that time was spent on the Queenstown-Chippawa development of Niagara Falls, Ont., of which he was appointed general superintendent in 1922. He retired in 1946 and returned to London a little more than a year ago.

He joined the Institute as a Student in 1900, transferring to Associate Member in 1904, becoming a Member in 1912. He attained Life Membership in the Institute in 1942.

Beaudry Leman, M.E.I.C., banker and engineer, chairman of the board of the Banque Canadienne Nationale, died at his home in Outremont, Montreal, on April 9, 1951. Mr. Leman's career had followed the unusual pattern of beginning with a distinguished record as an engineer and continuing with even greater distinction in banking.

Mr. Leman was born in Montreal in 1877. He was educated at Mont St. Louis College and under private tuition. He studied engineering at the University

Beaudry Leman, M.E.I.C.

of Lille in France, receiving a civil engineering degree there in 1899. He did post-graduate studies at McGill University which earned him a bachelor of science degree the following year. From

1900 to 1907 he was a civil engineer with the Shawinigan Water and Power Co., of which he was a director at the time of his death. During the last five of those six years, he was mayor of the Town of Shawinigan Falls, becoming, at 21 years of age, the first man to hold the position since it had been incorporated as a town.

Mr. Leman went into banking in 1912, with the old Banque d'Hochelaga, and two years later went to the newly-merged Banque Canadienne Nationale as general manager. He was vice-president of the bank in 1932, and was the president from 1934 to 1947.

Of the many commissions of which he was a member was the Royal Commission of Banking and Currency in 1933. In 1929 he was elected president of the Canadian Bankers Association. He was honorary president of that association from 1944 to 1949.

He was vice-president of the General Trust Co. of Canada. He held directorships in: Consolidated Bakeries of Canada Ltd.; Montreal Tramways Co.; Napierville Junction Railway Co.; Ogilvie Flour Mills Co. Ltd.; and Shawinigan Water and Power Company.

He was a member of the Canadian Record Council from 1939 to 1942.

He joined the Institute as a Student in 1901, becoming an Associate Member in 1902. He attained Life Membership in 1947.

He was awarded the Julian C. Smith medal of the Institute in 1941, for his contribution to the solution of public and municipal financial problems. At that time there was cited his service on Royal Commissions such as the Canadian Advisory Committee on the St. Lawrence Waterway in 1927-28; on the Railways and Transportation Commission in 1931-32; and later on the Allied Supplies Corporation.

Geo. H. Ferguson, M.E.I.C., consulting engineer of Ottawa, Ont., died on March 16, 1951.

Born in Toronto in 1883, Mr. Ferguson graduated from the University of Toronto with the degree of B.A.Sc., in 1906. Following graduation he was engaged on various work in the service of several consulting engineers, and later joined the staff of the Hydro-Electric Power Commission of Ontario as assistant hydraulic engineer, becoming hydraulic engineer of the Commission of Conservation of Canada in 1911.

He served overseas with the Royal Canadian Engineers during the First World War, and was awarded the Military Cross. He returned to duty at Ottawa in 1919. He joined the staff of the Grand Trunk Arbitration Board in 1920, and at the conclusion of that arbitration, served as special engineer to the general manager, Toronto Transportation Commission during the rehabilitation of the Toronto street railway. He returned to Ottawa in 1923, to develop the Public Health Engineering Division of the newly formed Department of National Health, of which division he became chief.

During the following 20 years, Mr. Ferguson actively co-operated with the engineers of the United States Public Health Service in regard to matters of public health engineering having a definitely international aspect. Also the work of the Public Health Engineering Division included many projects of active co-operation with the various provincial Departments of Health throughout Canada.

Mr. Ferguson was a member of the Engineering Board of Review that, at the invitation of the city of Toronto, in 1939 made the study and report in regard to sewage disposal for the city of Toronto.

During World War II he was actively engaged on public health engineering projects for the armed forces, prisoner of war camps and industrial developments.

Mr. Ferguson joined the Institute as a Student in 1906, transferring to Associate Member in 1919. He attained Life Membership in 1947. He was chairman of the Ottawa Branch in 1943.

Jerome Douglas Burbank, M.E.I.C., an electrical engineer at the Worthington Pump and Machinery Corporation died in Buffalo, N.Y., on February 6, 1951. He had been ill nearly a year.

Mr. Burbank was born at Toronto in 1897. He graduated as a B.A.Sc. from the University of Toronto in 1925. Later he did graduate work for which he received the electrical engineering degree in 1938. He had attended, during the First World War, the U.S. Naval Radio School at Harvard University. In 1926 he moved to Buffalo and was employed by the Niagara Hudson Power Corporation, where he remained until 1937. From 1939 to 1943 he was an electrical engineer for the City of Buffalo division of buildings. For two years he was with Colonial Radio Corporation in Buffalo, and in 1947 joined the staff of the Buffalo Board of Education as teacher of electricity and related subjects. He went to the Worthington Pump and Machinery Corporation in 1948.

He joined the Institute as a Student in 1921, transferring to Junior in 1926 and becoming an Associate Member in 1931 and a Member in 1940. He held membership, also, in the American Institute of Electrical Engineers, Institute of Radio Engineers, American Military Engineers, American Radio Relay League.

H. M. Watson, M.E.I.C., contracting engineer of Dominion Bridge Co. Limited Lachine, died in the Western Division of the Montreal General Hospital on April 3, 1951. Well known in engineering circles throughout Canada, he was born in Cornwall, Ont., in 1889.

H. M. Watson, M.E.I.C.

After graduating from McGill University in 1911, with a degree in civil engineering, he joined Dominion Bridge Company Limited and for nine years served in the capacity of draughtsman, designer, checker and squadleader. In 1920 he was appointed assistant chief draughtsman. In 1922 he joined the staff of the contracting department and six years later was appointed contracting engineer, a position he held continuously up to the time of his death. In the contracting department Mr. Watson played a considerable part in the negotiations for many of the large projects on which the Company was engaged.

He was a member of the Corporation of Professional Engineers of Quebec. He joined the Engineering Institute in 1927 as an Associate Member, transferring to Member in 1940.

V. H. Carruthers, M.E.I.C., district engineer, at Calgary, for the Board of Transport Commissioners of Canada, died on March 29, 1951.

Mr. Carruthers was born at Harcourt, N.B., in 1893. He was educated at Mount Allison Academy, and after service overseas in World War I, in the 6th Field Artillery, he attended University of Toronto, and received his degree of B.A.Sc. in 1923. He went to the Canadian Pacific Railways in 1919 working as transitman during the summers. He remained with the Company after graduation. He was roadmaster at Brandon, Fort William, Kettle Valley, Regina and Saskatoon. He was appointed division engineer at Winnipeg in 1938, serving later in that capacity at Edmonton and Revelstoke also. He became district engineer of the Board of Transport Commissioners in 1946.

He joined the Institute as a Member in 1948.

Portland Cement Research

The Portland Cement Association's $3-million laboratories, recently built near Chicago for research and development, are the largest and most completely equipped in the world devoted exclusively to research on cement and concrete.

Because concrete structures serve under widely differing conditions of climate and use, the staff constantly carries on observations of concrete under severe conditions of weather and wear. The Association's work has brought substantial savings through greater durability and longer service life for concrete structures. It is the Association's policy to make scientific discoveries and inventions relating to cement and concrete uses fully, freely and promptly available to the public.

News of the Branches

Activities of the Thirty-three Branches of the Institute and abstracts of papers presented at their meetings

Belleville

S. Sillitoe, m.e.i.c.
Secretary-Treasurer

The fifth meeting of the Belleville Branch of the Engineering Institute of Canada was held April 9th at the Kiwanis Centre with 55 members present. After Mr. F. F. Fulton, chairman, had called upon the secretary to read the minutes of the previous meeting, he called upon Mr. P. T. Seibert to introduce the speaker of the evening, Mr. John Dibblee, m.e.i.c., to deliver his paper, **Industry and Its Place in a Free World.**

Mr. Dibblee's discussion was attentively received by the interested audience and a stimulating effect of the meeting was evident in the formation of numerous discussion groups. At Mr. Dibblee's request no resumé of his paper is being attempted in these minutes because he is in the process of preparing this material for publication.

The thanks of those present was expressed by G. B. Daugharty.

Central British Columbia

M. L. Zirul, m.e.i.c.
Secretary-Treasurer

The regular general dinner and meeting was held at the club house of the Kelowna Golf Club, Kelowna, B.C., on March 16, 1951. Notices were sent to all members and branch affiliates and to practising engineers and others connected with engineering in the district. Twenty-eight persons were in attendance.

The meeting convened immediately after dinner with F. McCallum in the chair.

The secretary-treasurer gave a talk on **The Manufacture of Newsprint Paper at Powell River, B.C.** The talk was later illustrated by the film "River of Paper" loaned by the Power River Company.

A vote of thanks on behalf of the meeting was tendered by Mr. Lindsay Taylor.

The matter of the proposed formation of a branch of the B.C. Engineering Society in the interior was brought up for discussion. Mr. Harley Hatfield reported that a circular letter had gone out to all Professional Engineers in the district asking if they would support a local branch of the Society and that replies would be in shortly. The B.C. Professional Engineers present accepted the offer of the E.I.C. members to use the facilities of the next regular meeting of the Central B.C. Branch E.I.C., as an organizing meeting for the formation of the proposed Interior Branch of the B.C. Engineering Society.

The feeling was expressed that the matter of holding joint meetings between the E.I.C. and B.C. Engineering Society could be discussed if and when an Interior Branch of the Society was formed.

Cornwall

John A. Sarjeant, jr.e.i.c.
Secretary-Treasurer

A. A. B. McMath, m.e.i.c.
Branch News Editor

March 27th was Bell Telephone night for Cornwall Branch. Twenty-eight men turned out to hear Robert E. Martin describe present day telephone equipment, and some of the problems his company faces. During the past 10 years more than 800,000 telephones have been installed, and thousands of potential users are still waiting for service. Using energized demonstration equipment, the speaker described how relays "tell" equipment what to do, and also how they "forget" or "remember" what has taken place during a previous operation. Even on simple calls, hundreds of relays operate, while on long distance calls, a thousand or more come into play.

During a prolonged discussion period, Mr. Martin was assisted by J. F. Gardiner and H. B. Mison of the Cornwall Bell staff, in answering questions and outlining points not previously covered. J. F. Gardiner introduced the speaker, and R. L. Blackett thanked him. Chairman H. W. Nickerson presided at the meeting, held in the Howard Smith Assembly Room.

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After several unsuccessful attempts to visit the Cornwall Branch, President J. A. Vance arranged to attend the Branch meeting on April 5th. With him came J. B. Stirling, our good friend from Montreal.

During the dinner hour, the President met with seven members of the executive at the Cornwallis Hotel. Later on, 21 members assembled in the King George Hotel to hear the President's

The president at Cornwall. Mr. J. B. Stirling, vice-president of E.I.C., Montreal; Mr. Vance, and Branch Chairman H. W. Nickerson.

impressions of his visits across Canada. Showing a remarkable memory for places and names, Mr. Vance entertained his listeners with descriptions of many phases of engineering activity from Newfoundland to British Columbia.

In connection with world wide affairs, the speaker mentioned the Institute's contacts with American and British societies. He expressed the hope that greater contact could be made with England. He mentioned his forthcoming visit to Cuba, where American and Canadian engineering influence was expected to have a stabilizing effect on budding Latin-American societies. He gave his impressions of the South African Conference, which he attended with Dr. L. Austin Wright last summer. He closed his address with brief descriptions of parts of Africa which they had visited.

Donald Ross-Ross introduced Mr. Vance. Chairman H. W. Nickerson expressed the thanks of the Branch. Light refreshments were then served, and the president was introduced to most of those present. He left with them a fine impression of his friendly interest.

Edmonton

T. E. Bate, M.E.I.C.
Secretary-Treasurer

E. K. Cumming, M.E.I.C.
Branch News Editor

The Edmonton Branch was very fortunate in having a paper presented by Mr. P. H. N. White, of the Imperial Oil Limited, on December 12, 1950. Mr. White's paper was entitled, **Methods of Geophysical Prospecting for Petroleum.** Mr. White, who was born in South Africa and educated at Oxford, has worked in various parts of the world in the oil industry since 1937, and is now in charge of all geophysical exploration for Imperial Oil Limited in this area.

Mr. White stated that there are now various methods of exploring for petroleum. Usually the exploration begins with a reconnaissance of an area by geologists to determine whether or not it is practical to carry on a further search.

Various methods are used to obtain a picture of the geophysical formation.

One instrument used in surveying is a magnetometer. This instrument accurately measures variations in magnetic field. In the case of water borne and land borne instruments, the vertical and horizontal fields are measured and in the case of the air borne instrument the total field is measured. With this instrument, it is possible to map the magnetite content of the formation, thereby determining whether or not the area is favourable insofar as petroleum production is concerned.

A second instrument used in geophysical exploration is the gravity meter, a sensitive weighing device, which measures changes in gravity due to differences in density of the formation.

These two survey instruments will not, however, give a complete picture and it is necessary to make use of the seismograph to determine the physical characteristics of favourable formations. The seismograph depends upon the measurement of waves propagated through an elastic medium. In a seismographic survey, a number of holes are drilled in which a charge is exploded. The explosion sets up a wave which travels to an elastic discontinuity and then returns to the surface, where it is picked up by seismometers. When the wave velocities are known and times are measured, these can be converted into depth, thus providing information from which a reef can be located.

Mr. White pointed out that information obtained in this way would provide no guarantee that oil will be found in a favourable location, but it does indicate formations which are likely to produce oil.

Mr. White's paper was very much enjoyed by all members present. He provided a very excellent description of the methods used to aid in finding the oil which so vitally affects and interests all members of the Edmonton Branch.

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On January 10, 1951, 117 members of the Edmonton Branch were present to hear a paper presented by Mr. T. D. Stanley, M.E.I.C., production superintendent of the Calgary Power Company.

Mr. Stanley's paper described the activities of the Calgary Power Company in developing the Spray Lakes Power project. In his introductory remarks, Mr. Stanley pointed out that one of the most interesting features of the project was the foresight and engineering ingenuity which used the natural resources available in this area to provide a large source of power.

The project consists of five and one half miles of earth canal, 1,000 feet of rock canal, and a Penstock tunnel, 1236 feet on a 45-degree slope and 915 feet horizontal tunnel.

The project also includes four dams. At the South end of the Lower Spray Lake is the Canyon Dam and diversion tunnel. This dam is 175 feet high, 600 feet in length, and required one million cubic yards of earthfill. The Three Sisters Dam in Goat Pass is 48 feet in height, 980 feet long and required 2800 cubic yards of earthfill. The Dyke Dam across the Goat Valley is 15 feet in height, 370 feet long, and required 5,700 cubic yards of earthfill. The North Dam at Whiteman's Pass is 50 feet high, 520 feet long and required 7,500 cubic yards of earthfill. All Dams are of the rolled core and earthfill type of construction.

The water for the project is stored in the Spray Reservoir, which has a capacity of 180,000 acre-feet, and uses the natural basin of the Spray Lakes and Spray River. The reservoir has raised the elevation 165 feet above the present river elevation at the Canyon Dam and 140 feet above the Lower Spray Lake.

Power in this project will be produced by three power houses. The Three Sisters Power House in the Great Valley will have a capacity of 3600 hp. at an average head of 50 feet. The Spray Plant will have a capacity of 62,000 hp. at an average head of 900 feet and the Rundle Plant will have a capacity of 23,000 hp. at a head of 320 feet.

Mr. Stanley outlined the work required in building access roads to the project and the way in which the project has progressed to date. His description was very well illustrated by slides showing the dams, canals and power houses in various phases of construction. The method used in handling the turbine rotor and generator for the Spray Power house was very interesting in view of the fact that it was necessary to transport this equipment by truck from the railway siding in Canmore.

Mr. Stanley's paper was very much appreciated by the members, many of whom stated that they are looking forward to further papers of this nature, describing the development of the province's natural resources.

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On January 30, Chris Fisher, M.E.I.C., of Winnipeg, described to members of the Edmonton Branch, the engineering aspects of the Winnipeg Flood.

Mr. Fisher commenced by tracing the history of Winnipeg floods, quoting the writings of Sanford Fleming. In 1826, the flood level was 6 feet higher than in 1950, and the water rose 9 feet in 24 hours, forcing everyone to evacuate the area. Another quotation from the Bishop of Rupertland concerning the flood of 1882, contained a very picturesque description of the conditions at that time. From these records, Mr. Fisher made a comparison of the floods of 1826, 1852, and 1950. In each case, the water overflowed the bank of the Red River about May 3rd, and high level was reached within two days of May 21st.

Mr. Fisher pointed out the impossibility of controlling flooding in the Winnipeg area by storage due to the extreme flatness of the country through which the Red River flows. He stated that he felt that the problem was one of a combination of run-off control and flood control through dyking, diversion, etc. With the aid of a number of slides, the speaker described flooding at the Queen Elizabeth Hospital, Rover Street Power Plant, the bridges, and various other important points in the city. He described the building of a bridge as an escape route for the people of St. Vital, by a company of reserve engineers from Flin Flon. He also described the construction of the Lyndale Dyke using 11 drag lines, 75 bulldozers, 350 trucks, 11 scrapers and approximately 20,000 people. In his closing remarks, the speaker stated that the action of the people during this emergency provided a fine example of co-operation in our democratic way of life. It was his observation that the Army provided the authority and the communications for the operations, the engineers and contractors provided the useful "know-how" and the ordinary citizen did the work.

An interesting discussion followed Chris Fisher's talk, which dealt with various details of flood control. The Edmonton Branch is indeed indebted to Mr. Chris Fisher for an extremely interesting and educational description of the Winnipeg Flood.

Halifax Branch

W. E. Jefferson, M.E.I.C.
Secretary-Treasurer

M. F. Dean, M.E.I.C.
Branch News Editor

The March meeting of the Halifax Branch was on March 15, when Dr. P. L. Pratley, M.E.I.C., consulting engineer, spoke on **The Canso Bridge Plans.** Dr. Pratley gave details on all features of his design of the bridge, and displayed to the meeting slides of the alternate sites, giving sound reasons for his final choice. The speaker stated that there are forces natural to the site, not often found in any of a great many bridge projects. For example, the combination of ice and tidal flow is an important one dictating the design of the piers. This feature, he thinks, has been exaggerated by many people; icebergs do not find their way to the strait, but pan ice, when upended by shore crushing, is he source of the belief. Slides of photographs bore out this fact. The second important problem is deep salt water, and piers of Intrusion Prepakt concrete are the solution.

The bridge design features are: piers to withstand impact of 225-acre ice pan, 2 feet deep, moving at speed of 6 feet per second; clearance above water, 26 feet; depth of water 175 feet and 40 feet of overburden at centre piers; piers to be dowelled to rock with steel H-beams.

Dr. Pratley's lecture was attended by over 200 members, and was one of the most interesting the Branch has received this winter.

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The April meeting was the third 5.30 p.m. supper meeting held this year and again proved the popularity of this type of meeting. The speaker was the Secretary-Treasurer of the Branch, Mr. V. E. Jefferson, Chief Engineer of the Maritime Telegraph & Telephone Co. His subject was "Telephone Engineering."

Beginning with the invention of the telephone by Alexander Graham Bell, Mr. Jefferson traced briefly the subsequent development and history of the public use of the instrument. Very quick growth, and reception by the public, created many local operating companies. Manufacturing became specialized and depended on research by the holding companies. although many of the Manufacturers today carry out their own research projects also. Bell Laboratories is among the largest continuing study of new methods and equipment for telephone use and operation. The speaker described many examples of modern telephone equipment developed to improve service, such as, spliced amplifiers for long distance service improvement, recently used in a cable laid from Key West to Havana, Cuba, in which there were 13 spliced amplifiers; the latest cable of a single wire in lead sleeve, used in conjunction with frequency dividers, allows 400 conversations at one time; a new desk set that will not be in use for two years, is now in process of design.

A recent problem confronted by Maritime Tel. & Tel. was combating frequent winter damage by ice in Northumberland Strait, cutting Prince Edward Island off from service. These conditions were done away with by use of radio transmission to and from hills near New Glasgow and Charlottetown, which were in visual line, and using a micro-wave system with 6-channel low-frequency carrier. The service is 95 per cent efficient, failure occurring at sunset and during local fog conditions. At such times the operation is switched over to another frequency system. The Company also operates a 6-channel carrier between Halifax and St. John.

Operator toll-dialing is one of the newer innovations, whereby a subscriber in one centre can be reached by an operator of another centre by dialing, with no intermediate operator.

Mr. Jefferson stated that one example of their own research is looking for a method for operating a dial system in small communities. The operator system presents problems of difficult maintenance and loss of service.

Many questions followed Mr. Jefferson's lecture, and he was heartily thanked by the members for his interesting talk.

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A special meeting of the Branch was held recently with the students of the Nova Scotia Technical College. Mr. W. A. Take, welding engineer of Halifax Shipyards, gave a very worthwhile lecture on **Welding.**

A recent information campaign at Tech resulted in a 25 per cent increase in student membership in the E.I.C. Many students are genuinely interested and the credit for the large student membership in the Branch is due to the efforts of Mr. M. L. Baker and Prof. A. E. Flynn, both of the College staff, and to the present Branch chairman, A. R. Harrington, and recent past presidents, who have concentrated on enlarging the student membership in the Institute.

Kingston

I. Orloff, jr.e.i.c.
Branch News Editor

J. T. Provan, jr.e.i.c.
Secretary-Treasurer

"When a bridge or building is to be built in France, the contractors interested will submit their own designs, with their bids. Large contracting firms maintain staffs of engineers and engage the best consultants for the preparation of these designs. The work is awarded to the firm offering the most pleasing and most economical structure. This active competition has led to rapid and unique developments in the uses of concrete, in some instances outpacing American and Canadian practice."

Illustrating his points with slides, Dr. S. D. Lash held his audience of more than 100 engineers spellbound, as he talked on **Recent Developments in the Use of Concrete** to the Kingston Branch of the Engineering Institute of Canada on March 27 in the Officers Mess at R.C.E.M.E.

Unusual uses for concrete are not new. As early as 1868 a concrete boat was built, launched and used for water transport. The most commonly used concrete is made of Portland cement, water, coarse and fine aggregate. This concrete requires about 7 days to achieve enough strength to permit removal of forms. There is available however a special cement that hardens very rapidly achieving almost full strength in about 24 hours. There are also such developments as alkali-resistant concrete, and that produced by air entrainment.

Concrete is rarely designed for a strength of more than 4000 pounds per square inch, although concrete has been reliably tested with a strength of 40,000 lbs. More careful compaction, and more common use of vibrators would permit concretes with strengths of 7,000-10,000 pounds to be used.

Because of a severe shortage of timber in Holland and Belgium, the use of precast concrete has become highly developed. Fence posts, lamp posts, roof truss members, and even window frames and window sashes are being made by this method.

Great care is taken in the mixing of the concrete and in the preparation of the forms. The concrete is vibrated and jolted to a high degree of compaction which gives the finished product its great strength and durability.

Prestressed concrete was developed by a French engineer, Freyssinet, who took out his patents in 1928. With the recent expiry of his patent rights it is expected that the use of this development will be more common in Canada and the United States than hitherto.

Recently a very large bridge was constructed in Philadelphia by this technique. Great savings can be realized in the cost of a structure built by this method. Airport runways subjected to the landing loads of aircraft weighing up to 100 tons would have concrete up to 2 feet thick in addition to a prepared base of like thickness. By prestressing the concrete pavement the thickness could be cut about 60 per cent. Runways using this design have been constructed in both England and France.

The prestressing is done by stretching wires that run through pipes in the concrete with hydraulic jacks. The stretched wires are anchored by wedges or by grout. As they tend to regain their original size they put compression stress in the concrete. One European firm is manufacturing prestressed concrete beams of standard shapes and sizes on a commercial basis. The members are formed in long lengths and are sold to order by the foot, sawed to the desired lengths.

Another recent development is "the use of shell concrete". Very thin, and consequently very economical roofs of this type have been built over aircraft hangers, arenas, and factory buildings. Long spans with few columns are economically possible. In Canada, arenas with this type of roof have recently been built in Victoria and in Quebec City.

Dr. Lash expressed the opinion that the advanced achievements in Western Europe were largely due to their system of competitive designs. In Canada the owner of a proposed building, bridge, or dam has a single design prepared. Although care is taken to prepare economical and pleasing structures, a lack of competition is responsible for the relative slow development in the concrete field on this continent.

Mr. W. A. Trotter thanked Prof. Lash for his interesting, instructive and entertaining talk, and Mr. G. T. Andrews expressed the appreciation of the Branch to Col. J. R. Dunlop and his officers for the use of the mess.

Lakehead

G. S. Halter, m.e.i.c.
Secretary-Treasurer

J. W. Howe, jr.e.i.c.
Branch News Editor

The annual dinner dance of the Lakehead Branch took place in the Royal Edward Hotel on Wednesday evening, January 24. A beautiful rose corsage was presented to each lady as she entered the ballroom. Cocktails were served before the dinner and afterwards variety entertainment was provided by a piano-accordion duet and an impersonator. A five-piece orchestra provided the music for the dance.

Mr. O. J. Koreen, Branch chairman, presided at the dinner and there were 75 couples present.

Two large Engineering Institute shields were on proud display in prominent places. Mr. Halter thanked the guests on behalf of the executive for attending this annual event and making it such a success.

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On February 23 the Lakehead Branch held a dinner meeting at the Orpheum Grill, Port Arthur. Guest speaker for the occasion was Mr. Harry Thomasson, director, metallurgical section, research and development laboratory, Canadian Westinghouse Company. Coloured slides illustrated his talk on **The Modern Laboratory and Its Part in Quality Control.** He described several important machines, among them the microhardness machine, the impact testing machine, the weatherometer, and the master balance, which he claims is accurate to 40 millionths of a pound. He also gave a general picture of what the laboratory is doing, and of its importance to Canadian Westinghouse Company. Mr. Thomasson was introduced by Dave Hunter, local manager of Canadian Westinghouse, and the appreciation of the members was expressed by Les Emery. In addition to the 30 members of the Branch, five engineering students from the Lakehead Technical Institute attended the meeting. Mr. O. J. Koreen, Branch chairman, presided at the meeting.

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On March 30 the Lakehead Branch heard a talk by Mr. R. S. Williams, sales engineer for Canadian Johns-Manville Company, on the subject of **Modern Diesel Power.** He described the advantages of diesel locomotives over steam locomotives, and discussed the possible future use of gas turbine and steam turbine with electric traction, which are types of locomotives now under test. With the aid of slides and films he also explained the basic principles and different types of diesel engines now in use, and told how the various features of the modern diesels have been developed from the earlier models.

There were 35 members present at this meeting, which was a dinner meeting held in Fort William. Mr F. E. Ayers introduced Mr. Williams and the speaker was thanked by Mr. S. E. Flook.

Lethbridge

D. Cramer, M.E.I.C.
Secretary-Treasurer

J. T. Dokken, Jr.E.I.C.
Branch News Editor

The regular monthly dinner meeting of the Lethbridge Branch was held in the Marquis hotel on Saturday, March 17th. P. E. Kirkpatrick presided as chairman. The speaker for the evening was Mr. T. Cardell, an engineer at Calgary Power Co. Ltd.

Music was supplied by the Brown Instrumental Trio, and by vocalist Miss Joy Dalton accompanied by Mrs. P. Cull.

Mr. Cardell was introduced by P. E. Kirkpatrick. Mr. Cardell's topic was **Supervision and Remote Control of Power Plants.** The speaker first outlined the history and layout of his company's power development. There are at present six hydro plants supplying 110,000 kw. In the near future all plants will be under remote control, that is, centralized control by a single operator. The first reason for switching to remote control operation is for the savings involved. Instead of an operating crew for every plant only one is required. Further savings are encountered in decreasing the number of houses, schools, etc., required. Secondly an improved, faster and more reliable control is maintained since the whole system is under one operator's fingertips, and he is able to size up troubles instantly. Thirdly, personnel working conditions will be improved since all the staff will be in a centre handy to schools and stores and will work under clean and pleasant conditions. Lastly, hydro plants are easily adapted to automatic control.

The chief elements in a remote controlled system are the headgates, the penstock valves controlling water to the turbines, the turbine gates, the hydraulic governor, the ventilating system and all switchgear. Automatic plants provide their own protection, thus immediately trouble occurs the unit shuts down automatically.

Remote controlled systems perform operations, indicate what is happening at any time and telemeter hydraulic and electrical data.

Mr. Cardell illustrated his talk with interesting slides.

A. W. Rider moved a vote of thanks on behalf of all present to Mr. Cardell, for his interesting discussion.

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On Saturday, February 17, 1951, the Lethbridge Branch of the Institute and the Association of Professional Engineers of Alberta met at the annual joint dinner meeting at the Marquis Hotel. F. Austin Brownie, president of the A.P.E.A. presided over the meeting.

Dinner music was supplied by the Brown Instrumental Trio. For the musical programme R. S. Lawrence ably led in community singing; piano selections by Mrs. L. Kass, concert pianist, and violin selections by Mr. Jack Fowler accompanied by Mrs. Kass, were enjoyed by all.

Mayor L. S. Turcotte welcomed the engineers to the city stressing that engineers "are the backbone of the development of this country".

Mr. Brownie introduced the speaker, F. J. Stubbs, assistant general manager of Interprovincial Pipe Line Company. Mr. Stubbs outlined the vast amount of research and the many problems that had to be overcome by engineers to construct the pipe line. An aerial photographic survey for reconnaissance was the first step, followed by a ground survey.

Construction of the $90,000,000.00 line was divided into three parts: Edmonton—Regina; Regina—Gretna, Manitoba; and Gretna—Superior.

Discovery of the Leduc field first led to plans for an Edmonton—Regina line, but when the big Redwater oil field blew in engineers decided it was economical to build the line to Superior.

A total of 179,000 tons of high test steel went into construction of the line, with 20-inch pipe from Edmonton to Regina, 16-inch pipe between Regina and Gretna, and 18-inch with thinner walls from the latter point to Superior.

The tankage problem both at Redwater and Superior led to construction of storage space for 3,500,000 barrels. Some $6,000,000.00 worth of machinery was used to build the line at the rate of about 1.2 miles per day for each digging unit. The ditch in which the pipe was buried measured 32 inches wide and 5 feet deep—over plains, under rivers and through forests. A total of 3,000,000 cubic yards of dirt was moved.

The crude, moving at two miles per hour can flow from Edmonton to Superior in 26 days. A total of 20,000 barrels daily is taken out of the Superior end of the line.

The new tankers at Superior which haul the crude to Sarnia, Ontario, have a capacity of 115,000 barrels each, and can make the round trip in five days.

The flow of crude in the huge pipeline can be doubled with the addition of four more pumping stations in Canada and two more in the United States. The construction of these pumping stations is planned for 1951-52.

In conclusion Mr. Stubbs stated that the construction of the pipeline was sponsored by Imperial Oil, but that today the firm retains only one-third con-

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Presidential Visits

Top left — Sarnia. Foreground, Mr. and Mrs. S. V. Antenbring. Background, J. A. Vance, (two hidden), Mrs. Vance, Dr. B. B. Hillary, Mrs. Graeb, Mr. V. A. McKillop.

Second left — Sarnia. Left to right, Mrs. and Mr. P. Toft, Mrs. and Mr. H. L. Canfield, Mrs. and Mr. A. L. Carlisle.

Third left — Sarnia. B. H. Mackenzie and Mrs. Mackenzie, F. Belshaw and Mrs. Belshaw, Mrs. D. Waitzman.

Fourth left — Shawinigan Falls. Mrs. Kirkpatrick, Mr. Vance, R. E. Kirkpatrick, Mrs. de Tonnancour, S. E. Williams, Mrs. C. M. Williams.

Top right — Shawinigan Falls. C. M. Williams, Miss McLaren, Mr. Vance, Mrs. Heartz, Mr. Kirkpatrick, Mrs. Vance.

Second right — Saguenay. Left to right, D. T. Austin, G. Gareau, D. R. C. Morris, R. Bolduc, S. Gaunt, W. A. Armstrong, G. K. Clement.

Third right — Saguenay. Left to right, M. Frederick, R. Belanger, F. A. Dagg, G. T. Malby, A. C. Johnston.

Fourth right — Saguenay. Left to right, W. F. Campbell, R. Boisvert, R. D. McQuire, D. F. Smith.















trol with 42 per cent of the stock in the hands of the public and the remainder with other oil companies.

Coloured films depicting the construction of the pipe line were shown following Mr. Stubbs' talk.

On behalf of all present, A. L. H. Sommerville offered a vote of thanks to Mr. Stubbs for his interesting talk and films.

Moncton

V. C. Blackett, M.E.I.C.
Secretary-Treasurer

Gas, Arcs, Ships and Men, was the subject of an address on welding, delivered at a branch meeting held in the City Hall on February 20th. The speaker was P. H. Take, welding engineer, Halifax Shipyards, Ltd., and consultant for the Dominion Steel and Coal Corp., Ltd. N. B. Eagles, chairman of the Branch, presided.

According to Mr. Take, electric welding, both arc and resistance, has emerged from infancy. Its great versatility is demonstrated by its use in building a ship, or putting the iridium point on a fountain pen.

The new one thousand p.s.i. working pressure boilers for the City of Toronto, and the many electronic tubes used in radio, television and industrial electronics are all welded. Again, as an indication of the magnitude of the arc welding process, the figures of annual electrode consumption in Canada and the United States are astronomically high.

Besides providing a speedy, economical method of joining metals, the process makes obtainable many designs and many articles which would be impossible without its use.

However, electric welding and its allied processes of brazing and soldering require a greater knowledge of the laws of physics, chemistry and metallurgy, etc., than any other industrial process.

The art of welding which has to do with operator technique and qualifications is no longer a problem. The main problems today in arc welding have to do with elimination of notch points, "locked up" and residual stresses, and weldability. They are all on an engineering level.

In respect of this, particularly in construction and larger weldments, it has been found necessary to reconsider many of our former ideas about welded design. Mr. Take illustrated his remarks with a display of numerous samples of welding design.

The thanks of the meeting were extended to the speaker by the presiding chairman.

The following evening Mr. Take repeated his address at Sackville before a joint meeting of the Mount Allison Engineering Society and the Moncton Branch. The meeting was held in the Chemistry Building of the University, and was attended by engineering students and by Institute members resident in Sackville and in Amherst, N.S. The Branch chairman and several of the executive accompanied Mr. Take to Sackville. William Watson, president of the Engineering Society, presided and introduced the speaker. Following the address, a question period lasted one hour. The chairman thanked the speaker for the paper he had presented, and then called on Dr. H. W. McKiel, vice-president of Mount Allison University, who also expressed his appreciation of Mr. Take's address.

Peterborough

J. P. Watts, M.E.I.C.
Secretary-Treasurer

M. V. Powell, M.E.I.C.
Branch News Editor

On Thursday, March 29, the Peterborough Branch heard an address by Mr. Garth Wade on the **Operation of the Nashua Company.** The speaker has a thorough knowledge of his subject as he is the mechanical superintendent of the local plant and has personally supervised the installation of all the equipment in their new modern office and factory. This plant makes a specialty of wrappers such as multi-coloured and waxed covers for bread and produces gummed paper strips. The chief operations carried out at this plant are gumming, printing, waxing and sheeting or cutting into proper sheet sizes. The waxing process presents a few difficulties but printing is the most complicated and difficult part of the work. Modern methods are used by the Nashua plant in printing wrappers in three or more colours. The making of plates and type-setting is not ordinarily done at Peterborough but the rest of the work is carried on here. A powerful press makes the impression of the plate in the tympan sheet while it is flat and this sheet is then held in the arc of a circle in the casting box while type metal is cast against it to form part of the circular surface of a printing roll. For three colours, a press having three printing rolls, one for each colour, must be used and the registering of one colour with relation to the preceding presents an ever present and serious problem. Mr. Wade was introduced by the chairman, A. Bonney, and R. Hailey expressed the thanks of the audience.

After the lecture, the members and friends visited the Nashua Plant. The modern office building possesses up-to-date air-conditioning and lighting, fine furniture and large plate glass windows overlooking spacious grounds. During the trip through the factory, the visitors saw a large machine putting the gummed surface on brown paper and several large printing presses and waxing machines in operation. The power plant, pattern and repair shops were inspected, and in another department Mr. Wade demonstrated the operation of the various machines used in making the type metal printing rolls.

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The Peterborough Branch on March 1. heard a discussion by Mr. Ira Sylvester, technical sales engineer, Diesel Division of the Montreal Locomotive Works. His subject was **Canadian Diesel-Electric Locomotive Progress.** The speaker's experience in the application of diesels to railway motive power extends over 25 years. He served first with the C.N.R. and during this time was a member of the crew of the self-propelled diesel-electric car which made the first and record setting Montreal to Vancouver run of 3,000 miles in 67 hours in 1925.

Mr. Sylvester emphasized the fact that modern railways are continually demanding faster service and greater tonnage per day over their lines. This

Presidential Visits

Top left — Saguenay. Left to right, E. N. Coulthart, W. W. Robertson, I. J. Adair, C. W. Adams, H. J. Butterill, D. F. Nasmith, S. Herdan, Montreal.

Second left — Quebec. At the meeting of the Quebec Branch of the Garrison Club. Left to right, Hector Cimon, A. Lariviere, Dean Pouliot, the president, Branch Chairman J. St. Jacques, A. R. Decary, J. O. Martineau.

Third left — Quebec. During his visit to Laval University, Mr. Vance presented the certificate of the 1950 student prize to Marius Morais.

Fourth left — London. Left to right, Mrs. Humphries, Mr. McKillop, Mrs. Scroggie, Geo. Humphries, Mrs. McKillop, E. V. Buchanan, Mrs. Vance, Geo. Scroggie.

Top right — London. Left to right, Mrs. Code, R. G. Code, N. Meikle, Mrs. Meikle, Mrs. Howard, D. W. Howard.

Second right — Border Cities. Clockwise, Mrs. Blowey, H. J. A. Chambers, Mrs. Lusby, C. G. Walton, Mrs. Chambers, J. F. Blowey, G. W. Lusby.

Third right — Border Cities. Left to right, S. E. McGorman J. A. Vance, Mrs. F. J. Ryder, Winnipeg.

Fourth right — Border Cities. Left to right, Mrs. Fetherstonhaugh, Past-President E. P. Fetherstonhaugh, Mrs. McDonald, Dean A. E. McDonald, Mrs. Mohammed, Abe Mohammed.

calls for more and more power and pure electric locomotives have solved this problem only in special locations but it has been proven that the diesel-electric locomotives are the real solution as they combine the advantages of both steam and straight electric drives. With lantern slides, the speaker traced the evolution of the diesel-electric locomotive from the early self-propelled cars to the modern switchers and the stream-lined mainliners. The first important decision reached in the early investigation was that fuel oil was safer and much more economical than gasoline, or distillate. The diesel-electric switcher quickly evolved from the first plain box type to a wide cab and narrow engine for better visibility and finally to the modern steeple type cab located at the centre and raised above the engine giving a clear view in all directions. Switchers have retained the heavy frame at coupling level. The main line diesel-electric locomotives have their strength built into their side frames and also for passenger service must incorporate steam boilers. The main line diesel-electrics are built in two types, one with a cab and the other without a cab and arranged so that it may be coupled back of the first and controlled as a unit with it. Thus for specially heavy trains or winter service extra power is available without doubling the crew.

Diesel engines show greater fuel economy than steam and also do not require great quantities of water and such frequent overhauling. A great increase in power for the same cylinder size has been obtained by special scavenging pumps, adjustable plunger fuel injection pumps and recently a new type turbocharger driven by an exhaust gas turbine. This increase in power is illustrated by the fact that in the past 12 cylinders 12 in. by 12 in. developed 1,300 hp., whereas now only 12 cylinders 9 in. by 9 in. are required. Mechanically, the engines have been narrowed down to suit the space available. Bearing areas are larger, full lubrication employed and piston rings are cooled by lubricating oil. Cooling water spaces are smaller and cylinder liners and other parts are easily replaced.

A moving picture "Railroading on the Marybrook" illustrated that the use of diesel-electric locomotives greatly facilitated the sorting of up to 1,000 cars per day at the Marybrook yard and in hauling them up the heavy grade on their way east. Now a three-unit diesel-electric makes this climb more smoothly than four or more steam locomotives did previously. On the downhill run brakes are saved and finally higher speed can be maintained over the last bridge which is 200 ft. high.

Mr. Sylvester was introduced by Eric Whiteley and thanked by Hubert Sills. A. J. Bonney was chairman.

Saguenay

F. E. Hogg, M.E.I.C.
Secretary-Treasurer

W. A. Armstrong, Jr.E.I.C.
Branch News Editor

On March 13th a smoker was held in the Saguenay Inn on the occasion of the official visit to Saguenay Branch of the President, Mr. J. A. Vance.

The President and Mrs. Vance were welcomed on their arrival in Arvida by members of the Branch executive and their wives, and taken on a tour of the district.

The smoker was held at 8.30 p.m., and was attended by over fifty Branch members. B. L. Davis acted as chairman in the absence of F. W. Barker. Good fellowship was the keynote of the evening, with Dr. L. Austin Wright adding some of his interesting anecdotes.

Mr. Vance expressed confidence in Canada's future industrial development, and in the ability of the engineering profession to contribute greatly towards this development. He regretted the present deficiency of engineers, and foresaw a continued demand for more engineers than our universities are now graduating. In fact, many enterprises are being delayed due to the present shortage of trained men.

The president reviewed the highlights of his visits to the other districts, touching on his trip to South Africa to attend the conference of Commonwealth Engineering Societies. Dr. Wright described in some detail the efforts of the E.I.C. to promote the interests of the profession in Canada.

The matter of refreshments was in the capable hands of Jules Mercier.

Junior Section

R. H. Singleton, M.E.I.C.
Secretary-Treasurer

The annual dinner meeting of the Junior Section of the Saguenay Branch was held in the Grill Room of the Saguenay Inn, Arvida, Tuesday evening, April 10th. After a very enjoyable dinner, Chairman H. V. Page introduced Mr. A. C. Wilkinson, advertising and sales promotion manager of Electrolux (Canada) Limited, who spoke on **The Fitly Spoken Word.**

The speech, which was presented in a brilliantly eloquent manner, brought home the moral contained in the biblical quotation "The fitly spoken word is like apples of gold in baskets of silver". Simplicity and sincerity are the prime requisites of good speech. The hearers were definitely left with something to think about. Although of a serious vein, the speech was appropriately spaced with flashes of wit and humour. The speaker was thanked by Mr. M. Fredericks, vice-chairman, and the very keen appreciation of the audience was expressed by the enthusiastic applause.

Mr. Wilkinson's talk was followed by short speeches by Mr. L. C. Wellington, assistant manager of Canada's Aluminum Company of Canada's Arvida Works, and by Mr. A. Cunningham, chief engineer ,of the Price Brothers, Kenogami, paper mill. Following this, some interesting films were shown and the evening's entertainment concluded with a singsong.

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Mr. S. Mitescu of the Aluminum Company of Canada's Arvida Works addressed the Saguenay Junior Section Wednesday evening, March 28th. His topic was **Monetary Problems in Foreign Trade.**

Mr. Mitescu, a Rumanian chemical engineer, was in charge of Rumania's foreign trade office for a number of years between the World Wars. Despite his limited experience in conversing in the English language, the speaker presented a very informative general discussion of the topic with special reference to Rumania. The different types of international monetary systems, gold standard, etc., and the reasons why these systems were adopted were clarified as well as many other monetary aspects of foreign trade. A very lively discussion period followed.

Saint John

W. M. Brenan, M.E.I.C.
Secretary-Treasurer

S. V. Grisdale, M.E.I.C.
Branch News Editor

The joint annual dinner of the Saint John Branch of the Engineering Institute of Canada and the New Brunswick Association of Professional Engineers was held in the Admiral Beatty Ball Room on January 25th.

The speaker of the evening was Mr James M. H. Fraser, general superintendent of the Saint John Drydock Co. Limited. Mr. Fraser described at some length, the operation of the Drydock and related the details of some of the more interesting jobs which have been handled there in the past.

Mr. Fraser pointed out that the Drydock is large enough to handle practically any vessel afloat and facilities are available to make repairs of any kind. Special equipment for sewage disposal and to supply fresh water, power and telephone service permits the ship's company to live aboard, even when the ship is literally in the Drydock.

The speaker was introduced by Mr Andy Watt.

At the dinner the first award of the new scholarship of $200.00 was presented by Mr. J. P. Mooney, to Mr. Richard A. Hughes, a fourth year student at the University of New Brunswick. This scholarship was presented by the Association of Professional Engineers of the Province of New Brunswick and is to be open for annual competition.

Mr. W. R. Godfrey, director of works for the City of Saint John, and Chairman of the Saint John Branch of the Engineering Institute of Canada presided at the dinner.

Sarnia Branch

G. R. McMillin, M.E.I.C.
Secretary-Treasurer

C. M. Stewart, Jr.E.I.C
Branch News Editor

On February 22, 1951, the Sarnia Branch dinner meeting took the form of a forum on **Civil Defence.** This problem has been drawing a considerable amount of current interest, especially in Sarnia, the "Chemical Valley of Canada".

Guests of the Institute were Mr. H Turnbull, D.F.C., the Sarnia City Council representative on the Civil Defence Committee; Dr. R. E. Sidenberg, the medical adviser for Civil Defence; Mr. W. Greenwood, city engineer; and Group Captain D. Harding, O.B.E., A.F.C., who, together with Branch Chairman C. P. Sturdee, led the discussion and put forward a clear picture of what was required to provide an efficient, well-organized civil defence programme.

Civil defence becomes necessary when some form of attack, either by sabotage or bombing, is encountered. Its purpose is to keep the basic services functioning during the emergency period and to assist in restoring the situation to normal as soon as possible.

The primary aspects of civil defence

are public education for the emergency and the planning and organization work required to set up the machinery to handle the secondary problems such as warning systems, fire fighting, medical services, evacuation, and repair of damage which are actually encountered during the emergency period. These primary problems are at present under study and it was strongly emphasized, that with general public interest and assistance, together with the required financial support, this problem could be handled; but civil defence is everybody's job and its success or failure depends upon the individuals of the community.

As this problem is of international interest, a number of members of the Bluewater Chapter of the Michigan Society of Professional Engineers were in attendance.

The guest speakers were thanked by Mr. D. D. Livingstone for their interesting presentation of the various aspects of this problem and for their informative answers to the numerous questions raised by the membership at large.

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On March 7, the Sarnia section of the Institute, at a dinner meeting in the Sarnia Riding Club, honoured the occasion of the Presidential visit by Mr. J. A. Vance and his party.

Accompanying Mr. Vance was his wife, Mr. and Mrs. V. A. McKillop, London Branch councillor and Dr. L. Austin Wright, general secretary of the Engineering Institute of Canada. Mr. C. P. Sturdee, Chairman of the local section, as master of ceremonies introduced these guests and also the following from the Bluewater Chapter, Michigan Society of Professional Engineers—Mr. A. Carlisle, vice-president, and Mr. Howard H. Canfield, secretary of the Bluewater Chapter.

Mr. Vance extended his best wishes to the Sarnia Branch and stated that as a result of his recent trip to Western Canada he had found that everything points to Sarnia. For example, oil fields are being opened up in Alberta, pipelines are being built across Saskatchewan and Manitoba, new oil tankers are being constructed at the Lakehead cities and industries in the Sarnia area themselves are in the midst of considerable industrial expansion.

The president expressed satisfaction that some thinking had been done about civil defence since there is much that engineers can accomplish in this matter. An instance of their co-operation with the armed services was evident during the Manitoba floods in the spring of 1950. Mr. Vance also urged that engineers work closely for and with groups such as the Chamber of Commerce.

The president urged those who could contribute voluntary subscriptions should do so. There are two main purposes for asking voluntary subscriptions. First E.I.C. operational costs have increased as have all others; secondly, these subscriptions should help keep the assessed fees at their present level. The council is reluctant to raise fees—especially when there are so many young members who could not readily afford to pay increased fees, though they belong to other professional provincial engineering groups and American engineering societies. Many of these other groups have already decided to raise their fees.

Mr. Vance gave his views of recent trips to most parts of Canada. He has found that the demand for young engineers is on the increase and expressed the opinion that industry will be able to find places for all engineers our Universities can graduate for a good many years, in view of Canada's expanding industrial development. At present the Province of Alberta is leading in expansion and development. This is due to the oil and gas industries and also irrigation programmes. The St. Marys River Dams are examples of what Canadian engineers are learning about building earth dams and good irrigation projects.

Newfoundland is another region that has shown increased industrial development, especially in lumber, mining, and paper industries.

The president concluded his address by stating again that the future looks bright for all engineers and those who will graduate in future years from our engineering schools. He believes that for those young engineers who are not looking for security, the north and west will bring just and satisfying rewards.

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On Wednesday, April 4th, Mr. W. J. Muller of the Bingham Pump Company, New York, addressed a capacity audience of approximately seventy members of the Sarnia Branch, in the Imperial Oil Auditorium. Mr. G. R. McMillin presided in the absence of Chairman C. P. Sturdee, and conducted a short business meeting. The speaker, who was introduced by Frank Belshaw, spoke on the subject of **Centrifugal Pumps.**

Mr. Muller began his discussion of centrifugal volute type pumps by a consideration of the two major design factors in these types of pumps, namely those of axial and radial thrust forces. For example, a horizontal double suction

President J. A. Vance visited the Sarnia Branch in March. Upper photo, left to right, Dr. L. Austin Wright, general secretary; Mrs. C. P. Sturdee, Mr. and Mrs. J. A. Vance; and Branch Chairman C. P. Sturdee.

The lower photograph includes, from left to right, L. M. Dunn, state director of Michigan Society of Professional Engineers; R. A. Cosgrove, president of the Blue Water Chapter of the Michigan Society of Professional Engineers; H. B. Turnbull, city council representative on the Civil Defence Committee; C. P. Sturdee, chairman of the Sarnia Branch of the E.I.C.; and Dr. B. B. Hillary, past chairman of the Sarnia Branch.

volute pump is balanced axially because the suction pressure is equal on each side of the impeller. A single suction pump is not thus inherently balanced, and requires some method such as use of ribs or holes drilled through the back of the impeller to attempt to equalize this axial thrust. Also, the resultant of radial thrust forces may seriously affect the life of a pump, particularly on a single volute pump. At peak efficiency, this radial force tends to become balanced. Therefore if a pump is bought oversized for any particular service, it will necessarily be operating at a low efficiency and the radial thrust will be unbalanced. Flexing of pump shafts, resulting in bearing or mechanical seal difficulties frequently result.

The speaker illustrated his address with slides showing sections through the major volute pump types, such as the single and double suction, double volute and multi-stage horizontal and deep well turbine type pumps. The selection of various pump types to obtain the desired characteristics of head and capacity was explained. The importance of having a correct "net positive suction head" to prevent flashing of hydrocarbon liquids was also described. If the pump NPSH is unsuitable for the liquid to be pumped, vapour flashing within the pump could seriously upset hydraulic balancing forces for which it is designed, resulting in shaft deflection and seizure.

Following a question period, Mr. John Baxter expressed the appreciation of the gathering to Mr. Muller for his interesting address.

Sudbury

Dennis McKinty, jr.e.i.c.
Secretary-Treasurer

The Sudbury Branch was visited by the regional vice-president, Mr. W. J. W. Reid, on April 6, 1951. Mr. Reid was entertained at luncheon by the branch executive, all resident members being present to hear valuable counsel on branch problems.

In the afternoon, Mr. Reid was taken on a tour of the local Air Force radar station by Russ Eaton and Dennis McKinty, and was interviewed by radio station C.K.S.O.

The general dinner meeting was attended by thirty-seven members.

Mr. Reid, introduced by Russ Eaton, commenced by congratulating the Branch on its success during the first year since inauguration. He said the Branch could feel proud of its attendance record.

For his subject, Mr. Reid had chosen **Management,** and more particularly the art of dealing with people, this phase being the most foreign to those trained in engineering. He defined management as the art of directing human effort.

From among the many responsibilities of management, Mr. Reid elaborated on the following:

(a) unity of command; each man should be responsible to only one boss;
(b) division of responsibility; each man should know exactly what responsibility he has; this could possibly be achieved with a system of job description;
(c) co-ordination; the organization should be such as to encourage co-operation between departments on the same level without going through department heads—a true manager should only see people in trouble.

Mr. Reid stressed the necessity of employee co-operation to achieve maximum production. Yet no standard set of conditions would ensure the necessary harmony. Consequently no formula could be set up to give the answer to management's biggest problem

In conclusion, Mr. Reid pointed out that management should watch its public relations, to foster the goodwill of the people and, therefore, of the government.

Len Lane thanked the speaker on behalf of the Branch.

It was announced that the annual meeting would be held on May 7, 1951, and would be in the form of a "Ladies Night".

Vancouver Island

W. A. Bowman, jr.e.i.c.
Secretary-Treasurer

The Branch completed, early in April, a letter ballot on the change of name of the Victoria Branch. A decisive majority of returned ballots were in favour of the change, and the Branch is therefore officially known as the "Vancouver Island Branch."

Hamilton

Engineers' Wives Association

For the December 1950 meeting the Association tried to support the Branch by attending the Engineering Institute's First Ball, held at the Brant Inn where Mr. and Mrs. Vance were special guests.

The January 9th, 1951 meeting at the Cawesco Club, Hamilton (Engineers Club), was a business meeting wherein our constitution was discussed and the members became better acquainted.

The February 13th meeting was in the form of a Box Social, where the ladies had as guests their husbands, in the tune of St. Valentine's theme. An enjoyable time seemed to be had by all and dancing and cards were the entertainment.

A feature of the January meeting was a special motion that Mrs. L. C. Sentance became a permanent Executive during her lifetime in recognition of her deep devotion and work in developing the organization and to keep her special knowledge available to incoming Executive in the future.

Also, there has been some change in the Executive owing to demands of distance, and for convenience. The Honorary President is Mrs. Bailey; president, Mrs. George L. Schneider; vice-pres., Mrs. J. Arthur Reid; recording secretary, Mrs. Leslie C. Galloway; corresponding secretary, Mrs. V. T. L. Vollmer; treasurer, Mrs. F. J. Veale; social and programme convener, Mrs. John Carruthers; membership secretary, Mrs. J. Tyerman; permanent executive, Mrs. L. C. Sentance, who was honorary president last year.

Headquarters Records

Each time the *Journal* or other Institute mail is dispatched we are advised of undeliverable items due to incorrect addresses. Our records staff must follow up these changes and the regular service to members suffers thereby. *Please* advise headquarters when your address or occupation changes. The form below can be completed, clipped, and mailed to headquarters in a few moments.

Please Print

Name..
Surname Given names

Home Address.. ☐

Employer..

Employer's Address.. ☐

(Check address to be used for Institute mail.)

Product or Service..

Position or Title...

Degree, Year & College......................................

Advise Headquarters Promptly of Changes

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment.*

Situations Vacant

CHEMICAL

TWO CHEMICAL ENGINEERS required by paper company located in Province of Quebec. Applicants should have at least one year's experience in chemical laboratory work or related fields. Recent graduates of chemical engineering or general science will also be favourably considered. Apply to File No. 2098-V.

CHEMICAL ENGINEERS required by organization in Ontario. Plant experience preferred but not necessary. Salaries open. Apply to File No. 3015-V.

CHEMICAL ENGINEER required in central Ontario, with three to five years experience, preferably in a petrochemical industry. Salary open. Apply to File No. 3016-V.

CHEMICAL ENGINEER required for Ontario bleached sulphate pulp and paper mill. Pulp and paper experience desirable but not essential depending on age. Apply giving full particulars as to personal, education, experience, references to File No. 3029-V.

CIVIL

CIVIL ENGINEER required by firm of consultants in Montreal with considerable experience in reinforced concrete and some pre-stressed concrete design work. Applicant must be capable of working with a minimum of supervision and be capable of taking charge of a design group. Apply to File No. 3001-V.

CIVIL ENGINEER 1949 or 1950 graduate required in Montreal with some experience in concrete design or construction. Salary open. Apply to File No. 3013-V.

PROFESSOR OF CIVIL ENGINEERING required by university located in Ontario. The person appointed will be required to take charge of courses in highway engineering and to assist in associated civil engineering courses. Applicants should have had not less than ten years practical experience, part of which must have been spent in highway engineering. They should have graduated from a recognized university and post-graduate study will be considered an asset. An interest in soil mechanics is desirable. Salary, according to qualifications, up to $5,000.00. Apply to File No. 3014-V.

GRADUATE CIVIL ENGINEER required as transitman for railway company located in Province of Quebec. Starting salary $250.00. Apply to File No. 3025-V.

CIVIL ENGINEER required with about six years experience on construction of all types, by young progressive organization located in Province of Quebec. Applicant must have good personality and be thoroughly bilingual. Excellent opportunities offered. Starting salary about $5,000.00. Apply to File No. 3031-V.

TWO GRADUATE CIVIL ENGINEERS with a few years experience in heavy construction, preferably with contractors and on power house construction, required by large public utility in Province of Quebec. Salaries open. Apply to File No. 3035-V.

CIVIL ENGINEER, experienced, required by city in Eastern Ontario to act as building and plumbing inspector and to assist in the engineering department. Full employee benefits, salary according to qualifications. Apply to File No. 3037-V.

ELECTRICAL

ELECTRICAL ENGINEER required in Ontario with experience in the application of electrical wire and cable, or electrical engineer who has had at least a few years experience in some aspect of the electrical cable industry, either with a cable manufacturer or in the distribution department of a public utility. Salary open. Apply to File No. 2097-V.

ELECTRICAL ENGINEER required in Ontario. Age 25 to 35 years. Duties include product design development and engineering of small AC and DC motors. Excellent starting salary and future prospects. Apply to File No. 3041-V.

MECHANICAL

YOUNG MECHANICAL ENGINEER to act as expeditor in the purchasing department of organization in Montreal. Applicant should be between 30 to 35 years and be free to travel 50% of the time. Material handled would be all types of heavy equipment in connection with smelting plant. Apply to File No. 3019-V.

MECHANICAL ENGINEER required by organization in Montreal. Applicant should have had experience in production planning and the design and application of mechanical equipment to production operations. Duties will include research and the development of mechanical equipment for one of the primary industries. Preferably single and free to travel. Apply to File No. 3020-V.

MECHANICAL ENGINEER 1949 or 1950 graduate with some experience in heating or combustion engineering or ventilating and air conditioning, required by firm in Montreal. Apply to File No. 3021-V.

MECHANICAL ENGINEER required by firm of consultants in Montreal with some knowledge of heating and ventilating. Apply to File No. 3023-V.

MECHANICAL ENGINEERS 1950 graduates required by manufacturer in Montreal of heavy industrial equipment. Salary open. Apply to File No. 3030-V.

MECHANICAL ENGINEER, with 3 to 5 years experience in steam plant design and layout, required for draughting, design and project engineering in West Coast consulting engineers' office. Salary open. Apply to File No. 3040-V.

MECHANICAL ENGINEER required by architect's firm in Ontario. Applicant should be 30-45 years of age and a graduate mechanical engineer and have from five to ten years experience in the design of heating, ventilating, plumbing and electrical installations. Starting salary will be $4,500 to $6,500 depending on qualifications. Apply to File No. 3042-V.

MISCELLANEOUS

TOWN ENGINEER required in Ontario. Duties to commence any time after April 15, 1951. Apply to File No. 2099-V.

PRODUCTION ENGINEER required as an assistant to the production manager of a company manufacturing electrical switchgear and allied products in British Columbia. Graduate engineer preferred with some experience in production work. Reply in writing with particulars of qualifications to File No. 3000-V.

A MATURE GRADUATE ENGINEER with 10 years experience in the operation of ore dressing and hydrometallurgy plants is required, to take charge of hydrometallurgical ore treatment plant of 750 tons per day with ultimate capacity 1500 to 2000 tons. Position requires sound background in chemistry and chemical plant control equipment. The position offers excellent opportunities for advancement in a growing organization. Reply with full details of experience, educational background, marital status to File No. 3002-V.

WE ARE SEEKING a top quality business minded engineer with good executive drive for a new and modern coal mining operation in Alberta. Both strip and underground operations are involved. This man will work with the mine manager and be responsible to the managing director for all business aspects; planning, control, purchasing, etc. Underground mining experience is not a prerequisite but some experience in business administration and/or in dirt moving operations with heavy equipment would be desirable. Present accommodation is limited but the opportunity for other interests controlled by the same principals, is excellent. The salary is open. Apply to File No. 3004-V.

YOUNG GRADUATE ENGINEER, preferably two or three years experience in instrument process controls, sales and estimating work. Preferably bilingual but not essential. Salary depending on experience. Apply to File No. 3005-V.

ENGINEERS REQUIRED by firm of consultants in Montreal. Civil, mechanical, electrical and structural engineers and draughtsmen, also petroleum engineer required with some experience. Salaries open. Apply to File No. 3007-V.

EXPERIENCED INSTRUMENT ENGINEER required in Montreal. Permanent appointment for a man between 25 and 35 years of age and A.1 medical category. He should be able to select proper equipment for new jobs also interpret results and calculate correction factors of instruments. He must have experience and ability to organize instrument maintenance and carry out normal repairs. Apply to File No. 3010-V.

WANTED RESEARCH SCIENTIST. Salary $5,850 to $6,850 depending on qualifications and experience. Duties to direct laboratory research and pilot plant development work in the chemistry of explosives and propellants. University graduate preferably at the Ph.D. level; five to ten years' experience in explosives or propellant research or in related fields; administrative experience. Canadian citizen. Apply to File No. 3011-V.

STRUCTURAL DESIGNERS AND DRAUGHTSMEN, familiar with structural steel and reinforced concrete work required by firm of consultants in Toronto. Apply to File No. 3012-V.

ENGINEERS REQUIRED by firm of consultants in Toronto capable of taking responsibility for phases of electronic and mechanical equipment sales and engineering, mining or industrial plant construction. Apply to File No. 3012-V.

DESIGN ENGINEERS, mechanical or chemical required in Ontario. Should have one or more years' experience in the chemical or allied industry. Salary open. Apply to File No. 3015-V.

SAFETY ENGINEER assistant, recent graduate in chemical or mechanical engineering with an interest in plant safety work. Location Ontario. Salary open. Apply to File No. 3015-V.

ELECTRICAL AND MECHANIAL ENGINEER required by electrical organization in Ontario, presently engaged in the conversion programme of industrial firms. Applicants should have some industrial experience. Apply to File No. 3017-V.

APPLICATIONS ARE BEING INVITED for the position of engineering assistant in the city engineer's department of city in Western Canada. Applicants must have a degree in civil engineering or equivalent and preferably some municipal or consulting engineering experience. The position could be permanent for the right type of man who is conversant with hydraulic and concrete design and who has the ability for dealing tactfully with the public. Salary $250.00 up depending on experience. Applicants should write giving concise details of age, marital status, education, experience, references and when available. Apply to File No. 3018-V.

RESIDENT ENGINEERS required by firm of consultants in Ontario, for large construction projects. Applicants should be experienced and be thoroughly bilingual. Apply to File No. 3022-V.

ESTIMATOR, preferably graduate engineer experienced in quantity survey as relative to building construction. This is a permanent position with a good initial salary and the prospects for advancement would be excellent for the right man. Location Ontario. Apply to File No. 3026-V.

SALES & SERVICE ENGINEER in the water treatment field for manufacturer supplying chemicals and equipment to all types of industries throughout Canada. Engineering graduates with 2 or 3 years experience or 1951 graduates Territory Quebec and Ontario with considerable travelling. Car provided travelling expenses paid. Salary based on qualifications. Apply to File No 3027-V.

JUNIOR ENGINEER with a knowledge of sanitary engineering required by large inter-municipal corporation in Western Canada. Duties include preparation of plans and specifications, to layout and supervise construction and maintenance, to make reports of investigations of special engineering problems. The immediate problems are additions to present facilities and enforcement of the regulations to industrial wastes. Salary open. Apply to File No. 3028-V.

SALES REPRESENTATIVE at Montreal and Toronto by British machinery and tool importers, experienced in pulp and paper making machinery of value but not essential. Apply to File No. 3033-V.

VACANCIES EXIST with major oil company having operations in several South American countries for:—District Electrical Superintendent, Electrical Engineer, Senior Chemist (refinery), Assistant Chief Chemist (refinery), Junior Mechanical Engineer. Interested parties should submit full details of qualifications. All replies will be held in the strictest confidence and should be addressed to File No. 3034-V.

THE PUBLIC SERVICE OF CANADA requires an engineer, a graduate in mining or metallurgical engineering with training in mineral economics $4,272.00 to $4,896.00, for the department of mines and technical surveys at Ottawa. Details and application forms at Civil Service Commission Offices, National Employment Service Offices and Post Offices. Apply to File No. 3039-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMICAL ENGINEER required to take charge of process development group. Applicant should have at least five years development and production experience in chemical industry. Position in Ontario. Salary open. Apply to File No. 1335-V.

TWO JUNIOR OR INTERMEDIATE CHEMICAL ENGINEERS for the control department of pulp and paper industry in the Maritimes. Duties would be in connection with control and process work. Apply to File No. 1650-V.

CHEMICAL ENGINEERS with production ability, to operate chemical equipment such as filter presses, evaporators, vacuum jets, solvent recovery, etc. Location Valleyfield, Quebec. Excellent opportunity offered. Salary open. Apply to File No. 2053-V.

YOUNG CHEMICAL ENGINEER required in plant located in Province of Quebec. Applicant would be obliged after completing training period to take charge of analytical laboratory and to co-ordinate production with control both in alcohol distillery and in magnesia insulation plants. Preferably under 30 years of age with 1 or more years industrial experience. Apply to File No. 2054-V.

CHEMICAL ENGINEER 1949 or 1950 graduate required by large pulp and paper industry located in Province of Quebec. Apply to File No. 2059-V.

CHEMICAL ENGINEER required to head department of chemical technology in the Indian Institute of Science, Bangalore. Candidate should possess high academic qualifications in chemical technology, together with considerable research and teaching experience. Should have knowledge of design and operation of chemical pilot plants. No age limit is prescribed. Duties will involve instruction of personnel. This is the foremost research institute in India and has well established post-graduate departments of aeronautical engineering, electrical communication engineering, metallurgical engineering, internal combustion engineering, power engineering and electrical technology and chemical engineering and chemical technology. Post of head of chemical technology has been vacant for sometime. Apply to File No. 2077-V.

CIVIL

CIVIL ENGINEER required by large firm in Ontario, with about 10 years structural experience. Applicant must be experienced and able to assume responsibility. Apply to File No. 1644-V.

CIVIL ENGINEERS required by large construction company in Montreal. Applicants should have 2 or 3 years experience in field and general construction. Apply to File No. 2034-V.

YOUNG CIVIL ENGINEER with knowledge of reinforced concrete structures. Duties include supervision of concrete construction in Quebec, measurements on the work, drawings, reports and process estimates. Applicant must be bilingual. Reply in writing, giving full particulars as to experience, qualifications and salary expected to File No. 2060-V.

CIVIL ENGINEER required by engineering department of construction company. Duties include estimating, laying out construction work and engineering supervision. Salary dependent upon ability. Reply giving complete details of background and experience. Apply to File No. 2064-V.

CIVIL ENGINEER with at least ten years experience in design and detail of steel and reinforced concrete structures for Montreal office of consulting engineering firm. Salary open and possibility of association to right man. Apply to File No. 2091-V.

ELECTRICAL

GRADUATE ELECTRICAL ENGINEER required in the Province of Quebec as sales engineer for established wire and cable company. Experience in power field desirable. Salary open. Apply to File No. 1570-V.

ELECTRICAL ENGINEERS with experience in electronics and radar for positions in Ottawa. Salaries open. Apply to File No. 1588-V.

THE PUBLIC SERVICE OF CANADA requires Electrical Engineers (electronics and communications). Appointments at Ottawa, Toronto and Montreal. Salaries up to $4,740.00 per annum. Details and application forms may be obtained by writing Civil Service Commission, Ottawa. Competition No. 50-158-B. Apply to File No. 2016-V.

ELECTRICAL ENGINEER with at least five years professional experience, a substantial part of which should have been in hydro-electric central station and substation design. Salary $325.00 to $400.00 per month depending on qualifications and experience. Location Victoria, B.C. Apply to File No. 2073-V.

ELECTRICAL ENGINEER required by large organization in Montreal with about five years experience in general electrical engineering, preferably in the transportation field. Salary range $350.00 to $400.00 per month. Apply to File No. 2074-V.

YOUNG ELECTRICAL ENGINEER with about three years experience required by manufacturer located in Montreal. Applicant would be obliged to do some mechanical work in general plant engineering. Apply to File No. 2075-V.

ELECTRICAL ENGINEER required to head the departments of power engineering and electrical technology in the Indian Institute of Science, Bangalore. Candidate should have a doctorate or master's degree in electrical engineering from a recognized university, 15 years' experience in a responsible position in large power project, experience in guiding research and in the execution of large power projects. No age limit is prescribed. Duties will involve instruction of personnel. This is the foremost research institution in India, and has well established post graduate departments of aeronautical engineering, electrical communication engineering, metallurgical engineering, internal combustion engineering, power engineering, and electrical technology and chemical engineering and chemical technology. Post of head of the power engineering and electrical technology departments has been vacant for same time. Apply to File No. 2077-V.

ELECTRICAL ENGINEER, who is familiar with and particularly interested in the application of control equipment and the producing of wiring diagrams, required by manufacturer of conveying machinery located in Ontario. Apply to File No. 2082-V.

EXPERIENCED ELECTRICAL ENGINEER, preferably between 28 and 35 years of age required by paper industry located in Ontario. Not absolutely necessary, but preferably with design and practical experience in pulp and paper mill. Apply to File No. 2083-V.

ELECTRICAL ENGINEER, with at least 4 years experience in electrical field, preferably on substation layout and installation, required by P.U.C. with a total load of about 250,000 hp. and operate their own generating stations. Location about 100 miles north of Toronto. State wages expected, age etc. Apply to File No. 2096-V.

ELECTRICAL DRAUGHTSMAN, with at least 6 years experience required by P.U.C. of about 25,000 hp. State wages expected, age, etc. Apply to File No. 2096-V.

MECHANICAL

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for ordinary colliery plants screening equipment. Hoists, simple steel structures, etc. Salary open. Apply to File No. 1332-V.

MECHANICAL DESIGN ENGINEERS required by West Coast pulp and paper mill. Previous pulp and paper experience desirable but not necessary and consideration will be given to all applicants with industrial experience. Salaries from $3,600.00 upwards commensurate with experience. These are permanent appointments in a well established mill. Apply to File No. 1582-V.

MECHANICAL ENGINEER required by large firm in Montreal. Applicants should have experience in the pulp and paper industry particularly in the design and for operation of paper making machinery. One or two years experience desired. Salaries open. Apply to File No. 1600-V.

MECHANICAL ENGINEER required by large firm in Montreal to act as railroad car engineer. Applicant should have 2 or 3 years (or more) of experience in the design of tank cars, as defined by the Association of American Railroads. Familiarity with the requirements of the A.A.R., the I.C.C., the Bureau of Explosives and the Board of Transport Commissioners is essential. Salary open. Apply to File No. 1603-V.

MECHANICAL ENGINEERS with design experience and ingenuity required for an aggressive Canadian firm manufacturing electronic and mechanical controls and instruments. Project engineers and junior engineers required. Salaries open. Apply to File No. 1609-V.

MECHANICAL ENGINEER required immediately for sales department. Large company requires the immediate services of mechanical engineer, for its sales department, preferably bilingual. This is a permanent salaried position, with well established company. State age, education and outline all experience. All replies treated in confidence Apply to File No. 1620-V.

MECHANICAL ENGINEERS required by large manufacturing firm located one hundred miles from Montreal. Excellent opportunities for experience and promotion in time study standards department eventually leading to shop management. Apply to File No. 1621-V.

MECHANICAL ENGINEER required in Province of Quebec with some plant experience. Duties include design and plant layout work. Apply to File No. 1648-V.

MECHANICAL ENGINEER with knowledge of industrial steam power plant design, heating system design and application of steam, air and hydraulics as applied to processes, required by large established company. 5 years or more experience desirable location Montreal. Salary open. Apply to File No. 1655-V.

MECHANICAL ENGINEER 25 to 30 years of age required for manufacturer of spun synthetic textile yarns at Granby, Quebec. The plant superintendent is a graduate mechanical engineer and the position is that of assistant superintendent. Duties will include planning production, the maintenance of the machines, planning and installation of a new machinery and daily contact with all levels of personnel. Salary will be dependent on the experience of successful applicant. Minimum $300.00 per month. Apply to File No. 1700-V.

MECHANICAL ENGINEER wanted, with designing experience and mechanical ability, plus a desire to become sales engineer. by manufacturer of road building machinery located in the Province of Quebec. Good speaking knowledge of French is necessary. Apply to File No. 2037-V.

MECHANICAL ENGINEER required as assistant to chief inspection of large oil company in Montreal. Applicant should have at least three years experience in plant maintenance, involving shop fabricating methods and inspection. Knowledge of metallurgy and familiarity with corrosion problems an asset. Salary open. Apply to File No. 2052-V.

MECHANICAL ENGINEER REQUIRED for engineering office of large oil company. Applicant should have minimum of two years' experience in design and layout of mechanical equipment. Working knowledge of pressure vessel design an asset. Location Montreal. Salary open. Apply to File No. 2052-V.

MECHANICAL ENGINEER with 3 to 5 years experience in maintenance engineering. An asset if bilingual but not necessary. Location: Valleyfield, Quebec. Excellent opportunity offered. Salary open. Apply to File No. 2053-V.

MECHANICAL ENGINEER, recent graduate, to act as plant superintendent in large bakery in Montreal. Apply to File No. 2055-V.

MECHANICAL ENGINEER of about 35 to 40 years of age to assist mechanical superintendent of plant located in Eastern Canada. Work will involve assisting supervision of construction, installation and maintenance of plant equipment including pumps, boilers, refrigeration, air-conditioning equipment, etc. Salary about $5,000.00. Apply to File No. 2056-V.

MECHANICAL ENGINEER required for large construction quarry and concrete company. Must have some experience in layout and design of plants. Salary commensurate with ability. Reply giving complete details of background and experience. Apply to File No. 2064-V.

CHIEF MECHANICAL ENGINEER or assistant chief mechanical engineer required by large firm of consultants in Toronto. Salary open. Apply to File No. 2068-V.

MECHANICAL ENGINEERS with experience in process layout, design of steam plants, water supply systems and sewage and industrial waste treatment facilities. Salaries commensurate with experience. Apply to File No. 2068-V.

MECHANICAL ENGINEER with at least two to three years' experience in the design and job fabrication of A.S.M.C. pressure vessels and heat exchangers required for design, estimate and inspection work by engineering company located in Montreal. Salary commensurate with ability. Apply to File No. 2070-V.

MASTER MECHANIC required for central waterpower, irrigation and navigation commission, New Delhi, India Candidate should have considerable experience as a mechanic and have held responsible positions in the field of mechanical engineering. Age, about 45 years. Duties will involve supervision of the operation and maintenance of machines employed on river valley projects, such as the construction of large concrete, earth and other types of dams, large power houses and transmission systems and the excavation of canals. He will also be required to train Indian personnel working under him. Apply to File No. 2077-V.

SEVERAL 1951 mechanical engineering graduates required by pulp and paper industry located in the Province of Quebec. Apply to File No. 2081-V.

YOUNG MECHANICAL ENGINEER required by manufacturer of various types of machinery located in Montreal, for extensive design. Good opportunity to right man interested in this type of work. Apply to File No. 2092-V.

METALLURGICAL

FOUNDRY METALLURGIST required in British Columbia. Applicant should have broad experience in research work. Apply to File 1118-V.

METALLURGIST, recent graduate required for cast iron foundry located in Province of Quebec. Apply to File No. 2050-V.

MISCELLANEOUS

EXPERIENCED DESIGN ENGINEER required by a large Western Canadian steel fabricating shop. Must be experienced in design of boiler and pressure vessels. Material handling equipment, structural steel. Apply to File No. 1502-V.

SENIOR DESIGN ENGINEER required in Ottawa, with a degree in mechanical or chemical engineering. Applicant should have a minimum of 5 years experience in mechanical design particularly with reference to chemical plant equipment and process. Apply to File No. 1507-V.

ASSISTANT PRODUCTION SUPERINTENDENT—Press Operations required in Ontario. Applicant should be familiar with die equipment and be able to assume responsibility of a production shift consisting of two foremen and approximately eighty men. He must have a thorough knowledge of standards, production control, cost control, labour relations, etc. Apply to File No. 1559-V.

ASSISTANT PRODUCTION SUPERINTENDENT finishing operations, required by firm in Ontario. Applicant must be familiar on various types of steel; polishing, electro plating (copper, nickel and chromium) and buffing and be in a position to assume responsibility of a production shift consisting of foremen and approximately one hundred men. He therefore must have a thorough knowledge of standards, production control, cost control, labour relations, etc. Apply to File No. 1559-V.

TECHNICAL DIRECTOR wanted for paper company producing from 100% rag to 100% sulfite papers. Applicant should be a graduate chemist or chemical engineer and must be bilingual. Surroundings are ideal and living conditions very good. Mills located near Montreal in the Laurentian mountains. Apply to File No. 1586-V.

DEVELOPMENT ENGINEER by nuclear engineering branch to do experimental and development work in the field of mechanical engineering related to the design of atomic energy reactors and associated equipment. Applicants should have an engineering degree with high academic standing and five or more years engineering development experience. Apply to File No. 1602-V.

SENIOR PETROLEUM ENGINEER required by independent Canadian Oil Company with headquarters in Calgary. Applicant should be particularly experienced in reservoir engineering and production practices. No one with less than 7 years experience in the industry need apply. Give synopsis of education, training and experience and supply recent photo. Apply to File No. 1675-V.

GRADUATE ENGINEERS AND DRAUGHTSMEN, mechanical, civil, electrical required for projects in Ontario and Quebec. Preference to those with 3 years practical experience. Apply to File No. 1697-V.

TOP FLIGHT MAN for methods and time study work on all operations incidental to manufacturing of light and heavy sheet metal products. Excellent opportunity for man of proven ability and experience to establish himself with a sound company employing 200 people. Salary open. Applicants to apply in writing giving complete facts on education, experience and personal history. Enclose recent photograph. Apply to File No. 2029-V.

HYDRAULICS ENGINEER for the water rights branch, department of lands, B.C. Provincial Government. Salaries: hydraulic engineer, Victoria, and assistant district engineer, Kamloops, $3,695.00 to $4,295.00; assistant hydraulic engineer, Victoria, $3,336.00 to $3,576.00. Positions permanent; superannuation plan. Candidates must be British subjects, preferably under 45 years of age; graduates in civil engineering or equivalent; eligible for full registration in Association of Professional Engineers of B.C. (in case of the last position, eligible for registration as engineer in training), knowledge of survey methods, photogrammetry hydraulics and hydrology of river discharge, dam design, soil mechanics and samplings; field and office experience on engineering work in hydro electricity, or irrigation and water supply or hydrology. Apply to File No. 2032-V.

GRADUATE ENGINEER required in the development and engineering department of firm located in Montreal. Applicants must have a minimum of 4 years experience in a steel manufacturing plant. Position involves technical assistance to the steel industry in use of our products and work on problems related to this field. The territory will be mainly in Quebec and Ontario with headquarters in Montreal. This is an excellent opportunity along technico administrative lines for the suitable person. Apply to File No. 2042-V.

SALES ENGINEER, preferably mechanical, required by organization in Montreal. Applicants should be around 33 to 37 years. Duties would include designing and selling under supervision of specialty machinery used in pulp and paper mills for handling pulp wood and newsprint. Starting salary $4,000.00. Apply to File No. 2043-V.

ECHANICAL AND STRUCTURAL ENGINEERS to act as project engineers to undertake the study and necessary design and drawing work in connection with a combination bar and strip mill located in Ontario. Salaries open. Apply to File No. 2048-V.

ROJECT ENGINEER graduate with at least ten years experience in design, construction and operation of petroleum chemical plants on petroleum refineries, required to supervise project division of company engaged in engineering and construction of gas processing plants located in Montreal, Canada. Salary commensurate with ability and experience. Apply to File No. 2051-V.

NGINEER, age 35 to 45 years as maintenance superintendent and chief engineer for large Montreal property, approximately 750 rooms. Must be certified for large boiler plant, and be experienced in controlling cost of maintenance trades, including plumbers, carpenters, painters etc. Bilingual preferred. Attractive opportunity to become established in permanent congenial situation. Apply to File No. 2057-V.

ESIGN AND DETAIL ENGINEERS required by a package handling conveyer concern located in Ontario. Promotion to responsible positions is offered to applicants having the necessary ability and qualifications. Apply to File No. 2058-V.

RAUGHTSMAN, Senior layout man, required for the engineering department of new plant in Western Ontario. Must be capable of making complicated layouts from specifications, drawings, sketches or notes furnished by engineers and have considerable knowledge of manufacturing processes and their limitations. Should be capable of doing some designing. Experience in structural work and piping. University degree would be helpful not necessarily required. Apply to File No. 2062-V.

CIVIL, ELECTRICAL AND MECHANICAN ENGINEERS, required by Vancouver, B.C., firm for office design on large hydro-electric development. Desire only working engineers with three or more years hydro or related experience. Applications should include complete record of experience, salaries received, salary expected and time required to make a transfer to Vancouver. Salaries commensurate with qualifications. Apply to File No. 2065-V.

WE REQUIRE QUALIFIED ENGINEERS experienced in construction work on reinforced concrete, structural steel and frame buildings, as well as incidental services. Administrative ability and technical knowledge are essential. Employee benefits include three weeks annual vacation, sick leave allowance and a liberal plan for life insurance, hospitalization, and surgical benefits for the employee and his family. Replies are to contain details concerning education, experience, salary requirements, age, marital status and date available. Apply to File No. 2066-V.

GRADUATE ENGINEER with three to four years welding experience in metal fabricating plant is required by a firm manufacturing gases and welding equipment. Position involves technical assistances to firms in the correct application of various welding processes. Salary commensurate with experience and qualifications. Apply to File No. 2071-V.

POWERHOUSE FOREMAN required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidate should have considerable experience in the erection and maintenance of large hydro electric power plants. Age, about 45 years. Duties will involve erection and maintenance of diesel power houses for the supply of power on river valley projects, together with the erection and maintenance of large power houses, in connection with hydro electric projects. He will also be required to train Indian personnel working with him. Apply to File No. 2077-V.

WORKSHOP FOREMAN required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidate should have considerable experience in the management of large workshops, in the manufacture of gates for dams, spillways, canals, sluices, and in the manufacture of electrical transmission towers. Age, about 45 years. Duties will involve supervision of large workshops required during construction of river valley projects and the instruction of Indian personnel working under him. Apply to File No. 2077-V.

MASTER ELECTRICIAN required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidate should have considerable experience as an electrician and have held responsible positions in the field of electrical engineering. Age about 45 years. Duties will involve supervision of the operation and maintenance of electrical machinery employed on river valley projects, such as construction of large concrete, earth and other types of dams, large power houses and transmission systems. He will also be required to train Indian personnel working under him. Apply to File No. 2077-V

DESIGNING ENGINEER required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidates should have considerable experience in the design of high tension transmission lines and tower structures. Age 45 to 50 years. Duties will involve design of high tension transmission lines and tower structures, in connection with large hydro-electric projects. He will also be required to act in an advisory capacity on the design of transmission lines, and to train Indian engineers working with him. Apply to File No. 2077-V.

INDUSTRIAL ENGINEER required by firm of management consultants. Should be experienced in plant layout, production control, time studies, wage incentives, cost and budget controls. Age 35 to 60. Free to travel. Apply to File No. 2079-V.

ENGINEERS required in the manufacturing department of large electrical organization located in Ontario. Duties include the line up of operations and tooling, to initiate cost reduction programs, to lay-out departments, etc., on various products. Limited number of openings in production control, foundry work and in test work. Apply to File No. 2080-V.

PLANT ENGINEERS are required to do engineering work in connection with plant expansion and with plant maintenance, particularly along electrical lines. Location Ontario. Apply to File No. 2080-V.

DESIGN ENGINEERS required by large electrical organization in Ontario. Engineers are required to do both mechanical and electrical design but principally the latter on all types of electrical equipment. Specific experience is desired but not absolutely necessary. Apply to File No. 2080-V.

CIVIL OR MECHANICAL ENGINEER required by paper industry located in Ontario. Applicant should have design and practical experience, preferably five or six years in pulp and paper mill. Apply to File No. 2083-V.

MECHANICAL AND CHEMICAL ENGINEERS required in the control department of paper mill located in Newfoundland. Applicants must be interested in control and process work. Salaries open. Apply to File No. 2085-V.

RESIDENT ENGINEERS AND INSTRUMENTMEN required for work on the construction of the Quebec North Shore and Labrador Railway. Applicants should have some experience on highway work. Good working conditions Salaries open. Apply to File No. 2086-V.

MECHANICAL EQUIPMENT SUPERINTENDENT required by woods department of pulp and paper company. Should have degree in mechanical engineering or equivalent. Capable of initiating and supervising preventive maintenance program and repair work to all mechanical and power equipment. This is a senior position for an active man with a proven record of success in this type of work. Candidate for opening must be bilingual. The salary will be commensurate to experience and qualifications. Apply to File No. 2089-V.

POSITIONS AVAILABLE with The Consolidated Mining and Smelting Company of Canada Limited, at Trail, B.C., for experienced mechanical, structural and electrical designers and draughtsmen, for work connected with the design and layout of equipment and buildings in our mining, metallurgical and chemical and fertilizer plants. Application should be made in writing giving full particulars on education, experience and stating approximate salary expected, to the manager, Personnel Division at the above address. Apply to File No. 2090-V.

ECHANICAL DRAUGHTSMAN with at least three to five years experience in equipment, tool and jig work for Montreal office. Supply full details in first letter. Apply to File No. 2091-V.

TRUCTURAL STEEL AND REINFORCED CONCRETE DETAILERS for Montreal office with a minimum of five years experience in either field State full particulars in first letter. Salary open. Apply to File No. 2091-V.

'OOL ENGINEERS and patent lawyer required by large automotive industry in Ontario. Apply to File No. 2094-V.

ESEARCH SCIENTIST to conduct research and development in food packaging and packing. This will involve work independently and in co-operation with manufacturers and other agencies on suitable container materials and methods of container fabrication and will require a knowledge of such materials as paper and paper products, plastic films, metal foils, metal cans, enamels, adhesives, inks, etc. Applicants should have a Ph.D. or M.Sc. degree in chemical engineering, organic chemistry, or physical chemistry and should have had some industrial experience with the container materials mentioned above. Apply to File No. 2095-V.

Situations Wanted

LECTRICAL ENGINEER, aged 36, 1st class honors degree, P.Eng., M.E.I.C., A.A.I.E.E., A.M.I.E.E. Apprenticeship and erection experience with large electrical manufacturing company and 10 years experience as electrical engineer for large industrial companies—all companies are of world renown. Two years Canadian experience. Desires post as electrical engineer for industrial company or other suitable post preferably in Southern Ontario or British Columbia. Available at short notice. Apply to File No. 391-W.

Attention, Members

Please telephone in advance and make an appointment if you propose using the Institute's Employment Department.

This will result in a better service to everyone concerned.

TELEPHONE PLateau 5078

Except in special cases all interviews will be arranged between the hours of 9 and 12.

GRADUATE CIVIL ENGINEER AND LAND SURVEYOR with proven ability to carry out responsibilities. Available on short notice. Over 23 years of wide experience on four continents. Experience includes design layout and field supervision of: roads, dams, buildings, drainage, irrigation works. Veteran C.R.E. and E.A.E., married, bilingual. Situations held in Canada: Chief of survey parties, resident engineer. Abroad: as district and assistant chief engineer for over 19 years in the British, Turkish, Iraqui, Government Services. Apply to File No. 489-W.

ELECTRICAL ENGINEER, S.E.I.C. graduate Nova Scotia Technical College 1950, married, veteran, 34, presently employed by large cable manufacturing company in Montreal as a junior development engineer in their electrical laboratory, desires position in Nova Scotia preferably Halifax area. Previous experience in surveying, communications, d.c. machinery. Willing to accept position in any branch of electrical engineering including sales. Available for interview in Montreal anytime and in Nova Scotia in July, 1951. Apply to File No. 1325-W.

CIVIL ENGINEER, Jr.E.I.C., P.Eng. (Ontario) B.Sc. (Hons.) Birmingham, England, 1948. Age 28. Single. Ex-Sapper, Field Engineers of Union Defence Force (South Africa). Presently employed in temporary position in Toronto. Seeks permanent employment where hard work and initiative will lead to advancement. Fifteen months experience in municipal roads and drainage work in South Africa, including surveying, design and supervision. Also eleven months with waterworks in Canada on design of steel and reinforced concrete structures and writing of specifications. Willing to work anywhere. Apply to File No. 1465-W.

MECHANICAL ENGINEER, M.E.I.C., U.B.C., 1936. Age 37, married. 3 years experience as designer in paper machinery department of large manufacturer. 5 years as senior officer in the A.I.D. of the R.C.A.F. engaged on technical and administrative duties. 6 years as engineer in the paper and saw milling industry on the west coast, engaged on the layout, design and installation of wood-handling plant and equipment, including considerable experience in the design and erection of timber, steel and concrete structures. Desires position as resident engineer or senior engineering position covering industrial planning and development. Apply to File No. 1965-W.

INDUSTRIAL AND CIVIL ENGINEER, B.A.Sc., 1939, M.E.I.C., Prof. Eng., age 42, married, thoroughly bilingual. Experience: all phases of production, sales, maintenance, construction. Available on short notice. Apply to File No. 2157-W.

WORKS MANAGER and administrator with experience in mechanical, electrical and civil engineering work open for appointment. Apply to File No. 2429-W.

ENGINEER, MECHANICAL, M.E.I.C., interested in position offering opportunity as representative, plant or assistant engineer. Experience includes twelve years design, construction and maintenance with pulp and paper industry. Age 40, married. Apply to File No. 2642-W.

MECHANICAL ENGINEER, M.E.I.C., Queens, 1936, age 38, married. Currently engaged in research work, 2½ years. Desire to return to industrial or commercial field in Toronto district. Have had the following experience since graduation: About 10 years diversified work in plant engineering embracing dust control, 2½ years; application of control to metallurgical processes (primary metal producers), 3 years; industrial ventilation and air-conditioning, 1 year; general plant maintenance, 3½ years; about 2 years steel forging experience in small plant covering purchase, installation, and operation of equipment. Would be available at reasonable notice to present employer. Apply to File No. 2966-W.

CIVIL ENGINEER (London University, 1934) A.M.I.C.E., M.E.I.C., P.Eng., veteran, age 37 married. Executive experience in construction and design in building, services, refinery equipment, combustion equipment at home and abroad. Desires a responsible position with good prospects in a growing concern. Go anywhere. Adaptable, good organizer. Available at reasonable notice. Apply to File No. 3139-W.

Engineering Salesman

A large manufacturer requires salesman for heavy machinery and hydraulic equipment. Good background, engineering experience, successful record of sales in this field required. Reply in full first letter. Salary. File No. 3045-V.

MECHANICAL ENGINEER, Toronto, Jr. E.I.C., P.Eng. Age 29, married. Wishes to join a medium sized company to cooperate with management in reducing manufacturing costs by better production methods. Five years experience as chief engineer in charge of production and product design. Accustomed to working closely with shop and inspection department. Capable of acting as group leader and of assuming full responsibility relative to tooling, processing, and plant layout for increased productivity. Interested in working into management position. Apply to File No. 3361-W.

GRADUATE MECHANICAL ENGINEER, M.E.I.C., with extensive experience at draughting, designing and estimating of all types of plate, structural and machine work, now fully employed, desires part time work for evenings and week-ends. Apply to File No. 3367-W.

CIVIL ENGINEER, M.Sc., M.E.I.C., P.Eng., age 39. Practical experience since 1934 in design of reinforced concrete and steel structures (warehouses, factory buildings, power station, boiler houses, heavy foundations, hydraulic structures, oil refinery plants, gas plants, jetties) estimate and surveying. Seeks position in Ontario or Quebec. Apply to File No. 3369-W.

BRITISH DIESEL and electrical engineer, A.M.I.E.E.; six years electrical officer R.N.V.R.; nine years commercial experience in U.K., Malaya and Ceylon in sales, contracts and servicing equipment ranging from generators to household appliances; accustomed to executive responsibility and currently chief engineer for leading British firm in Ceylon; has had brief experience of conditions in Canada and desires progressive position and permanency there. Age 36. Available July. Wife Canadian. Apply to File No. 3398-V.

BRITISH CIVIL ENGINEER 27 years of age, single. Graduate of Trinity College, Dublin, with B.A. degree geology: and B.A.I. in civil engineering. Technical officer with Royal Engineers, 5 years practical engineering experience. Presently employed in Canada. Desires position with a future, possibly administrative where academic training, technical knowledge and personal qualities may be combined. Willing to work hard and accept responsibility. Apply to File No. 3400-W.

WELDING ENGINEER, M.E.I.C., P.Eng., B.A., B.Sc., Queen's 1941. Age 34, married. 7 years production and development experience in the fabrication of heavy industrial equipment with particular reference to welded pressure vessels. Desires continued experience in this or related fields. Available on short notice. Apply to File No. 3407-W.

EXPERIENCED ENGINEER, A.M.I.C.E., M.E.I.C., Age 31. 14 years combined civil mechanical background. Design and construction in roadworks water supply, sewage systems and large factory construction in U.K. Hydro-electric construction and investigation in U.K. and Canada. Geophysical investigation and deep well drilling and operation for water supply in N. Africa. Aircraft component design and machine shop practice in U.K. Require progressive position where experience may be utilized combined with aptitude for administration organization and production. Apply to File No. 3435-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C. Sask. 1950. At present taking Masters degree at University of Toronto. R.C.A.F. veteran, 5 years practical engineering experience. Willing to work hard and accept responsibility. References and detailed experience on request. Available May 1951. Apply to File No. 3439-W.

ELECTRICAL ENGINEER, Higher National Diploma 1949 (Power Course), Dundee Technical College, Scotland. P.Eng. Ont. One year experience as field engineer on design and reconstruction transmission and distribution lines in Scotland. Six years as technical officer in R.E.M.E. Four years as apprentice technical with power company in Poland. Experience in diesel-electric and hydro-electric plants in planning office and line surveying. Wishes to find employment in power field or design, would like to learn from the start the Canadian way of work. Apply to File No. 3443-W.

CHEMICAL ENGINEER, Jr.E.I.C. (B.Sc. Queen's 1948). Age 29, married, one child. Two years experience production supervision and development engineering in chlorine-alkali industry. Some experience in coal tar refining. At present employed. Desires position in Ontario or Quebec. Apply to File No. 3452-W.

SALES AND TECHNICAL SERVICE engineering employment desired by young engineer (24 years, single) expecting to graduate in Metallurgical Engineering (McGill) in May 1951, S.E.I.C. Many summer months experience in the making, shaping and inspection of steel. Location is practically immaterial and applicant is willing to travel. Willing to start on training program if necessary. Available June 1st. 1951. Apply to File No. 3453-W.

METALLURGICAL ENGINEER, Jr.E.I.C., Toronto 1948. Business Administration, University of Western Ontario, 1951. Desires position in production engineering or as technical salesman for a manufacturer of durable producers' and consumers' goods. Age 28, married. Naval Veteran. Over two years' experience with a large Canadian manufacturing firm chiefly as a production supervisor. Conversant with French. Available in May. Apply to File No. 3457-W.

CIVIL ENGINEER, Jr.E.I.C., P.Eng. (Ont.) B.Sc. University of Alberta 1945, age 27, married, 1 year in highway location, design, estimates and construction; 5 years field and office experience in surveys, design, layout and construction supervision in transmission lines, tower footings, reinf. conc. and pile foundations, also some knowledge of municipal engineering. Presently employed in Ontario. Desire position in Alberta with consulting engineers, construction company, or other company with own engineering staff. Available after September 1951. Apply to File No. 3458-W.

BRITISH SUBJECT, chartered electrical engineer, apprenticeship trained, presently holding technical and commercial managerial appointment in branch works of one of the premier manufacturing electrical companies in England, wishes to contact Canadian principals with view to ultimate emigration to Canada or with Canadian subsidiaries overseas. Three years wartime experience in Canada. Canadian references. Six years commissioned Naval Service. Age 37. Married. Apply to File No. 3463-W.

ELECTRICAL ENGINEER, Sask., 1950, S.E.I.C., P.Eng., age 30, married, veteran. Desires permanent employment anywhere in Canada. Experience includes 4 years radar mechanic, one summer sales, several months practical experience on wiring and installation of transformer banks switch gear, motors, etc Apply to File No. 3464-W.

AERONAUTICAL ENGINEER, Jr.E.I.C., graduate Mass. Institute of Tech., age 28, married, good health. Seven years experience with major airline on aircraft specifications and negotiations, mock-up, stress analysis, performance calculation, aircraft evaluation, detailed design, testing, report writing, correspondence, administration. Hard worker, willing to take responsibilities. Apply to File No. 3470-W.

GRADUATE ENGINEER, Jr.E.I.C., University of Saskatchewan, 1948, Age 25, single and in good health. Three years experience in farm implement design. Seeks employment in design or production engineering. Willing to undertake any required training. Presently employed but desires position leading to responsibility. Available on short notice. Apply to File No. 3472-W.

PLANT ENGINEER of medium sized company, Mechanical, McGill, 1948, Jr. E.I.C. Veteran, single, 27 years, desires affiliation with medium or large concern. Undertook and completed movement of two plants. Designed, costed and implemented major changes and installations of boiler house, air compressor house, air exhausting systems, electrical mains, instruments, heating and steam process mains. Staff of approx. 100, 20% licensed tradesmen. Collection of basic production machine data for time loading, scheduling, etc. Other studies and training courses. Excellent references. One month's notice. Apply to File No. 3476-W.

CIVIL ENGINEER, S.E.I.C., B.Sc., U.N.B., 1950, navy veteran, age 26, married with one child. Have considerable experience in highway construction in N.B. References on request. Apply to File No. 3477-W.

CIVIL ENGINEER, Jr.E.I.C., B.Eng., McGill, 1949, age 26, married, presently employed by construction firm in Montreal, would offer services for part-time employment in designing, estimating, etc., related to varied fields of building construction, especially reinforced concrete, steel or timber structures and foundations. Apply to File No. 3480-W.

ELECTRICAL ENGINEER, Jr.E.I.C., 1949, graduate of the University of Manitoba, about to complete two year apprenticeship in England, seeks employment in Canada, as from August, 1951. Experience includes testing of instrument transformers, testing of A.C. and D.C. motors and generators, 6 months in D.C. machine design engineers office, 3 months in electronic development laboratory, 6 months erection of steel mill rolling equipment. Undergraduate experience includes summer employment as student engineer in steel plant. Apply to File No. 3481-W.

GRADUATE ENGINEER, Jr.E.I.C., honors graduate, McGill, 1949, married, overseas R.C.A.F. veteran. Varied experience in the field of production control and planning, methods analysis, time-study quality control and allied engineering subjects. Desirous of obtaining a position in the management sphere. Location, Toronto area. Available immediately. Apply to File No. 3482-W.

CIVIL ENGINEER, B.Eng., McGill, 1944, M.E.I.C., P.Eng., married with two children, veteran R.C.E. Have had about ten years experience in construction, maintenance and industry including long-range planning, design and economic studies; also supervision and inspection as resident engineer. Familiar with general office routine and accounting procedures. Proven ability to handle labour, direct staff work and meet the public. Now enrolled in course on Modern Business with Alexander Hamilton Institute. Present employment highly responsible but wish to locate in Montreal area. Ambitious toward executive position requiring engineering and business training. Apply to File No. 3486-W.

CHEMICAL ENGINEER, B.A.Sc. Excellent background. 8 years experience. Presently employed on large scale production supervision. Seeks position of responsibility with promising future. Preferably in Ontario. Married, 3 children. Apply to File No. 3487-W.

ELECTRICAL AND MECHANICAL ENGINEER, S.E.I.C. Age 24. Experience 12 months powerhouse electrician, (Des Joachims). Graduating end of May. Undertaking valuation of European power plants this summer. Available October 1st. Interested in power plant equipment and operation—diesel steam or hydraulic. Apply to File No. 3488-W.

GRADUATE ENGINEER with qualifications and experience to handle position as works manager or plant superintendent, extensive experience in connection with mechanical equipment of mining and metallurgical industries as well as in metal-working establishments. Presently employed in responsible position. Interested in either domestic or foreign assignment. Apply to File No. 3493-W.

MECHANICAL ENGINEER, Jr.E.I.C., Sask., 1949. Age 27, married, ex-R.C.A.F. One year in office of management engineering company dealing with electric public utilities and one year in diesel plant (10,000 H.P.) of a Canadian public utility operating in South America—acting as Junior Engineer, Chief Operator and in charge of cooling water testing and treatment. Desire work in Canada along similar lines or in diesel field. However am willing to consider other work that has good opportunities for person willing to take responsibility. Location Ontario or west. Apply to File No. 3494-W.

MECHANICAL ENGINEER, Jr.E.I.C. Graduate University of Saskatchewan, 1950. Single, age 23. Have been employed in non technical work in the west. Desire position in maintenance or plant engineering work with an opportunity to gain experience and advancement. Type of position more important than remuneration. Apply to File No. 3495-W.

ELECTRICAL ENGINEER, M.Sc., Jr. E.I.C., completing a two year graduate training course with a large electrical manufacturer, seeks to better his position. Would consider professional employment with any progressive manufacturer or consulting engineer, however, prefer British Columbia or Alberta. Apply to File No. 3499-W.

ELECTRICAL ENGINEER: Sask, 1950. Three summers experience as electricians helper with industrial concerns. Also experienced in the installation of large power equipment. Desires position with consultant firm or in city engineering department. Available upon short notice. Married veteran with one child. Apply to File No. 3500-W.

CIVIL ENGINEER, S.E.I.C., University of Toronto 1951. Age 32. Married. Former radar mechanic in R.C.A.F. Summer experience includes construction labour, transmission line specification writing and testing soils. Desires work related to structural engineering. Prefer Montreal or Toronto areas but would go elsewhere for a suitable position. Apply to File No. 3506-W.

MINING AND STRUCTURAL ENGINEER, M.E.I.C. and P.Eng. Married. With long experience in open pit and underground mining, in design and inspection of construction dwellings, mine and mill buildings, railway trestles and conveyor belt trestles. At present employed. Available September 1st, 1951. Apply to File No. 3507-W.

SENIOR MECHANICAL ENGINEER, M.E.I.C. Four years' experience as chief engineer with small company. Nine years on board as designer. Sixteen years' total experience with medium to heavy machinery including hydraulic presses, forging machines, valves, pumps, controls, boilers, tanks, etc. Also in charge plant services and maintenance. Organization and administration. Experienced writer and lecturer. Apply to File No. 3508-W.

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ABSTRACT

INSTITUTION OF ELECTRICAL ENGINEERS

'he Control of Hydro-Electric Plant:

A.C.H. Frost and W. Brittlebank. (IEE proof No. S 1049)

The rapid growth of both industrial and lomestic load in most countries since 1939 ıas forced the development of many water-›ower schemes, some of which had ›reviously been dormant owing to mar-;inal economies. Earlier schemes were ›ften isolated and (with certain notable :xceptions) of relative insignificance in :omparison with steam-driven generating ›lants. With the present need for develop-ng every practical source of power, ıowever, the problems of controlling ıydro-electric plant take on new aspects, nvolving consideration of uniformity and :conomy of operation and maintenance ;taffs, and the most efficient use of the :atchments on each river system as a vhole.

After the terms used have been defined, he nature of the control problems involved ıre examined. Certain control schemes are lescribed, with emphasis laid on the levelopment of sequential-parallel auto-natic control and the reasons why it is ›referred. Some practical aspects of the ıpparatus involved are described, after vhich the operating and maintenance equirements are examined. The electrical ınd hydraulic functions of group control ıre discussed in relation to a complete river ;ystem. Finally, those factors influencing he choice of a control scheme are sum-narized.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

\eronautical Engineering Catalog; 'th ed., 1951:

New York, Institute of the aeronautical sciences, c1951. 298 pp., illus.

\grarian Socialism; The Cooperative Commonwealth Federation in Sas-katchewan; A Study in Political Sociology:

S. M. Lipset. Toronto, Oxford University press, c1950. 315 pp., $5.00.

Behaviour of Engineering Metals:

H. W. Gillett. New York, Wiley, c1951. 395 pp., illus., $6.50.

Diesel-electric Locomotive Handbook; Electrical Equipment:

George F. McGowan. New York, Simmons-Boardman, 1951. 290 pp., illus., $4.95.

Diesel-electric Locomotive Handbook; Mechanical Equipment:

George F. McGowan. New York, Simmons-Boardman, 1951. 262 pp., illus., $4.95.

Dynamic Motion and Time Study:

James J. Gillespie. Brooklyn, Chemical pub. co., 1950. 140 pp., $3.75.

Electric Circuits for Engineers:

Edward K. Kraybill. New York, Macmillan, c1951. 212 pp., illus., $3.85.

Fer et Aciers frittés:

R. Kieffer and W. Hotop. Paris, Dunod, 1951. 573 pp., illus., 3200 fr.

Fuel Oil and its Combustion:

Cleveland, North American Manufacturing Co., c1943. 37 pp.

Hydraulics of Sediment-bearing Canals and rivers:

T. Blench. Vancouver, Evans Industries Ltd., c1951. illus., $4.75.

Jacobian Elliptic Function Tables; A Guide to Practical Computation with Elliptic Functions and Integrals Together with Tables of sn u, cn u, dn u, Z(u):

L. M. Milne-Thomson, New York, Dover 1950. 132 pp., $2.45.

K & E Catalog. Part 1, Drafting and Reproduction Equipment and Materials; Slide Rules. Part 2, Surveying Equipment and Materials; Measuring Tapes:

Montreal, Keuffel & Esser Co., c1949. 254 pp., 413 pp., illus.

Mécanique Théorique des Sols:

K. Terzaghi. Paris, Dunod, 1951. 474 pp., illus., 2950 fr.

M. M. Year Book 1951:

London, Machinery market, 1951. 602 pp., 15/-.

Molesworth's Handbook of Engineering Formulae and Data, 34th ed.:

A. P. Thurston ed. London, Spon, 1951. 1672 pp., illus., 25/-.

Montreal; By-law Concerning the Erection of Buildings in the City of Montreal, No. 1900:

Montreal, 1948, 489 pp.

Plant Layout Planning and Practice:

Randolph W. Mallick and Armand T. Gaudreau. New York, Wiley, c1951. 391 pp., illus., $7.50.

Society for Advancement of Management; Proceedings of the Annual Conference on Principles, Methods and Techniques for Increasing Productivity, Reducing Costs and Improving Human Relations:

New York, the society, c1951. 212 pp., $5.00.

Sound Reproduction; 2nd ed.:

G. A. Briggs. Montreal, C. W. Pointon, 1950. 246 pp., illus., 10/6.

Sourcebook on Atomic Energy:

Samuel Glasstone. Toronto, Van Nostrand, c1950. 546 pp., illus., $3.50.

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Bibliographies and Literary Searches

Short subject bibliographies are compiled on request.

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Books, periodicals, photostats, translation, etc. may be borrowed for two weeks at a time. **A fine of 25c. per day will be charged for each day borrowed items are retained beyond this period.**

A library deposit of $5.00 at par in Montreal is required before items may be borrowed. Books, periodicals, etc. may be ordered by members through the library. All carrying charges are payable by the individual concerned. Except in the case of library deposits, please make **no payments in advance.**

Non-members may consult the library, but may not borrow material.

Structure and Mechanical Properties of Metals:

Bruce Chalmers. London, Chapman, 1951. 132 pp., illus., 18 s. (Being volume 2 of a series of monographs on metallic materials published under the authority of the Royal aeronautical society).

Theory and Application of Electrical Engineering:

Eugene W. Schilling. Scranton, International textbook, c1951. 402 pp., illus., $6.50.

World Airline Record 1950-1951:

Chicago, Roy R. Roadcap & Associates, c1950. 263 pp., illus., $9.75.

TECHNICAL BULLETINS, PAMPHLETS, ETC.

American Water Works Association. Tentative Standard Specifications:

No. 5W1.10-T — Ammonium sulphate.
No. 5W1.31-T—Ferrous sulphate.

Community planning Association of Canada. Community Planning Review:

V. 1, N. 1, February, 1951.

County Sanitation Districts of Los Angeles County. Reports:

Collection and disposal of refuse, October 1950.

Edison Electric Institute. Specifications:

No. TD-3—Lag screws.

...Publications:

No. MSJ-3—AEIC-EEI-NEMA standards for metering current transformers for primary circuits.

National Institute of Agricultural Engineering. Reports:

Testing of grass driers.

National Research Council of Canada. Radio and Electrical Engineering Division. Publications:

New electronic aids to marine navigation.

Philips' Gloeilampenfabrieken Laboratoria. Separaat:

No. 1950—Induction phenomena in photosynthesis, R. van der Veen. No. 1951—Investigations on quinones and quinone-derivatives, H. O. Huisman. No. 1953—Le fer dans le verre, J. M. Stevels. No. 1956—Density variations in aluminium, J. L. Snoek. No. 1958—The relation between the dielectric losses and the composition of glass, J. M. Stevels, No. 1959—The fluorescence of magnesium germanate activated by manganese, F. A. Kroger and J. van den Boomgaard. No. 1962—On the deviations between theoretical and experimental values of the specific heat of superconductors, K. F. Niessen. No. 1963—Absorption spectrum and photodecomposition of o-hydroxybenzene-diazonium sulphate, J. de Jonge and others. No. 1964—Ferrite materials, D. Polder.

Royal Canadian Air Force. Experimental and Proving Establishment Reports:

No. 935—Harvard 2 standard and armament trainer; part 1—radio installations. (with 2 blueprints). No. 962—Improvements to survey camera optics. No. 967—Performance of Goose 2 aircraft; part 2—aerodynamic report.

Royal Commission on Transportion. Reports:

February 9, 1951.

Welding Research Council. Bulletin Series:

No. 8—Tests of columns under combined thrust and moment.

BRITISH STANDARDS:

British Standards Institution, 24/28 Victoria St., London, S.W.1. British Standards are available from the Canadian Standards Association, National Research Building, Ottawa, Canada.

B.S. 581: 1950—Electrically-driven Point-operating Machines for Railways, 2/-.

This standard covers electrically-driven machines for operating railway points, derailers, movable diamonds and facing-point or fouling bars. It lays down the sequence of operations, standard voltages, construction, etc.

B.S. 592: 1950—Carbon Steel Castings for General Engineering Purposes, 2/-.

The present work provides a comprehensive range of carbon steel castings for engineering purposes, including the construction of ships, marine engines and railway rolling stock.

B.S. 714: 1950—Cartridge Fuse-links for Use in Railway Signalling Circuits, 2/-.

This British Standard has been drawn up to apply to cartridge fuse-links only, and covers fuse-links suitable for use in railway signalling circuits in which the declared voltage does not exceed 250 volts between conductors or between conductor and earth.

B.S. 1644: 1950—Dimensions of Unscreened Camshaft Speed Magnetos, 2/6.

This publication deals only with the dimensions of unscreened, camshaft-speed magnetos (combined with distributor head) having shank and spigot mountings. The dimensions included are those necessary to ensure interchangeability.

B. S. 1649: 1950—Guards for Couplings and Associated Shafting, 2/-.

In this new standard, general requirements have been laid down for guards which should be applied to couplings between units such as a motor and a pump, and also guards that are required for a length of shafting and coupling.

B.S. 1658: 1950—Dimensions of Housings for Hydraulic Seals, 2/-.

This standard lays down the basic dimensions for the standardization of housings accommodating hydraulic seals for use with reciprocating shafts where the friction caused by the seal is not a major importance, and the working pressures do not exceed 5,000 lb. sq. in.

B.S. 1677: 1950 — Draughtsmen's Drawing Pins, 1/-.

Materials, dimensions, general requirements and finish are specified, and the two types of manufacture with domed and bevelled heads are illustrated.

B.S. 1686: 1950 — Equipment and Method for Long-period High-sensitivity tensile Creep Testing, 2/-.

B.S. 1687: 1950—Equipment and Method for Medium-sensitivity Tensile Creep Testing, 2/-.

B.S. 1688: 1950—Equipment and Method for the Determination of Time to Rupture Under Stress, with or Without Measurement of Creep Strain, 2/-.

These three standards originated in specifications that had been prepared specially to meet the needs of the aircraft industry.

B.S. 922: 1950—Electrical Refrigerators and Food Freezers for Household use in all Climates, 3/-.

B.S. 1691: 1951—Electrical Refrigerators and Food Freezers for Household Use in Temperate Climates Only, 3/-.

These two standards prescribe the general constructional requirements, the methods of determining the performance and computing the volume and shelf area of electrical refrigerators designed for household food storage and of electrical refrigerators designed as household food freezers and having a net volume up to and including 12 cubic feet.

BOOK NOTES

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AMENAGEMENTS HYDRO-ELECTRIQUES:

I. Leviant. Paris, Dunod, 1951. 148 pp., illus., 640 fr.

The purpose of this work is to make a synoptic survey of the most recent and the most representative information and schools of thought on hydro-electric installations. This synthetic study will be useful to thermic, hydraulic and electrical engineers, and also to all people concerned in one way or another with hydro-electric equipment. Most installations considered are French.

AUTOMATIC CONTROL OF INDUSTRIAL PLANT AND PROCESSES:

J. W. Ashley. London, Emmott, 1950. 65 pp., illus., 3/-. (Mechanical world monograph No. 60).

These notes were prepared to provide users of automatic controllers with a straight-forward, non-mathematical presentation of the fundamentals of automatic control. It will be gathered that any automatic control installation requires final tuning on the actual job; the monograph shows that controllers with the correct type of adjustable characteristics should be provided.

BLISS POWER PRESS HANDBOOK:

Toledo, E. W. Bliss Co., 1950. 717 pp., illus., $7.50.

The valuable information contained in this handbook is divided in six sections. The first section describes and illustrates the four major classifications of sheet metal working: blanking, forming, drawing, and squeezing; the second contains illustrations and descriptions of available Bliss presses, and mention of the work to which they are best suited; the third describes and illustrates the operation and design features of Bliss-Marquette die cushions; the fourth covers the operation and maintenance of various types of presses built by Bliss or its subsidiaries; the fifth is a reference table of comparative press numbers, shaft diameters, tonnage ratings, etc.; the sixth is a glossary of terms and expressions of popular usage in the pressed metal industry.

CAMS AND SPRINGS FOR POPPET VALVES:

W. H. Lee. London, Emmott, 1950. 42 pp., illus., 2/6. (Mechanical world monograph No. 61).

One of the components of internal combustion engines affected by higher rotational speeds is the valve gear. The aim of this monograph is to provide a collection of data whereby the nature and intensity of the forces generated by the cam and the characteristics of the spring to control them may be accurately computed. A complete mathematical treatment of the velocity and acceleration of commonly employed cams is given.

CANADIAN OFFICIAL RAILWAY GUIDE WITH AIRLINES, January 1951, No. 1021:

Montreal, International Railway Publishing Co. Single copies $4.00. Yearly subscription $10.00.

This monthly publication is devoted to the dissemination of information respecting the transportation lines of Canada. It contains the current timetables of Canadian railways, airlines, navigation routes and connecting lines in the United States. It includes the "Canadian Gazetteer and Shippers' Guide". This Gazetteer is an alphabetical list of places, showing the location of post offices, railway, airline and steamer line point, telephone or telegraph, customs houses, banks, populations, express offices, etc.

ELECTRICAL YEAR BOOK 1951; A COLLECTION OF ELECTRICAL ENGINEERING NOTES, RULES, TABLES AND DATA:

London, Emmott, 1951. 360 pp., illus., 3/-.

This 1951 issue of the Electrical year book contains tables of B.S. Whitworth bolts and nuts, B.A. screw threads, B.S. fine screw threads, and also many tables of general usefulness, like logarithms, decimal equivalents, price equivalents, etc. Useful information, in the form of short chapters is given on direct-current generators, turbo-alternators, electric motors, automatic protection, jointing conductors, etc. The time being opportune, the subject of space heating has been chosen for particular treatment.

EXPLANATORY HANDBOOK ON THE B.S. CODE OF PRACTICE FOR REINFORCED CONCRETE:

W. L. Scott and others. London, Concrete pub., 1950. 119 pp. illus., 9/-.

The present handbook is a completely revised work based upon the British standard code of practice for the structural use of normal reinforced concrete in buildings issued in 1948. It has been written in the light of recent knowledge and experience. The code which is reproduced in its entirety, is insetted and indicated by black lines in the left-hand margin, and the author's comments follow the clauses.

EXPOSES D'ECONOMIQUE. VOLUME 1, INTRODUCTION GENERALE; L'APPORT DES INGENIEURS FRANCAIS AUX SCIENCES ECONOMIQUES:

F. Divisia. Paris, Dunod, 1951. 158 pp., illus., 650 fr.

This first volume is devoted to the part played by French engineers in the development of economics. The book opens with a series of short biographical notices on the most important pioneers. This is followed by a chapter on what is being done currently on this subject, and another chapter on the most important works already published. A parallel between economics and technology is followed by the author's tentative synthesis and conclusion.

FUNDAMENTALS OF QUANTUM MECHANICS:

Enrico Persico. New York, Prentice-Hall, 1950. 484 pp., illus., $8.00.

In this book are presented the fundamental laws and principal working methods in quantum mechanics. The author has dwelled somewhat at length on the epistemological foundations of the new atomic mechanics. The book begins with a historical, overall view of the evolution of quantum mechanics, the approach being as primary and intuitive as possible. It goes on with a mathematical introduction establishing the principles of quantum mechanics, with a development of the old quantum theory of Bohr and Sommerfeld, and with a presentation of the principles of quantum mechanics in their most general form.

MEASURING DIAGRAM FOR DAYLIGHT ILLUMINATION:

P. S. Waldram. London, B. T. Batsford, 1950. 5/-.

The object of this brochure is to render available for architects the only precise method of predetermining the daylight which will enter an interior when the form of the obstructing building is complex. The Waldram diagram is, in England, the only authorized daylight predeterminator for those who wish to design their own buildings. The diagram measures 20 x 10 inches and is accompanied by full explanatory text.

PRESSURE VESSELS; A SIMPLE AND PRACTICAL APPROACH TO THEIR DESIGN AND CERTIFICATION:

William Buchan Ritchie. London, Emmott, 1950. 71 pp., illus. (Mechanical world monograph No. 58).

The primary object of this book is to draw attention to the legal, moral and financial responsibilities concerned with the design, manufacture and use of all pressure vessels having an explosion or implosion potential and by correlating the different aspects, to provide a realistic approach to the fundamentals entailed. This work will serve as a practical guide to all who are interested in the subject.

PROCESS ENGINEERING:

William H. Schutt. New York, McGraw-Hill, 1948. 309 pp., illus., $5.85.

The purpose of this book is to give training in process engineering to people who are already familiar with time and motion study. Process engineering as referred to in this book is that phase of industrial engineering which determines the means, the methods and the procedures of manufacturing an article economically. The application of established time values shown in the text for all manual movements together with the use of proved formulas for speeds and feeds will enable the process engineer to determine scientifically the correct labor cost of an article.

STANDARD METAL DIRECTORY, 1950; 12th ed.:

New York, Atlas Pub. Co., c1950. 818 pp., illus., $15.00.

This directory contains descriptive lists of iron and steel plants, foundries (ferrous and non-ferrous), metal rolling mills, smelters and refiners, steel rolling mills. These descriptive lists give, whenever possible, a company's address, names of members of executive, equipment, products, material consumed, location of plants, date of incorporation, capital, etc. This is followed by a very extensive list of industries grouped under their respective trades.

TECHNICAL DRAFTING ESSENTIALS FOR VOCATIONAL AND TECHNICAL STUDENTS:

Warren J. Luzadder and William S. Hornung. New York, Prentice-Hall, 1950. 326 pp., illus., $3.00.

This book has been prepared to fulfill the need for a text in the technical field that will present the basic fundamentals of engineering drafting in accordance with sound pedagogy. One objective has been to create a nearly self-teaching text that presents all the essential information covering the theory and the conventions of projection and dimentioning in accordance with present day up-to-date industrial practices. Other objectives such as simplicity and completeness of presentation determined the choice and construction of the illustrations.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

AIRPLANE AERODYNAMICS:

D. O. Dommasch. Pitman, New York, 1951. 520 pp., illus., $6.50.

Designed for students having a background in college physics, mathematics, calculus, mechanics and dynamics, this book is devoted to the "how" and "why" of modern aerodynamics. Emphasis is placed on high-speed flight and on modern developments. Considerable space is devoted to the fundamental principles of fluid mechanics and dynamics and to a detailed discussion of the stability and control of aircraft. Numerous illustrative examples and unworked problems are included with answers to many of the problems.

ASTM MANUAL ON MEASUREMENT AND SAMPLING OF PETROLEUM AND PETROLEUM PRODUCTS:

Philadelphia ASTM, 1951. 120 pp., illus., $2.00.

This new manual contains recommended methods for measuring the volume (or weight in some cases) of petroleum and its products and for obtaining representative samples. Included are methods of gaging, and temperature measurement; a recommended practice for volume calculations and corrections; and tests for water and sediment by centrifuge, and gravity by hydrometer. There is also a proposed method of sampling liquefied petroleum gases.

DIE DESIGN AND DIEMAKING PRACTICE:

Edited by F. D. Jones. 3rd. ed. Industrial Press, New York; 1951. 1014 pp., illus., $7.00.

This treatise for die designers and diemakers contains illustrated descriptions of a large variety of selected dies for all kinds of power press operations. Practical information and data on approved designing practice and die construction are provided. The third edition contains five new chapters, an expanded cross-index, and a detailed table of contents. The new chapters treat special aspects of sheet-metal working dies and the designing of dies for powdered-metal parts.

ELECTRIC ILLUMINATION:

J. O. Kraehenbuehl. 2nd. ed. Wiley, New York; 1951. 446 pp., illus., $10.00.

This book presents the principles underlying the specification and design of electric lighting for commercial and industrial buildings. Reflecting the advances made since the first edition, changes include new material on glare and glare calculations, a treatment of the calculation of illumination from line and surface sources, consideration of louverall lighting systems, revision of the material on wiring and on economies of light production, New illustrations and appendices are included.

ELEMENTS OF ORE DRESSING:

A. F. Taggart. Wiley, New York; 1951. 595 pp., illus., $10.00.

Serving as an introduction to the subject, this book is an analysis of the machines and processes used in ore dressing. Through the use of flow-sheet forms and the method of flow-sheet analysis, consideration of mills as process units is stressed. Reversing the usual approach to the subject, the author discusses separation prior to severance and the general accessory operations. The appendix contains detailed instructions for 18 laboratory experiments. Review questions follow each chapter, and references are given at the end of some.

INGENIOUS MECHANISMS FOR DESIGNERS AND INVENTORS, Volume III.

Edited by H. L. Horton. Industrial Press, New York, 1951. 536 pp., $6.00.

A companion to Volumes I and II of this series, this self-contained reference work is a part of a set which forms a comprehensive encyclopedia of mechanical movements. It contains illustrated descriptions of a large variety of standard and special mechanisms for use in designing automatic machines and other mechanical devices. Mechanisms of the same general type are grouped in chapters comparable with the arrangement in the previous volume.

PHYSICS IN CHEMICAL INDUSTRY:

R. C. L. Bosworth, Toronto, Macmillan, 1950. 928 pp., illus., $13.35.

This book considers the principles of those branches of physics which are of fundamental importance to many of the operations concerned in industrial chemistry. Part I is concerned with aspects of applied mathematics; Part II treats the properties of matter, with particular attention to those types of matter with properties intermediate between solids and liquids; Part III deals with motion, particularly molecular motion; and in the last part the principles of measuring and scientific instruments are discussed.

TRANSFORMER ENGINEERING:

L. F. Blume. 2nd ed. Wiley, New York; 1951. 500 pp., $7.50.

This book is written to help engineers solve the technical problems arising in the specification, selection, application, and operation of transformers. Emphasis is placed on presenting the essential physics concerned in each problem, rather than a complete or exact mathematical treatment. In this second edition, compiled twelve years after the first, the major changes occur in the chapters on insulation, thermal characteristics, and the load ratio control problem.

TRAVELING WAVES ON TRANSMISSION SYSTEMS:

L. V. Bowley. 2nd ed. New York; London, 1951. 545 pp., illus., $12.00.

This book is a collection of the modern theories of transient voltage phenomena on electric power transmission lines and in transformer windings. Special emphasis is placed on the use of these theories in the design of lightning-proof transmission lines. The present edition is enlarged by half to include new developments in the field and to include problems at the end of the chapters. A working knowledge of operational calculus is assumed.

TV MASTER ANTENNA SYSTEMS (Installation & Distribution).

I. Kamen and R. H. Dorf. New York, Rider, 1951. 356 pp., illus., $5.00.

Designed as a working manual, this book discusses the installation and distribution, maintenance, usage and merchandising of TV master antenna systems. Individual receiver antenna installations are first considered. The largest part of the text is devoted to detailed expositions of important master antenna systems now in manufacture, complete with schematic diagrams, performance figures, and design data. The latter chapters deal with video distribution systems and general sales methods.

WORLD GEOGRAPHY OF PETROLEUM:

Edited by W. E. Pratt and D. Good, Toronto, Saunders, 1950. 464 pp., illus., $11.25.

Based on information provided by a group of expert petroleum geologists and administrators, this book is a comprehensive discussion of the world oil situation. Part I is devoted to the discovery of oil-bearing areas. Part II describes the organization of the petroleum industry including development, production, storage, transportation, refining and distribution. The main section of the book, Part III considers all the great productive regions with the problems induced by their geology, topography, climate, vegetation, accessibility, population, culture, and industrial development. In Part IV the central theme is the geography of petroleum use. Fifty specially prepared maps, eleven diagrams, and ninety-eight photographs are included to supplement the text.

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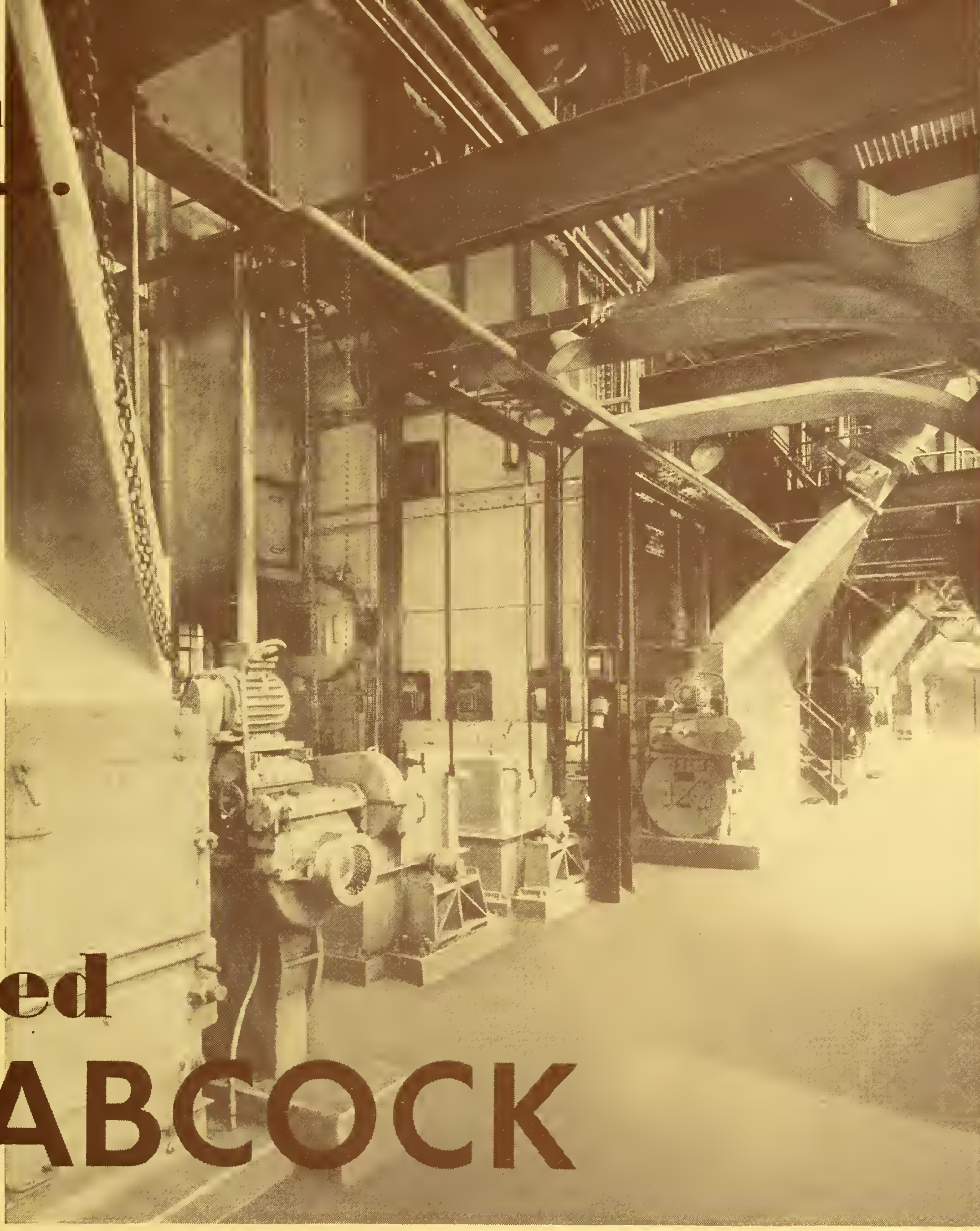
nother Canadian ndustry . . .

★The Procter & Gamble Company of Canada, Limited, Burlington Street East, Hamilton, have recently added two more Babcock boilers. This makes four in all, to serve the increased production, demanded by the growing popularity of their well-known products.



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Only the most careful attention to design and workmanship can guarantee the capacity and constant pressure requirements, essential to such large chemical processes as are employed here.

The two new boilers have capacities of 60,000 lbs. of steam per hour each and operate at 850 lbs. per square inch pressure. The two previously installed have a capacity of 40,000 lbs. of steam per hour each and operate at 160 lbs. pressure. All vigilantly meet the required load fluctuations and maintain a constant pressure. They are fired by Babcock chain grate stokers.

Investigate how such money saving efficiency can turn costs into profits. Small or large, Babcock boilers will meet your needs. Write us today.

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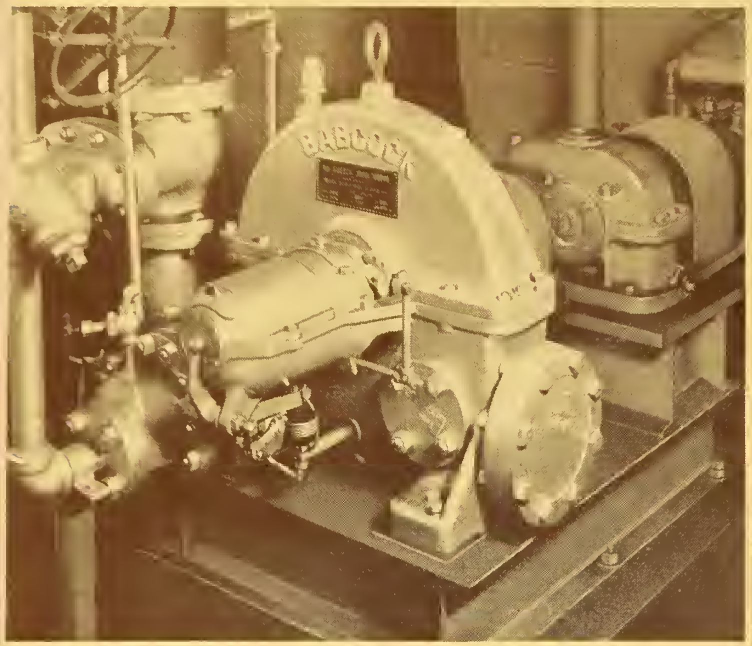

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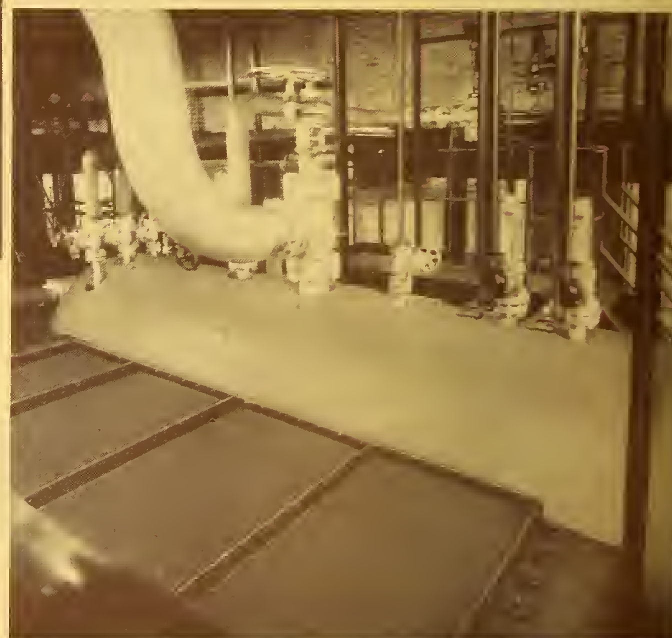
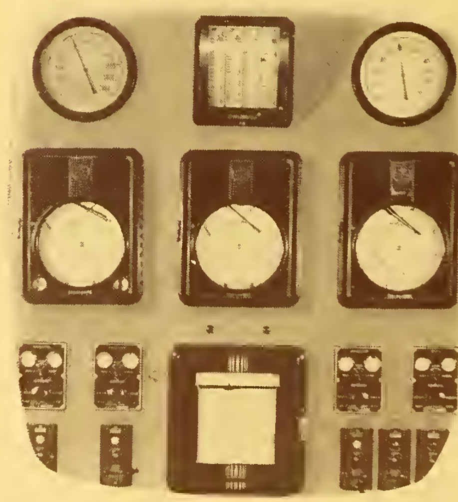


⇧ in steam

Have the steam you need always available. Neatness and safety are indicated in this view of the steam outlet and safety valves at the top of one boiler.



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Business & Industrial Briefs

A Digest of Information received by The Editor

Appointments and Transfers

J. L. Bourbonniere.—A new company Bogue Electric of Canada Limited, a subsidiary of Belco Water Treating Specialists has been formed. J. L. Bourbonniere has been appointed Canadian sales manager. Head office will be at 1405 Bishop Street, Montreal.

Crane Appointments.—Crane Limited announce the following retirement and appointments. Frank B. Thompson, manager of the Company's Winnipeg branch is retiring after more than forty-five years of service. F. (Pete) Hutchison, formerly manager at Regina, has been appointed to succeed Mr. Thompson. Previous to his new appointment Mr. Hutchison was manager at Regina where he will be succeeded by H. A. Welch formerly assistant manager in Winnipeg. Norman B. Wiles, formerly of Ottawa will serve as assistant manager in Winnipeg.

H. William Jewell.—H. William Jewell has been appointed chief of research and development for the National Sewer Pipe Co. Ltd., Toronto. He is a graduate civil engineer and has, for the past 15 years, been chief engineer of Pacific Clay Products Co., of Los Angeles, Calif.

Mr. Jewell has done a great deal of work in connection with the development of special joints, and in improved methods of manufacturing plain-end and unglazed vitrified pipe. He has also designed machinery for the manufacture of such pipe and joints. It is probable that the National Sewer Pipe Co. Ltd., will make use of many of his developments in the operation of their proposed new $1,400,000 plant to be built, this year, near Swansea, Ontario.

Bristol Aeroplane Co. Appointments.—Bristol Aeroplane Company Ltd., has started operations in Canada. The Canadian Company will market the Bristol Type 170 Freighter. The headquarters of the company which will be known as the Bristol Aeroplane Company of Canada Limited, are in the International Aviation Building, Mtl. R. J. Reynolds is a director and secretary-treasurer and W. S. Haggett is sales manager of the Canadian company.

Northern Electric Changes. — The Northern Electric Company have made the following appointments. K. P. Macpherson, formerly sales manager of the Wire and Cable Division, has been named to succeed L. P. Stiles as manager of central district. Mr. Macpherson's successor will be D. C. Borden, industrial supply manager of the general sales division.

J. S. Vanderploeg.—J. S. Vanderploeg has been named vice-president and managing director of Anaconda American Brass Limited, New Toronto. Announcement of the appointment was made by A. H. Quigley, president of the Company. Mr. Vanderploeg has been general manager of the Company for the past eight years.

George A. Mueller

George A. Mueller.—George A. Mueller has been appointed vice-president in charge of sales by the Canadian Locomotive Company. Mr. Mueller was educated at the University of Cincinnati and associated with Massachusetts Institute of Technology during World War II. He has had wide experience in the engineering and sales of Diesel products. He will make his headquarters at 980 St. Antoine Street, Montreal.

New Cement Distributor. — Canada Crushed Stone Ltd., Hamilton, Ont. has been appointed a stock-dealer of Ciment Fondu Lafarge (Canada) Ltd. Ciment Fondu is a high-alumina cement of British manufacture. It produces concrete of great strength in a much shorter time than is required to secure equivalent strength with ordinary cement.

New Jeffrey Office.—Jeffrey Manufacturing Co. Ltd., Canadian manufacturers of materials handling, mining, crushing and pulverizing, and electric vibrating machinery, has opened a district sales office in Halifax, N.S.

The Halifax office is located at 480 Barrington Street. It is under the direction of R. W. Ford, who was recently appointed district manager.

Mine Safety Appliances Changes.—W. G. Claus has been named purchasing agent for Mine Safety Appliances Company Ltd. He will be located at 500 MacPherson Avenue, Toronto. Mr. Claus was formerly manager of the Company's Montreal branch office. He will be succeeded in that post by Fred W. Curtis who has been on the sales staff of the Company in Western Ontario. The Montreal office and warehouse of the Company have been moved to 1271 Ducharme Street, Outremont.

Dodge Mfg., Address Change.—The Montreal Branch of the Dodge Manufacturing Division of United Steel Corporation is now located at 433 St. Martin Street, Montreal. The new premises contain the offices and complete warehousing facilities necessary for the expanded business of the branch. The office remains under the management of G. A. Ferrier.

Amalgamated Electric Changes.—H. J. Ashbee has been appointed district sales manager for the Vancouver district, by Amalgamated Electric Corporation Ltd. John W. Kennedy has been appointed application engineer in the engineering division of the Company. For the past three years he has been attached to the Montreal office as a sales engineer.

A new department of the sales division has been created. It will be known as the Duct System Sales and it will be under the supervision of James H. Wilson.

W. A. Dalrymple has been made manager of Lighting Equipment Sales and C. Jones is now manager of the Wiring Supply Sales in the Sales Division at Toronto.

D. W. Patterson has been named sales manager for the Montreal district of the Company.

●

R. M. Fowler.—On April 18, The Right Honourable C. D. Howe announced that R. M. Fowler, president of the Canadian Pulp and Paper Association, had been appointed director of a newly-formed pulp and paper division of the materials branch of the Department of Defence Production. F. L. Mitchell and J. M. Smith, also officers of the Canadian Pulp and Paper Association, will be associated with Mr. Fowler in the new division.

●

Webster Appointment.—Webster and Sons Ltd., Montreal 2, Que. announce that they have been appointed eastern Canadian representatives of the Crittall Mfg. Co. Ltd., of Braintree, Essex, England.

The Crittall Company makes steel sash. Their five factories in England and Scotland average an output of 800 tons of steel sash per week, apart from ancillary products. They also maintain factories in Australia, New Zealand, South Africa, Eire, and Germany.

A technical representative of the Crittall Manufacturing Co. has been appointed to a resident position in Montreal.

●

W. J. Morgan.—The organizing secretary of the British Machine Tool Section, Canadian International Trade Fair, Toronto, 1951 is William J. Morgan, M.B.E. Mr. Morgan's permanent position is that of general manager of the British Machine Tool Trades Association.

●

R. W. Asquith.—Robert W. Asquith, joint managing director and deputy chairman of William Asquith Limited, Halifax, England is chairman of the organizing committee for the British Machine Tool Section at the Fair. He succeeds Sir Holland Goddard, chairman of the Section's organizing committee last year.

●

Ontario Hydro Appointment.—E. D. Holdup, will be placed in charge of the J. Clark Keith power station at Windsor, Ont. when it goes into operation in the Fall. Mr. Holdup has spent 15 years in the British electricity supply industry, serving with the Central Electricity Board and later in the Deptford West and Battersea power stations of the London Power Company.

●

New C.I.L. President.—H. Greville Smith, C.B.E., is now president of Canadian Industries Ltd. and chairman of the executive committee. He succeeds George W. Huggett, who will continue to serve as chairman of the Board.

Mr. Smith was born in Sheffield, England in 1902. He graduated in chemistry from Oxford University. Formerly associated with Imperial Chemical Industries Limited of Great Britain, he joined C-I-L in 1932 in charge of the chemical development department. Two years later he became manager of the cellu-


Canadian National Railways
Canadian Pacific
Molson's
Canada Malting Co. Limited
Consumers Gas Co. of Toronto
The T. Eaton Co. Limited
McGill University
C-I-L
Canadian Industries Limited
B/A
Goderich salt
Canadian Copper Refiners
Texaco
Melchers Distilleries
Maritime Electric Company Ltd.
Gyproc
Fire Protective Wallboard
Purity Flour Mills Limited
Purity
Selected Hard Spring Wheat
Maritime Industries
Standard Clay Products Ltd.

lose products group and in 1939 he was made a vice-president of the Company. He was appointed a director in 1940 and elected vice-chairman of the executive committee in 1949.

•

A. M. Cameron.—A. M. Cameron has been appointed superintendent of Rolling Mills at Atlas Steels Ltd., Welland, Ontario. Previous to this appointment, Mr. Cameron was assistant superintendent of Rolling and Forging, South Plant. He joined Atlas in 1929 and was formerly with Jessop Steel, Washington, Pa., where he was a roll designer.

Mr. Cameron was born in Trenton, Nova Scotia and served his apprenticeship as roll turner with the Nova Scotia Steel and Coal Company (Trenton Industries Ltd.), Trenton, N.S. He was educated in Nova Scotia and at the Carnegie Institute of Technology, Pittsburgh, Pa.

•

New Peacock Directors.—Following the annual meeting of Peacock Brothers Limited on April 25th, F. T. Peacock, chairman, announced the election to the board of directors of The Honourable J. K. Weir, C.B.E., managing director of G. & J. Weir Ltd., Glasgow, Scotland, and J. D. Collier, Hopkinsons Limited, Huddersfield, England.

•

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Small Motors.—The English Electric Company of Canada Limited, St. Catharines, Ontario, have just released a new leaflet describing small induction motors. The leaflet, Number 11.5 is a completely new publication. Copies may be obtained from the Company.

•

Convection Heaters.—Trane Company of Canada Limited have introduced a complete line for all applications of the New Trane Code-rated Convector. Code-rated means that the ratings have been approved by the Convector Rating Committee of the U.S. Bureau of Standards. This standard is important to consulting engineers, heating contractors and architects, as it allows them to select with accuracy and confidence the proper size and type of unit to suit their requirements.

A particularly interesting addition to the line is the new Trane "picture window" Convector-radiator. It stands only 12 inches high, thus permitting unobtrusive installation beneath low picture windows. This style is available in either cabinet or recessed models.

In developing this new line of Code-rated Convector-radiators, which is the first to gain such approval in Canada, Trane have incorporated many new design, installation, and performance features. The radiators are described in bulletin A 4-31. Copies are available free, upon request to Trane Company of Canada Limited, 4 Mowat Avenue, Toronto, Ontario.

•

Plywood Publication. — "Sylvaply News" is the name of a publication of H. R. MacMillan Sales Ltd., 837 West Hastings, St., Vancouver. It is designed to be of interest to contractors and architects. To be placed on the mailing list apply to the Company at the above address.

•

Glass Data Sheets.—Pilkington Glass Ltd., 165 Bloor Street East, Toronto, Ont., are issuing a series of leaflets entitled "Facts by Pilkington about Glass". These leaflets are issued in loose-leaf form to facilitate binding. They carry some most interesting information. To be placed on the mailing list apply to the Company at the address given above.

•

Diesel Publication. — Russel-Hipwell Engines Ltd., Owen Sound, Ontario, eastern Canadian representatives of Cummins Engine Company are Canadian distributors of a two-colour, well-produced publication "The Dependable Diesel". It is a semi-technical publication and contains information of interest to those who are concerned with diesel engines. To be placed on the mailing list, apply to the Company at the address given above.

•

Roofing Booklet.—The Tremco Manufacturing Co. (Canada) Ltd., 57 Bloor Street West, Toronto, have recently released a 32 page publication "Solving Roof Problems". It describes various types of bases, the use of paper felts used in roofing, laying the built-up roof, various types of roofs, how to diagnose roof condition, how to plan roof repairs, the repair of copings and parapets, etc., etc. The publisher will be pleased to supply copies.

●

Bepco Journal.—No. 3 of volume 9 of the Bepco Journal contains an article "Modern Design Pumpsets" by J. B. McInroy, and a description by W. H. Crosby of a 2,000,000-volt impulse generator used for insulation testing. To be placed on the mailing list apply to Bepco Canada Ltd., 4018 St. Catherine St. W., Montreal 6, Que.

●

Timber-Concrete Bridges.—The B.C. Coast Woods Trade Extension Bureau, 837 West Hastings Street, Vancouver, B.C., has issued a four page folder "Modern Timber-Concrete Bridges". The Bureau will be pleased to forward copies.

●

"C.I.L. Oval".—The April issue of the C.I.L. Oval contains some interesting reading material. One article is entitled "Report from the Heavens". It describes the behaviour of cosmic rays and how they are recorded by a unique kind of balloon-borne photography. There is also another interesting article "War on Weeds". It describes the chemical control of weeds. For copies of the Oval apply to the Editor, C.I.L. Oval, Box 10, Montreal, Que.

●

"Dexion News".—Dexion News, published by Dexion Ltd., Triumph House, 189 Regent Street, London. W.1, is published at regular intervals to describe the use of the Dexion Angle, a product designed for rapid assembly for such things as benches, desks, scaffolding, etc. For copies of this and other Dexion publications apply directly to the Company.

●

Fiberglas Publications. — Fiberglas Canada Ltd., 1200 Bay Street, offers *Journal* readers copies of the following interesting publications. "Insulations for Heated Equipment"; "Fiberglas Aerocor —A versatile Thermal And Acoustical Insulation"; "Fiberglas Insulating Form Board"; "Fiberglas Pipe-Line Outer Wrap"; Fiberglas Roof Insulation"; "Dust-Stop Air Filtration Banks"; "Fiberglas Building Insulation in Residential construction"; "Fibreglas Perimeter Insulations"; "Fiberglas Duct Insulations"; "Fibreglas Ceiling Board for Suspended Ceilings".

The Company also offers a number of interesting technical bulletins describing the various uses and methods of application of "Fiberglas." For copies of any of the publications listed above, or for technical data on specific subjects, apply directly to the Company.

●

Car Shaker Bulletin.—Canadian Allis-Chalmers Limited, Lachine, Que., has issued a new bulletin describing the Allis-Chalmers Car Shaker for unloading granular material from hopper-bottom gondola cars. Construction features of the shaker are given together with specifications and a cross section through the vibrating mechanism.

For copies of the bulletin apply to Canadian Allis-Chalmers Limited, P.O. Box 37, Montreal. Ask for Bulletin No. 07B7221A.

●

Fork Lift Truck.—Coventry Climax Engines Limited, Widdrington Road Works, Coventry, England, have issued a six page bulletin describing their Fork Lift Truck. For copies apply to the company asking for descriptive literature. The Company will be represented at the Canadian International Trade Fair.

●

Non-Frosting Gauges. — Apply to Peacock Brothers Limited, P.O. Box 6070, Montreal, Que., for bulletins on Jerguson non-frosting large-chamber gauges, series REF-10 (reflex) or series TLF (transparent). These gauges are particularly adapted to the gauging of low temperature, light, gaseous fluids that tend to boil or surge because of the larger area at the meniscus—approximately 3 in. as against approximately 5 in. in the standard gauge. This results in less turbulence at the meniscus.

Use of the new Jerguson model in the chemical, petroleum, and other process industries, for low temperature ammonia, freon, propane, ethylene and other services, where low temperature fluids must be gauged, will speed up, as well as materially increase the accuracy of readings on all such applications.

●

Paper-Insulated Cables.—A 20-page illustrated booklet on "Paper-Insulated Cables" is now available from Canadian

General Electric Company for engineering departments of utilities, mines, and large industries.

The booklet covers both "Solid" and "Gas-Filled" cables, describing in each case their purpose, design, and installation. Diagrams and detailed data charts make the booklet a useful reference for engineers responsible for the design or installation of transmission and distributing systems.

Inquiries should refer to it by number — 4446 — Address inquiries to Canadian General Electric Co., Limited, 212 King St., West, Toronto 1.

•

Chains and Sprockets.—Jeffrey Manufacturing Co. Limited, P.O. Box 428, Montreal 32, Que., has available copies of a 215 page catalogue describing "Chains and Sprockets".

The catalogue describes the broad range of Jeffrey chains and sprockets and carries useful data on chains for elevating, conveying, and drive service.

It contains information on ultimate strengths, working values, and detailed dimension data, and a number of useful tables which simplify the selection of malleable and steel chains for most industrial applications.

Copies of this interesting publication are offered to *Journal* readers. Apply to the address given above and ask for Catalogue No. A-418.

•

Defence Production Organization. — The Department of Defence Production has prepared an organization chart of the department. For copies apply to the Department of Trade and Commerce, Ottawa, Ontario. Ask for a copy of "Department of Defence Production's Organization Chart".

•

Belting Manual.—Beardmore & Company Limited, 37 Front Street East, Toronto 1, are Canadian distributors of a two-colour 40-page publication "Uni-Pull Drive Manual". The publication describes the uni-pull drive and it contains tables designed to provide the designer, engineer, or maintenance man with a guide as to the correct selection of the proper size of belt, pulleys, and motor base for a given drive. All data in the publication are in agreement with the recommendations of the American Leather Belting Association and the National Electrical Manufacturers Association. Copies may be obtained from Beardmore & Company.

•

Expansion Joints. — Zallea Brothers, Wilmington, Delaware, announce publication of a new 4-page bulletin describing the complete line of Zallea Expansion Joints.

The bulletin gives sizes, dimensions, suggested applications, and other technical data on a variety of joints from small flexible connectors for use on Diesel exhaust lines to 30-foot diameter self-equalizing joints for use in such applications as wind tunnels, etc.

For copies apply to Zallea Brothers, Taylor and Locust Streets, Wilmington 99, Delaware, and ask for Bulletin No. 351.

•

Miniature Bearings.—Miniature Precision Bearings, Inc., Keene, New Hampshire, U.S.A., offers Catalogue No. 51-B. It describes the complete line of miniature bearings manufactured by the company.

•

Dust Precipitators.—A catalogue covering the latest design of Dust Precipitators made by Canadian Sirocco Company, Limited, Windsor, Ontario, is available.

The equipment is referred to as the Series 342 Precipitator and is designed to handle fly ash, cinders, and industrial dusts. It has been developed to meet the need and demand of industry for a simple, compact, economical, all purpose mechanical type dust precipitator.

The unit is built in a range of standard sizes with two basic arrangements and can be modified to fit special requirements. This line of mechanical collectors supplements Canadian Sirocco's complete line of air handling and conditioning equipment which already includes a wide variety of dust collectors and precipitators.

Ask for Bulletin No. 1728 and address inquiries to Canadian Sirocco Company, Limited. Dept. D-55, 310 Ellis Street, Windsor, Ontario.

•

Stainless Steel.—"Atlas Steel News" is the name of a publication issued at regular intervals by Atlas Steels Limited, Welland, Ont. It is a semi-technical publication which describes applications and methods of fabrication of stainless steel. To be placed on the mailing list apply to the Company.

•

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1049-4

Hose Connectors.—R. N. G. Oil Equipment Co., 5337 Papineau Ave., Montreal, are Canadian distributors of "Ever-Tite" quick coupling units. These units are intended for use on hoses ranging in size from ½ in. to 6 in. They are quickly connected, make absolutely tight joints, and are easily detached. They are specially designed for use with gasoline, fuel oil, gases, benzol, aromatics, steam, chemicals, paints, syrups, etc. For illustrated literature apply to the Company.

●

Silent Chain Drives.—Hamilton Gear & Machine Co. Ltd., 950 Dupont St., Toronto, have added an additional item to their series of technical data bulletins. The subject of the new publication is "Silent Chain Drives — Method of Design". For copies of this and other Hamilton Gear bulletins apply to the Company.

●

C.S.A. Bulletin.—W. R. McCaffrey, general manager of the Canadian Standards Association, has announced the release of the latest quarterly bulletin of the Association.

A brief review is given of all CSA committee meetings, including meetings on such subjects as wooden containers, control cable for electrical power plant equipment, marine valves and fittings, Canadian electrical code, part II on electrical approvals specifications, Canadian electrical code part VI on electrical approvals specifications for mining equipment, safety equipment for linemen, hydraulic lifts for service stations, drawing office practice, materials handling, reinforced concrete poles, structural timber. In addition, the bulletin announces new publications, personnel of the new committees, and covers many other items in which both producers and consumers will be interested.

To obtain copies apply to the Canadian Standards Association, National Research Building, Ottawa.

●

Oxy-Acetylene Booklet. — The Dominion Oxygen Company Limited, 159 Bay Street, Toronto 1, Ontario, have recently released a new publication "Oxy-Acetylene Flames and Metalworking — A Story of Industrial Progress".

The booklet gives a history of the flame, and also explains how industry is using it today. In addition to the more well-known uses of this flame, such as welding and cutting, the booklet describes many of the less known uses such as hard-facing, flame softening, flame hardening, powder-cutting, and steel conditioning. It is written in non technical style. Copies may be obtained by applying to the Dominion Oxygen Co. Ltd.

●

Cement Booklet.—Ciment Fondu Lafarge (Canada) Limited, 1405 Peel Street, Montreal 2, Que., have issued a small size leaflet on their product which it is claimed is "The most powerful concrete in the world".

The leaflet describes reconstruction of a railway bridge, a highway construction job, a new wharf construction. It also lists the Canadian distributors of Ciment Fondu.

●

New Equipment and Developments

Anaconda Expansion.—Following the annual meeting, on April 4, of Anaconda American Brass Limited, New Toronto, A. H. Quigley, president, announced that plans had been approved for expanding the firm's manufacturing facilities for products presently being fabricated.

The expansion will be accomplished by an extension to the tube mill in which both copper and copper-alloy tubes are currently produced; and by constructing a new copper department to absorb and provide extra capacity for copper strip, bus bar, commutator copper, etc., which now comprises a portion of the output of the existing rod and sheet mill. The transfer of such items from those two departments will automatically leave room therein for the expansion of brass and other copper-base alloys already being made.

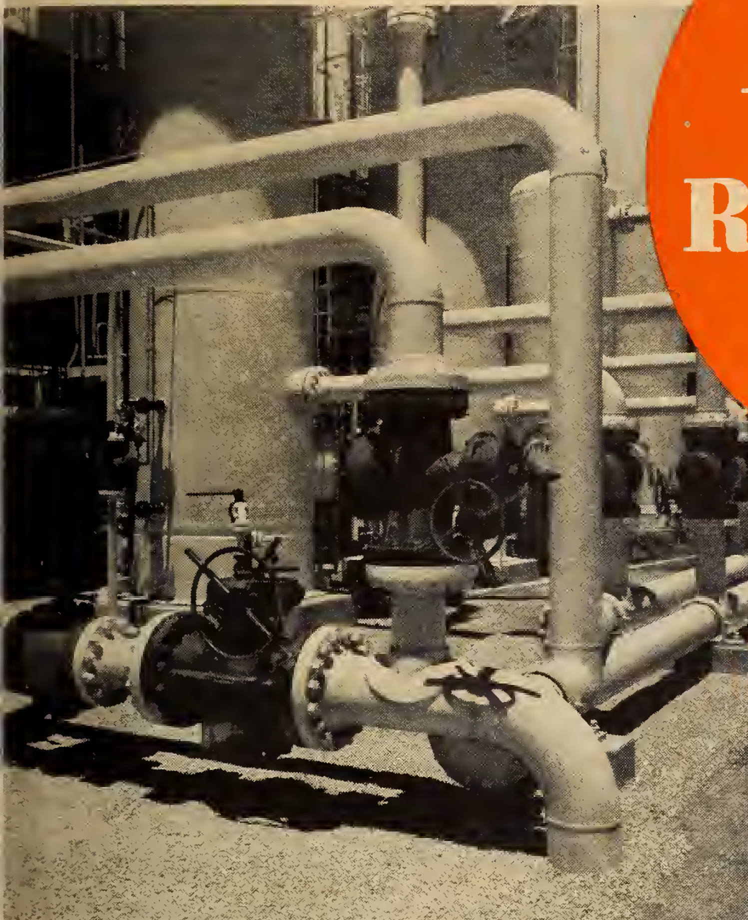
The plans for the new plant have been under contemplation for many months. They will involve an expenditure for buildings and equipment of approximately $4,000,000 and will enable Anaconda to render a more complete and rapid service to Canada's expanding industrial and commercial enterprises.

●

Drawing Device.—The Quickdraw Company, 127 Gunnerbury Avenue, London, England, are manufacturing a new precision instrument called "The Quickdraw".

Grinnell Welding Fittings for

MINIMUM RESISTANCE TO FLOW



Grinnell Welding Fittings on towers of natural gasoline plant.

TRUE CIRCULAR SECTION

True circular section at all points makes a Grinnell fitting easy to align and weld . . . no distortion or flattening to affect flow adversely.

FULL EFFECTIVE RADIUS

Pressure loss through Grinnell welding elbows is held to a minimum because of the full, effective sweep of the radius.

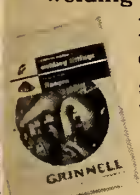
SMOOTH, CLEAN INSIDE SURFACE

Grinnell fittings have uniformly smooth inner walls . . . no waves or ridges to cause turbulence or accelerate erosion or corrosion. No pockets to trap solids or foreign matter.

EASY, SWEEPING TURNS

In Grinnell welding tees, the corners where the outlet joins the run are well-rounded and perfectly smooth to minimize resistance to flow and to prevent trapping.

Any qualified welder can make welds quickly and easily with Grinnell welding fittings. These fittings are made by a hydraulic forging process that assures uniform wall thickness at all points and true circularity throughout. Of seamless, one-piece construction, they can be cut at any angle to match up with standard weight, extra strong and heavier wall pipe in I. D. or O. D. sizes. Pressure-temperature ratings are equal to or greater than those of seamless steel pipe. Grinnell welding fittings are process stress-relieved.



Full data on the complete line of Grinnell carbon steel butt welding fittings and forged steel flanges is contained in the Grinnell Welding Fittings Catalog.

SEND FOR THIS CATALOG

GRINNELL

WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY OF CANADA, LTD., Montreal • Toronto • Vancouver. Grinnell jobbers in principal cities.

This instrument "mechanizes" the drawing of sketches, plans, etc. and for the expert in the drawing office it can speed up work considerably.

It consists of a "Perspex" template, carefully cut with mathematical accuracy to produce varying angles, triangles and rectangles as well as circles. Graduations are marked both in inches and millimeters. The template is toggle-hinged to a folder which acts as a drawing-board holding the paper over which the instrument is moved to obtain the correct ruling guide.

There are nine vertical holes in the template, spaced an eighth of an inch apart. These enable the users to draw any number of parallel lines at exact distances apart.

The instrument fitted to the folder measures only 14 inches and is quite light in weight. Pockets are provided at the bottom corners to retain paper for drawings. One pin is required to secure the paper into position. The largest size of drawings that can be produced with the instrument is 13 inches by 10 inches.

●

Diesel Plant for St. Johns, Que.—On April 9 it was announced that a new plant to manufacture Diesel motor equipment will be established in St. John's, Quebec. It will employ more than 1000 workers.

The announcement was made by Mayor Georges Phaneuf of St. John's, Que.

●

Function Plotter.—The automatic compiling of two measurements and plotting of a curve to show their interrelationship, namely: Y equals f (X), is made possible by a new electronic instrument.

The instrument, the Brown ElectroniK function plotter, developed by Minneapolis-Honeywell Regulator Company, is said by the Brown Instruments division engineers, to incorporate two measuring systems, one of which actuates the recorder pen while the other motivates the instrument chart.

Through this arrangement the chart is driven up and down in response to the changes in one variable simultaneously with the movement of the pen in response to changes in a second variable. The result is a curve which continuously evaluates one variable in terms of the other.

Laboratory or over-all industrial investigations involving such inter-dependent non-linear variables are greatly facilitated with the function plotter. For such investigations, it is claimed, plotting curves manually from data collected point by point is a laborious, time-consuming process which has many disadvantages. By using the function plotter, the measurements are compiled and the curve is plotted automatically. Measurements of the entire curve are continuous; no interruption is needed to complete data between points of measurement. For complete information communicate with Minneapolis-Honeywell Regulator Co. Limited, Leaside, Ontario.

●

Avro Subcontracts.—About 400 Canadian plants, from the prairies to the maritimes, are participating in Avro Canada's defence work for the Royal Canadian Air Force, according to information released by A. V. Roe Canada, Ltd.

●

Canadian Defence Orders.—The volume of defence orders placed by the Canadian Government in the twelve months ending March 31, 1951, amounted to over $800 million. This was more than three times the defence orders issued in the fiscal year 1949-50.

Forty percent of the defence programme was accounted for by aircraft orders, amounting to about $330 million in the fiscal year. The bulk of the aircraft orders were for the F-86 Sabre jet fighter built by Canadair in Montreal and for the CF-100 all-weather fighter and the Orenda engine produced by A. V. Roe Canada Limited.

Orders for electronics and communications equipment were next in importance, amounting to approximately $90 million.

The shipbuilding programme showed a spectacular increase from $4 million in 1949-50 to $79 million in 1950-51. The bulk of new shipbuilding orders was for minesweepers and anti-submarine escort vessels.

Contracts were placed for military construction costing about $68 million dollars. These figures include expenditures on the repair and maintenance of military establishments, but new construction of airports, buildings, and other installations accounted for most of the volume of defence construction.

Orders for military vehicles and other automotive equipment amounted to $65 million.

Power Line Contract.—F. A. Tucker Canada Limited, of Montreal, have been awarded the contract for the erection of the 170,000 volt power line between Kootenay River and Kimberley, according to an announcement made recently by The Consolidated Mining and Smelting Company of Canada, Limited.

The contract calls for the clearing of a 66-foot right-of-way, erection of the H-frame pole line and stringing of the wires from Cominco's South Slocan power plant on the Kootenay River to a point adjacent to the Sullivan Concentrator at Kimberley.

New C.G.E. Office.—The Canadian General Electric Company's Toronto office has been moved to an ultra-modern building at 1350 Castlefield Ave.

The new building includes office and warehouse facilities to provide complete dealer and customer service for the Toronto area. It also provides a headquarters for Company offices throughout Southern Ontario (less the Ottawa valley) and Northern Ontario as far as Sault Ste. Marie. A complete stock of electrical equipment is maintained.

The building has 185,000 square feet of floor space and is of brick and steel construction with a full basement.

Canadian Truck Manufacture.—Preparations for the partial manufacture and complete assembly of a limited number of 2½ ton and ¾ ton trucks has started in two Canadian plants, according to a statement made recently by the Rt. Hon. C. D. Howe.

The initial order, to be completed in the current fiscal year, calls for approximately 456 of the ¾ ton trucks to be produced by Chrysler Corporation of Canada Limited, Windsor, and 780 of the 2½ ton trucks to be made by General Motors of Canada Limited. Both these types of vehicles will be built according to U.S. standards and specifications.

Mr. Howe explained that full tooling and production to meet the limited requirements of the three Canadian Services is out of the question at present. The possibility of securing U.S. orders for Canadian factories was carefully examined but there is excess capac[ity] in that country for producing these types of vehicles. Nevertheless, he claimed some production must be undertaken in Canada in order to encourage the production of components in this country and to ensure the highest possible Canadian content in these vehicles. It is also important to make arrangements for some tooling-up in Canadian plants and to give Canadian industry an opportunity to become familiar with these types of vehicles.

Negotiations are under way with the Willys Overland Company of Toledo for Canadian production of ¼ ton 4 x [4] jeeps by the Ford Company of Canada Limited, Windsor, Ontario, on a similar basis and it is expected that an announcement will be made shortly.

Controlled Chemicals.—On April 24 the Department of Defence Production announced that an Order-in-Council has been passed declaring certain chemicals to be essential materials under the Defence Production Act.

The most important chemicals covered by the Order-in-Council are sulphur and chlorine benzol and sulphuric acid. Other chemicals listed in the order are glycerine, formaldehyde phenol, toluol, soda ash, caustic soda, phthalic anhydride and zinc oxide.

C.P.R. Report.—The following points were covered in the 1950 annual report of the Canadian Pacific Railway Company.

The new St. Luc freight terminal ne[ar] Montreal, which was constructed at [a] cost of $12,000,000 has made possible the speedy and efficient handling of [a] substantially larger number of cars th[an] could be handled previously in separa[te] yards, which are now in the process [of] being closed down. New motive pow[er] delivered during the year consisted [of] 58 Diesel-electric units which were p[ut] into service on the Schreiber divisi[on] north of Lake Superior in Ontario. The[re] were 1,870 new freight cars and 1[...] passenger train cars placed in serv[ice] during the year. A new type of car, t[he] "restaurant sleeper" was introduced [on] two trains late in the year.

Two new vessels are being readied f[or] use by the British Columbia Coast Se[r]vice of the Company. The report sho[ws] that 569 new manufacturing, warehou[s]ing and distributing plants were locat[ed] on the lines of the company in 19[50] and to serve 156 of these, 26 miles [of] siding tracks were constructed.

During the year capital appropr[ia]tions to the extent of $28.7 million, in addition to those approved at t[he] last annual meeting, were authorized [by] the directors. Three thousand new b[ox] cars accounted for $21.4 million of t[he] total.

On itemized list totalling 54.5 milli[on] of expenditures for 1951 was placed b[e]fore the shareholders for approval. T[he] sum includes $41.91 million for new ro[lling stock]

ing stock, making provision for 3,575 freight cars, 25 baggage and express cars, and 272 work cars, as well as 40 diesel electric units, 28 of which will be placed in freight service on the Laggan and Mountain subdivisions on the main transcontinental line between Calgary and Revelstoke. The other 12 units will be yard switchers.

The 1950 railway dollar, the report shows, was earned on the following basis: 12 cents from passengers; 17 cents from products of the farm; 20 cents from products of mines and forests; 44 cents from movement of manufactures and miscellaneous; and seven cents from other or unclassified traffic. Expenditures, in divisions of a dollar were, pay rolls, 47 cents; materials and supplies, 30 cents; taxes and other expenses, 13 cents; fixed charges, four cents; dividends and improvements, six cents.

●

Industrial Design Contest.—A lack of understanding of mass production needs and techniques was shown by most of the 330 entrants in the National Industrial Design Committee's $10,000 competition for new designs in aluminum and wood, according to a government release received from Ottawa. As a result no first, second, or third prizes are to be awarded in this contest. The judges felt that some entries, while not fully professional in calibre, were of such original merit that the designers submitting them should be awarded special prizes of $500.00 each.

D. W. Buchanan, secretary of the National Industrial Design Committee, announced that immediate consideration will be given to a recommendation made by the judges that the $7,000 which remains unallotted out of the present contest, be applied later this year to another competition with more precise emphasis on mass production.

●

Telephone-type Jack.—A new telephone-type jack has been announced by Switchcraft Inc., 1328 N. Halsted Street, Chicago 22, Ill. Known as the "T-Jax" this jack was designed especially for high quality communication equipment, and to meet the exacting specifications of the armed services. It has a strong steel frame, produced in specially designed dies, and is press-welded to provide the rigidity and dimensional stability required for heavy service.

The springs are produced in dies of special design and are made of a special alloy of nickel silver insuring maximum spring life and corrosion resistance. Fine silver contacts are standard in switching circuits; palladium cross-bar contacts are also available. Insulation is in accordance with miltary standards. Further details may be obtained from the manufacturer.

●

Trade Fair Comments.—The 1951 International Trade Fair May 28 to June 8, promises to be the most successful to date.

The Fair will be bigger than in previous years and there will be a wider variety of products. The exhibits will be in excess of 160,000 square feet.

Great Britain will again be the major exhibitor. The section devoted to machinery, plant equipment, and related capital goods will be the largest, and in many ways the most impressive, of the show. The present trend indicates that it will almost certainly be larger than last year, and to date eight countries have booked space in this section.

Among the Canadian exhibits there will be a line of modern melting furnaces and other industrial furnaces. The electric melting furnace features hydraulically operated roof raising, swinging and tilting. Many features of the machine, such as the electric holders and parts of the regulator, are patented.

Another unique exhibit will be a new-

USE LIGHT WEIGHT CASTINGS

for

MAGNESIUM
ALUMINUM

LOWER PRODUCTION COSTS

Substantial reductions in production costs are often the result of a new product designed or an old one redesigned to use either magnesium or aluminum castings. Light metal castings save pounds and dollars at the same time—they are strong as they are light and can be cast to such close tolerances that much costly machining is eliminated.

We have case histories on record where changes in structural design to use light metals not only increased the originally planned strength but brought big savings in metal and machining. It takes experience and know how to produce high quality light weight castings. Our experience has been gathered through many hundreds of successful applications. It is at your disposal—simply write Light Alloys Limited, Renfrew, Ontario.

Magnesium Sand Casting

Magnesium Permanent Mold Casting

Magnesium Pressure Die Casting

LIGHT ALLOYS LIMITED

Subsidiary of Dominion Magnesium Limited, Suite 1505, 320 Bay Street, Toronto.

ly invented machine for inserting and tightening the spokes in bicycle wheels. This is the development of a large Canadian cycle firm. Before the introduction of this machine, one skilled operator could do about 50 wheels per hour. Through the use of the machine an unskilled man can operate two of the machines simultaneously and turn out from 150 to 200 wheels in an hour.

Other Canadian engineering equipment to be displayed will be marine boilers, chemical process equipment, rock crushers, steam and diesel engines, hydraulic gates, lime kilns, rolling mill machinery, oil equipment, mechanical presses, model ships.

The huge British exhibit of machinery and plant equipment this year includes two joint efforts by four trade associations. The Association of British Tool Makers and the Machine Tools Trades Association are combining in one exhibit, and the National Federation of Engineers' Tool Makers are joining with the British Federation of Hand Tool Manufacturers in another. Besides these displays, a great many British firms are exhibiting individually.

Among the British exhibits will be several types of fork lift trucks, and one British exhibitor will show a working model of an aerial ropeway and mechanical handling installation.

Another British exhibitor is introducing a number of machines designed entirely for the Canadian market. Among them are an electric hydraulic veneer press, an automatic belt-sanding machine, an overhead belt-sanding machine, and a double cut-off and squaring sawbench. A three spindle, quick acting, hand operated veneer press, which has been supplied to a few Canadian customers, will be generally introduced for the first time.

A British manufacturer of filters is exhibiting for the purpose of establishing an agency in Canada to supply a market which he feels has large potentials. His product has two distinctive features for reconditioning used oil and it is claimed that, with the filter, over 98 per cent of the oil drained from Diesel engines can be made available for re-use at a cost of about two cents a gallon.

●

Junction Boxes. — New, heavy-duty, weatherproof junction boxes made of non-corrosive, cast aluminum are announced by the Stone Manufacturing Company, Elizabeth 4, New Jersey.

This new list of products includes a variety of covers and fittings for universal use on almost any outdoor wiring or lighting job. Complete information may be obtained from the manufacturer.

●

British Engineering Exhibition.—What is claimed to be the largest display of engineering products in the world will once again be on view at the Engineering, Marine and Welding Exhibition which will be held in London, England, from August 30 to September 13, 1951.

The Exhibition has been held in alternate years since 1906, except for the interruptions caused by the two world wars.

The chief sponsor of the exhibition, the British Engineers' Association, 32 Victoria Street, London, S.W.1, England, will be pleased to supply further details.

●

Oil Refinery.—Engineering of several major processing units for Canadian Oil Companies' new $18 million refinery at Sarnia, has progressed from the planning stage to the production phase. Construction started in April according to the Canadian Kellogg Company Ltd. Canadian Oil Companies and Canadian Oil Refineries will own and operate the refinery.

Completion of the plant is scheduled for 1952. The combination unit, first of its kind to have the new Orthoflow catalytic cracker operating in combination with catalytic polymerization, will produce high-octane stock for both aviation and automotive gasoline. Gas oil feed for the cracker will be produced from 20,000 BPD of Alberta crude.

Rubber's role in defence is spot-lighted by the special fractionating equipment which will send butylenes to the nearby government-owned Polymer Corporation's synthetic rubber plant.

●

New British Jet Plane.—A new jet aircraft has just made its first flight in Britain. Named the FD 1, the plane's performance is still secret, but it is an extremely "swept-back wing" craft powered by a Rolls Royce jet engine.

●

aritime Power & Plant Expansion.—ıe Nova Scotia Light and Power Comıny has ordered from the Metropolitan ickers Co. in Britain for installation at alifax, a 20,000 kw. 3,600 r.p.m. turbonerator set complete with condenser ıd feed water heaters.

●

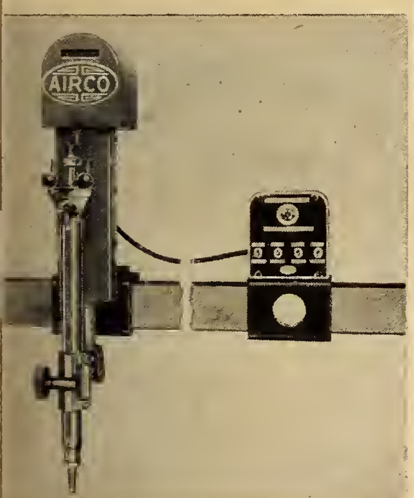
nperial Oil Refinery Contract.—A ntract for construction of an atmosıeric and vacuum distillation unit, a ıid catalytic cracking unit and a light ıds recovery plant at Imperial Oil's ırnia refinery has been awarded to the ınadian Kellogg Co. Ltd., Toronto. ıe distillation unit, with a capacity of ,500 barrels per day, and the catalytic acking unit with 23,250 barrels daily pacity, will be the largest of their kind Canada.

The contract price is in the neighborıod of $9 millions. A proposed new ıiler plant and increased water pumpg facilities are not included and will handled through other contracts.

●

otorized Torch Cutter.—A motorized rch holder for remote control raising ıd lowering of cutting torches mounted ı oxyacetylene cutting machines has ıen announced by Airco Company Inrnational, a division of Air Reduction ompany, Incorporated.

The device, which is designed for ounting on the 3 inch square torch bar an Airco Oxygraph or Travograph



ｘyacetylene gas cutting machine, raises lowers the cutting torch through 5 ches of travel. The remote control vitch box mounted on the torch bar the operator's control station provides switch to actuate each of four torches dividually and a master switch for multaneous control of all four torches. nother control box is added for each ur additional torches employed.

The torch holder can be positioned rtically, 90 deg. left or right parallel the longitudinal axis of the torch bar, ıd, with an adapter, can be positioned deg. forward perpendicular to the ırizontal axis of the torch bar.

Both motorized torch holder and reote control switch box can be placed the location most convenient to the ıeration being performed.

For further information write to Canaan Liquid Air Co. Ltd., 1111 Beaver all Hill, Montreal.

●

Radial Arm Saw.—Consolidated Machinery and Supply Co. Ltd., 2031 Santa Fe Avenue, Los Angeles 21, California, have recently introduced a large radial arm saw which will cut off or mitre construction timbers up to 17 by 17 inches. This machine, known as the Comet Timber Cutter, was designed primarily for use in mining, bridge building, shipbuilding, and other heavy construction work.

Comet Timber Cutters are available in three sizes from 7½ to 10 hp., 1800 or 1200 r.p.m. 220/440 volt motors that swing blades up to 44 inches in diameter.

The saw assembly is mounted on a rigid arm of hardened steel tubing supported by an adjustable steel column. Eight ball bearing rollers allow the saw to move forward and backward on milled tracks in this arm. These are totally enclosed and sealed from dirt and dust by felt wipers. Adjustment for depth of cut is made through a screw gear raising device with controls located at the front of the machine. Adjustment for mitre is made by rotating the column to the desired angle. Width of cut-off is controlled by a manually operated chain drive attached to the saw assembly. Complete information may be obtained from the manufacturer.

•

Regulator Controls.—Regulator controls that are at least 99 per cent accurate, regardless of changes in temperature or load, are now being supplied by Canadian General Electric Company, as standard equipment on all G-E station-type induction and step regulators.

All the control elements are individually pre-tested before assembly. A final check of the operation of all the completely assembled regulators assures coordination of all components.

For further information, communicate with Canadian General Electric Company Limited, 212 King St., West, Toronto 1, Ont.

•

G.E.C. Exhibit.—One of the exhibitors at the Canadian International Trade Fair this year will be the General Electric Company Limited, of England, Britain's largest manufacturer of electrical goods and equipment. The British company will be represented by its recently formed subsidiary, The British General Electric Co. (Canadian) Limited. This will be the first time since the inauguration of the Trade Fair that "G.E.C.", as the Company is generally known throughout most of the world, will have a comprehensive display of products for the Canadian market.

•

Mechanical Shaft Seal.—The Crane Packing Company, 1800 Cuyler Avenue, Chicago 30, Illinois, announce a new, improved mechanical seal.

The new seal is designated as Type 9 Mechanical Shaft Seal. It incorporates a flexible ring molded from Teflon. The Type 9 Seal has been designed for service on various rotating shaft applications, such as centrifugal pumps, turbines, positive displacement pumps and agitators. Complete information may be obtained from the Company at the address given above.

•

Vacuum Lifters.—Industrial Products Company, Philadelphia 33, Pa., announces an improved line of vacuum lifters for punch press feeding and other production uses. The lifter has been designed to prevent finger and hand injuries and to speed up the work. It is practical for both high and low stroke punch presses, lifting, feeding, and positioning blanks without requiring hands or fingers to be inserted within the danger zone. An additional advantage is the rapid transferring of blanks from piles or stacks, especially when oily or greasy and difficult to grasp with the fingers.

These punch press feeders are light, easy to handle, and respond instantly. A slight blow affixes vacuum cup to blank being handled. Release is instantaneous by a depressing thumb lever. The manufacturer will be pleased to supply prices and further details.

•

Controlled Materials.—The effect of the United States Controlled Materials Plan on Canada, and the mechanics of Canadian participation in the scheme, have been the subject of discussions recently concluded in Washington between government officials of both countries.

The Controlled Materials Plan, which will go into operation in the United States on July 1, 1951, will allocate steel, copper, and aluminum to producers of defence and other essential items on the basis of detailed requirements submitted in advance to the U.S. Government.

As a result of the recent discussions, it is believed that when it comes to meeting requirements for defence and other essential purposes from the United States, Canada will fit into the plan, in almost exactly the same way as in 1943 to 1945. It is anticipated that the Canadian system of programme classification will be necessary, under which the Canadian importers will show the general distribution of his products by principal classes of use.

Under the plan the U.S. Government will have quantitative measurement of materials available for defence and other essential purposes and can make allocations through government departments and agencies to prime contractors.

At the present time a single band priorities system is being used in the United States to channel materials and components into defence and other essential production. However, as the production programme builds up, and as the impact of defence orders spreads throughout the economy, such a system is inadequate to deal with the accumulation of demands for materials for essential purposes.

Under the current priorities system, essential materials are channeled to industry either by an outright directive, in the case of very urgent military programmes, or by a DO rating in the case of defence and essential industrial and civilian requirements. As C.M.P. comes into effect, there will be three methods for channeling materials:

(a) Directives;
(b) C.M.P. allotments, which will validate DO's in the procurement of the three controlled materials; and
(c) DO ratings for the procurement of items other than controlled materials.

The Department of Defence Production, Ottawa, emphasizes the fact that many aspects of the plan are still in the formative stage and procedures for Canadian participation will be developed and sent out to industry as quickly as possible.

•

Nickel Sponsored Fellowships.—Commemorating the two-hundredth anniversary of the isolation of nickel as an element, the International Nickel Company of Canada Limited, has established three graduate fellowships, each valued at $6,000 to encourage research in the fields serving the metal industries. They will be awarded yearly by the National Conference of Canadian Universities.

Professor D. L. Thomson, dean of the Faculty of Graduate Studies and Research of McGill, in announcing the awards, said "the fellowships are for research in the fields of geology, mining, ore dressing, metallurgy, and the physics and chemistry of metals. Each fellowship provides $2,000 a year and is tenable for three years. Applications will be considered from any Canadian university qualified to confer a Master's or Doctor's degree in the acceptable fields.

•

B.C. Mine In Operation.—The Consolidated Mining and Smelting Co. of Canada Limited, announced recently that it will bring the H. B. Mine, near Salmo, B.C. into production in the next two years at a cost of $2,750,000. The H. B. Mine a zinc-lead-silver operation, is about six miles from Salmo, and concentrates from the property will be trucked about 40 miles to Trail for treatment. The plans include the driving of a 4000 ft. haulage tunnel to the orebody and the erection of a 1,000-ton concentrator, together with necessary plant buildings adjacent to the portal of the haulage tunnel.

•

New Chemical Plant.—Dow Chemical of Canada, Limited, announce the completion of a plant at Sarnia for the pro-

duction of carbon tetrachloride, trichloroethylene, and perchloroethylene. This is the first production of carbon tetrachloride in Canada.

●

British Air Compressors.—Arpic Engineering Limited is a new British company, located at Glasgow, Scotland, which has been set up for the production of portable Diesel-driven air compressors.

Their range will be 75, 105, 160, 210, 315 and 500 c.f.m. actual output.

The compressors are of two-stage air-cooled design and possess a number of advanced features, such as group controls, patented oil operated clutch, electric starter, manifold heater, and fuel injector for cold weather starting.

The Canadian sales & service agents are J. T. Hepburn Limited, 916 Dupont St., Toronto.

●

Small pH Meter.—Analytical Measurements Incorporated, 585 Main Street, Chatham, New Jersey, announce a pocket-size pH meter and companion probe unit, which, it is claimed, permits instant, on-the-spot pH determinations anywhere.

Completely self-contained, with batteries, in bakelite case, this instrument is furnished, camera fashion, in an ever-ready case with novel plastic tubes of buffer and KC1 solutions. Total weight is 3 lbs.

The meter is scaled from 2 to 12 pH for easy reading, and a simple adjustment gives readings of from 0 to 14. Accuracy of 0.1 pH is obtainable. Hearing-aid type batteries provide up to 1300 hours of operation. The manufacturer has literature fully describing this equipment. Copies are available.

●

Non-ferrous Metal Control.—The following is the text of a news release issued by the Department of Defence, Non-Ferrous Metals Division. It is known as Order M-1.

(Primary Nickel and Electrical Resistance Alloys)

Under and by virtue of the powers contained in The Defence Production Act,

THE MINISTER OF DEFENCE PRODUCTION HEREBY ORDERS AS FOLLOWS:

1. *Interpretation*

For the purpose of this Order:

(a) "person" shall include any individual, partnership, corporation, co-operative or other association, society or organization;

(b) "primary nickel" shall mean nickel of any concentration in the following forms: Copper nickel shot used for remelting, electrolytic cathodes, ingot and shot;

(c) "electrical resistance alloys" shall mean any electrical resistance alloys containing 50% or more by weight of nickel or nickel plus chromium, produced by any hot or cold working processes.

2. *Authorization Required*

On and after May 1, 1951:

(a) No person shall purchase or otherwise acquire any primary nickel or electrical resistance alloy, as above defined, unless he has submitted his purchase order to the Director, Non-Ferrous Metals Division, and the Director has authorized the placing of such purchase order;

(b) No person shall supply or deliver any primary nickel or electrical resistance alloy to anyone until he has received a purchase order with the proper authorization as described in subsection (a) of this section.

3. *Reports*

Any person who acquires, sells, deals in, or carries an inventory of primary nickel or electrical resistance alloys shall give the Director of the Non-Ferrous Metals Division such information in such form and at such times as the Director may require.

4. This Order shall come into force on the 16th day of April A.D., 1951.

F. V. C. HEWETT,
Director,
Non-Ferrous Metals Division.

●

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CONTENTS

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The Saint Lawrence Waterway

An All-Canadian and Very Deep Route

by

J. G. G. Kerry, M.E.I.C.

Port Hope, Ontario

A paper presented at the 65th Annual General and Professional Meeting of The Engineering Institute of Canada at Montreal, May 11, 1951.

Few subjects have been more exhaustively written up than the proposed St. Lawrence Seaway. The writer who tries to add anything of value to this mass of literature might reasonably be regarded as presumptuous. There is, however, one aspect of this problem to which little or no attention has been directed. That is the ultimate standard up to which the channels of the river are capable of being improved. All previous studies have been directed to designing improvements to meet some previously established standard of excellence. None have as yet been directed towards the ultimate possibilities.

Today it would appear that the optimum standard to be worked towards is a channel that will accommodate any vessel that can pass through the great inter-ocean canals of the world, and one that will keep itself clear of obstructing ice all winter long. Curiously enough a channel that will meet the needs of the second objective is sure to satisfy the needs of the first, for an indefinite period that cannot be foreseen. Great depth and volume are two most important features for a channel in which ice will not tend to form quickly.

This paper will consider only the so-called International Section of the Seaway, extending from the deeps of Lake Ontario to Lake St. Francis. Improvements to any standard that can be secured on it can also be secured all down the river to the head of the estuary. This section is sharply divided naturally into two parts, a lake section extending eastward as far as the head of the Galops Rapids, and a river section continuing on to Lake St. Francis, whose southern shore is cut by the International Boundary near its west end.

The author of this paper has devoted years of study to ice conditions, particularly in relation to the St. Lawrence River. He has long held the vision of an "all season" seaway, kept free of ice by utilizing the latent heat contained in the deep waters of Lake Ontario. Here he gives his ideas of how such an objective might be attained.

A second proposal is also advanced, namely diversion of Canada's share of St. Lawrence waters, from Galops Island across the St. Lawrence Lowland by canal, emptying it into the Ottawa River near Point Fortune. Here power would be developed along lines generally similar to Beauharnois, keeping the seaway as a national undertaking.

Lake Section

Viewed from the standpoint already set up in this paper, the lake section leaves little to be desired. It is amply deep, of more than ample cross section, and the present steamboat channel is distinctly international. This channel clings to the New York shore from Cape Vincent passing Clayton, Alexandria and Chippewa Point to cross over to the Ontario side and to pass through the Brockville Islands, past Brockville, through the McNair Islands and past Prescott to the head of the Galops Canal. It is abundantly deep but obstructed at many points by small shoals and rock islets.

If a channel 60 ft. deep be desired, it can be secured at reasonable expense. It would also be possible to build two independent and strictly national channels of satisfactory width and depth, but there seems to be little reason why this additional work should be undertaken unless it is found to be advantageous to build the winter channel in Canadian waters, a channel that could pass by Kingston and Gananoque to join the present channel near Grenadier Island or Whitney Point. This is quite feasible.

The maintenance of an ice-free channel calls for the creation of a fairly rapid current in the river. This cannot be achieved without cutting down the winter cross section of the river with the aid of an extensive group of dykes, levees, jetties and removable bulkheads.

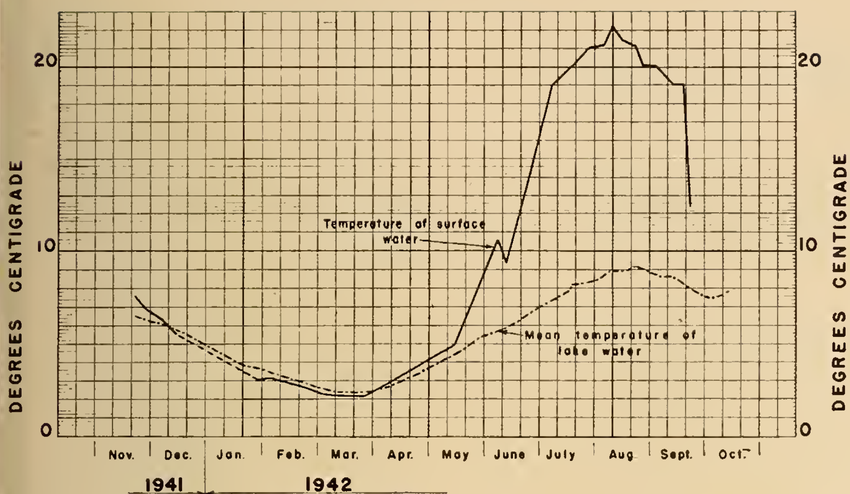


Fig. 1. Surface and mean temperatures of the waters of Lake Michigan.

The cross section throughout the lake section must be reduced to a width and depth suitable to the desired velocity, and to the volume of the discharge of the river. Dr. Barnes in his "Ice Engineering"* was the first to point out that such an improvement of the channel would keep the river free from ice. It may be that he did not realize how large a construction job would be necessary. Stagnant areas back of the levees must be allowed to freeze over and the movement of any of the ice into the open channel prevented.

*H. T. Barnes, "Ice Engineering", 1928, Renouf Publishing Co., Montreal.

Water Temperatures

Fig. 1 shows for one year the surface temperatures of the waters of Lake Michigan, and the simultaneous temperatures of the whole body of the waters in the lake, that is, in so far as it was possible to determine these by a necessarily limited number of observations. Note that during the winter months (December to April, inclusive) the average temperature of the body of the lake waters is practically the same as that of the surface waters.

Fig. 2 shows the depth temperatures of the lake, as observed on one cruise of a vessel across it. The waters are obviously isothermal from top to bottom, and the more rapid cooling off of the waters close to shore is made very evident. This diagram may be regarded as confirming the conclusion drawn from Fig. 1.

Fig. 3 shows the results of a series of depth temperature observations taken in the summer months, mainly in Lake Ontario. The form of the curves is typical for the Great Lakes in summer, always a warm shallow surface layer, and a deep mass of waters with a temperature approaching 39 deg. F.

Fig. 4 shows for a period of nearly three years:

(a) the temperatures of the surface waters of Lake Michigan during the winter months, when the

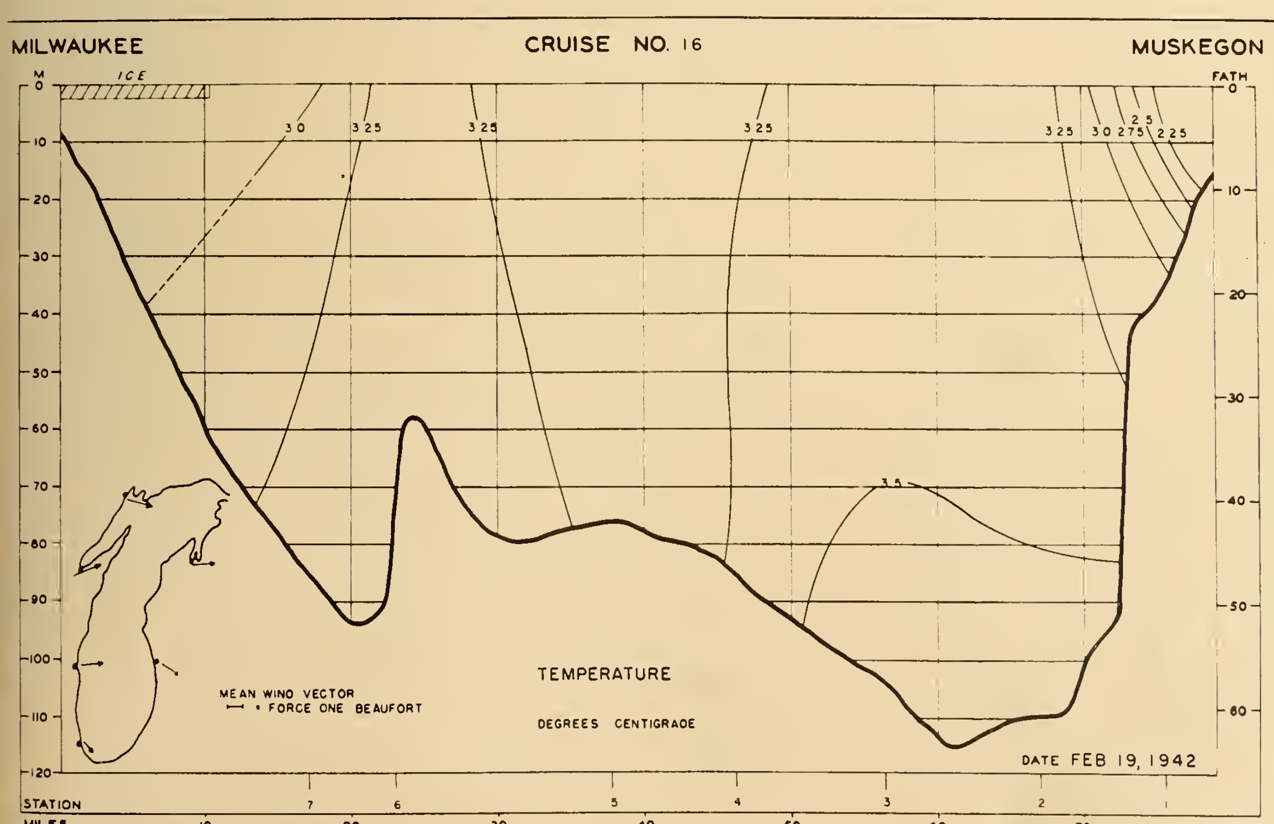


Fig. 2. Depth temperatures of Lake Michigan

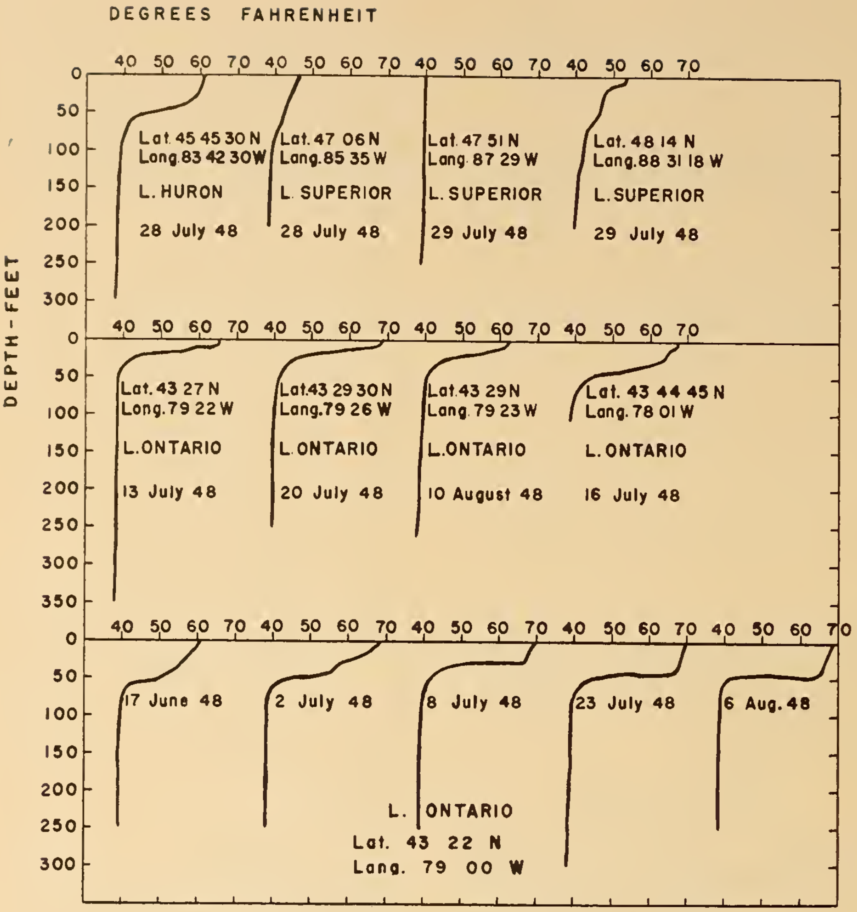


Fig. 3. Depth temperatures of Lake Ontario.

whole body of the lake waters was nearly isothermal.

(b) the air temperatures as observed at Milwaukee, (five day means). Daily observations would, of course, have been much more irregular.

(c) the heat content of the waters near the centre of the lake, given in calories per cm.^{2}, the heat content at 0 deg. C. being taken as zero. (To convert calories per cm.^{2} to B.t.u. per sq. ft. multiply by 3.68+)

The points to be observed from Fig. 4 are the very regular changes from day to day in the surface water temperatures and in the heat content of the lake. There is only a very general correspondence between the air temperatures and the heat content of the lake. Data drawn from the plotted curve of heat content are probably much more reliable guides for the purposes of design than calculations based on isolated observations of air and water temperatures.

It will be noted from the plotted curves that the rate of heat loss per day flattens off rapidly in February and becomes almost zero in March.

Fig. 5 shows water surface temperatures taken on Lake Ontario concurrently with the observations on Lake Michigan (Fig. 4). Surface temperature curves on the two lakes correspond closely, but the Lake Ontario temperatures do not show the low points observed on Lake Michigan in the winter of 1942-43, possibly due to the greater depth of Lake Ontario.

The distance from the deep waters of Lake Ontario to the open salt waters of the Estuary is about 420 miles., about six days travel at 3 m.p.h. The critical time for ice formation comes usually in February when the air temperatures are still low, and when lake waters have cooled to a minimum. If heat loss in February is taken from Fig. 4 and the lake temperature is assumed not below 34 deg. F. in February, after six days travel the waters will still be above the temperatures at which either sheet ice or frazil will form.

It is of course a truism that ice will not form in water which has not been cooled down to 32 deg. F. nor as the studies of Dr. Barnes have shown, is it likely that frazil will form in quantity under Canadian winter conditions if the temperature of the water is as high as 32½ deg. F. For a more precise defining of the relations between air temperature, water temperature and the formation of frazil, the reader should consult Dr. Barnes' "Ice Engineering".

Heat Energy in Lake Ontario

A speed of 3 m.p.h. or over is not unknown on the charts of the

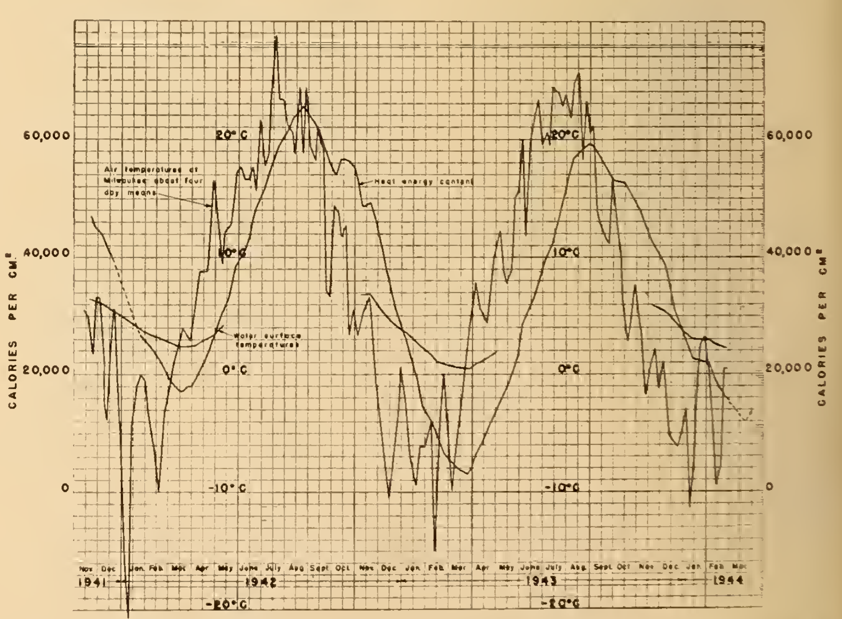


Fig. 4. Surface temperatures and heat content of Lake Michigan with air temperatures at Milwaukee.

St. Lawrence Ship Channel. It would appear that this velocity will be suitable both to navigation and to the carrying of the waters of the St. Lawrence River ice free over their appointed course. Such a supply of heat energy as is stored in the waters of Lake Ontario during the winter months is almost unique. It is a great national asset that the engineers of Canada should not fail to use to the greater advantage of Canada.

As the length of the lake section of the International Section is only about one-fifth of the whole active length of the St. Lawrence River, if this section of the river can be regimented to an even flow at 3 m.p.h. there will be little reason for difficulties with ice. The expense of the regimenting will be serious, but the benefit of this conservation will be felt all down the river even to the confines of Newfoundland.

The flow of the regimented river will reach the head of the Galops Rapids from the deep lake in a little more than one day. It may be well to compare this figure with present conditions. Fig. 6 shows the broad shallows lying between the reef that crosses Lake Ontario along the line of the Duck Islands and the actual mouth of the river. The time of water transit from the mouth of the river to the head of the Galops Canal is known from the observations of the Joint Board of Engineers to be about 11 days, making the total time of transit and of cooling off some 25 or 26 days. This means that the loss of heat from the river surface between Main Duck Island and the Galops Rapids can be reduced to about one-twentieth part by suitable regimentation.

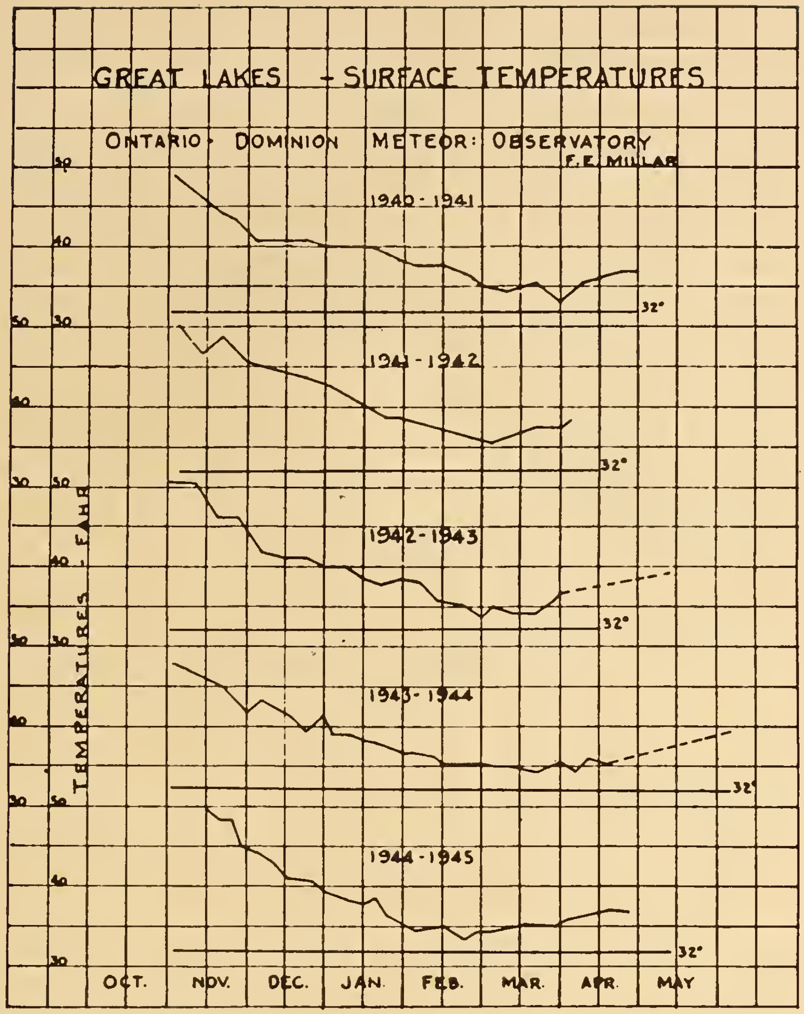


Fig. 5. Surface temperatures on Lake Ontario. These curves include the period covered by Figure 4.

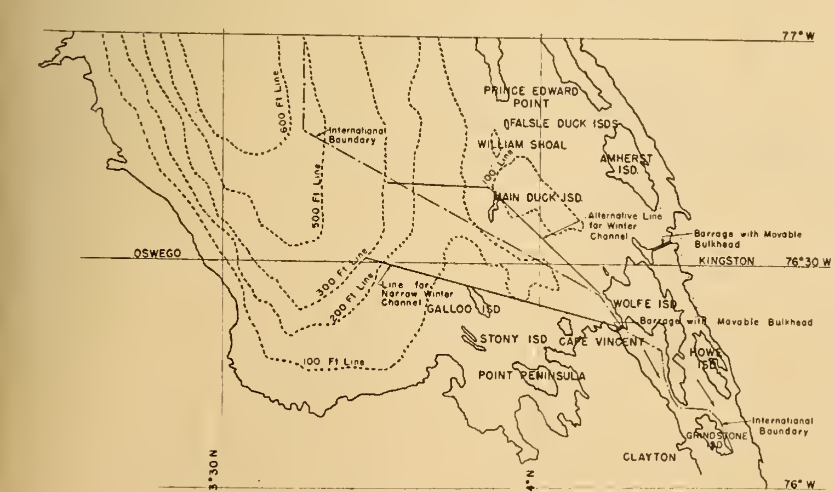


Fig. 6. Plan of the St. Lawrence river headwaters.

Cost of Open Channel — Moderate

It will be objected that the creation of a strongly flowing river in place of an arm of the lake will result in unnecessary loss of head. This objection is hardly tenable, for the Joint Board of Engineers places the loss of head at the Barnhart Island dam due to winter conditions at about 10 ft. It should not be difficult to provide under the conditions existing a regimented channel with a hydraulic radius of about 55. The value of C in the Bazin formula with such a radius can, from the observations made by the Joint Board of Engineers near Sorel, be placed at better than 125, say 135. The resulting slope with a current velocity of 4 ft. per sec. will be measured by a fall of about 1 ft. for every 12 miles, or 10 ft. in all from the Ducks to Barnhart Island.

There will therefore be no net loss of head in winter with an open strongly flowing channel. If

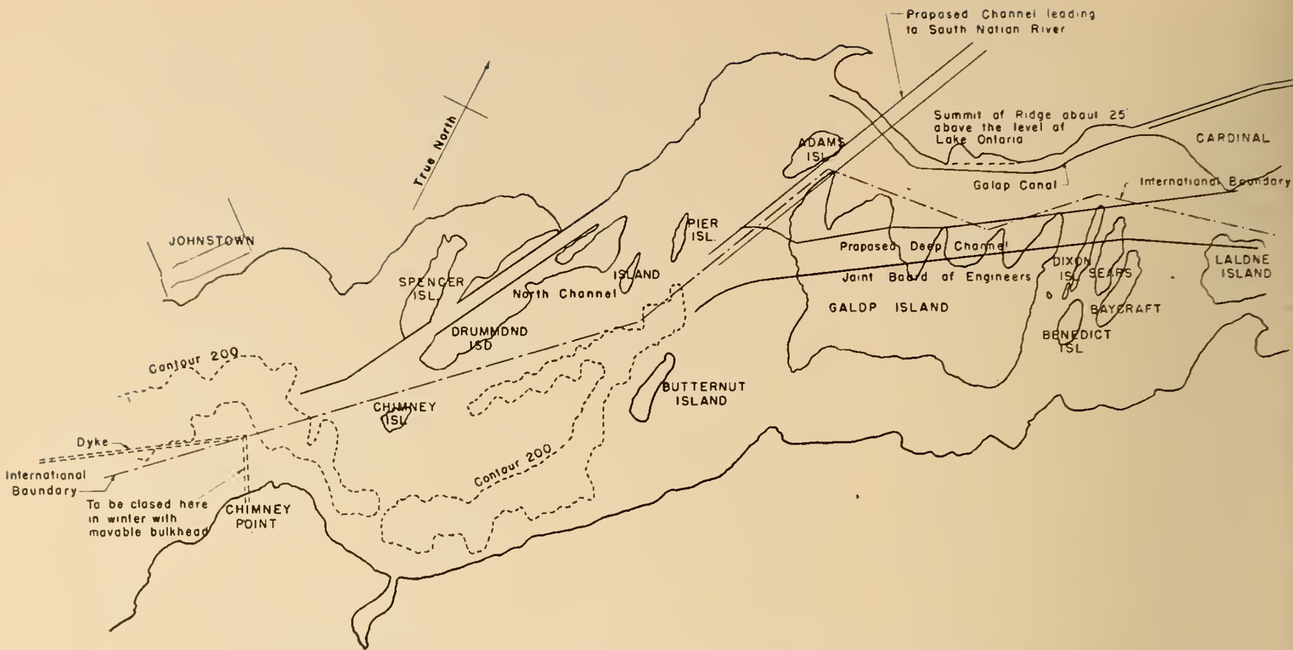


Fig. 7. Plan of the St. Lawrence river at the head of Galops Rapids.

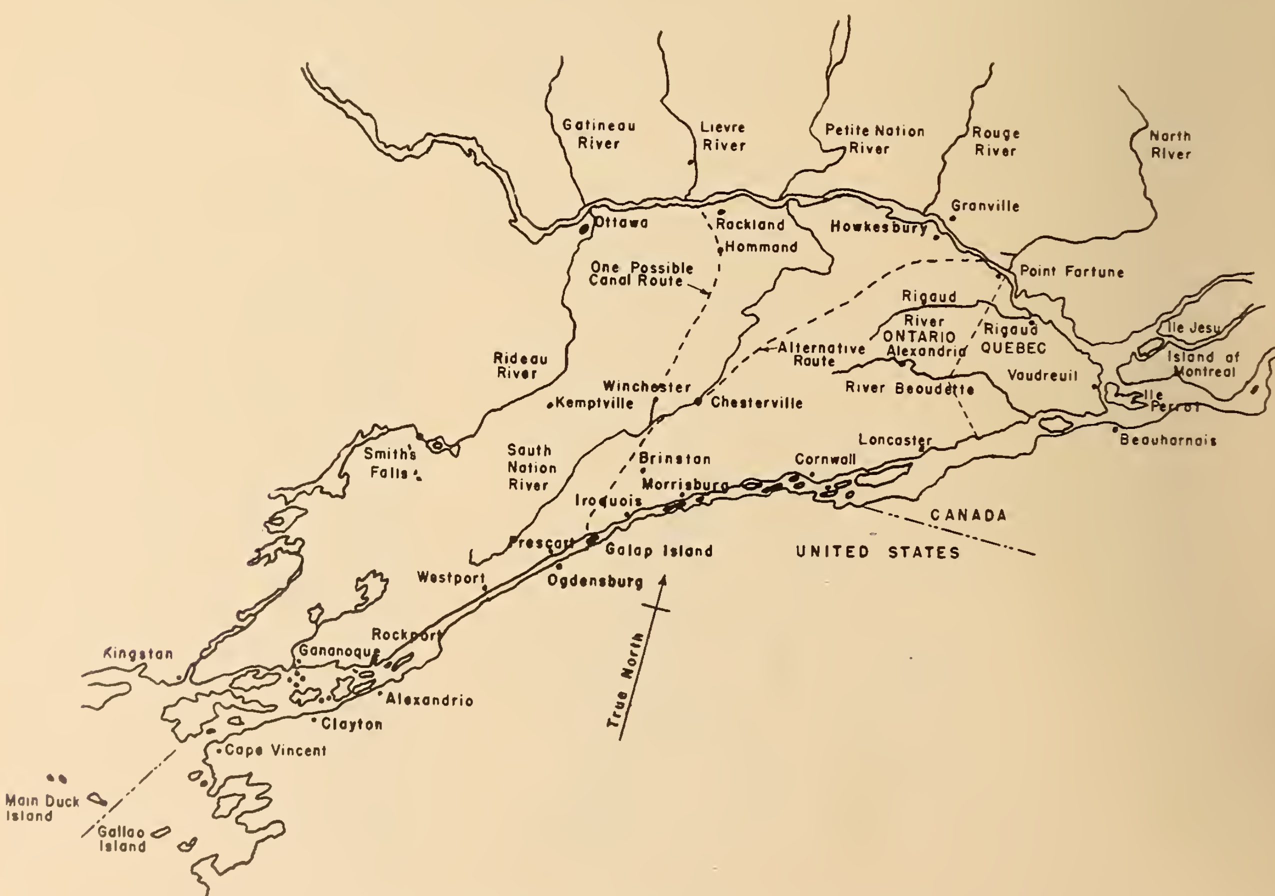


Fig. 8. Plan of the Ottawa-St. Lawrence Lowland.

necessity makes a demand for even higher velocities and for more water at the power houses, the result with the open channel will be simply more loss of head with a largely increased temporary output from the power houses. If such a special demand had to be met under ice cover conditions it is questionable whether the ice cover could successfully resist the attack resulting from the increased energy of the underflowing stream. It might well be that an ice jam at Ogdensburg such as that described by Dr. Barnes would develop. The privilege of maintaining an open channel all year long can apparently be secured at no cost over and above a moderate outlay on levees and dykes.

One change in the official plans will be desirable, the lowering of the sill level of the proposed cut through Galops Island to about elev. 190. This elevation shows in the soundings both above and below Galops Island and no weir, no matter how broad crested, should be permitted to cross the main line of river flow.

It will be noted from Fig. 6 that it will be necessary to confine the flow of the river between Main Duck Island and Cape St. Vincent by levees. In winter both the Canadian and American channels leading from the lake would be closed by dykes with movable bulkheads, thus forcing all the outflow from the lake to pass between the proposed levees.

The conclusion to be drawn from all the foregoing discussion is that down to the head of the Galops Rapids a river channel of ample depth, and one well designed to prevent the formation of ice on its surface, can be constructed at no unreasonable cost.

As success in maintaining an open river channel depends in large measure upon the amount of heat energy stored in Lake Ontario, it would seem to be appropriate that the Engineering Institute, as the recognized mouthpiece of the engineers of Canada, should represent to the Federal Government that it is most desirable that the annual temperature cycle of the waters of Lake Ontario be studied and recorded, particularly along a section extending from Oswego to Point Edward.

Two Channels Advocated in River Section

In view of the present conflict of interests in the United States it might be wise to study the improvement of the river from the Galops Rapids down to Lake St. Francis both from an international and a national standpoint. With a limited use of levees and dykes the open channel can be readily carried down to Barnhart Island and down into Lake St. Francis, thus avoiding all choking of the river flow, and the backwater below Barnhart's Island, specially allowed for in the report of the Joint Board of Engineers.

Fig. 7 shows certain contours and shore lines around the head of the Galops Rapids. It would not be too difficult a matter to divide the flow of the river into two at this point; one half of the flow, the American half, would discharge through the cut across Galops Island and then follow the existing main river channels. The development of this section both for navigation and for power would be left entirely in American hands, with flooding rights, etc., where necessary granted by the Canadian Governments.

The development of this section with only our half of the present flow to handle would undoubtedly be a much easier and cheaper job to undertake than the full development as recommended by the Joint Board. The dividing of the flow of the river would require the approval of the International Joint Commission, but it does not appear that the interests of either nation would be materially injured by the proposed division, and it has much to recommend it.

Lowland Triangle between the Rivers

It will be noted from Fig. 7 that a low divide exists on the north shore near Galops Island separating the St. Lawrence River from the valley of the parallel South Nation River. A cut through this divide, as indicated on Fig. 7, would carry the St. Lawrence waters into the valley of the South Nation River, and on to what is geologically known as the Ottawa-St. Lawrence Lowland.

The most notable feature of the Lowland is the absence of any continuing slope, it can be described as a level plain mildly affected by denudation and stream erosion. Its general position is shown on Fig. 8.

Geologically the Lowland is said to have been part of the bed of the vanished Champlain Sea, and into that sea poured the discharge of the Ottawa River. When the Champlain Sea withdrew, the Ottawa River proceeded to cut its own deep and beautiful valley from the city of Ottawa down to Carillon. The Lowland itself is now partly drained by the many branches of the South Nation River. Geologically this is a young drainage, and as yet it is by no means fully developed. A characteristic feature of the hydrography of the valley is the relatively very heavy annual spring floods of short duration. This is primarily due to lack of slope, and the area may be compared in some ways to the mossed-over areas in the James Bay district, where the moss continues to grow and to obstruct all drainage that tries to flow off these lands that have only a very modest slope. The South Nation River valley notably lacks an efficient drainage system.

Ottawa River Once Flowed Across It

It is noteworthy of the Lowland that its elevations along the Ottawa River edge are often higher than the elevation of Lake Ontario, and that the ground levels near Ottawa are no higher than those back of Hawkesbury and Point Fortune, some 70 miles downstream. The Ottawa and the St. Lawrence follow here roughly parallel courses about 45 miles apart. Near Ottawa the bed of the Ottawa is perhaps 100 ft. lower in elevation than that of the St. Lawrence.

Owing to the general flatness of the Lowlands a locating engineer would find that he could lay down a canal route to reach the Ottawa River at any point between Ottawa and Point Fortune. The problem of locating a canal to take the St. Lawrence waters across the Lowlands and to drop them into the Ottawa River is practically more one for the geologist and the geophysical engineer, rather than for an ordinary field survey party.

The Lowlands are known to be underlaid with rock beds, heavily faulted and to some extent disturbed in elevation. The rock beds are heavily covered with overburden, and the depth to rock must be determined by geophysical methods before the most economical route for a canal can be chosen. Geological opinion has been expressed to the effect that the waters of the Ottawa River once found their way across the original rock beds into the St. Lawrence

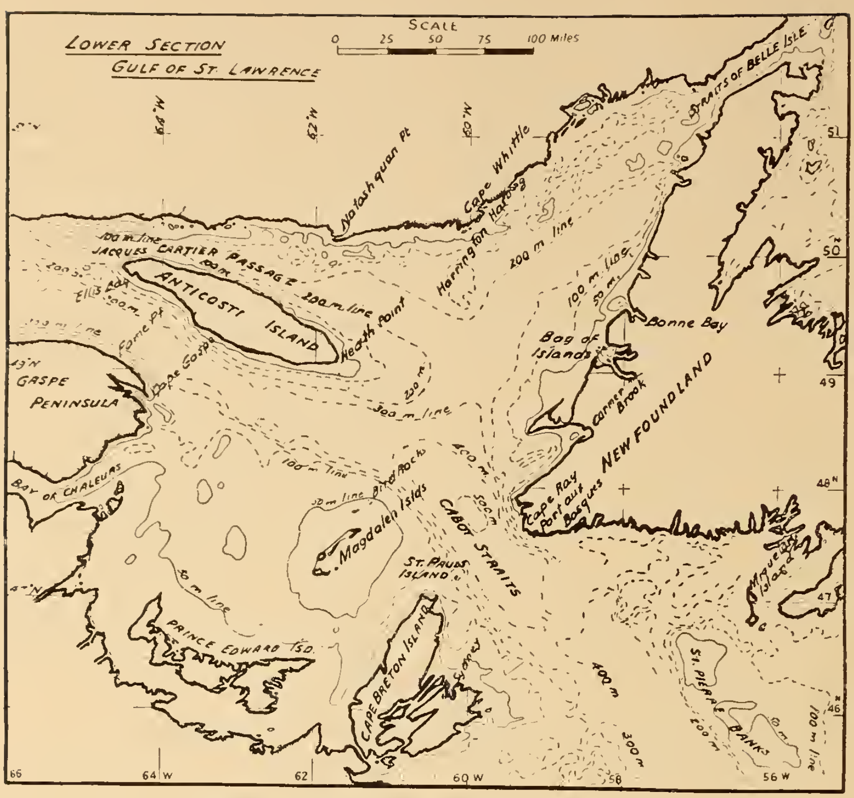


Fig. 9. Plan of the Gulf of St. Lawrence.

valley. A parallel instance is the buried channel of the St. Lawrence River underlying Massena Point with a rock surface nearly 70 ft. below Lake St. Francis.

Divert St. Lawrence into The Ottawa?

The idea of carrying the waters of the St. Lawrence across the Lowlands into the Ottawa River is not a new one, although a diversion on so large a scale as now suggested may not previously have been considered. The first proposal along these lines was made by the late Noulan Cauchon, M.E.I.C., about 1920. The idea was lost sight of when the United States, reversing a policy of over one hundred years standing, expressed a willingness to co-operate with Canada in the development of the St. Lawrence Waterway, the first step towards this end being the preparation of the well known Bowden-Wooton Report.

Mr. Cauchon's plans were subsequently reviewed by the late C. R. F. Coutlee, M.E.I.C., one of the brilliant engineers who have aided in building the canals of Canada, who called attention to the increased overall length of the Waterway that would result from accepting Mr. Cauchon's route. The cost of the necessary canal excavation will depend more on the quality of the material to be handled than on the quantity of it and the overall length of the route can be steadily reduced by moving the junction point between the canal and the Ottawa River eastward towards Point Fortune.

Generally speaking, the route of the proposed canal would run everywhere through cultivated lands. At such points as Winchester and Chesterville the elevations of the underlying rock beds are more or less established from depths of wells. This record is naturally what might be termed spotty, but it would not be surprising to discover that between Chesterville, where the rock level is satisfactory, and the head of the Galops there exists an area in which the rock elevations are relatively low.

Cost Comparable

Mr. Cauchon believed that the cost of building the cut off canal would be no larger than the cost of improving the waterway along the St. Lawrence Route. The data are not today available with which either to confirm or to refute this claim. It would be a great gain today if the representatives of Canada at Washington had available reliable estimates of the cost of building this cut-off canal; such estimates can be readily prepared once the contours of the buried rock surfaces are known. There are large quantities of alluvial soils to be excavated that would vanish before the impact of a powerful flow of water.

The Province of Ontario has already offered to invest about $250 millions in power plant construction on the St. Lawrence River. If this sum were made available for the construction of the proposed cut-off canal it would go a long way towards providing for the necessary costs of construction. The available head would be slightly greater than at Cornwall. A favourable site can be found on the banks of the Ottawa River for a power house, and many miles of the canal will run through cheaply-handled material. Some of the practices followed at Des Joachims might advantageously be used again on this canal.

In this study the writer has not dealt with the improvement of the Ottawa River between the proposed power house site and Lake St. Louis. The report on the Ottawa and Georgian Bay Ship Canal furnishes much information on this section of the river. If the proposed dam at Point Fortune is to be as bold in design as Des Joachims there will be little or no work required between the end of the canal, wherever it is located, and Point Fortune. Dredging will be required to deepen the channel across the Lake of Two Mountains, and a deep and long cut will be necessary at Vaudreuil to reach the channel of Lake St. Louis that lies west of Ile Perrot. There is little reason to think that the costs of these channel deepenings will exceed that necessary to deepen the Beauharnois Tailrace and to cut an adequate channel across Lake St. Francis. They can therefore be disregarded in a comparison.

Advantages of Wholly National Seaway

All things considered, the writer favours this plan for a wholly national power plant and waterway construction, subject always to a revision of opinion when more complete surveys have been made. This plan adheres to the principle of independent action which Canadians have observed for perhaps 150 years. It will probably not increase first costs materially and the design of the canal and all the operation details in connection with it in the future will be wholly in Canadian hands. Action will not need to be delayed by controversies within the United States, with which Canada has no direct connection.

The canal would also furnish a splendid site similar in nearly all respects to the Welland Canal for further industrial development. This alone would justify favourable action by the Government of Ontario. The adjoining lands are fertile and well settled and both road and rail transportation are well developed. The route lies close to great stores of low grade minerals.

Against this project must be recorded the increase in the overall length of the waterway, of 20 to 50 miles according to the location chosen; and the diversion of much of the water otherwise available for power at Beauharnois. However, as the power at Point Fortune would be under the same ownership as that at Beauharnois this objection is not too important.

A further advantage of the cut-off route lies in the opportunity it provides for equalizing the flow of the St. Lawrence from Lake St. Louis to the sea. When the Ottawa River is in flood, part of Canada's share of the St. Lawrence flow can be held back and stored in Lake Ontario. These reserves can then be drawn upon when the Ottawa passes into its regular low water stage.

Perhaps most important of all in the long run is the fact that there will be in Canadian hands a channel to the sea that can always be kept open and free from ice, whenever circumstances make an open winter waterway a national or provincial need. This writer has never been content to accept as a first principle in the design of a power house on the St. Lawrence, the building up of an ice cover over all the area above the proposed plant. Properly regimented, the river is fully capable of protecting itself from ice. The open channel to the markets of the world will in time become of immeasurable value to the Canadian cities along the Waterway, besides providing a sorely needed link between the markets of Central Canada and the naturally enterprising and mechanically gifted peoples in the Maritime Provinces.

As the advantages to be secured from this plan for a cut-off canal connecting the two main rivers would in large measure fall to the Province of Ontario, the Engineering Institute might wisely recommend to the Government of that Province that the possibilities of the project be explored by accurate surveys. The project is not without precedent. It is simply Beauharnois over again in a different setting, in a section of Ontario where industrial development is sadly lacking.

This study of certain problems connected with the development of the St. Lawrence Waterway is not to be considered as recommending any particular action or actions, other than further concentrated study of some of the great engineering problems that still remain to be solved in our own country.

If any student of the St. Lawrence problems cares to carry his studies down to the open ocean, he will find some information in this writer's paper on the Winter Navigation of the St. Lawrence Waterway which was published in November and December, 1950, by the Dock and Harbour Authority of London, England. Copies of this paper are on file in the Library of the Institute.

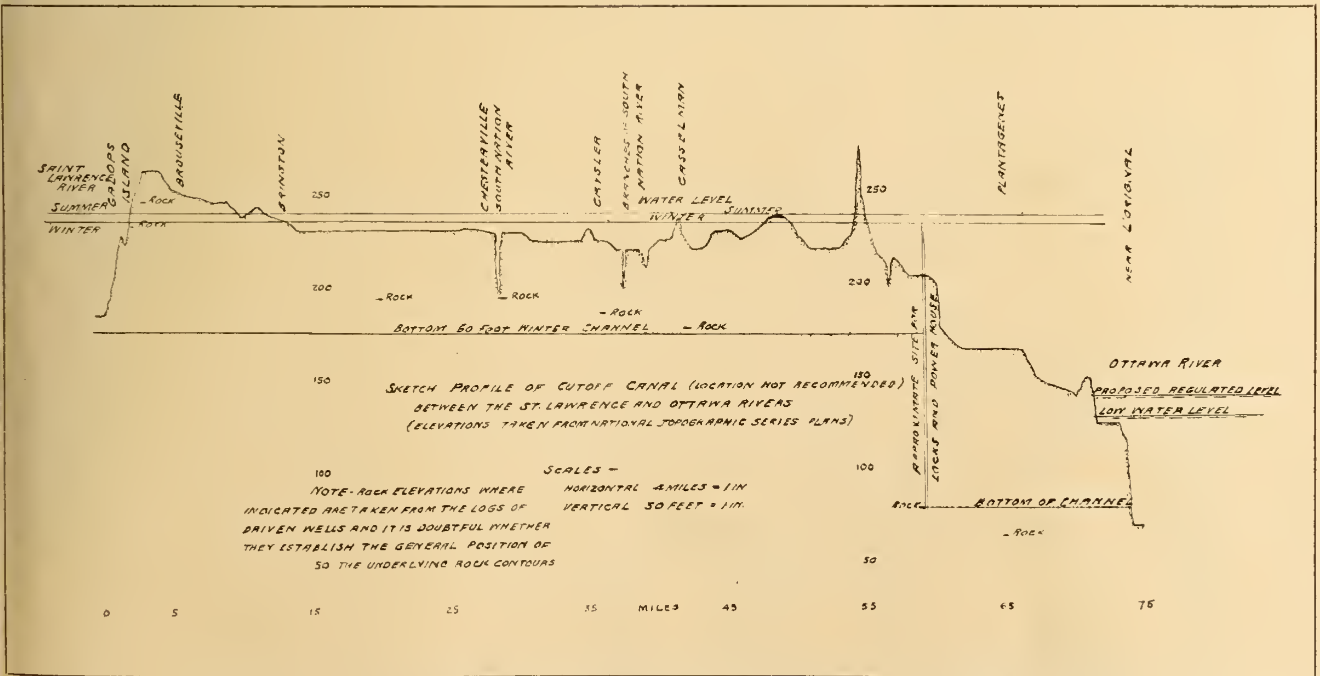


Fig. 10. Profile of suggested cut-off canal between St. Lawrence and Ottawa rivers.

Indoor Environment and Human Comfort

by

G. Lorne Wiggs, M.E.I.C.

Senior partner, Wiggs, Walford, Frost & Lindsay, Consulting Engineers, Montreal and Toronto

A paper presented before the Mechanical Section of the Montreal Branch, Engineering Institute of Canada, March 12, 1951

This paper discusses certain problems involved in determining human comfort in indoor environments, which affect the engineer. It deals with the physiological and physical factors involved in radiant and convection heating and cooling, as well as those in air conditioning. It records some of the indices of human comfort in common use, and describes and illustrates the various comfort charts used in Canada, the United States and England. Finally, other physical factors affecting human comfort are given.

In all heating, cooling and air conditioning of enclosures for human comfort, in order to control these properly it is essential to first have a measure of human comfort. Unfortunately, as yet, no universal measurement of human comfort has been found and adopted, although a number of different methods of measurement and indices have been developed in different parts of the world. A number have been advocated by men with little or no practical knowledge of radiant heating and cooling of buildings. Consequently, most of the scales of human comfort, and also the comfort charts in common use on this continent, pay little regard to the radiant heat transfer between the human occupants of an enclosure and their surroundings.

It has been frequently said that anything which can be measured can be controlled. It is well known that dry bulb temperatures can be precisely measured, and also accurately controlled. Similarly wet bulb temperatures can be accurately measured, but close control for extended periods of time is more difficult. For a long time relative humidity was measured and controlled by human hair, or by animal membrane hydrometers and humidistats respectively, neither of which are usually classed as accurate instruments.

Recently the development of dew-point temperature instruments to measure precisely and control such temperatures has taken place. Accurate instruments are available for the measurement of air velocities, but such velocities are still difficult to control commercially with any high degree of accuracy. Thermopiles or radiation surface thermometers have been used considerably to measure the radiation from hot surfaces. But no known attempt has been made to use similar instruments to control the radiation from warm or hot surfaces. Thus we may say we have available all the instruments necessary for measuring the various components of the environment in an enclosure.

Radiant Heat Transfer Important

The author's long and extensive experience with radiant heating and some experience with radiant cooling has shown that radiant heat transfer between a human being and his environment is so significant that it cannot be neglected. It should be taken into consideration in all scientific investigations into human comfort, particularly into the development and use of comfort charts used by the heating and ventilating engineers, as well as those responsible for human comfort in buildings, railroad trains, etc.

Besides this, until recently the universal heating system used here has been convection heating. With convection heating, no method of controlling the mean radiant temperature of the floor, walls and ceiling is possible. As a result no one paid much attention to the mean radiant temperature of the enclosures. Now, by means of radiant heating and cooling systems combined with air conditioning, we are able to maintain the

ir temperature, the relative hu-
iidity and the air motion inde-
endently of each other, over the
ractical operating range of such
ystems.

Fig. 1 shows an installation in
'oronto by means of which this
accomplished. Aluminum radiant
eating and cooling panels are in-
alled around the exterior walls
f the room, to offset the heat gain
r heat loss through the exterior
alls. Similar panels are installed
nder the windows to do the same
r them. The lighting units are
nstructed with radiant panels,
hich absorb the heat from the
ghts and from the occupants of
e room below them.

Square diffusers are installed,
rough which conditioned air at
e desired temperature and rela-
ve humidity is supplied, in such
antities as to maintain the de-
red air purity and the required
r motion. The remainder of the
iling is composed of a highly
ficient sound absorbing material,
us assuring the room of the
oper acoustical condition. Thus
e have the ability to provide and
ntrol all the physical conditions
sired in the room. Now the prob-
m that remains is that of deter-
ining just what conditions should
maintained in the building, so
to give the optimum comfort
nditions.

Human Comfort

The purpose of this paper is to
view briefly some of the factors
hich enter into human comfort
d then to show and explain some
the indices of human comfort
d of the comfort charts in use
different parts of the world in
e light of our present knowledge
both convection and radiant
ating and of air conditioning.

It would be fortunate if human
mfort could be clearly and ab-
lutely defined, as well as meas-
ed directly. Unfortunately, no
own definitions or direct meas-
ements exist, although mean
in temperature offers some prom-
e as such a basis. Therefore we
e compelled to adopt some in-
x of human comfort, which takes
to account the various physical
ctors that affect it, and that can
measured or controlled directly.
et us consider for a moment some
the physiological properties of
e human body. It is these which
termine or affect human com-
rt.

The most important physiological property to practising engineers is metabolism. This is the term applied to the heat production of a human being, generally spoken of as the *chemical regulation* of the body temperature. The Basal Metabolic Rate refers to the metabolic rate of a subject who is awake, who is as nearly as possible at complete muscular and mental rest, and whose digestive processes are quiescent. It is usually taken at a room temperature of 20 deg. C. (or 68 deg. F.). It is usually determined in the clinic or laboratory by means of the Benedict and Roth apparatus, by which heat production is calculated from the oxygen consumption alone.

Fig. 1 Mock-up of ceiling system incorporating radiant heating and cooling combined with air and acoustic conditioning for the new Manufacturers Life Building, Toronto—Marani & Morris, Architects.

Basic Metabolic Rates

The average basal metabolic rate is constant for all normal men in proportion to their body surface area and not to their weight, being

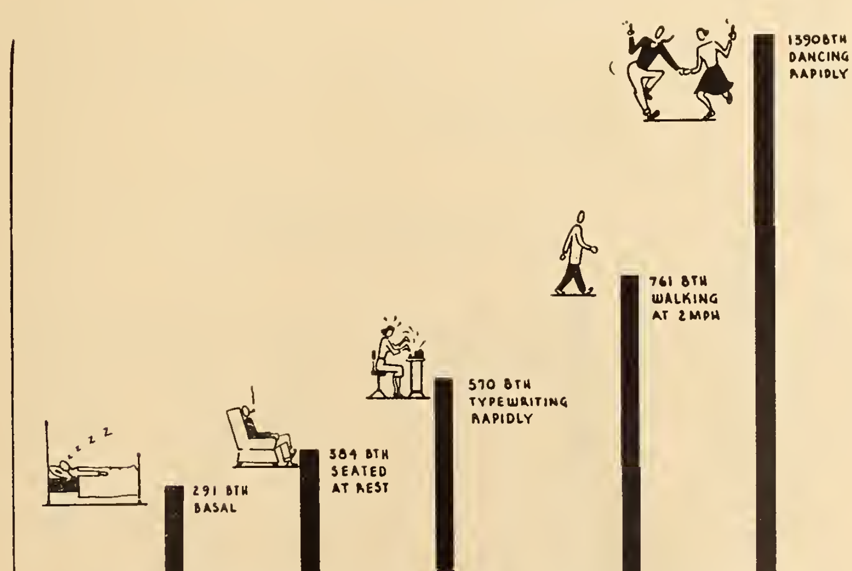


Fig. 2. Variation in metabolism for various occupations.

about 38 to 40 Calories per square meter (14.02 B.t.u. per square foot) of body service per hour. Actually the average basal rate diminishes progressively from infancy to old age, being about 50 Calories per meter (18.4 B.t.u. per square foot) per hour at the age of ten to twelve years down to about 32 Calories (11.8 B.t.u.) at ninety years. The average sur-

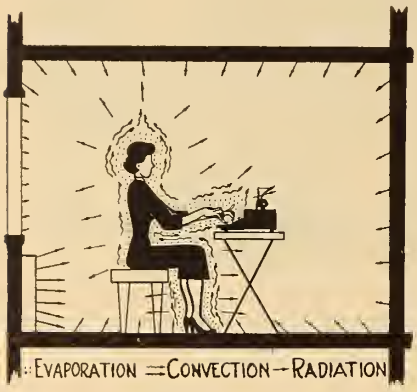


Fig. 3. Interchange of heat between a typist and her environment.

face area of adults on this continent is about 1.6 square meters (17.22 square feet) for women and 1.8 square meters (19.37 square feet) for men. The total basal heat production of the majority of normal adults, therefore, ranges between 1400 to 1800 Calories (5558 to 7146 B.t.u.) per day. (231.5 to 297.7 B.t.u. per hour.)

The heat production of an average man doing light work is about 3000 Calories (11.910 B.t.u.). Very strenuous work or exercise may increase this from 10 to 15 times above the basal level. The effect of some of the more common occupations is illustrated graphically in Fig. 2. On the other hand, mental effort causes an almost negligible increase in the metabolic rate. During sleep, when muscles are relaxed, the metabolism falls below the basal level, probably from 10 to 13 per cent.

The temperature of the human body is maintained constant by its efficient heat regulating mechanism, by maintaining a balance between the heat produced in the tissues (and the heat acquired in hot food) and the heat loss to the environment. This heat loss is dependent on physiological and physical factors, and is referred to as the *physical regulation* of body temperature. Fig. 3 shows how the heat loss is affected by the environmental conditions in an enclosure. Unfortunately the artist has reversed the direction of all the arrows shown emanating from the window, the ceiling, the wall and the floor. Actually these surfaces in winter are usually cooler than the average surface temperature of a normally clothed human being.

This shows that heat is lost from the body by evaporation from the skin and lungs, and by convection and radiation from the body. Heat loss also takes place by conduction, by contact with the floor and the furniture. Besides these, some heat is lost in raising the inspired air to body temperature, but this does not amount to more than 2 or 3 per cent of the total.

Calorimeter Tests

Figure 4 shows the results of careful calorimeter studies on a fasting, nude man by Dr. Eugene F. DuBois. The first column of each series represents the heat production as determined by indirect calorimetry, the second column, the heat elimination. Of the latter, the vertical lined section represents the heat loss by evaporation; the dotted area, the loss by convection; the unmarked area, the loss by radiation. It will be seen that at a low calorimeter temperature the greatest heat loss takes place by radiation. At the highest calorimeter temperature shown, the greatest heat loss takes place by evaporation, while the heat loss by radiation is almost negligible.

In most of the calorimeter tests the temperature of the air and of the surfaces of the enclosure is held constant, although in the partitional calorimeter of Winslow, Herrington, and Gagge, these temperatures may be varied or held constant independent of each other. In addition, both air motion and relative humidity may also be accurately controlled. For the purposes of this paper the methods used or the values obtained are relatively unimportant. The important thing is that, within certain limits of room conditons, heat loss and production can be balanced over a wide variation of each of the heat losses by radiation, convection and evaporation.

These calorimeter tests were made with nude subjects, but other studies have shown that the relation of skin temperature to comfort is close, and is identical for both nude and clothed subjects. Yaglow and Messer later verified the validity of skin temperature measurements, over a wide range of practical conditions and over an environmental temperature range of 30 deg. F. to 8? deg. F. They also found that the influence of humidities of less than 50 per cent on skin temperature appears to be negligible.

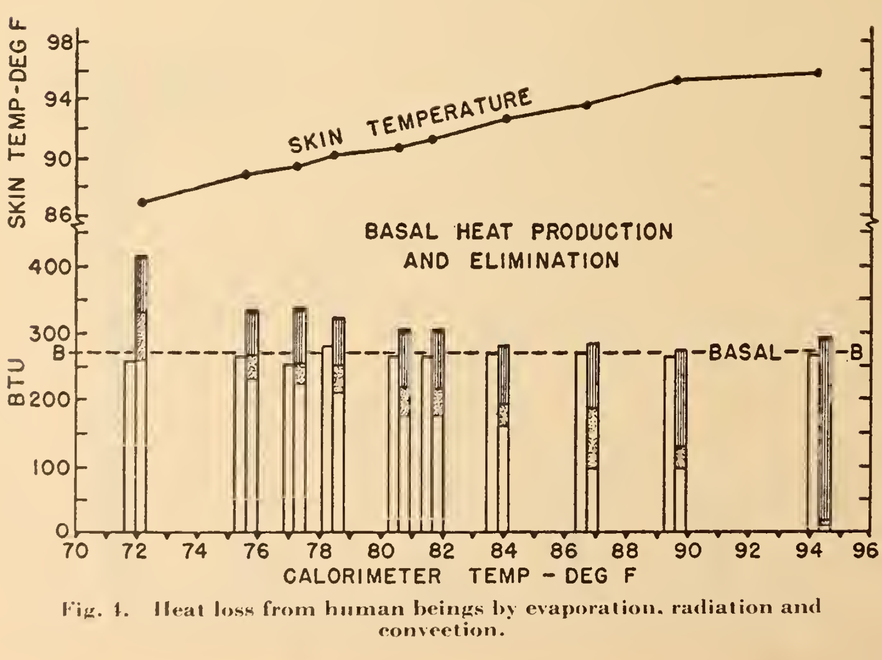


Fig. 4. Heat loss from human beings by evaporation, radiation and convection.

Ideal Conditions For Comfort

The function of a heating sys-
em, or of an air conditioning sys-
em, is to maintain in a building
he proper thermal environmental
onditions for human comfort. The
lifficulty is to measure and control
he proper thermal environmental
onditions. This becomes greatly
implified if the objective to be
ttained can be stated in precise
hysiological terms. According to
Vinslow, Herrington and Gagge
he ideal comfort conditions are
xperienced when the following
hree conditions are maintained; a
kin temperature of 30 deg. C., a
ninimal heat change in the body
issues, and a minimal evaporative
ate.

Such a precise statement of hu-
nan comfort may be satisfactory
o the physiologists. Unfortunately
t is not of practical value to prac-
ising engineers. They are there-
ore compelled to adopt some other
ndex of human comfort. They
nust deal with the various physi-
al factors in the environment
which affect human comfort.
These are the four factors of air
emperature, air motion, relative
humidity of the air and the mean
radiant temperature of the en-
losure.

Various attempts have been made to combine two or more of these factors in a single index. The first and best known to engineers here is the "effective temperature" index of the A.S.H.V.E. It is an empirical index, which indicates the sensation of warmth. This index represents the combined effect of air temperature and relative humidity in still air conditions. It completely disregards the mean radiant temperature. Figure 5 shows the A.S.H.V.E. Comfort Chart, showing the effective temperature lines of equal sensations of warmth. It also shows what are considered the summer and winter comfort zones. This chart is open to criticism as to its validity in the zone of optimum comfort. Because it neglects the mean radiant temperature of the enclosure, it is practically valueless in buildings heated or cooled by radiant heating or cooling systems, alone or in combination with air radiant heating.

For problems involving radiant heating only, Raber and Hutchinson have advocated the use of a simple formula, for determining the required radiant temperature to maintain comfort at any air temperature; that is, the required mean radiant temperature must equal 140 minus the air temperature. This is satisfactory for the design of simple radiant heating systems, but is of no value in determing the relative comfort under different conditions of air temperature and of mean radiant temperature.

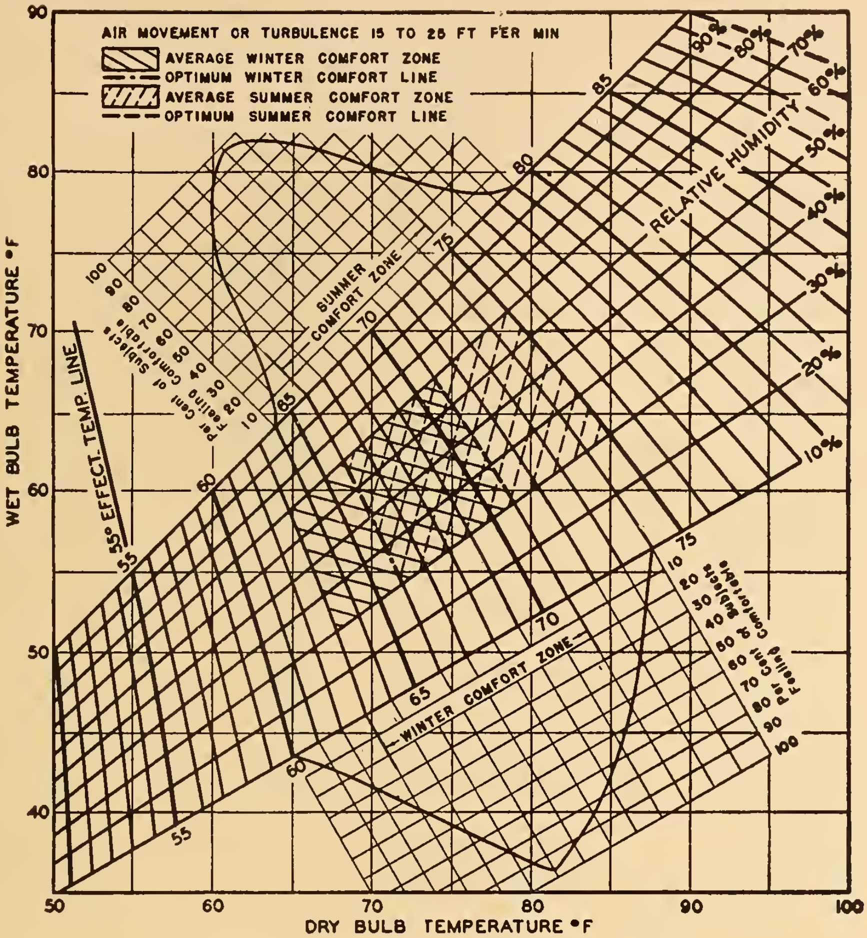


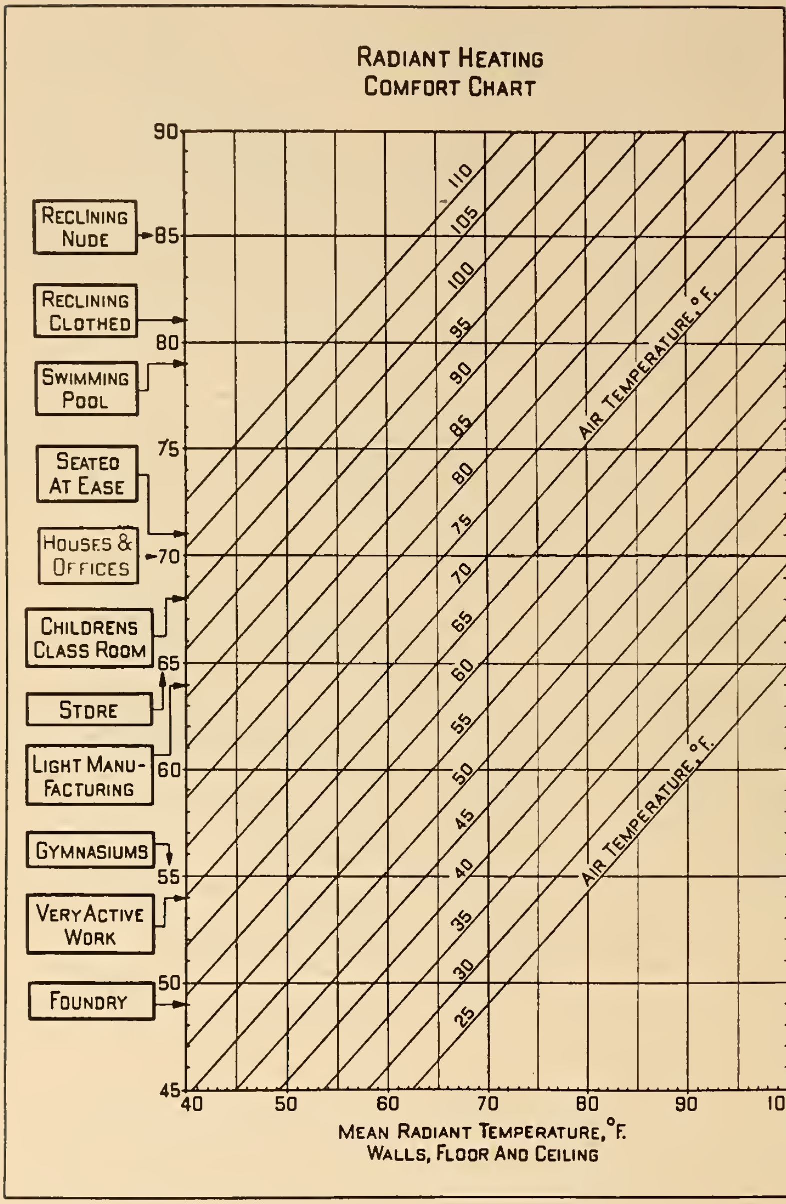
Fig. 5. A.S.H.V.E. Comfort chart for still air.

The Radiant Heating Comfort Chart

Figure 6 is a comfort chart called the Radiant Heating Comfort Chart. Its origin is not known, but it is a step forward from the Raber and Hutchinson formula. It introduces a new concept or index called "Operative Temperature", conceived by A. P. Gagge. This index takes into account the air temperature, the air motion and the mean radiant temperature of the enclosure surfaces. It disregards the relative humidity of the air and, based on the work of Dr. Thomas Bedford of the Medical Research Council of England, operative temperature is not necessarily an accurate index of the influence of the environment on thermal comfort. Besides this, it is the author's opinion that American physiologists are not thoroughly familiar with the present day practice of radiant heating. They are therefore not carrying on any of their research under conditions found in present radiant heating practice.

Equivalent Temperature Scales

In trying to find a comfort chart which is based on a sound knowledge of present day radiant heating practice, the writings of Dr. Thomas Bedford, an outstanding British physiologist thoroughly familiar with radiant heating, were consulted. Dr. Bedford advocates the use of the "Equivalent Temperature" scale, conceived by A. F. Dufton of the Building Research Station. This takes into account air temperature and motion, as well as the effect of mean radiant temperature of the sur-



Courtesy "Heating and Ventilating."

Fig. 6. Radiant heat comfort chart.

roundings. It makes no allowance for variations in relative humidity. It can be measured directly by means of an instrument called the "Eupathesoscope" but it can also be obtained from the readings of other instruments.

Equivalent temperature = $0.522\ t_a + 0.478\ t_w - 0.01474\ \sqrt{V}\ (100 - t_a)$,

where t_a is the air temperature in °F.; t_w is the mean radiant temperature in °F.; and V is the air velocity in feet per minute.

The index of equivalent temperature has been used in England for over fifteen years with some slight modifications.

Figure 7 is one of Dr. Bedford's charts, from which the equivalent temperature may be obtained from readings of air temperature, air motion and mean radiant temperature. The difficulty with this chart is the determination of the mean radiant temperature of the enclosure. However, in actual practice, equivalent temperature may be found readily by taking simultaneous readings of air temperature, air velocity and globe thermometer temperature. Then by the use of the alignment chart shown in Fig. 8, the equivalent temperature is obtained. Fig. 9 shows another alignment chart, by which equivalent warmth conditions may be obtained from dry bulb and wet bulb temperature, air velocity and mean radiant temperature.

In 1936 Dr. Bedford investigated the reliability of various scales of comfort in relation to environmental conditions, including the effective temperature scale, the dry kata thermometer cooling power, and the globe thermometer temperatures. He made slightly over 3,000 sets of observations, with nearly 2,000 different subjects doing light work. From these, he concluded that "up to a temperature of about 75 deg. F. the equivalent temperature scale is the best of the measures of warmth included in the comparison."

"It can be used," he said, "in calm atmospheres, or where there is much air movement, and it gives full weight to the effects of radiant heat. It is true that the scale makes no allowance for the effects of atmospheric moisture, but until the temperature approaches 75 deg. F. humidity exerts no great influence on warmth sensations." Furthermore, he added that "the reading of the globe thermometer is a good index of warmth where there is no great amount of air movement, as in the average workroom or office, since it makes adequate allowance for both air temperature and radiant heat."

Regardless of whether or not the comfort chart is correct, there is no doubt that in convected heated buildings, the air temperatures are invariably higher than the mean radiant temperatures of the rooms. H. M. Vernon and his colleagues of England in 1928 made a careful investigation of this. They found that, in general, in rooms heated by convection the mean radiant temperature was 3 deg. F. lower than the air temperature. Compared with this, they found that in panel heated rooms the mean radiant temperature was 3 deg. F. higher.

Lower Temperatures with Radiant Heat

As far as our experience goes, Canadians almost invariably maintain winter temperatures of 70 deg. F. to 72 deg. F. in convection heated buildings. We have found that most of the radiant heated homes are kept at between 66 deg. F. and 68 deg. F. with an air temperature of about 67½ deg. as the mean. In sub-zero temperatures we get a ceiling temperature averaging 90 deg. F. to 95 deg. F., and floor temperatures of about 72½ deg. F., with the air tempera-

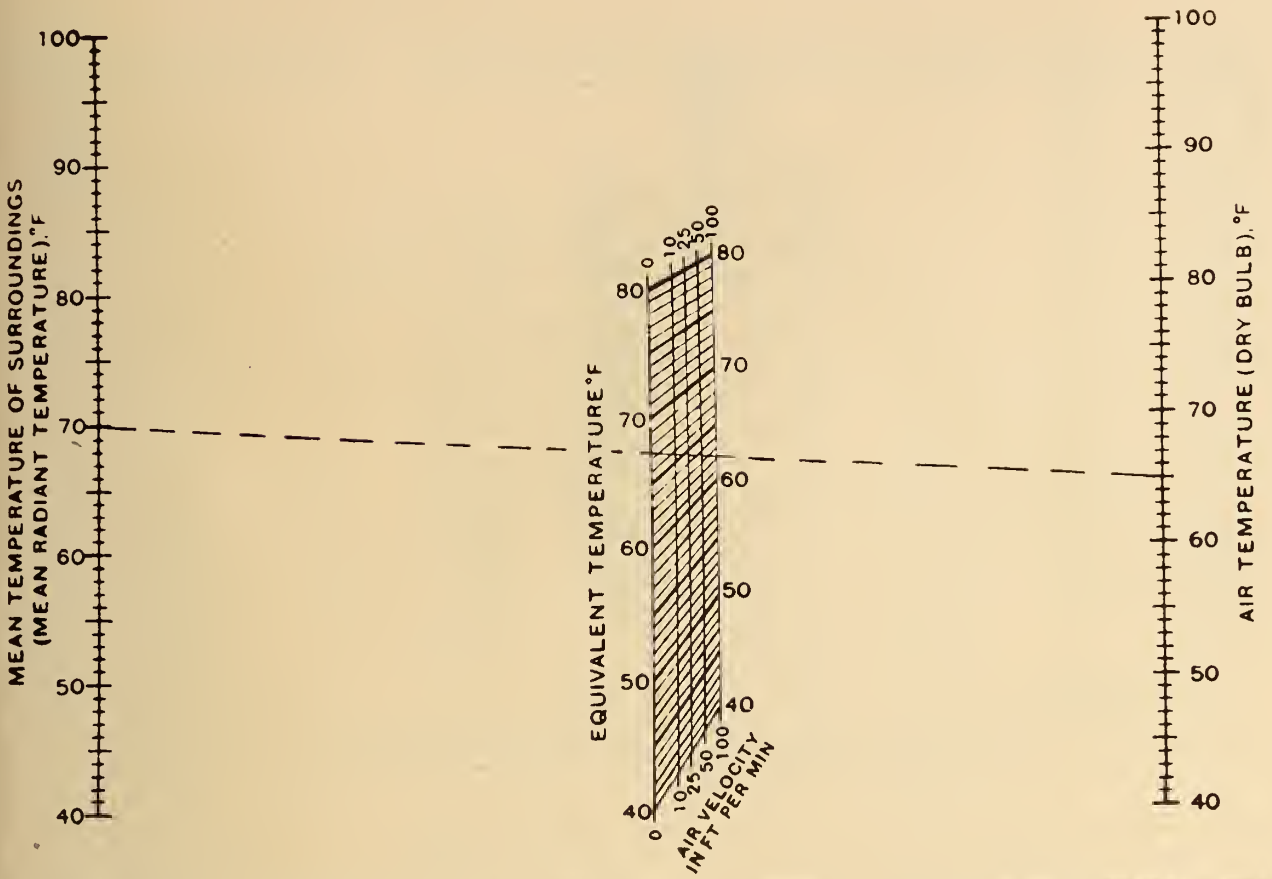


Fig. 7. Chart for the estimation of equivalent temperature for persons normally clad and doing sedentary or very light work. (I.H.R.B. Rept. No. 76, H.M.S.O.)

ture at 67½ deg. F. This provides a higher degree of comfort than is attained with convection systems, where the ceiling temperatures would be of the order of 72½ deg. F. when air temperature is 70 deg F. and the floor temperature is about 65 deg. F.

Fresh Air

In addition to the factors covered by the various comfort charts, there are also a few other physical conditions in an enclosure which have a very definite effect on human comfort. Bedford and Warner in their paper "Subjective Impressions of Freshness in Relation to Environmental Conditions" reached the following conclusions:

> The maintenance of a suitable degree of warmth is not the only requisite of a really satisfactory

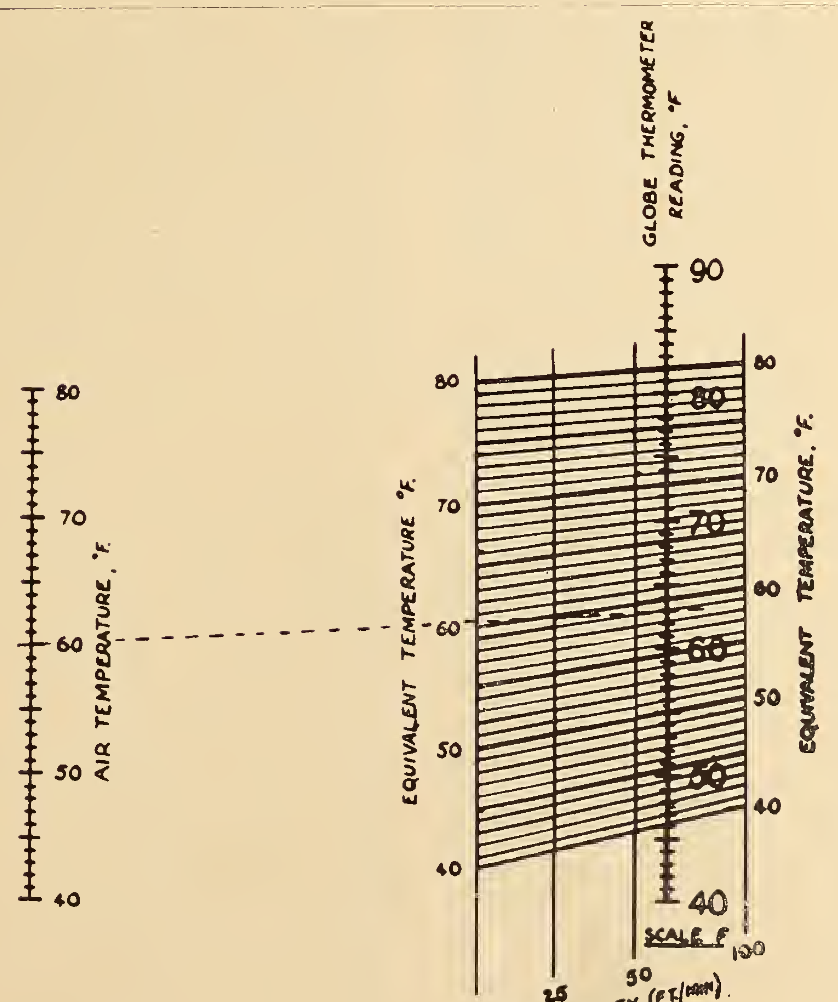


Fig. 8. Chart for the estimation of equivalent temperature from globe thermometer readings.

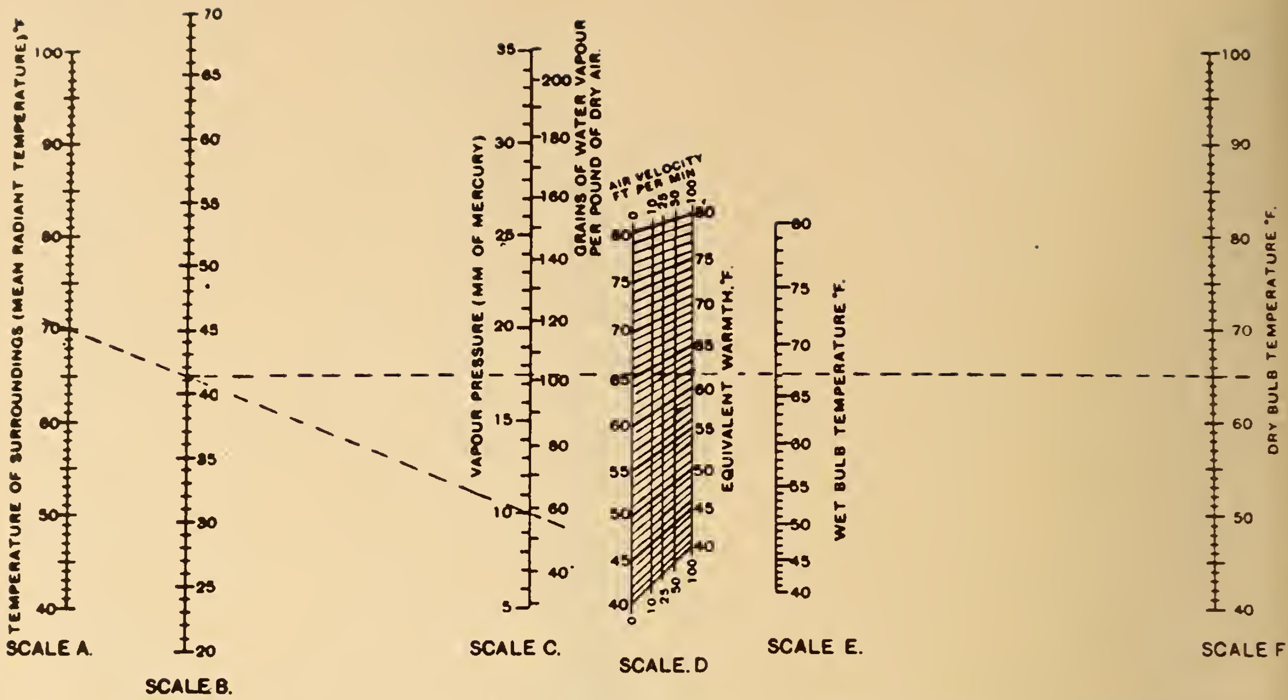


Fig. 9. Chart for the estimation of equivalent warmth conditions for persons normally clad and doing sedentary or very light work. (I.H.R.B. Rept. No. 76, H.M.S.O.)

system of heating and ventilation. It is not enough to ensure that the equivalent temperature, effective temperature, or other index of warmth is satisfactory, even though such an index makes adequate allowance for the thermal effects of the air movement and other variables. The factors which affect sensations of warmth also influence the invigorating properties of the environment, and help to determine whether a room will arouse feelings of freshness or of stuffiness in the occupants.

Dr. Bedford, in his paper "Radiant and Convection Heating" makes the following observations. "A room should be as cool as is compatible with comfort, since freshness tends to increase as the temperature is reduced. There should be adequate air movement, and that should be variable rather than uniform and monotonous. The relative humidity should be kept reasonably low. The air at head level should not be distinctly warmer than that near the floor, and the heads of the occupants should not be exposed to excessive radiant heat. We have noted the general recognition that an environment in which the mean radiant temperature is above air temperature tends to be pleasanter than one in which the air and walls are at the same temperature, or where the walls are cooler than the air." The author concurs with Dr. Bedford, for where people used to convection heating with the wall surfaces cooler than the air temperature enter a properly radiant heated room, many of them remark on the different, pleasant sensation they notice. It is believed this is due to the mean radiant temperature being invariably higher than the air temperature.

Value of Comfort Chart Doubtful

We have not made use of the Bedford charts, but our experience with radiant heating and cooling has convinced us that the A.S.H.V.E. comfort chart is of little value in radiant heating and cooling engineering. We had planned to carry on some investigations this winter to determine equivalent temperatures which occur in practice in Canada, both with convection heating and with radiant heating. The pressure of defence work, in addition to our already large practice has prevented this. A useful purpose has been served however in placing the information contained in this paper before members of the Engineering Institute. Thus others might be interested in pursuing this interesting subject. Also, manufacturers of measuring instruments and of automatic temperature control equipment might develop the instruments to better measure and control human comfort.

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Canadian Industrial Preparedness

by

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A paper presented at the 65th Annual General and Professional Meeting of The Engineering Institute of Canada at Montreal, May 9, 1951

Preparedness is a subject on which much has already been said, and much more will be said about it before we, in Canada, arrive at a state of satisfactory industrial preparedness for defence. It is proposed here to indulge in some generalities and definitions, in order to summarize the situation and the problems involved in its resolution.

First, what do we mean by Industrial Preparedness? It is generally accepted that we may be said to be prepared for our defence, insofar as industry is concerned, when we have prepared a plan for the most effective utilization of our industrial resources and potential to produce the requirements of our Armed Services, as well as those of our allies, and of our essential civilian economy.

Such a plan involves the allotment of emergency tasks to our major manufacturing facilities, the equitable distribution of manpower and materials between the Armed Services and essential civilian needs, including civil defence, as well as the control of power, transportation and communication utilities.

Such a plan must be broad in concept and, above all, flexible. It can never be considered complete. If we can plan the advance of a war, to meet some 60 per cent of the total requirements which are foreseeable, we will be doing well. Then too, in this day and age of rapid scientific, engineering and production development, what is new today is obsolescent tomorrow. Unless we are prepared to continue to work on our plan, to revise and amend it with changing designs and concepts, we may be better off without any plan whatever.

How Preparedness Fits in With Defence

Having roughly indicated what we mean by industrial preparedness for defence, and outlined briefly its scope and limitations, it would be appropriate to ask just how important this scheme for industrial mobilization may be. Where does it fit into the larger plan for the effective military defence of our country, and our western democratic way of life?

We accept the fact that we must have navies, armies and air forces in being. We must also have plans for the rapid expansion of these, should we be faced with the horrible expedient of another war. In short, we must have a military mobilization plan. We are also aware that warfare, and the means of waging it, are becoming more scientific by the day. Therefore, more nations have included, in their military set-up, armed service research, as well as design and development establishments.

Showing how industrial preparedness fits into the overall plans for mobilization, the author explains the reasons why industrial preparation takes more time than the training of fighting personnel. Outlining Canada's defence supply organization today, he shows how industry is being consulted and is giving advice to defence officials. The need for industrial planning for defence on an international scale is discussed, and the establishment of a joint board is recommended to co-ordinate national industrial efforts. Suggestions are added as to what may be done in the way of preparatory work to save valuable time.

With the ever increasing complexity of modern weapons and defence equipment, it is apparent that an increasingly greater load is being placed on the manufacturing facilities necessary to supply the armed services with what they need to fight a successful war. This being the case it does not require any great application of logic to place industrial mobilization on an equal footing in the scale of importance, with military mobilization. One is useless without the other. There are times, however, when one may be tempted to wonder if this equality of importance affords complete justice to the case for industrial mobilization, especially in North America.

Today's Supplies Move by Transport

About a hundred and fifty years ago, Napoleon remarked that an army moves on its stomach. That statement was generally correct until after World War I. It still has a considerable semblance of truth in so far as Russia and her satellites, slavic or oriental, are concerned. This is because the men and women in the armed services of those communistic slave states are treated somewhat less humanely than are the range cattle of our western plains. One has only to compare the number of what we call "employed personnel" in one of our combat units with the number of similar personnel in a Russian unit of the same size, to realize the difference between our potential enemies and ourselves.

Regarding our own fighting forces, Napoleon's opinion is strictly passé. Our armed services move on wheels and track treads. We use and need more rubber and petroleum products than we do food. We believe our men to be superior, man for man, to any against whom they may be placed. For this reason we place a much higher value on their lives, their welfare and their comfort. We extend our better standard of living to the very front line of battle. Thus we tend to be prodigal with our equipment, our labour and life saving devices, our weapons and ammunition. We rely on superior equipment, and more of it, to compensate for an inferiority in numbers. With us it is firepower and mobility against flesh.

Bulk of Equipment From America

Another point we must consider in North America, in assessing the relative importance of industrial mobilization in our defence preparations, is the fact that Western Europe has not, in the past, been materially self-sufficient in war time. The industrial potential of that part of the world is less than it was during the last war. Should there be another large scale conflict, we on this continent must be prepared to supply, in great quantity, that equipment which will enable our European allies to develop their full military power for their own defence, and to counter any communist aggression. We are making a start on such a programme in peace time. In time of war, the call on our resources will be immeasurably more pressing.

Industrial Mobilization Slower

Another factor which lends emphasis to the need for planning industrial mobilization is the time element. The time taken to enlist and train a sailor, soldier or airman, is much less than the time taken to start production of the weapons with which he must fight. Our Canadian Brigade is now in Korea, trained and ready to fight. A part of it has been in action for some time. Had it been necessary for them to wait until we could manufacture new weapons and equipment for them, they would not fight until some time next winter at the earliest. We do not, in peace time, maintain an arms industry in Canada, and we did an extraordinarily good job of converting our war plants of the last war to commercial output.

Considerations such as those might well lead us to the view that industrial mobilization planning in North America is of somewhat greater importance than military mobilization planning, even though the one be useless without the other. At this stage it seems appropriate to look at the organization which has been provided in Canada to be responsible for the provision of military supplies and equipment both now, and in the event of an emergency.

Canada's Supply Organization Today

First, there are the supply branches of the three Armed Services. Under the direction of the Principal Supply Officers, these branches prepare the lists of requirements which are based on strategic plans prepared by the Chiefs of Staff, and approved by the Defence Committee of the Cabinet. The necessary expenditure of funds is first approved by the Treasury Board and the Cabinet, and, as part of the Governmental estimates, is submitted to Parliament. With Parliamentary approval being given, the contract demands are prepared and forwarded to the Department of Defence Production for procurement action. The Services themselves do not do any buying, although they are responsible for the provision of all technical information, including drawings, specifications and inspection.

The Department of Defence Production is, as you have noted from the numerous charts published, very similar to the wartime Department of Munitions and Supply. It has a number of production sections under a co-ordinator, a central purchasing division and a materials division, together with the financial and legal sections and a Washington office. There is one significant difference between the new department and the old one. The new production divisions are responsible for procurement and purchasing in their own fields, the general purchasing division being responsible for all other purchases. In the Department of Munitions and Supply, all purchasing was centralized. The Department of Defence Production is also responsible for the operation of the several crown companies including Canadian Arsenals Limited.

In addition to its duties of placing current defence contracts, it is a natural function of the new department to plan for industrial mobilization. Immediate procurement, and planning for effective industrial mobilization to meet an emergency are, basically, two separate matters. Nevertheless they are in a sense related, in that orders placed now, even for relatively small quantities, do provide experience and 'know-how' on which increased production can be based. It is easier to expand existing facilities than it is to create new ones.

Industry Being Consulted

Following sound practice, the Government has appointed to the key positions in the new department, leaders from Canadian Industry. It is only logical that if industry must bear the burden of defence production, its voice should be loud in the councils which determine what action should be taken. Aside from staffing its responsible department from industry, the Government has, wisely we think, availed itself of the opportunity to consult industry itself on any pertinent problems, by utilizing the services offered by the Canadian Industrial Preparedness Association.

This organization formed and wholly supported by industry, was formed for the sole purpose of furthering industrial preparedness for defence in Canada by any means within its power. It has a membership of some three hundred and forty Canadian companies, representing a large proportion of the productive power of the country. I believe it is a tribute to the public spirit of Canadian industry that it should finance this effort, and that its executives do spare their valuable time to take part in and support its activities.

The businessmen responsible for the formation of the Association some four years ago, had experienced during World War II the great difficulties encountered in bringing the industrial defence effort of this country to its peak. They were greatly impressed with the time lags encountered due to a late start. They realized that in the event of another emergency we could not count on any period of what at the time was popularly called "phony war". Therefore, they set out to ensure adequate industrial planning to meet any eventuality.

The method adopted was to organize industry-wide committees in some twenty-five fields. These committees, formed of individuals with vast experience and knowledge in their own industry, could provide the best advice obtainable anywhere. Our committees have brought to light problems arising within the industry, and have made recommendations as to the solution of those problems. They have also had referred to them by the Government, matters of detail and policy. They have presented the views of the industry in regard to these matters. Foreseen shortages of material, stockpiling, labour questions and others have been dealt with.

Some committees have made extensive studies of the buildings, tools and materials required to produce certain weapons, others have made studies of existing capacities. One has recommended emergency rationalization of the industry it represents. Neither the Association nor its committees attempt to interfere with current contracts, or to allot current business. The responsibility for all decisions properly rests with the Government. Even for future emergency allocation, the Association can only advise when new facilities appear to be required. The Government must make the decisions.

Planning On an International Scale

Thus, we now have the organization which will carry out our industrial mobilization planning in Canada. As regards International planning, there is, as you know, a North Atlantic Treaty Defence Production Board, on which Canada is lucky to have a strong and able representative. We also have equal representation with the United States on the Joint United States and Canada Industrial Mobilization Planning Committee. This body is purely advisory, and is responsible for the set of principles governing the joint planning of the two countries which were agreed upon and published last October.

Perhaps, before we look at our achievements in industrial mobilization planning, we should first glance at some of the difficulties we face. Canada, as you know, in many areas of military production, has a potential far in excess of the needs of our own Armed Services. In others, where designs are complex, and quantities small, production in Canada would not be economical. Thus we are faced with the problem of finding a place where the production from our excess capacity will do the most good, and of finding a place where we may procure those items for which we have no economical production capacity.

The first necessity in planning efficient production is information on the types and rates required. The rate should be large enough to ensure the economical use of tools and skilled manpower. We may have a good idea of the requirements of our own Armed Services, especially since we have recently made major decisions regarding types. On the other hand we have but the vaguest idea of what we should manufacture for our Allies including the United States, in the event of an emergency. Without a comprehensive list of requirements, our planning, can, at best, be only a partial effort.

Thus it is, that we in Canada find ourselves in the first phase of industrial mobilization planning. There are exceptions to this generality. I refer to the Naval Gun programme, and to Aircraft and Ships of one or two types. Other than these three categories, we are in the pilot order stage. Quantities of other items are small, and difficulty may be experienced in placing orders for them with the most appropriate civilian facility. Naturally, in a situation such as this, the Canadian Arsenal divisions will receive orders to the limit of their capacity. Placing orders with Arsenals, while obviously economical, does not get civilian industry started on defence equipment production. Then too, quantities being small, and facilities in Canada being limited or otherwise occupied, we must buy largely from the production lines in full operation in the United States or from existing stocks in that country.

Need For a Joint Board

Aside from achieving a reasonable financial balance in our trade in arms and equipment with the United States, assurance from that country that our Canadian production facilities would be required in the event of an emergency, and some indication of what we should produce, would be a great help to us in planning the most effective use of our capacity should war come.

The circumstances in which we find ourselves purchasing from the United States several times what that country purchases from us in the way of defence equipment, leads us to suggest a joint Board or body. Such a Board should be delegated real authority to coordinate the procurement and planning in both countries, on a North American basis. The existing Committee is advisory. At this time we need decision.

Insofar as supplying our European Allies are concerned we have, as you know, shipped from stock a considerable volume of Army equipment, which will be replaced with American types. So far we have had relatively few calls on our manufacturing capacity, and so far as emergency requirements are concerned, industry has no knowledge of them. It is to be hoped that the North Atlantic Treaty Organization Defence Production Board, will, when it has dealt with immediate and urgent deficiencies, devote some of its foresight and knowledge to developing a list of requirements which would be needed if war were to come.

Preparatory Work Now

Since we seem to be, with three notable exceptions, in a limited pilot plant stage of production planning, what can we do, as companies, as organizations and individual citizens, to assist in readying the industry of our country to play its part in our defence? The answer to this question lies in our own imagination and initiative. We can survey our resources in facilities and manpower. Some of this is being done by Provincial Departments, by Federal Departments, and by the Canadian Industrial Preparedness Association. We can form our own views as to what we consider to be essential production and what is not essential. We can determine what employees, technical, skilled and unskilled might be spared for the Armed Services and essential war work.

We know there is now an overall shortage of engineers. In the unhappy event of war, the shortage will become much more acute. How can we dilute existing engineering staffs with individuals having less knowledge and experience? Then too, the Reserve Armed Services, especially the technical branches, deserve more attention from industry. Anything we can learn regarding the armed service requirements for specialist personnel cannot be otherwise than helpful to us in planning our own action should war prove to be unavoidable. Engineers can and should devote their energies, when the opportunity offers, to suggesting improvements and simplification of military equipment with which they come in contact. Suggestions so made saved many dollars, and tons of scarce materials during the last war.

Speaking of materials, the investigation of substitutes for those materials that are now scarce, and likely to remain so, is a fruitful field to explore, as well as a profitable one, especially now. √

Sixty-fifth Annual General Meeting

Convened at Headquarters, Montreal, on January 25th, 1951, and adjourned to the Mount Royal Hotel, Montreal, Que., May 9th, 1951

THE BUSINESS MEETING

The Sixty-Fifth Annual General Meeting of The Engineering Institute of Canada was convened at Headquarters on Thursday, January 25th, 1951, at eight o'clock p.m., with Vice-President R. E. Heartz in the chair.

The general secretary having read the notice convening the meeting, the minutes of the Sixty-Fourth Annual General Meeting, as published on pages 700 to 703 of the August 1950 *Journal*, were taken as read and approved.

Appointment of Scrutineers

On the motion of R. B. Wotherspoon, seconded by H. W. B. Swabey, Messrs. R. C. Flitton, Guy Savard, and F. W. Davidson were appointed scrutineers to canvass the officers' ballot and report the results.

There being no other formal business, on the motion of J. B. Stirling, seconded by Claude E. Howard, it was resolved that the meeting do adjourn to reconvene at the Mount Royal Hotel, Montreal, on Wednesday, May 9th, 1951.

The adjourned meeting convened at nine o'clock p.m., May 9th, 1951, with President James A. Vance in the chair.

Retiring President's Address

The text of the address of the retiring president James A. Vance appears on page 570 in this *Journal*.

This picture shows the student conference delegates, photographed during their meeting on Tuesday, May 8. From left to right they are, F. A. Batchellor, Alberta; D. H. Cullen, Nova Scotia Tech.; R. B. Gander, New Brunswick; M. Dufour, Ecole Polytechnique; H. Masse, Laval; V. Jolivet, McGill; James Harris of Toronto, chairman of the meeting; A. H. Lee, Queen's; D. B. Sherk, Toronto; M. V. Spence, Toronto; R. G. Foxall, British Columbia; D. A. Young, Manitoba; M. R. Jones, Saskatchewan.

Among those who attended the branch officers conference were: Extreme left—L. Austin Wright, the general secretary; R. B. Wotherspoon, Montreal Branch secretary; W. D. Laird, the assistant general secretary. Fourth row (l. to r.): J. F. Wickenden, vice-president, Zone C; F. W. Bradshaw, St. Maurice Valley; W. C. Smith, Toronto; C. D. Carruthers, chairman, Toronto; E. R. Graydon, councillor, Toronto; W. D. Hurst, chairman, Winnipeg; J. St. Jacques, chairman, Quebec; E. T. W. Bailey, chairman, Hamilton. Third row (l. to r.): P. M. Sauder, councillor, Lethbridge; H. W. Tye, councillor, Edmonton; H. N. Macpherson, vice-president; M. G. Saunders (deceased) councillor, Kingston; G. T. L. Andrews, chairman, Kingston; F. F. Dyer, councillor, Sarnia; C. P. Sturdee, chairman, Sarnia. Second row (l. to r.): C. N. Murray, chairman, Cape Breton; R. E. Kirkpatrick, chairman, St. Maurice Valley; S. Sillitoe, secretary, Belleville; A. J. Bonney, chairman, Peterborough; W. E. Brown, councillor, Hamilton; G. L. Schneider, secretary-treasurer, Hamilton; J. W. MacDonald, member of executive, Halifax; A. R. Harrington, chairman, Halifax. First Row (l. to r.): A. H. W. Busby, councillor, Kootenay; B. G. Ballard, chairman, Ottawa; G. W. Lusby, councillor, Border Cities; F. E. Wellwood, secretary-treasurer, Toronto; E. R. Eaton, councillor, Sudbury; E. A. Cross, councillor, Toronto.

Nominating Committee—1951

The general secretary announced the membership for the Nominating Committee of the Institute for the year 1951, as follows:

Chairman: G. R. Henderson, Sarnia, Ont.

Branch	*Representative*
Belleville	J. E. Buchan
Border Cities	F. J. Ryder
Calgary	H. R. Younger
Cape Breton	S. G. Naish
Central B.C.	W. Ramsay
Cornwall	John Hawkes
Edmonton	J. W. Porteous
Halifax	C. D. Martin
Hamilton	W. A. T. Gilmour
Kingston	R. D. Bennett
Kitchener	A. J. Girdwood
Kootenay	A. C. Ridgers
Lakehead	H. M. Olsson
Lethbridge	James Haimes
London	G. N. Scroggie
Moncton	W. C. Baggs
Montreal	J. A. Beauchemin
Newfoundland	H. Forbes-Roberts
Niagara Peninsula	C. G. Cline
Ottawa	G. R. Turner
Peterborough	A. L. Killaly
Quebec	C. H. Boisvert
Saguenay	W. F. Campbell
Saint John	A. R. Bonnell
St. Maurice Valley	J. S. Whyte
Sarnia	J. E. Harris
Saskatchewan	A. H. Douglas
Sault Ste. Marie	R. A. Campbell
Sudbury	W. B. Ibbotson
Toronto	W. E. Bonn
Vancouver	Sidney Hogg
Victoria	P. E. Doncaster
Winnipeg	C. V. Antenbring

Honorary Memberships

The general secretary reported that the following had been elected to honorary membership in the Institute and that certificates would be presented at the annual banquet or on some appropriate later occasion:

Edwin Victor Caton, chief engineer and manager of electric utility, Winnipeg Electric Company, Winnipeg, Man.

William Allan Mather, president, Canadian Pacific Railway Company, Montreal, Que.

Wallace Rupert Turnbull, inventor and research worker, Rothesay, N.B.

Awards of Medals and Prizes

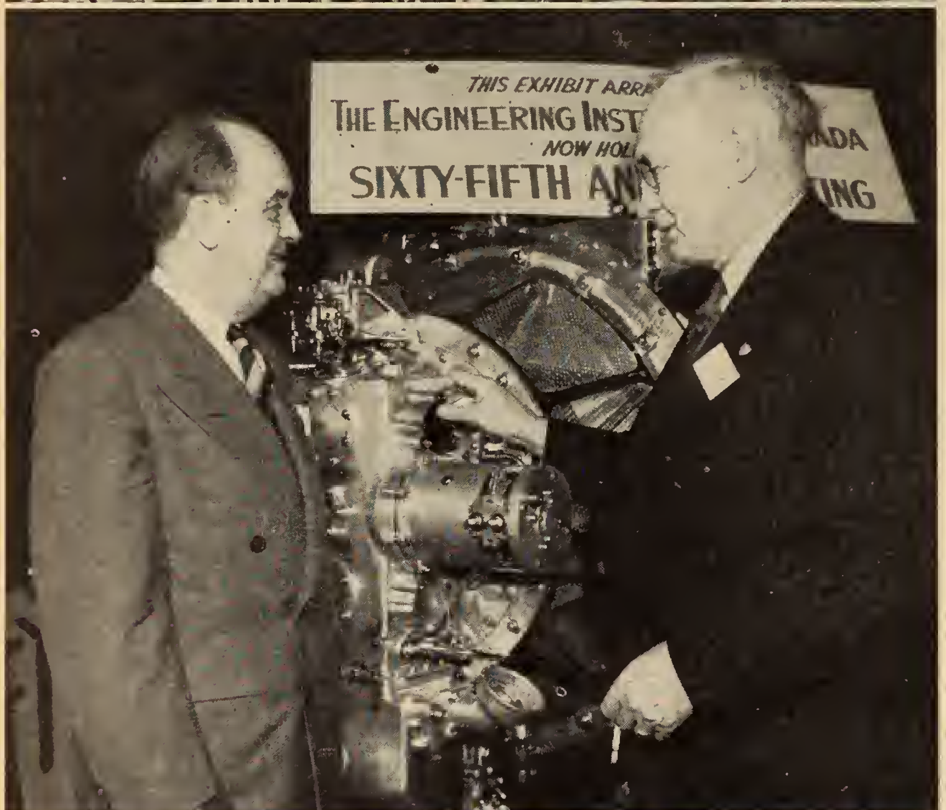
The general secretary announced the various awards of the Institute for the year as follows stating that the formal presentation of these distinctions would be made at the annual banquet of the Institute on May 11th.

Sir John Kennedy Medal—"As a recognition of outstanding merit in the profession or of noteworthy contributions to the science of engineering or to the benefit of the Institute", to Dr. C. R. Young, Hon. M.E.I.C., Toronto, Ont.

Julian C. Smith Medal—"For achievement in the development of Canada", to C. M. Anson, M.E.I.C., Sydney, N.S., and C. P. Edwards, M.E.I.C., Ottawa.

Gzowski Medal—"For the best paper of the medal year", to F. S. Small, M.E.I.C., Apohaqui, N.B. — for his paper, "A Plan for the Development of The St. Lawrence — Lachine Section".

Leonard Medal—To O. W. Ellis, M.E.I.C., for his paper, "A Study of Some Alloys of Titanium in the Manufacture of which Commercial Titanium Hydride Power was used" (written jointly with W. E. Kuhn and H. V. Kinney).



Students' and Juniors' Prizes

John Galbraith Prize—To C. G. Saunders, S.E.I.C., for his paper "Length-Stress Relationship of 65 ST Specimens when bowed in fixed length Holders for Stress Corrosion".

Ernest Marceau Prize — To Jacques Barriere, S.E.I.C., for his paper "Viaduc et Trefle a Quatre Feuilles sur Boulevard Cure Labelle".

Report of Council, Report of Finance Committee, Financial Statement and Treasurer's Report

On the motion of J. F. Wickenden, seconded by J. E. Armstrong, it was resolved that the report of Council, the Report of the Finance Committee, the Financial Statement and the Treasurer's Report be accepted and approved.

Report of Committees

On the motion of H. Gaudefroy, seconded by W. M. Gardiner, it was resolved that the reports of the following committees be taken as read and accepted: Legislation, Employment Conditions, Employment Service, Library and House, Membership, Board of Examiners, Professional Interests, Admissions, Prairie Water Problems, Atmospheric Pollution in Canada, Canadian Standards Association, Canadian Chamber of Commerce, National Construction Council.

Top. This photograph shows a portion of the audience at the E.C.P.D. symposium, "The First Five Years of Professional Development."

Centre. Through the courtesy of Rolls Royce, Montreal Ltd., and McGill University, a NENE Jet Engine was on display in the lobby of the Mount Royal Hotel during the meeting. This photograph shows President Macnab (right) discussing the engine with R. H. Nash, general manager of the hotel.

Bottom. Some of the members of the Montreal Branch Committee who were largely responsible for the success of the meeting (l. to r.): R. H. Hobner, chairman "Muriel's Room" committee; L. A. Duchastel, vice-chairman, and E. B. Jubien, chairman of the general committee; B. A. Evans, papers; and J. C. Antliff, hotel arrangements.

Branch Reports and Ontario Division Report

On the motion of W. N. Kelly, seconded by E. R. Graydon, it was resolved that the reports of the various branches and the Ontario Division be taken as read and approved.

The general secretary read the Report of the Scrutineers appointed to canvass the officers' ballot for the year 1951, as follows:

President:

Dr. Ira P. Macnab, Halifax, N.S.

Vice-Presidents:

Province of Ontario—C. G. R. Armstrong, Windsor.

Province of Quebec — J. B. Stirling, Montreal, Que.

Western Provinces — J. W. Sanger, Winnipeg, Man.

Councillors:

Vancouver Island Branch — R. Bowering

Vancouver Branch—G. W. Allen, P. B. Stroyan

Central British Columbia Branch—M. L. Wade

Kootenay Branch—A. H. W. Busby

Edmonton Branch—H. W. Tye

Saskatchewan Branch—E. J. Durnin

Lakehead Branch—S. E. Flook

Sudbury Branch—E. R. Eaton

Border Cities Branch—G. W. Lusby

London Branch—V. A. McKillop

Toronto Branch—E. R. Graydon

Ottawa Branch—A. C. Ross

Belleville Branch—Douglas W. Bews

Kingston Branch—M. G. Saunders

Montreal Branch—H. Gaudefroy, A. S. Rutherford

St. Maurice Valley Branch — Milton Eaton

Saguenay Branch—W. P. C. LeBoutillier.

Top. A portion of the large audience listening to J. G. G. Kerry discuss the St. Lawrence Waterway.

Centre. The entertainment of the ladies who attended the Annual Meeting was the responsibility of a committee headed by Mrs. E. B. Jubien. With her in this photo are (standing l. to r.), Mrs. B. A. Evans, Mrs. I. R. Tait, Mrs. R. H. Hobner, Mrs. R. N. Coke. (Seated l. to r.) Mrs. L. A. Duchastel, Mrs. Jubien, and Mrs. A. T. E. Smith.

Bottom. The oldest and youngest. F. X. T. Berlinguet, M.E.I.C., of Three Rivers, and A. H. Lee, S.E.I.C., student delegate of Queen's University, pictured during the annual business meeting on Wednesday night. Mr. Berlinguet, now in his 97th year, joined the original Canadian Society of Civil Engineers as a corporate member when it was founded in 1887. Mr. Lee was the youngest of the delegates who attended the annual student conference.

The head table at the luncheon on Wednesday included (l. to r.) E. B. Jubien, chairman annual meeting committee; five authors who presented papers on that day, Major-General G. B. Howard, Montreal, Professor D. L. Mordell, Montreal; M. J. O'Shaughnessy, Sorel, Que., H. K. Breckenridge, Pittsburgh, and G. W. Marshall, London, England; L. E. Potvin, president, Quebec Hydro Electric Commission; Professor Arthur L. Phelps, the principal speaker; E. R. Smallhorn, Montreal Branch chairman. And on the facing page, Mr. Smallhorn (repeated); Camillien Houde, the mayor of Montreal; four others of the day's authors, N. M. Brydon, Glasgow, Scotland, J. C. McKeon, Pittsburgh, Pa., Group Captain E. C. Luke, Ottawa, K. B. McEachron, Jr., Schenectady, N.Y.; and L. A. Duchastel, vice-chairman of the annual meeting committee.

Saint John Branch—D. O. Turnbull
Halifax Branch—M. L. Baker
Newfoundland Branch—J. W. Morris

On the motion of J. M. Crawford, seconded by J. G. Chenevert, it was resolved that the Report of the Scrutineers be adopted; that the scrutineers be thanked for their services in preparing the report and that the ballot papers be destroyed.

A.S.M.E. Summer Meeting

C. E. Davies, secretary of the American Society of Mechanical Engineers, made an announcement about the forthcoming summer meeting which is being held in Toronto during the week of June 11th. He explained that every member of the Institute was invited to participate and he reminded the group that the luncheon speaker on Wednesday, the 13th, would be the president of the Engineering Institute, Dr. Macnab. The chairman of the meeting would be Colonel L. F. Grant. He hoped that many members would be there and would feel that it was their own meeting.

1952 Annual Meeting—Vancouver

Mr. Kelly reminded the meeting that the 1952 annual meeting of the Institute was to be held in Vancouver on May 7th, 8th and 9th. He hoped that everyone present here would also be present there and he could promise them all a very pleasant time.

Vote of Thanks to Montreal Branch

On the motion of W. R. Manock, seconded by L. W. Geake, it was unanimously resolved that a hearty vote of thanks be extended to the Montreal Branch in recognition of their hospitality and activity in connection with the sixty-fifth annual general meeting.

Vote of Thanks to Retiring Officers

On the motion of L. L. O'Sullivan, seconded by C. R. Young, it was unanimously resolved that a hearty vote of thanks be extended to the retiring president, vice-presidents and councillors in appreciation of the work which they have done for the Institute during the past year.

Leo Scharry, Jr.E.I.C., referred to the Institute's proposal to encourage engineers from the United Kingdom to come to Canada and inquired as to the reasons back of it. The president explained that the action was being taken on the authority of Council. Council had been impressed with the serious shortage of engineers in Canada and felt that the Institute's connections in the Old Country might be used to advantage in relieving the situation. He emphasized the great need as indicated by the large number of inquiries at the Institute Employment service.

The meeting adjourned at nine forty-five P.M.

The Professional Meeting

No two annual meetings are exactly alike, and yet the basic pattern of them all is pretty much the same year in and year out. To some extent, the differences are the product of the times. This year's programme was tied in to several current activities and interests such as civil defence, industrial preparedness, defence preparedness, the development of electricity by steam power, the development of new national resources, the St. Lawrence Waterway, tunnelling, public relations, and so on. It is essential that the members of the Institute keep themselves informed on current developments and the annual meeting would fail of its opportunities if it did not assist in bringing out the desired information. It is believed that this year's programme was outstanding from this angle.

The attendance at the technical sessions was never better, the capacity of the rooms being insufficient on several occasions. It is too bad that Canadian hotels (with one exception) do not have more public space for meetings of this type. However the over-all attendance was down. The registration was only slightly over 700. It is interesting to study this development in order to discover how the meetings can be made more attractive and profitable to more people. Already there have been uncovered several useful ideas on this point.

International Flavour

Not since the semi-centennial in 1937, has the programme had such international participation. There were four speakers from the United States, four from the United Kingdom, and one from France. Each of them was outstanding and together they made a most useful contribution to the success of the meeting. It is a great thing for the Institute to have so many friends in other lands, who come here at their own expense to make their contribution to the development of the profession.

Annual Meeting of Council

The last meeting of the old Council was held on Monday, May 7th, and took up both the morning and the afternoon. The total attendance was 51 and 23 branches were represented. There were five past-presidents there, and perhaps for the first time in the Institute's history, all six vice-presidents were present.

President's Dinner

This pleasant function was held at the University Club, with 83 present—the second largest turnout on record. Following custom, each past-president was asked to speak, as was also Sir Wm. Stanier, a guest of the president. There were two short movies about British aircraft which seemed to fit well into the programme.

Branch Officers' Conference

Tuesday, May 8th, was the branch officers' day. The customary conference was held in the morning and the afternoon with E. R. Smallhorn, Montreal Branch, chairman, presiding and R. B. Wotherspoon acting as secretary. There was a good turnout with the following branches represented—Belleville, Border Cities, Calgary, Cape Breton, Edmonton, Halifax, Hamilton, Kingston, Kootenay, London, Montreal, St. Maurice Valley, Ottawa, Sarnia, Toronto, Sudbury, Saint John, Quebec, Winnipeg and Peterborough.

Students' Conference

For the sixth year the Institute held its student conference. To this is invited the incoming president of the undergraduate engineering society, or the president of the student branch of the Institute on the campus, at all engineering degree granting universities in Canada. These eleven young men are looked on as the forthcoming leaders of the profession, and it is important that the Institute establish and maintain a close contact with them in order to render a useful service to the student group.

James F. Harris, M.E.I.C. of Toronto was the chairman of the opening session, and A. H. Lee, S.E.I.C. the delegate from Queen's was chosen as chairman for the balance of the sessions. V. M. Jolivet, S.E.I.C. the delegate from McGill acted as secretary throughout. The other delegates were—F. A. Batchellor, Alberta; M. R. Jones, Saskatchewan; D. A. Young, S.E.I.C., Manitoba; D. R. Sherk, S.E.I.C., Toronto; Marcel Dufour, S.E.I.C., Ecole Polytechnique; Honoré Massé, S.E.I.C., Laval; Douglas H. Cullen, S.E.I.C., Nova Scotia Technical College; R. B. Gander, S.E.I.C., New Brunswick.

Several prominent engineers were introduced to the group. Included were James A. Vance, Ira P. Macnab, J. B. Stirling, Dr. Lillian Gilbreth, J. M. Dymond of the Department of Labour, Ottawa, Professor Baker of the Nova Scotia Technical College and the three members of the E.C.P.D. Committee on Professional Training, who attended the conference at the students' own invitation.

John Fisher, the C.B.C. commentator, also spoke to the group at some length on the advantages of young engineers remaining in Canada. He gave them a really stirring private session, a sort of a "John Fisher Reports" to the engineering students of Canada.

Ladies' Events

The ladies committee under the chairmanship of Mrs. E. B. Jubien, prepared a programme that was outstanding. Of course there was the usual coffee rendez-vous each morning, presided over by the members of the committee, but as well there were interesting events outside of the hotel.

On Monday night, the ladies whose husbands were attending the president's dinner, dined with the committee at the Cercle Universitaire. They claimed they had a better dinner than their husbands.

On Wednesday afternoon His Worship, Mayor Camilien Houde and the City of Montreal entertained the ladies on a tour of the City followed by tea at the historic chalet on Mount Royal—and did it well.

Over a hundred women were there, as the accompanying photograph shows. The photo was taken by the City's official photographer and a mounted copy was provided for each lady present at the tea. Copies are still available from Headquarters for any lady who did not obtain her copy at the Annual Meeting. The committee was greatly appreciative of the Mayor's cooperation, and everyone voted the occasion a great success.

On Thursday afternoon the ladies for the most part accompanied their husbands on the trip to Beauharnois and Canadair—or took advantage of the excellent shopping facilities of Montreal.

On Friday afternoon, the Canadian Broadcasting Corporation was host to the ladies in a preview tour of the new Radio Canada Building formerly the Ford Hotel on Dorchester Street. It was agreed by all who attended that the building has been converted to a most attractive and impressive headquarters for C.B.C.'s radio and television activities.

Technical Sessions

The technical programme opened on Wednesday, May 9th. A copy of the final programme follows these notes and therefore it is not proposed to go into it in detail

Participants in the E.C.P.D. symposium, "The First Five Years of Professional Development", were (l. to r.): K. B. McEachron, Jr., manager, Technical Education Division, General Electric Co., Schenectady, N.Y.; J. C. McKeon, manager, University Relations, Westinghouse Electric Corp., Pittsburgh, Pa.; Lt-Col. L. F. Grant, field secretary of E.I.C., who is vice-chairman of E.C.P.D.; and H. K. Breckenridge, vice-president, West Penn Power Co., Pittsburgh.

at the moment. Neither is there any intention of comparing one paper or one speaker with another. It is true that some were better than others, but opinions differ as to which ones they were.

Probably it is safe to refer to the more pretentious presentations such as the E.C.P.D. symposium and the management panel. These would have been outstanding on any programme.

The presentation of the programme of the Engineers' Council for Professional Development (E.C.P.D.) "The first five years of professional development — a challenge to management" was skillfully handled by J. C. McKeon of the Westinghouse Company, Pittsburgh, who in addition to speaking as chairman of a sub-committee, acted as master of ceremonies. He introduced the other two chairmen, H. K. Breckenridge of Pittsburgh, and K. B. McEachron of Schenectady. Between them they outlined E.C.P.D.'s proposals for the following three particular phases of the problem—

(a) Orientation and Training of the Young Engineer in Industry

(b) The Continued Education of Graduate Engineers

(c) Integrating the Young Engineer into his Community

(There is a limited supply of the complete report of the committee. Copies can be secured from Headquarters, Montreal, at $5.00. Additional copies will be printed if the demand exceeds the supply.)

Management and Public Relations

Under this title seven senior business executives filled out an interesting and profitable two-and-a-half-hour session which would have gone longer had the other functions of the day permitted. Under the guidance of Hugh Crombie, M.E.I.C., vice-president and treasurer of the Dominion Engineering Co. Limited, who acted as moderator, the following gentlemen gave a capacity audience an unrehearsed presentation of their ideas on a much-debated subject: J. A. Fuller, president, Shawinigan Water & Power Co. Limited; H. H. Lank, vice-president, Canadian Industries Limited; W. C. Beamer, assistant vice-president, Bell Telephone Co. of Canada; F. W. Bruce, sales manager, Aluminum Co. of Canada Limited; H. W. Tate, M.E.I.C., assistant general manager, Toronto Transportation Commission; and Hugh Campbell, chief of public relations, Canadian Pacific Railway; who at the last moment took the place of D. I. McNeill, vice-president, Canadian Pacific Railway.

It is planned to print the verbatim of this unusual session in an early issue of *The Engineering Journal*.

Speakers

The Institute's usual good luck followed the selection of speakers for the luncheons and the banquet. At Wednesday lunch, Arthur Phelps, professor of English at McGill spoke on "The Engineer and his English". Here was an intriguing subject and here too was a speaker who knew how to handle it. Seldom have Institute audiences heard anything so thrilling. It was far from the technical and professional material considered so appropriate to such occasions, but it was something infinitely more valuable and more delightful.

It was the opinion of many that Professor Phelps had given the engineers another classic, to be a running mate with Wickenden's now famous "The Second Mile". *The Engineering Journal* will print this entire address in an early issue.

Mayor Houde of Montreal has an established reputation as a com-

On Thursday morning, a session of particular interest was the panel discussion "Management and Public Relations". The panel, shown here, included (l. to r.): F. W. Bruce, sales manager, Aluminum Company of Canada Ltd.; H. W. Tate, assistant general manager, Toronto Transportation Commission; J. A. Fuller, president, Shawinigan Water & Power Co. Ltd.; Hugh Crombie, assistant to the president, Dominion Engineering Works, Ltd.; H. H. Lank, vice-president, Canadian Industries Ltd.; J. H. Campbell, manager, Public Relations, Canadian Pacific Railway; and W. C. Beamer, assistant vice-president, Bell Telephone Co. of Canada.

The head table at the annual banquet (l. to r. on this and the facing page) Ira P. Macnab, Mrs. E. R. Smallhorn, G. H. Thompson, Colonel J. R. B. Jones, Hugh Crombie, Dr. Adrien Pouliot, Mrs. George W. Holden, J. B. Stirling, Mrs. R. H. Mather, W. D. Hurst, Mrs. W. H. M. Laughlin, J. Roxborough Smith, Mrs. D. H. McDougall, Dr. Thomas H. Chilton, Mrs. A. H. Frampton, Mgr. Olivier Maurault, E. V. Caton, Mrs. James A. Vance, Sir William Stanier, James A. Vance, F. X. T. Berlinguet, Miss Joan E. Stanier, Gail A. Hathaway, Mrs. Ira P. Macnab, Colonel D. H. McDougall, Mrs. J. B. Stirling, A. H. Frampton, Mrs. Hugh Crombie, J. A. H. Henderson, Dr. George W. Holden, Mrs. J. Roxborough Smith, W. H. M. Laughlin, Mrs. G. H. Thompson, Ordnance Cmdr. George Taylor, R.C.N., R. H. Mather, Mrs. J. A. H. Henderson, Wing-Cmdr. C. F. Johns, R.C.A.F., E. R. Smallhorn.

Facing page, lower. E. V. Caton, chief engineer and manager of electric utility, Winnipeg Electric Company, receives his certificate of Honorary Membership from the president. Seated left and right are Sir William Stanier, London, England; and F. X. T. Berlinguet of Three Rivers, Que.

Below. President Vance presents the Julian C. Smith Medal to C. M. Anson, general manager, Dominion Steel and Coal Corporation Ltd., Sydney, N.S.


CANADA

On the facing page, top. President Vance is shown here as he presented his retiring address (see page 570) at the dinner on Wednesday night. With him at the head table were D. B. Sherk, student delegate, University of Toronto; Marcel Dufour, student delegate, Ecole Polytechnique; Past President C. R. Young, emeritus dean of engineering, University of Toronto; R. G. Foxall, student delegate, University of British Columbia; R. E. Heartz, vice-president of the Institute, Montreal; Mr. Vance; Dr. Lillian Gilbreth, Hon. M.E.I.C., Montclair, N.J.; Vincent Jolivet, student delegate, McGill University; D. H. Cullen, student delegate, N.S.T.C.

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Centre. This photo was taken during the dance which followed the annual banquet on Friday Night.

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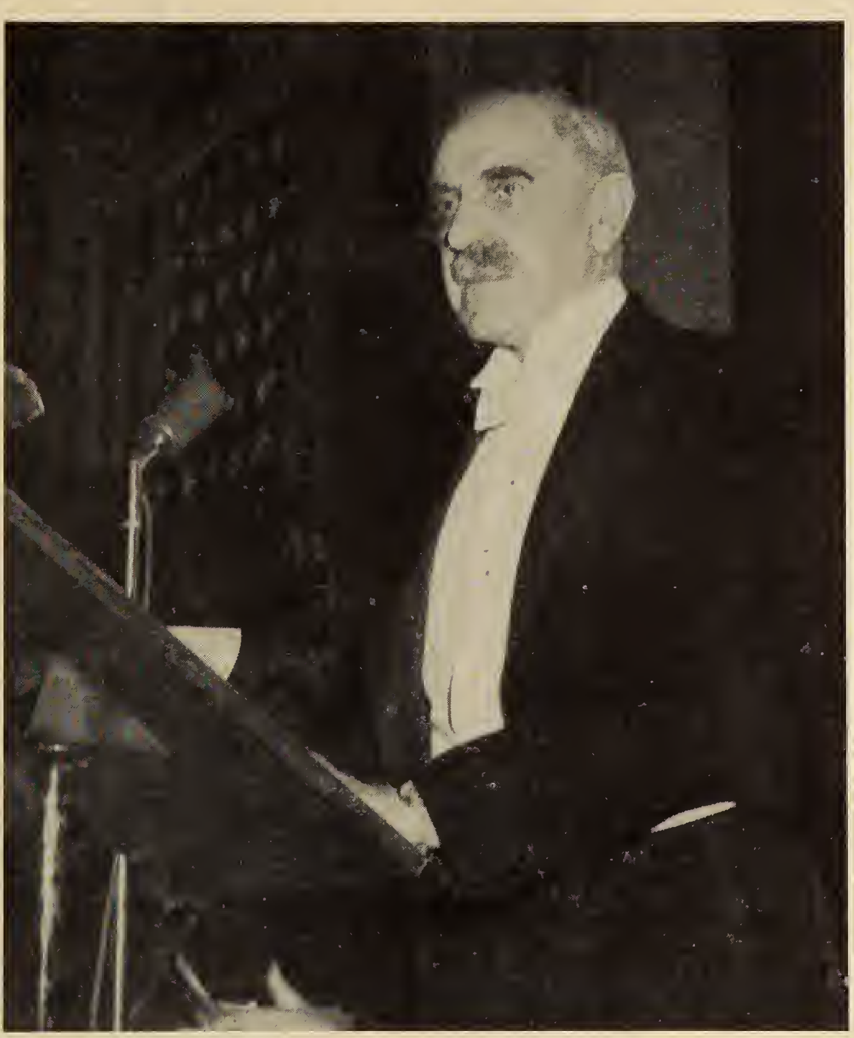
Bottom. The principals in the president's reception following the annual banquet. Left to right: E. R. Smallhorn, Montreal Branch chairman, and Mrs. Smallhorn; retiring president Vance and Mrs. Vance; the new president Dr. I. P. Macnab, and Mrs. Macnab; Sir William Stanier who was the speaker at the banquet.



Sir William Stanier, speaker at the annual banquet, emphasized in his remarks the importance of practical shop training in the education of an engineer.

petent speaker and his welcome on behalf of the City, which preceded Professor Phelps' address, left nothing to be desired. His remarks were most appropriate and were delightfully flavoured with the humour for which he is famous.

At the dinner Wednesday evening, the president, James A. Vance, gave his retiring address, "Looking Back, then Forward". The text of this address appears on page 570 of this issue. It deals with the history of the Institute in terms of what it can mean for the future. After dinner the annual business meeting was held.

Plant Tours

Thursday afternoon was devoted to two plant visits. Over 200 persons went to Beauharnois to see the greatly extended plant of the Quebec Hydro Commission. The Commission provided luncheon upon arrival of the bus loads from Montreal. The group was broken up into small parties and, under able guides, everyone saw the works. It was a tired but well satisfied group that returned to the hotel about 6 p.m.

The second group went to the Canadair plant, where company officials did a splendid job of taking care of them. It is here that the famous fighter, the Sabre, is being manufactured for the Royal Canadian Air Force. About 150 delegates and ladies were received at the plant gates, were divided into small groups and given a most comprehensive tour of the huge enterprise. As the tired but appreciative visitors assembled for the return to the hotel, the managment of Canadair introduced a most welcome surprise in the form of light refreshments.

Open House

"Something new has been added". For the first time, visitors were invited to come to the Institute headquarters building close by the Mount Royal Hotel, to inspect the premises, meet the staff, and see how the various departments operate. This was on Thursday night allegedly from eight to ten o'clock.

The visitors began to arrive before eight and by ten everything was going under full power. It was midnight before the last members left—so apparently it was a success. Fortunately not everyone arrived at the same time. However, even at that there were times when it was almost impossible to move about the auditorium, or from there to any other room. The estimate is that about 350 members and wives were present.

Friday's Programme

At luncheon Friday Dr. O. M. Solandt, Affil.E.I.C., chairman of the Defence Research Board was the speaker. He gave a lot of interesting information about what the Board in its many ramifications, has done, is doing, and plans to do in the future. This address will be published in full and those who were not fortunate enough to be present are urged to read it. It will give an

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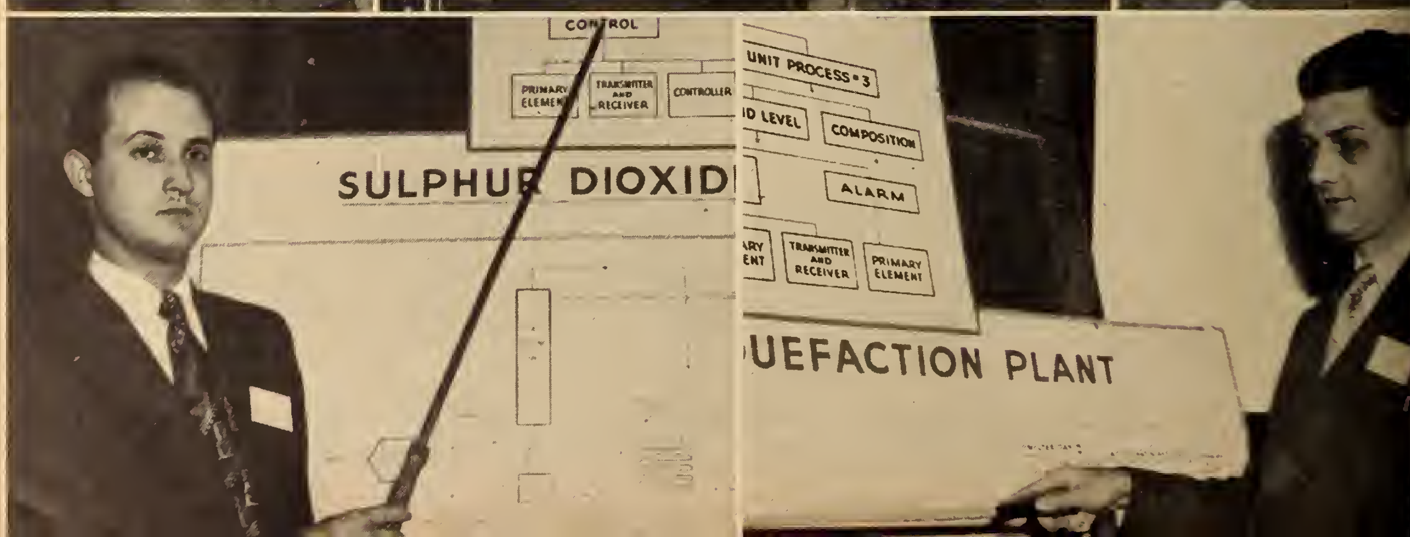

CONTROL
PRIMARY ELEMENT
TRANSMITTER AND RECEIVER
CONTROLLER
UNIT PROCESS # 3
ID LEVEL
COMPOSITION
SULPHUR DIOXID
ALARM
TRANSMITTER AND RECEIVER
PRIMARY ELEMENT
UEFACTION PLANT

The Technical Papers

Facing Page:

1. Dr. J. J. Green, Defence Research Board, who was chairman, and J. L. Orr, National Research Council, who delivered the paper on Electro-thermal De-icing of Aircraft.

2. J. G. G. Kerry, Port Hope, Ont., illustrating his proposals for the St. Lawrence Waterway to Prof. R. E. Jamieson (left) of McGill University, and H. B. Hachey (right) chief oceanographer, St. Andrews, N.B.

3. E. W. Hutton, Schenectady, N.Y., photographed during the delivery of his paper on electronic control.

4. Professor E. A. Allcutt of The University of Toronto, spoke on Air Sanitation.

5. P. E. Savage of Dominion Bridge Company was the author of a paper on the Erection of the Digesters for the new Plant of Columbia Cellulose Ltd., at Watson Island, near Prince Rupert, B.C.

6. Brian H. Colquhoun, eminent consulting engineer from London, England, flew over from the United Kingdom, to deliver a paper on Tunnelling in Soft Ground.

7. The speaker at the luncheon on Friday was Dr. O. M. Solandt, chairman of the Defence Research Board, who is pictured here with H. N. Macpherson of Vancouver, who presided at the luncheon.

8. The operation of rotary lime kilns at the plant of Shawinigan Chemicals Ltd., Shawinigan Falls, Que., was described by R. H. Hall.

9 and 10. J. A. Rice, Fischer & Porter (Canada) Ltd., Toronto (left), and J. V. Quinn, Canadian Industries Limited, Montreal (right), were teamed together for an interesting presentation of a paper on Instrumentation for Chemical Processes.

Below:

11. R. L. Hearn, general manager and chief engineer, Hydro Electric Power Commission of Ontario, is pictured here during the presentation of his paper on the Hydro steam plants at Toronto and Windsor.

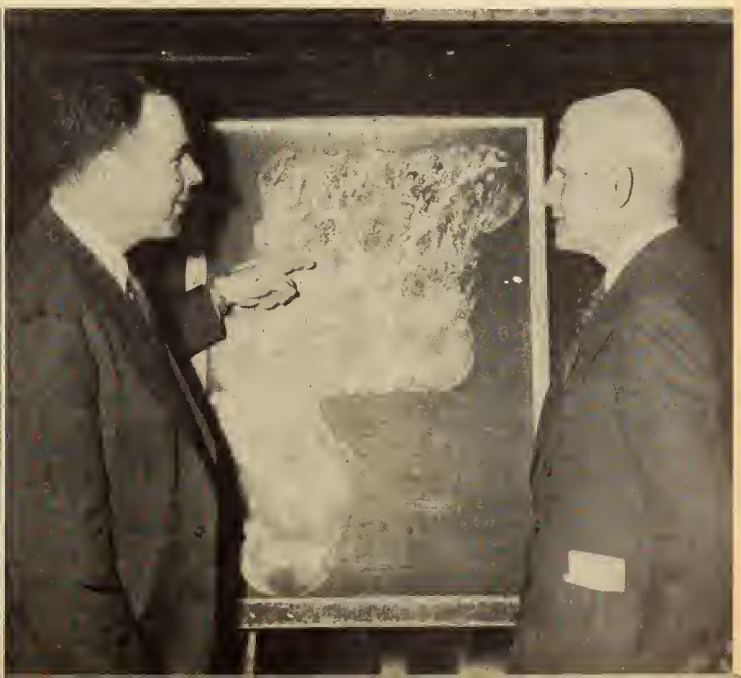
12. M. J. O'Shaughnessy (left), Quebec Iron and Titanium Corporation, Sorel, Que., presented a paper on the new Titanium Developments in Quebec. The chairman for this session was Carlyle Gerow (right) secretary-treasurer of The Canadian Institute of Mining and Metallurgy.

excellent picture of the Board's work, and will impress the reader with its success and its importance.

The Banquet

Always the main feature of the annual meeting, the banquet this year was no disappointment to its planners or to its guests. The attendance was slightly over 700 which was just a few too many for the ball room. The head table was graced by the senior officers of many associated organizations. It is always a pleasure and an honour to have so many outstanding representatives (and their wives). Perhaps the reader would like to know just what organizations were represented. Here they are—

Gail R. Hathaway, president, Amerian Society of Civil Engineers; Dr. Thomas A. Chilton, president, American Institute of Electrical Engineers; Col. D. H. McDougall, representing the Canadian Institute of Mining and Metallurgy and the Mining Society of Nova Scotia; J. Roxborough Smith, president, Royal Architectural Institute of Canada; A. H. Frampton, vice-president for Canada, American Institute of Electrical Engineers; W. D. Hurst, president, Association of Professional Engineers of Manitoba; J. A. Henderson, president, Dominion Council of Professional Engineers; J. B. Stirling, president, Montreal Board of Trade; Dr. George W. Holden, representing the Chemical Institute of Canada; Dean Adrien Pouliot, president, Corporation of Professional Engineers of Quebec; W. H. M. Laughlin, president, Association of Professional Engineers of Ontario; Hugh Crombie, vice-



president, Canadian Manufacturers Association; G. H. Thompson, president, Canadian Electrical Association; R. H. Mather, representing Canadian Standards Association. The three Armed Services were represented by officers appointed by the deputy minister: Colonel J. R. B. Jones (Army), Ordnance Commander George Taylor (Navy), Wing Commander C. F. Johns (Air Force).

The banquet speaker was Sir William Stanier, one of the great figures in the progress of the profession in the United Kingdom. His long experience as engineer and consultant to the British Railways, and his broad interest in the technical and professional affairs of his societies, have given him an unusual background from which to speak to an audience anywhere. His personal charm, his critical comment, his constructive suggestions, and his keen sense of humour endeared him to his audience. His address when published in the *Journal* will be welcome reading to members everywhere.

In particular it was pleasant to have the presidents of two of the leading societies of the United States—the American Society of Civil Engineers and the American Institute of Chemical Engineers. The Secretary of the Civils, Wm. N. Carey was present, also S. Paul Johnston of New York, director of the Institute of the Aeronautical Sciences.

The chairman on this important occasion was the retiring president, James A. Vance, who as his last official presidential act introduced his successor, Dr. Ira P. Macnab. Dr. Macnab was presented with his presidential gavel and took over the meeting for the closing ceremonies.

Reception

Never before have so many people passed through the reception line. In fact those on the receiving end were inclined to believe some were going through for the second time. The line was made up of Mr. and Mrs. Smallhorn, representing the Montreal Branch, Mr. and Mrs. Vance, Dr. and Mrs. Macnab, and Sir William Stanier and his daughter Joan.

The Dance

As usual the dance after the banquet was popular with a lot of people. In fact it was so popular that the orchestra time was extended for almost another hour.

Muriel's Room

No account of an annual meeting, no matter how sketchy, would be acceptable if it did not refer to Muriel's Room. This pleasant social centre and rendezvous was just as useful and just as pleasant as ever—in fact it may have been more so. Certainly there has not been a better setting for it than was provided by the Champlain Room. The Institute continues to be indebted to its many friends in industry who anonymously make this feature possible year after year.

2.30 a.m. on Saturday, May 12th, saw the curtain ring down on another annual meeting. Looking back over all the arrangements, it does seem as if the event was a success. Any meeting is made a success or a failure by the people who attend it, and certainly great numbers of the right people were there.

On to Vancouver

The next focal point for the attention of the members and the staff is the 1952 meeting which will be held in Vancouver on May 7th, 8th and 9th. Already the technical programme is under way, and the Vancouver members are making elaborate plans to ensure that the meeting will be a memorable event. Better make a note of it now—and shape your other plans around it—just to be sure.

His Worship Mayor Camillien Houde of Montreal was host to the visiting ladies at the chalet on Mount Royal.

THE ANNUAL MEETING PROGRAMME—1951

• WEDNESDAY, MAY 9th]

THE FIRST FIVE YEARS OF PROFESSIONAL DEVELOPMENT—A CHALLENGE TO MANAGEMENT

A symposium of the Training Committee of the Engineers' Council for Professional Development.
H. K. Breckenridge, Vice-President, West Penn Power Co., Pittsburgh; K. B. McEachron, Jr., Manager, Technical Education Division, General Electric Co., Schenectady, N.Y.; J. C. McKeon, Manager, University Relations, Westinghouse Electric Corp., Pittsburgh, Pa.

DEVELOPMENT OF THE ALLARD LAKE ILMENITE

M. J. O'Shaughnessy, M.C.I.M., Plant Superintendent, Sorel Operations, Quebec Iron and Titanium Corp.
Chairman: Carlyle Gerow, M.E.I.C., Sec.-Treas., Canadian Institute of Mining and Metallurgy.

CANADIAN MILITARY AIRCRAFT—1946-51

Group Captain E. C. Luke, O.B.E., M.E.I.C., Chief, Logistics Planning Section, Royal Canadian Air Force, Otta 'a
Chairman: A/V-M. A. Ferrier, M.E.I.C., Asst. Sec. Gen. for Air Navigation, International Civil Aviation Organization.

SPECIAL FEATURES OF BRITISH POWER TRANSMISSION

C. W. Marshall, M.I.E.E., Deputy Chief Engineer, British Electricity Authority, London, England.
Chairman: W. P. Dobson, M.E.I.C., Director of Research, Hydro-Electric Power Commission of Ontario.

MAINTAINING VITAL SERVICES UNDER ENEMY ACTION

N. M. Brydon, M.E.I.C., Managing Director, Brydon Construction Co. Ltd., Glasgow, Scotland.
Chairman: W. D. Hurst, M.E.I.C., City Engineer and Commissioner of Bldgs., City of Winnipeg.

RESEARCH IN GAS DYNAMICS AT McGILL

D. L. Mordell, M.E.I.C., Assoc. Prof. of Mechanical Engineering and Director of the Gas Dynamics Laboratory, McGill University, Montreal.
Chairman: J. H. Parkin, M.E.I.C., Director, Division of Mechanical Engineering, National Research Council.

INDUSTRIAL PREPAREDNESS FOR DEFENCE

Maj. Gen. G. B. Howard, General Manager, Canadian Industrial Preparedness Association, Montreal.
Chairman: W. J. W. Reid, M.E.I.C., President, Otis Elevator Co. Ltd., Hamilton, Ont.

WESTERN GAS RESOURCES IN THE ECONOMY OF CANADA

Dr. G. S. Hume, O.B.E., Dept. of Mines and Technical Surveys.
Chairman: J. R. Donald, M.E.I.C., President, J. T. Donald & Co., Ltd.

ANNUAL GENERAL MEETING OF THE INSTITUTE

Reports and election of officers.

• THURSDAY, MAY 10th

PANEL DISCUSSION — MANAGEMENT AND PUBLIC RELATIONS

J. A. Fuller, President, Shawinigan Water & Power Co. Ltd.; H. H. Lank, Vice-President, Canadian Industries Ltd.; W. C. Beamer, Assistant Vice-President, Bell Telephone Co. of Canada; F. W. Bruce, Sales Manager, Aluminum Co. of Canada Ltd.; H. W. Tate, M.E.I.C., Assistant General Manager, Toronto Transportation Commission; D. I. McNeill, Vice-President, Canadian Pacific Railway.
Moderator: Hugh Crombie, M.E.I.C., Assistant to the President, Dominion Engineering Works, Ltd.

ELECTRO-THERMAL DE-ICING OF AIRCRAFT

J. L. Orr, M.E.I.C., Senior Research Officer, Low Temperature Laboratory, National Research Council, Ottawa.
Chairman: J. J. Green, M.E.I.C., Deputy Director General, Defence Research Board of Canada.

INSPECTION TRIP TO BEAUHARNOIS PLANT OF THE QUEBEC HYDRO-ELECTRIC COMMISSION

Luncheon on arrival at 1.30 p.m. as guests of the Commission.

INSPECTION TRIP TO PLANT OF CANADAIR LIMITED

Builders of the Sabre jet fighter and the North Star transport aircraft.

• FRIDAY, MAY 11th

STEAM GENERATING STATIONS OF THE ONTARIO HYDRO

R. L. Hearn, M.E.I.C., General Manager and Chief Engineer, Hydro-Electric Power Commission of Ontario, Toronto.
Chairman: A. M. Brown, M.E.I.C., Vice-President and General Manager, C. A. Parsons of Canada Ltd.

PREPARATION AND BURNING OF BARK AT WATSON ISLAND PLANT OF COLUMBIA CELLULOSE LTD.

S. B. Roberts, M.A.S.M.E., Chief Engineer, Celanese Corp. of America, New York City.
Chairman: J. E. Neilson, M.E.I.C., Chief Engineer, Foster-Wheeler, Ltd.

THE ST. LAWRENCE WATERWAY — AN ALL-CANADIAN AND VERY DEEP ROUTE

J. G. G. Kerry, M.E.I.C., Port Hope, Ont.
Chairman: R. E. Jamieson, M.E.I.C., Prof. of Civil Engineering, McGill University.

FIELD WELDED DIGESTERS FOR THE COLUMBIA CELLULOSE PLANT

P. E. Savage, M.E.I.C., erection engineer, Dominion Bridge Co., Montreal.
Chairman: J. E. Neilson, M.E.I.C.

AIR SANITATION

E. A. Allcut, M.E.I.C., Prof. and Head, Dept. of Mechanical Engineering, University of Toronto, Toronto, Ont.
Chairman: G. N. Martin, M.E.I.C., Combustion Sales Engineer, Dominion Bridge Company.

ROTARY LIME KILN OPERATION AT SHAWINIGAN CHEMICALS

R. H. Hall, Plant Research Dept., Shawinigan Chemicals Ltd., Shawinigan Falls, P.Q.
Chairman: W. E. Patterson, M.E.I.C., Manager, Engineering and Development, Merck and Co. Ltd.

SOME MODERN ASPECTS OF TUNNELLING

Brian H. Colquhoun, M.I.C.E., M.E.I.C., Brian Colquhoun & Partners, Consulting Engineers, London, England.
Chairman: E. O. Turner, M.E.I.C., Dean of Engineering, University of New Brunswick.

ELECTRONIC CONTROLS

E. W. Hutton, M.A.I.E.E., Electronics and Regulator Control Engineering Division, General Electric Co., Schenectady, N.Y.
Chairman: B. G. Ballard, M.E.I.C., Director, Radio and Electrical Engineering Division, National Research Council.

INSTRUMENTATION FOR CHEMICAL PROCESSES

J. V. Quinn, Process Engineer, Chemical Development Division, Canadian Industries Ltd., Montreal; and J. A. Rice, Field Engineer, Fischer & Porter (Canada) Ltd., Toronto.
Chairman: I. R. Tait, M.E.I.C., Chief Engineer, Canadian Industries Limited.

HYDRAULIC LABORATORY EXPERI NCE IN FRANCE

Pierre Danel, Director-General, Laboratoire Dauphinois d'Hydraulique, Grenoble, France.

MODEL TESTS OF LARGE BUTTERFLY VALVES USING AIR

G. Ross Lord, M.E.I.C., Assoc. Prof. of Mechanical Engineering, University of Toronto.

MODEL STUDY OF SPILLWAYS & FLOOD CHANNELS FOR TRENCHE DEVELOPMENT

R. Boucher, M.E.I.C., Prof. and Head, Dept. of Hydraulic Engineering, Ecole Polytechnique; and J. A. Thomas, hydraulic engineer, Shawinigan Engineering Co., Montreal.

Looking Back, Then Forward

James A. Vance, M.E.I.C.
Woodstock, Ont.

Delivered at the 65th Annual General and Professional Meeting of The Engineering Institute of Canada at Montreal, May 9, 1951.

For me at least, tonight is a memorable occasion. It marks the end of my tenure of the presidency of this Institute and it winds up one complete phase of my life. Under these circumstances I hope I may be forgiven if I take you back with me over the last several years to see what is going on in the Institute and from those observations try to form some thoughts as to what may be in store for the future.

It makes sense to plan the future from the experiences of the past. In fact any planning for the future must be based on such knowledge, or it should not be called planning — it is just wishful thinking — let us look back and then forward.

When I joined the Institute in 1914 its numbers were small—just over 3000—compared with today's 14,000, but even then it was the outstanding organization for engineers. Its usefulness and its prestige were high, and in the minds of many the sign of having "arrived" in the profession was membership in this organization. To the engineers of those days it rendered just as great a service as it renders today. The history of the profession in Canada is irrevocably tied in with the history of the Institute.

During the thirty-seven years since I joined as a Student many things have happened to the organization, but it has never ceased to be a dignified, resourceful, energetic and useful servant of the profession. The membership has increased fourfold— the number of committees has trebled, the number of branches has increased by 25 and the activities of Council and Headquarters have increased beyond count. Over these years there have been many changes in interests and outlook and some changes in policy. The development of registration has brought about a policy of co-operation with the associations, and the increasing enrollment at the universities has brought about a greater interest in the engineering student.

With the development of industry in Canada there have come new opportunities to serve. For instance, the employment service has been expanded greatly. Where at one time this could be handled with the part time of one employee, it now requires three full time. The use of the library has increased beyond all expectations. This at one time was handled with the part time of one employee whereas now four are required full time.

The Engineering Journal too is another indication of the ability of the Institute to adapt itself to changing conditions. Today the *Journal* is the outstanding publication in its field. It has grown in size and stature along with Canada and the Institute, and now for the first time in its history is paid for entirely by the revenue from advertising.

Take a look at the programme for this 65th Annual Meeting. Personally I cannot recall so many papers, so many speakers, so many functions, so many members at the technical sessions. This along with the other things I have mentioned are manifestations of the vitality of the Institute and of its willingness to accept the responsibilities that go with its place of prominence in a young, progressive and aggressive country.

No one has the opportunity to see and know the Institute, as has the president who sees it in all its branches, who meets the members at their homes from coast to coast, and who meets with other groups as a representative of the Institute. Only in this way can one really know the Institute. From such experiences I have come at last to know the organization intimately, to realize that it is indeed a privilege to be a member of it and that through it I can best render a service to my profession and to my country.

On my travels I have been interested particularly in the work with the students. Today the Institute has 5,000 student members — a previously unheard of number. Up to now we have not been able to do for these young men all that we have in mind, even though the programme has been expanded. A great field for useful service lies here. To those who follow after me, I would emphasize the importance of continuing and expanding the interest in this dynamic group.

The young engineer in his first years after graduation is another field in which we have been interested. Most of you this morning heard our distinguished friends from the United States outline the proposals of the Engineers' Council for Professional Development for the young man's "first five years". There is a great work to be done here and it is through such organizations as ours that it can be done best.

I would like to see more stress placed on the advisability of the young engineer getting into business for himself. I would like to see more time spent on planning to be self employed rather than on contemplation of what can be gained by collective bargaining! There are opportunities for self employment all around us. I think we older engineers might help point them out, and even, we might help to get the young man launched in such an enterprise. The greater the number of engineers so occupied the better it will be for our Canadian economy — and for the profession.

Turning back again we see that from its inception the Institute has enjoyed the best of relationship with similar organizations in Canada, the United States and Great Britain. These associations have been both enjoyable and helpful. There have been many joint meetings, many joint activities of committees, and a free interchange of courtesies, information and other forms of assistance. Within recent years there has been an acceleration in such matters, in some instances developing into written agreements.

For instance in 1943 an agreement was signed with the American Society of Mechanical Engineers whose purpose was to put in writing those things which had been practised in the past, and to provide for an expansion not only in the previous activities but in the number and variety of such activities. Each year the joint committee meets at least twice— in fact it meets tomorrow morning right in this hotel. The officers of the Institute are grateful to our American associates for their friendly helpfulness, and look forward with them to a long, unbroken period of close co-operation and joint effort.

Another instance of formal co-operation is the Conference of Commonwealth Engineering Institutions. To this belong the institutions of England, Australia, New Zealand, South Africa, India and Canada. Through such a conference we are able to secure many privileges for our members.

The latest conference of this type has just been inaugurated at Havana, Cuba. It is a Pan American Conference of Engineering Organizations including the five senior societies in the United States and fourteen others from South America and the Engineering Institute of Canada. This group like that of the Commonwealth Conference is made up wholly of the technical voluntary type of organization—national in character.

It is a rare privilege to be so closely associated through these agreements with the leading engineering societies of the world. It is a good thing for the Institute and a good thing for the profession. It is my hope that succeeding councils will continue the Institute's support of such activities.

Any mention of co-operative efforts should include a tribute to the Engineers' Council for Professional Development, of which the Institute is a member. This organization is outstanding in its ambitious programme and its down-to-earth thinking. The Institute is fortunate indeed to be associated so closely in this activity with the seven American organizations who make up its membership. Much good can be accomplished for the profession through E.C.P.D. Incidentally, through the committees on which the Institute is represented, there is a great opportunity for our Canadian engineers to become better acquainted with their opposite numbers in the States.

Speaking of co-operation, I must express the pleasure and satisfaction it gave me to participate in the ceremony of signing a co-operative agreement with the Association of Professional Engineers of Manitoba. This brings the total of such agreements up to six, and enlarges the opportunities to better serve the profession.

International contacts of this kind are quite fitting in view of Canada's increasing importance in world affairs. Few countries in the world enjoy the great potential for expansion that belongs to Canada. It is essential that engineers carry a great share of the burden of this expansion, and in a lesser way it is essential that the Institute make its contribution to the brilliant future that is before our beloved Canada.

Just a word about finances. The Institute's affairs are in excellent condition, but with the great opportunities and responsibilities that are ahead of us, it is important that an increased income be developed. This year Council inaugurated the idea of a Voluntary Contribution. With so many other organizations increasing their fees, and with the cost of living skyrocketing, Council felt that every effort should be made to hold the Institute's fees at their present level. You will admit that this was a wise decision. In a world of climbing costs the Institute is conspicuous as one of the few organizations that have carried on without placing a further obligation on its members.

The Voluntary Contribution places no burden on anyone. Those who wish to, and feel they can afford it have been given an opportunity for further service to their society—and they have come through splendidly. It was our thought that in this way in the first year we might raise the sum of $5000.00. We are pretty good guessers for the total of contributions today stands at $4600.00. May I, on behalf of Council, express our appreciation of these splendid efforts.

We hope to set the sum aside as a reserve, for reserves are sadly lacking in the Institute set up. It has been the policy of Council over many years to give a service rather than to accumulate a large sum of money. However with the dollar dropping so drastically in value, it becomes an essential part of good management to set aside a larger portion of our income— even to maintain our present position. Incidentally, I might mention that if anyone in this audience has not yet made his Voluntary Contribution, it is still not too late. The books will be kept open just so that no one will be disappointed. The more help we get this way the less likely it is that fees will have to be increased.

And now I come to the end of my remarks. This is fittingly called my swan song. Tradition has it that the swan, mute throughout his life, sings only as he is about to die. It seems appropriate enough, except that I have not been mute throughout my life, but without a doubt I have come to the end of it as far as this great office is concerned. I must seize these last few minutes to thank those many members who by their kindnesses and their assistance have made it possible for me to accomplish at least a fair share of the duties that devolve upon the president. Without this loyal friendly support the job could not be done.

As always, the future is "in the lap of the gods". However I am confident that if the same high level of support as has been given up to now, is continued into the future, that future will be great indeed. The Engineering Institute of Canada is a great organization; it is a great influence for good; it is a great tribute to the profession. It has a great work still to do. With your aid that work will be done.

From Month To Month

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

Engineers Are a Scarce Commodity

It is hardly necessary to tell anyone in Canada that there is a great shortage of experienced engineering personnel. In fact almost anyone in business today can tell you of his own needs which to him at least appear to be quite urgent.

In the employment department of the Institute over eighty of the leading employers in Canada have listed their requirements for one or more engineers. At the moment there is not a single suitable unemployed engineer available to fill any of these openings. Some placements are still being made however because a certain number are interested in improving themselves and are moving from their former employment to new opportunities.

This situation was presented to the Council of the Institute at its April meeting and again at the annual meeting in May. On both occasions approval was given to a suggestion that the Institute should use its overseas facilities in an endeavour to encourage engineers from the United Kingdom to come to Canada.

About sixty of the employers on the Institute's list were written, and advised of the proposal with the suggestion that if they approved of the idea and were willing to underwrite the cost of it, the Institute would be prepared to send someone to the old country to seek out at least a small group of persons who could help relieve the conditions in Canada.

The situation today is eminently clear and enough employers have approved the proposal and have agreed to making a subscription to it. Under these circumstances it has been arranged that the general secretary will leave for England on June 20th.

Arrangements have been completed with the British institutions of civil, electrical, and mechanical engineers and with their placement office so that the facilities of these organizations will be available to the Institute. Also the Department of Labour and the Department of Citizenship and Immigration at Ottawa have expressed their interest and support of the proposal.

The director of the Department has stated that he has visited many industrial centres in Canada and has found a great need in all parts of the country for engineers. It was because of this that the department is encouraging the Institute to proceed with its proposal.

During the recent annual meeting there were some enquiries with regard to the wisdom of encouraging engineers to migrate to Canada. In one instance at least, the member suggested that such persons would only tend to keep down salaries here and might even displace Canadians already employed.

Fortunately there is no indication of any wide-spread thinking along this line. Most people recognize that Canada is a very large country, much too large in fact for the present volume of population, and also that industry and government agencies today are in great need of additional professional assistance.

Engineers from the United Kingdom are not likely to lower the level of income for engineers already in Canada. They will be well qualified persons with a full appreciation of their own value on the Canadian market. Canadians need have no fears from this angle.

Another angle from which this might be regarded is that of the development of Canadian industry. Beyond a doubt, certain developments and expansions which are now contemplated cannot be carried out if there are not sufficient engineers, not only to construct the projects but to operate them. Thus industry may be curtailed, and present Canadians in many instances may be denied

Cover Picture

One of the most timely and interesting papers presented at the Annual Meeting was J. G. G. Kerry's "The St. Lawrence Waterway—an All-Canadian and Very Deep Route." The paper is featured in this issue and the cover photograph has been selected to illustrate the great engineering works that will be involved if the waterway is built. It shows the Humberstone lock of the Welland Canal which, at 1,380 feet, is the longest in the world.

opportunities for promotion which would be theirs if the companies' programmes of expansion were not retarded.

Still another angle on this subject is that it is the shortage of properly qualified engineers and technicians that, in several instances, has led to the export of Canada's natural resources in their raw state rather than as manufactured articles or materials. If enough properly qualified people can be supplied, it should be possible to do most of the processing here. Thus an increase in the number of engineers should lead to additional employment for thousands of Canadians.

The proposal to employers has stated clearly that the Institute accepts no responsibility, either to find suitable prospects or to guarantee that if found, they will come to Canada. On the other hand the employer is not bound in any way to accept any of the Institute's reports or recommendations.

It is not likely that any great number of engineers will be obtained from the United Kingdom. Employment conditions there are excellent and, while Canada may have many advantages to offer, these are not apparent to all the people in the Old Country. However it is believed that there are enough who are interested in coming to Canada that the Institute can do a real national service by proceeding along the proposed lines. It so happens that, with its excellent connections in the United Kingdom, the Institute is unusually well situated to render this service.

The Manitoba Agreement

The recently-negotiated co-operative Agreement between the Institute and the Association of Professional Engineers of Manitoba will do much to enable the two organizations to operate as one in that province. Economies will be possible in accounting, record keeping, mailing, publicity, etc., and meetings will be held jointly by the two bodies. Experience with these agreements in Nova Scotia, New Brunswick, Saskatchewan, and Alberta has shown that they effectively clarify and define the national and provincial objectives and enable the Institute and the licensing bodies to work together in the service of the profession.

A first step in the operation of the agreement is the combination, as far as possible, of the E.I.C. executive and the Council of the Association. Headquarters has recently been advised that the Management Committee of the Winnipeg Branch has been appointed and, in accordance with the agreement, the committee includes all members of the Association council who are E.I.C. members. The members of the Committee with their E.I.C. and Association offices are as follows:

E.I.C.	*Committee Members*	*Association*
Chairman	W. D. Hurst	President
Vice-Chairman	C. L. Fisher	Vice-President
Secretary-Treasurer	C. S. Landon	Secretary-Treasurer
Committeeman	E. S. Kent	Councillor
Committeeman	J. L. Charles	Councillor
Committeeman	D. M. Stephens	Councillor
Committeeman	T. L. Woodhall	Councillor
Council Appointee	T. E. Storey	
Council Appointee	J. C. Trueman	
Chairman, Meetings Committee	J. G. Horsburgh	
Chairman, Membership Committee	D. W. Laird	
Branch Reporter	G. E. Cole	Chairman, Publicity Committee
Chairman, Electrical Section	L. A. Bateman	
Councillor for Winnipeg Branch	T. H. Kirby	
Assistant Secretary	G. W. Moule	Assistant Secretary
Vice-President—Zone A	J. W. Sanger	

Field Secretary's Activities

As has been reported from time to time in the *Journal*. Lt.-Col. L. F. Grant, the Institute's field secretary has been devoting much of his time and effort to the establishment of contacts with non-resident members. The by-laws define non-residents as those residing more than 25 miles from the headquarters of a branch, and the services of the branches and Headquarters are not as readily available to these as to the branch residents. Col. Grant has visited many towns outside the branch centres and has held small informal meetings of engineers.

With as many as possible of these groups he has endeavoured to have a member appointed correspondent for the group and has thereby established lines of communication with many non-resident engineers whose only contact with the Institute had previously been the *Journal*. It is felt that a list of these correspondents will be of interest to Institute members.

The correspondents are:

Border Cities Branch Area

Chatham	H. H. Todgham, JR.E.I.C., P.O. Box 327, CHATHAM, Ont.
Wallaceburg	H. B. R. Craig, M.E.I.C., P.O. Box 92, WALLACEBURG, Ont.

Cape Breton Branch Area

Antigonish	Rev. W. P. Fogarty, M.E.I.C., Professor of Engineering, St. Francis Xavier University, ANTIGONISH, N.S.

Halifax Branch Area

Amherst	J. N. Ritchie, M.E.I.C., Robb Engineering Works, AMHERST, N.S.
Annapolis Valley	Prof. B. N. Cain, M.E.I.C., P.O. Box 498, WOLFVILLE, N.S.
South Shore	L. D. Wickwire, M.E.I.C., Mersey Paper Co. Ltd., Liverpool Queen's Co., N.S.,
Truro	J. K. Godfrey, M.E.I.C., 44 Smith Avenue, TRURO, N.S.

Kingston Branch Area

Brockville	J. S. Waddington, M.E.I.C., Phillips Elect. Works Ltd., Box 100, BROCKVILLE, Ont.

Kootenay Branch Area

Cranbrook	C. E. MacKinnon, M.E.I.C., Cranbrook Foundry Co. Ltd., CRANBROOK, B.C.

Fernie — L. H. Anderson, S.E.I.C., Box 522, FERNIE, B.C.

Nelson — R. Pollard, M.E.I.C., Box 330, NELSON, B.C.

Lethbridge Branch Area

Blairmore — R. L. Morrison, M.E.I.C., Box 255, BLAIRMORE, Alta.

Medicine Hat — C. M. Moore, M.E.I.C., SEVEN PERSONS, Alta.

Moncton Branch Area

Bathurst — G. P. Milton, M.E.I.C., Box 637, BATHURST, N.B.

Campbellton — J. M. Woods, JR.E.I.C., 37 Queen Street, CAMPBELLTON, N.B.

Charlottetown — V. A. Ainsworth, M.E.I.C., General Manager, Maritime Electric Co. Ltd., Box 399, CHARLOTTETOWN, P.E.I.

Chatham — A. C. Golding, M.E.I.C., District Highway Engineer, CHATHAM, N.B.

Quebec Branch Area

Rimouski — Jean Menard, M.E.I.C., P.O. Box 460, RIMOUSKI, Que.

Saskatchewan Branch Area

Moose Jaw — J. W. Morgan, M.E.I.C., British American Oil Co. Ltd., MOOSE JAW, Sask.

Swift Current — M. E. Dodds, JR.E.I.C., Dominion Experimental Farm, SWIFT CURRENT, Sask.

Toronto Branch Area

Orillia — G. A. Antenbring, M.E.I.C., 131 Poughkeepsie Street, ORILLIA, Ont.

Oshawa — Col. Frank Chappel, M.E.I.C., 45 Connaught Street, OSHAWA, Ontario

Owen Sound — W. L. Saunders, M.E.I.C., Division Engineer, Dept. of Highways, Ontario, 450—12th Street West, OWEN SOUND, Ont.

Vancouver Branch Area

Ocean Falls — A. S. Mansbridge, M.E.I.C., OCEAN FALLS, B.C.

Prince Rupert — J. H. Cartmell, S.E.I.C., Columbia Cellulose Company, Box 1000, PRINCE RUPERT, B.C.

Vancouver Island Branch Area

Ganges, Salt Spring Island — F. O. Mills, M.E.I.C., Ganges, SALT SPRING ISLAND, B.C.

Nanaimo — M. C. Nesbitt, M.E.I.C., 452 Lamber Street, NANAIMO, B.C.

Port Alberni — J. S. Motherwell, M.E.I.C., 116—7th Avenue, S., PORT ALBERNI, B.C.

Winnipeg Branch Area

Brandon — W. J. Hodge, JR.E.I.C., 934—9th Street, BRANDON, Man.

A Course for Junior Engineers

The Toronto Experiment

"I hold every man a debtor to his profession; from the which, as men of course do seek to receive countenance and profit, so ought they of duty to endeavour themselves by way of amends to be a help and ornament thereto.". . . Bacon.

Adoption of the Monteith Report *The First Five Years of Professional Development* by E.C.P.D. in October last, and subsequently by the Council of the E.I.C., immediately raised the problem of how the proposals in the report could be implemented.

The keynote of the report is given in the following paragraph taken from page 5:—

> "The aggressive young engineer soon finds, upon entering his new job after graduation, that education is a journey and not a destination. He finds that there is much still to learn. If he is of the right calibre he will immediately start planning his continued education. This is one place where industry, the colleges, and the societies can fill a void in the young engineer's life. He should be encouraged to read extensively, both professional and general literature; to take courses that will broaden him, and to become a part of his professional society."

The survey on which the report was based, found that most big companies (those normally engaging more than 25 graduates a year) in the United States were giving their young engineers a course, entirely at the company's expense, varying in length from one to two years, and having a cultural as well as a professional side. Of the medium size companies—those which ordinarily engage from 5 to 25 graduates annually—some had such courses, but not all. Of the small companies, few if any, gave any formalized instruction, and even when given it was more for the immediate needs of the employer than to assist in the all-around development of the young man. Informal inquiries in Canada gave about the same impression.

The Institute was thus faced with a challenge to carry out, at least in part, the recommendations of the Monteith Report which Council had adopted. Three questions arose: — would the young men be interested; who would do the instructing; how could the necessary money be raised?

The field secretary of the Institute discussed the problems with a number of older engineers, giving special attention to the problem of reaching the young engineer who was not employed by a big company and who did not live in a university town. Finally at a meeting at Wolfville, N.S., on November 24th last year, the suggestion was made by Dr. F. H. Sexton, Hon. M.E.I.C. that something might be done through the extension departments of the universities.

On December 14th, an informal meeting was held in Toronto at which both senior and junior engineers were present. It was decided that the Toronto Branch would support a course for young engineers to commence as soon as possible after the New Year, and that the assistance of the Extension Department of the University of Toronto should be sought, as suggested by Dr. Sexton.

Toronto was selected because the field secretary's office was prepared to give some assistance in making the necessary administrative arrangements, and also because assurance had been given that the Extension Department of the University of Toronto would help. It was decided to start in a very small way, with a short programme and under the easiest conditions. If successful, the course could then be tried in places where there is no university, and finally in smaller centres.

With the able advice and assistance of Mr. J. R. Gilley of the Extension Department, a syllabus of eighteen lectures was drawn up, and some of the lecturers engaged. Meantime the junior section of the Toronto Branch had circularized its members but, of some 300, only twenty-three volunteered to take the course. Fortunately, this was all that those directing it desired for the first attempt, as it was hoped that a great part of the time would be spent in discussion which larger numbers would preclude. Of the twenty-three, two were moved from Toronto by their employers before the course had well started.

It was hoped to hold the course in the building where the Field Secretary's office is located, but a room was not available. At one time the lack of a good place caused some concern but finally through the courtesy of the Rev. W. R. Sproule, a suitable room was obtained in the Church of the Messiah immediately adjoining, and the lectures were held there.

Generally the lectures lasted for an hour, following which another hour was devoted to questions, answers, and discussions. Lectures were on the following subjects:—

1. Introductory.
2. Public speaking and voice control.
3. The Canadian economic situation, with special reference to inflation.

4- 7. An introduction to industrial management.

8-10. Labour relations.
   (a) From management's point of view
   (b) From labour's point of view
   (c) From an independent point of view

11. Letter and report writing.
12. Elementary accounting.

13-14. Corporation finance.
   (a) How to read a balance sheet
   (b) An investment policy for the individual

15. The international situation, with special reference to Canada's obligations to U.N.
16. Citizenship and professional obligations of engineers.
17. The consulting engineer and his work.
18. Engineering salesmanship.

The lectures were given either by professors or by men actually engaged in the work. For instance, the first lecture on labour relations was given by the executive assistant to the vice-president in charge of labour for one of Canada's largest industrial companies, the second, was given by a labour organizer, and the third by a member of the staff of the Institute of Business Administration of the University of Toronto.

The total cost of the course was slightly under $350, of which the Toronto Branch of the E.I.C. gave $150, each student was charged $5, and the balance was made up by anonymous donations from two members of the Toronto Branch. The wisdom of charging the students was evident in the interest and application shown by them. In spite of a 'flu epidemic and in spite of some of the students being sent out of town from time to time by their employers, the average attendance was over 76%. On the conclusion one student said 'Before I went to college I was quite a reader and quite a thinker. At college I had to confine my reading and thinking to my studies, but this course has started me again in reading and thinking outside of my work'.

When the course was finished, the names of the students were sent to their employers together with an outline of the subject matter covered.

Those responsible for the course think that it was a three-fold success. It gave something of value to the twenty-one men who took it, it gave the junior section of the Toronto Branch something definite to offer its members another year, and it indicated how the Institute branches can implement the Monteith programme of professional development for young engineers. There should be no great difficulty in operating such a course in any Canadian city. With the advice and help of university extension departments it may be possible to extend it to any young engineer no matter how far he may be from a centre of business and industry.

Naturally many improvements can be made in what was done last winter in Toronto. Already last year's students have taken steps to continue in 1951-52, and some junior members of the Niagara Peninsula Branch have arrangements under way.

A few suggestions to those interested may be in order.

The students should be charged, not only to help with the cost, but also to give them a stake in the course. The course can probably be operated more cheaply than last year's pioneer effort.

Since the local branch will probably have to help financially, only E.I.C. members should be eligible except under very exceptional circumstances.

The students themselves should carry as much of the load as possible. For instance, the students should take the chair in rotation at each lecture, and each speaker should be introduced by one of the students.

Many good suggestions came from the students themselves. These and other information can be obtained from the field secretary's office. The field secretary will consider a visit to any branch or group where his assistance or advice in starting such a programme would help.

"N.R.C."

"N.R.C." has become a familiar symbol to most Canadian engineers — it stands, of course, for the National Research Council — but we wonder how many of those who are perfectly familiar with the symbols are even vaguely familiar with the great number and variety of projects with which the N.R.C. concerns itself. Nobody outside of the Council's immediate staff could possibly name one per cent of them.

These reflections are inspired by a casual reading of the October-December, 1950, progress report in the fields of radio and electrical engineering, issued by the Council in January last. Here are thumbnail accounts of 26 investigations in progress, many of them involving sub-investigations, covering a field ranging from the observation of shooting stars to electrical methods for determining blood pressure at the heart. A few of the intriguing entries in the table of contents are "Solar Noise Observations", "An Electron Accelerator", "Merchant Marine Radar", "Static Electricity Hazards in Operating Rooms" and "A Flash Generator".

To those of us not too familiar with its operations, this report gives some clue to the breadth of N.R.C.'s interests, especially when it is remembered that radio and electrical engineering is only one of the several divisions in which research is proceeding. Again, this report shows a nice balance between the purely theoretical and the practical, which suggests that perhaps engineers could to advantage call upon the National Research Council for advice and assistance oftener than they do.

Pan American Conference

Above. A group of delegates photographed on the opening day of the meeting, against a backdrop of the flags of the participating countries. Left to right, H. B. Morales, Puerto Rico; Francisco Pons, Puerto Rico; Francisco Morales, Panama; L. I. Migone, Argentina; M. J. Puente, Cuba, chairman of the conference; A. J. Ackerman, United States; L. A. Wright, Canada; S. E. Reimel, United States; J. A. Vance, Canada; W. N. Carey, United States; Prof. Villa, Cuba; J. P. A. Tabio, Bolivia.

Under the title "Upadi" there appeared in the May Journal a general article on the newly created Pan American Conference of Engineering Societies. That article stressed the usefulness of a coordinated group of such societies, and referred to some of the objectives. This article purposes to be a description of the conference itself, and is published in the belief that members will wish to know about it, and that, with knowledge will come recognition of its merits and its potential.

The dates of the conference were April 19th to 22nd inclusive, and the location was Havana, Cuba. The meetings were held in the beautiful premises of the Cuban Society of Engineers, although much of the committee work was done in quieter and more comfortable surroundings at the hotel.

The Institute was represented by its president, James A. Vance and the general secretary. On the list of subscribing societies 19 countries were included although the count of those actually represented at Havana was 15. In most instances the delegates were the president and secretary of each society. The American delegation was made up of 10 representatives including the presidents of three organizations, and represented the five senior so-

Below, left. President James A. Todd, of the Engineers' Joint Council, is shown here as he addressed the closing banquet. On his right is Ing. Saturnino de Brito Filho, of Brazil, provisional president of Upadi; from his immediate left are Senor Puente, Cuba; A. J. Ackerman, U.S.A.; and Senora Puente.

Below, right. The president of Cuba, Dr. Carlos Prio Soccaras (in white), meets the delegates at his palace.

President Vance of the Institute receives the key to the city of Havana from Mayor Alcade Castellanos. On the mayor's left is Senor Manuel Puente, chairman of the conference.

Since much of the conference discussion was in Spanish and Portuguese, translations had to be made for the Canadian and American delegates. This photo shows A. J. Ackerman, who headed the U.S. delegation as he addressed remarks to the chair.

cieties that constitute the Engineers Joint Council.

This conference was the follow up of an earlier exploratory conference held in 1948 at Rio de Janiero. On that occasion a provisional agreement was written. The most time-consuming item on the Havana agenda was the attempt to put into workable terms, this provisional agreement or constitution. A completely satisfactory answer was not found, but with certain important changes the provisional constitution was accepted until the next meeting. In the meantime the committee on constitution and by-laws is to continue its work, so that a wholly acceptable and workable constitution will be ready for final approval in 1954.

The formal programme began on the 19th, but as far as the Canadians were concerned the work began on the 18th. On that day there was a long conference with the United States delegates, at which the thinking and planning of the two groups was integrated nicely to the end that they could make their maximum contribution to the proceedings.

The conference opened on Thursday the 19th with much fanfare. The platform was draped with the flags of the nations represented and the president of the Cuban society welcomed the visitors with warm words of hospitality. Throughout the days of the conference local institutions and celebrities kept up the programme of hospitality. The local press was generous and carried many photographs of persons and functions, and a running account of the proceedings.

The demands of the committees left but little time over the four days for other interests, but the diversions which were offered included a pre-luncheon "party" at the offices of the Bacardi Company (fortunately situated directly across the street from the engineering society's building), a reception at the Presidential Palace by the President of the Republic, Dr. Carlos Prio Soccaras, another reception, this time by Mayor Alcade Castellanos, at one of the city's beautiful parks, a wonderful luncheon at the equally wonderful Havana Yacht Club, and finally the closing banquet on Sunday night. This started about 11 p.m. (scheduled for 9 p.m.) and finished at 2 a.m.

The outstanding feature of the whole conference was the determination of all delegates to complete the business and reach agreement, regardless of differences of opinion, language, nationality and geography. The same broadminded policy could be used to good advantage on a much larger stage.

The objectives of UPADI are quite ambitious. The interim constitution lists them like this:-

Art. 3 OBJECTIVES:

The UPADI is established for the following purposes:

a) To encourage
   1) The organizing and conducting of periodic Pan-American Engineering Conventions;
   2) the organizing of Conventions for the advancement of the professional standing of Engineers.

b) To promote
   1) individual and collective visits between member countries and to other places of interest;
   2) the interchange of teachers, lecturers, engineers, and students among the universities, schools, and engineering associations;
   3) personal contacts between the engineers of different countries.

c) To organize
   1) relations between engineering organizations on an administrative level;
   2) the technical, professional, economic, and social interchange, either individually or collectively, between the members of the constituent organizations;
   3) technical competitions among

The delegates and their ladies are pictured here as they were entertained by Mayor Castellanos in Havana's magnificent city park.

the engineers and engineering students of the Americas.

d) To develop
 1) professional rules of practice;
 2) the application of codes of professional ethics.

e) To promote the study of
 1) technical problems jointly affecting member countries;
 2) Inter-American public works and economic problems.

f) To contribute
 1) to the enhancement of the status of the engineering profession;
 2) to the increased usefulness of the profession to the public;
 3) towards the strengthening of the cause of peace, and the ties between nations;
 4) to closer technical relations between American countries;
 5) to the economic development of American countries.

In his address of welcome Senor Manuel Puente of Cuba, president of the meeting said "The significance of this event rises as we appreciate the unique nature of our business, in bringing into being the Pan American Union of Engineering Societies, an organization which we affirm will so greatly benefit our profession that its social mission will be most fruitfully carried on for the advancement of engineering in this hemisphere".

Senor Puente went on to say "My conviction is most deep that, at the completion of our task, we shall have made these goals and laid down the foundations for a continuous and progressive understanding that will benefit not alone our class, its objectives and interests, but as well, the national and spiritual advancement of the great inter-continental family".

The programme of work for the first three days was outlined on the printed sheets which were distributed at the opening session. This called for business sessions each day from 9 a.m. to noon—3 p.m. to 6 p.m. and 9 p.m. "till closing"—an ambitious programme for sure—particularly with the thermometer at 85 plus and humidity at the saturation point.

Four main committees were set up whose work came under these headings:-

1—Constitution and by-laws
2—Professional ethics
3—Information and Publicity
4—Finance

Membership is restricted to organizations of a national character, one to a country, located within the general boundaries of North and South America. The general description of qualifications is that the member "is a representative of the engineering profession of its country, from a general and national standpoint".

The proposed method of financing is interesting. It is not planned to have any fixed fee or charge for each organization. The plan is to set up a foundation to which contribution can be made by societies, individuals, or business organizations. This fund is under the management of the Board.

The secretary (without remuneration) will be at the same location as the president, although a permanent address for the safekeeping of records, etc., will be established at Montevideo, Uruguay, which is now the headquarters of the South American joint organization known as "USAI".

The board of directors will be made up of representatives of nine societies, or nine countries. Canada is one of the first nine selected, and at the annual meeting of the Council of the Institute, on May 7th, the retiring president, James A. Vance, was appointed to this post. The Board selects the president.

F. Saturnino de Brito Filho, president of the provisional committee was one of the featured speakers. He reviewed the history of engineering organization in South America, and the development of UPADI, and concluded with these moving words: "UPADI is not an artificial organization arbitrarily conceived, for it springs from the natural laws governing the evolution of human communities, and leads them to act with increasing agreement and growing brotherhood. Your provisional committee states its unflinching faith in the high ideal which has brought us together — the continuous improvement of our professional relationships and the flawless altruism which brings together the engineers of the young nations of our hemisphere".

That was the dominant note of the entire conference. Senor de Brito's words seem like a fit and proper closing for these rambling remarks of your representatives.

Associate Committee on Publication and Abstracting Services

The following is a report presented to Council on April 7th, and printed herewith under its instructions.

This committee has been set up under the auspices of UNESCO. The National Research Council has adopted it as one of its associate committees at the request of UNESCO. The Institute is one of the organizations invited to participate.

The first meeting was held at the National Research Council in Ottawa on March 22nd. There were in attendance representatives of several departments of the government such as the Archives, N.R.C. library, Department of Fisheries, Department of Agriculture, Department of National Defence, National Research Council.

There were also representatives from several commercial publishing firms and there were three professional institutes represented including the Chemical Institute of Canada, the Canadian Medical Association, and the Engineering Institute.

The purpose of the committee is to study ways and means by which a better abstracting service can be provided for engineers and scientists in Canada. This same question is being studied by similar committees in many parts of the world.

The first meeting was interested principally in discussing the existing abstracting services. It was felt that information of this kind was essential before any planning could be done for anything further in Canada or elsewhere.

Specific items on the agenda had to do with:

(a) copyrights and the Fair Copying Declaration of the Royal Society
(b) author's abstracts or synopses
(c) how to provide material for abstracting journals
(d) translations from foreign language publications

(e) new methods of publication
(f) mechanical methods of locating information from files.

It was surprising to find out how many different organizations and government agencies were interested in this type of abstract. It was apparent very quickly that already there is a great deal of duplication of the services. One of the interests of the committee is to discover if some means can be found whereby the abstracting might be pooled in such a way that much of the duplication might be eliminated.

It was interesting also to find out that in the United States they are working on new types of mechanical methods for filing and for sorting abstract information. These are automatic machines which could quickly gather together information in any one of hundreds of categories within a short period of time.

The Institute's interest in these things is considerable. Anything that we can do that would make a better abstracting service for our members would be very helpful. Already we are in association with the American Society of Mechanical Engineers and the Institution of Mechanical Engineers of Great Britain in the publishing of Applied Mechanics Reviews. This is a monthly publication providing a critical report on thousands of different articles appearing in a great variety of publications.

The chairman reported to us that UNESCO estimated that there were each year about a million or a million and a half scientific papers published through fifty thousand separate sources. It is rather staggering to hear this and in fact makes one wonder whether or not any solution could ever be found.

A sub-committee was appointed to make a further study of some of the items on the agenda. The next meeting of the committee will depend upon the report which comes from this sub-committee.

American Academy of Political and Social Sciences

Fifty-fifth Annual Meeting

The undersigned local members of The Institute attended the Fifty-Fifth Annual Meeting of The American Academy of Political and Social Sciences at the Benjamin Franklin Hotel in Philadelphia, Pennsylvania, on April sixth and seventh as delegates of The Engineering Institute of Canada.

The general topic of discussion was "Lessons from Asia", which was timely, interesting, instructive, and enjoyable as it included not only a very good luncheon but also The Battle For The Mike, a Donnybrook Fair of which, later.

The first session, with Dr. Frank Aydelotte in the chair, on "Totalitarianism and Democracy" was very interesting. Mr. Harold R. Isaacs, Far East correspondent and author, took both Great Britain and these United States to task for the vacillating Far Eastern Policy of immediate self interest. He deplored the Korean incident and thinks it possible to negotiate an honourable settlement at present. In this he was opposed by Thomas H. D. Mahoney, Professor of History, M.I.T., who favours MacArthur's suggestion of a blockade and bombing of China's coastline cities with ground forces as needed. This would, of course, put the fat in the fire and touch off World War III.

The second session on "The East and The West" concerned itself with the Near East, Turkey, Israel, the Arab nations, and Iran as being the meeting point of three continents and the origin of the principal religions of the world. The Anglo-Iranian Oil nationalization came in for thorough discussion. India and Southeast Asia were included.

The third session on "Two Views" brought forth the fireworks.

Mr. Juliusz Katz-Suchy, Permanent Representative of Poland to the United Nations, read a prepared harangue of some 7,500 words of Russian propaganda of the Vishinsky-Molotov type, accusing Great Britain and United States of rank Imperialism. His contention that capitalism leads to both political and economic imperialism and all the ills of the nations, repeated over and over again in different forms for over an hour, got under the skin of the audience. Finally a woman got up and demanded a stop. The ambassador said he could finish in five minutes, at the end of which he still had six pages to read so the chairman, Vice-President Kulp, flagged him down but not before he said some very nasty and funny things, such as "The decisive role played by Russia in the defeat of the Japanese Imperialists" and so on, with little regard for truth or facts.

Mr. Adolf A. Berle, Jr., professor of law at Columbia University and adviser to President Franklin Roosevelt, answered in a less ponderous vein, including ridicule, sarcasm, quote and unquote, and starting with "Fellow Imperialists, Interventionists, and Oppressors". He continued with a few pertinent remarks such as "I only hope that when the learned representative gets back to Poland and reports to the Russian General who directs that "liberated" country he explains our strength and weaknesses. I was glad to witness the courtesy shown him here."

Katz-Suchy jumped up, put on his hat and pulled a Gromyko, although he had promised the chairman to remain for the question and discussion period. Katz-Suchy could "dish it out but could not take it". He returned briefly and tried to grab the mike for further propaganda. Mr. Berle merely put it behind him and the Chairman stepped in and broke up the clinch. Tut, tut — such things are not done in the staid Academy of Political and Social Sciences. Mr. Berle went ahead and tore Katz-Suchy's statements to pieces, only time calling a halt, — such statements as "the unhappy division of India was an imperialistic scheme of Great Britain" when, in fact, she fought this division and only agreed because it seemed the only solution. Also (for you Canadians) "the British Commonwealth of Nations is only the old Empire in a different form" although as a boy and man in Canada for thirty years we cannot remember "the iron heel of Great

Britain" under good Queen Victoria and Edward The Peacemaker (this by Pardoe as a genuine Canadian. Kerr, being a United States citizen, cannot make such remarks).

The fourth session on "Interpretations by Asians" was largely geo-physical and economic, with emphasis on overpopulation and insufficient arable land calling for industrialization and exportation of finished products, which is a long term project. In the meantime help such as grain for India (held up presently in the U.S. Senate) and other help such as E.C.A. and Point Four are required.

We fear we bore you. The fifth and sixth sessions on "Fundamentals in Asia" and "How Others View Us" went along with no outstanding event. As far as your delegates were concerned, "a very pleasant time was had".

W. S. Pardoe, M.E.I.C.
S. Logan Kerr, M.E.I.C.

Correspondence

Montreal, Que.

Dear Mr. Editor:

To simplify the work of architects, engineers, and contractors—the *Standard Specification* enclosed herewith is submitted for the careful consideration of all those connected with the building trades.

The proposed specification based, more or less, on actual experience, takes cognizance of the fact, that, in dealing with human beings, it is ridiculous to strive for the unattainable. The usual vague generalities and ambiguities have been omitted, leaving only the very basic essentials. Any similarity to specifications—past, present or future—is absolutely accidental.

Suggestions, additions and amendments are welcome—so that eventually the perfect specification may be compiled—which will have the blessings of the architect, estimator and construction superintendent.

L. Shector, M.E.I.C.

Standard Specification

Scope

Furnish all labour and materials required to erect building on the site chosen. Building is to extend to property lines on all four sides, and to be carried up to a height consistent with the load-bearing capacity of the soil.

Note

This specification is accompanied by plans and vice versa. In the case of similarity between plans and specifications, the architect is to be heartily congratulated.

Payment

Payments will be made on the first of each month, an amount equal to the contractor's anticipated disbursements for said month plus 15 per cent. It is hoped that the building will be completed within six months after final payment has been made.

Substitutions

Substitutions may be made provided same do not involve additional expenditures on the part of the contractor.

Extras

Extras will comprise the making good of inadvertent omissions on plans of such encumbrances as lintels, columns, chimneys, etc. In order to avoid embarrassing discussions with the owners re such situations, no applications for "extra" payment will be considered. However, compensation will be derived from the fact that the contract will be awarded to the highest bidder.

Job Meetings

Rotating chairmanship — with not more than six cross-discussions taking place simultaneously.

Progress Chart

After job is completed, submit progress chart, along with properly dimensioned plans.

Excavation

A hole shall be dug to accommodate the building. It shall be slightly on the small side, so as to permit a snug fit, and thus minimize vibration. If water, rock or other obstacles are encountered, try another site nearby.

Foundations and Concrete Generally

Concrete footings of aesthetic proportions shall be poured prior to commencing superstructure. If footings overlap, move column centres farther apart.

Any well known admixture supplied free by the manufacturers, may be used—provided room is left for the occasional bag of cement.

Concrete shall be three weeks older at 28 days than at 7 days. Tests shall be made to ensure that this is so.

Formwork

Formwork should not be stripped until after concrete has been poured. If the structure remains standing after stripping the structural designer is to be congratulated.

Reinforcing

Reinforcing steel dumped off trucks onto formwork is to be levelled approximately and carefully coated with form oil—so as to facilitate removal and re-use—if the structure collapses. All reinforcing steel left over—is to be melted down—and re-used for ornamental iron work.

Structural Steel

Structural steel framework shall conform to architectural requirements. Columns are to be located in corners, where this is not possible—use cantilevers. Beams shall be cut, notched or burnt as required to permit clearance for conduits, ducts, pipes, windows, etc.

Bolted connections shall either be riveted or welded—to be on the safe side.

Floors and ceilings shall be kept clear of all structural members, so as not to be affected by deflection in any way.

Masonry

Bricks to be laid with careful deliberation. Joints to be filled thoroughly, only in the presence of architect's representative. After walls have been erected, apply generous coating of pitch to exterior surface—so that splashing and pitch stains by roofer will not be noticeable.

Mechanical Trades

Building is to be heated—with heat losses kept to a minimum by equalizing inside and outside air temperatures.

Lighting fixtures are to be centred on sprinkler heads.

If risers coincide with pipe sleeves, heating contractor is to be congratulated.

Reduce ventilating ducts to one-half of size shown on plans, so as to permit crawling space below them.

If there is interference between electrical conduits, and slab reinforcing we wouldn't be a bit surprised.

Interference with other trades is to be expected. The owner has kindly consented to bear the cost of moving and reinstallation of any work.

Tenders

Tenders must be submitted not later than 2 o'clock next month. In the case of identical tenders, duplicate awards will be made—that is—two or more buildings will be erected.

Elections and Transfers

At the meeting of Council held at the Mount Royal Hotel on Monday, May 7th, 1951, a number of applications were presented for consideration and on the recommendation of the Admissions Committee the following elections and transfers were effected:

Members:

J. H. Beatty, *Owen Sound*
T. A. Bernier, *Rimouski*
J. A. Brownlee, *Shawinigan Falls*
P. G. Campbell, *La Cave, Ont.*
R. H. Clark, *Winnipeg*
J. U. Copeman, *Victoria*
F. H. Fargey, *Montreal*
J. Farley, *Toronto*
G. G. Fyke, *Penticton*
A. Gagnon, *Rimouski*
R. B. Hall, *Calgary*
H. W. Hignett, *Winnipeg*
A. E. Hyde, *Kingston*
J. C. Kesson, *Montreal*
A. Klain, *Montreal*
O. A. Kuys, *Montreal*
B. C. Lamble, *Orillia*
M. S. Lipovscak, *Hamilton*
G. R. Pink, *Winnipeg*
G. Reed, *Montreal*
P. E. R. Thomas, *Rimouski*
A. E. Tyson, *Geraldton, Ont.*
B. D. Wood, *Winnipeg*

Juniors:

J. M. Bennet, *Halifax*
R. W. Blair, *Shawinigan Falls*
J. M. Cathro, *Edmonton*
R. J. Gill, *Montreal*
J. W. Golding, *Niagara Falls*
K. Grotterod, *Montreal*
H. R. Kivisild, *Montreal*
G. O. Lucas, *Winnipeg*
N. F. Macfarlane, *Arvida, Que.*
T. J. McClean, *Sarnia*
W. A. H. McCorquodale, *Montreal*
B. M. McVicar, *Edmonton*
R. F. V. Read, *Montreal*
J. M. Takacs, *Windsor*
E. J. Woods, *Cornwall*

Transferred from the class of Junior to that of Member:

J. L. Allen, *Asbestos, Que.*
A. D. Bloomberg, *Shawinigan Falls*
W. G. deHart, *Pointe Claire*
B. A. Eskenazi, *Montreal*
G. W. Lawson, *Brandon*
H. D. McNiven, *Toronto*
H. Spector, *Watertown, N.Y.*
H. H. Todgham, *Chatham*
J. H. Wilson, *Hudson Heights*

Transferred from the class of Student to that of Member:

D. G. Carty, *Edmonton*

Transferred from the class of Student to that of Junior:

M. Kostiuck, *Kirkland Lake*
P. Leonidas, *Edmonton*

The following Students were admitted:

R. A. Baillie
W. E. Bridgeman
M. G. Brown
G. S. Dickey
D. C. Gordon
P. T. Gunby
K. T. Kennah
J. A. Macdonald
V. McDonald
W. W. Mungall
D. W. Murray
L. O. Rispler
R. A. W. Robinson
I. C. Smith

Applications Through Associations

By virtue of the co-operative agreements between the Institute and the Associations of Professional Engineers, the following elections and transfers have become effective:

ALBERTA

Member:

M. R. Knott, *Turner Valley*

Junior:

F. B. Matthews, *Edmonton*

Junior to Member:

P. H. Dau, *Edmonton*

SASKATCHEWAN

Junior:

W. J. Hardstaff, *Saskatoon*

Students:

J. A. Bryan, *Bridgeford*
G. A. Crispin, *Saskatoon*
W. Daviduk, *Kuroki*
J. S. Kermeen, *Saskatoon*
W. C. Phillips, *Saskatoon*
A. D. Reed, *Saskatoon*
L. A. Rowe, *Saskatoon*
M. Shayna, *Saskatoon*
B. F. Sworder, *Saskatoon*
E. H. Vogt, *Swift Current*

Junior to Member:

J. M. Patterson, *Regina, Sask.*

Student to Junior:

A. E. Dawson, *Regina*

MANITOBA

Members:

P. C. Campbell, *Winnipeg*
J. D. Walker, *Winnipeg*
R. S. Williams, *Winnipeg*

QUEBEC

Member:

E. M. Silver, *Montreal*

News of Other Societies

The **American Institute of Chemical Engineers** (120 East 41st Street, New York 17, N.Y.) has scheduled the annual meeting for December 2 to 5, 1951, at the Chalfonte-Haddon Hall Hotel, Atlantic City, N.J.

The **American Society of Mechanical Engineers** (29 West 39th Street, New York) announces the following meetings to take place during the coming months: the 6th annual petroleum mechanical engineering conference, September 24 to 26, at Tulsa, Oklahoma; the fall meeting, at Hotel Radisson, Minneapolis, Minn., September 25 to 28; the exhibit and joint conference of the industrial instruments and regulators division of A.S.M.E., and the Instrument Society of America, at Houston, Texas, September 10 to 14; the fuels and coal conference, a joint meeting with the American Institute of Mining Engineers, at Roanoke, Va., October 11-12; the annual meeting of A.S.M.E., at Atlantic City, N.J., Chalfonte-Haddon Hall Hotel, November 25 to 30.

Two general meetings of the **American Institute of Electrical Engineers** (33 West 39th St., New York) are scheduled for late summer and fall. The Pacific general meeting will be held at the Multnomah Hotel, in Portland, Oreg., August 20 to 23; and the fall general meeting will be at Cleveland, Ohio, October 22 to 26.

At the **General Discussion on Heat Transmission,** London, England, September 11 to 13, Prof. E. A. Allcut, M.E.I.C., of the University of Toronto, will represent the Engineering Institute of Canada. The joint committee on North American participation consists of representatives of many of the engineering societies of the continent, with the American Society of Mechanical Engineers, co-ordinating administrative details. The Institution of Mechanical Engineers, England, is co-ordinating details of participation by British and European engineers, with the co-operation of technical societies in Britain, Australia, India, New Zealand, South Africa, Belgium, Denmark, France, Holland, Norway, Sweden and Switzerland.

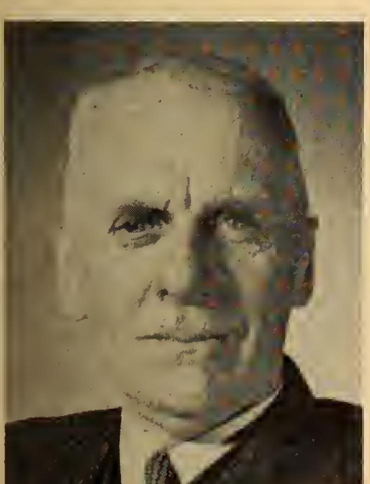
Institute Awards

At the Annual Banquet on Friday, May 11, Institute honours and awards were presented to those of their recipients who were able to be at the meeting. These distinguished members of the profession were E. V Caton, who was made Honorary Member, C. R. Young, who received the Sir John Kennedy Medal, C. M. Anson, who was awarded the Julian C. Smith Medal, and Jacques Barriere, who obtained the Ernest Marceau Prize.

Other recipients of honours and awards, who were unable to receive them at the Annual Banquet were: W. A. Mather and W. R. Turnbull, Honorary Memberships; C. P. Edwards, Julian C. Smith Medal; F. S. Small, Gzowski Medal; and C. G. Saunders, John Galbraith Prize. It is expected that these awards will be made as appropriate occasions arise during the year.

Honorary Memberships

Edward Victor Caton, HON. M.E.I.C., chief engineer and manager of electric utility, Winnipeg Electric Company, was born in Hove, England, September 26, 1884, and began his technical training at Brighton Technical College and the City



E. V. Caton, Hon.M.E.I.C.

and Guilds of London, where he won the certificate in honours electrical engineering in 1903. He served an apprenticeship with Crompton and Company, Chelmsford, England, and was with Hove Electric Light Company and Vickers Limited, Sheffield, in charge of electrical tests. He came to Canada for Vickers with machines for the City of Winnipeg Hydro Electric System plant at Pointe du Bois, and remained in this country, joining the Winnipeg Hydro engineering staff. He became chief engineer in 1912 and held this position until 1922 during the most difficult formative years of the Company. During this time the Pointe du Bois power house was completed and preliminary work was done on the Slave Falls plant of the Winnipeg Hydro Electric System and the steam heating and standby plant.

In 1922, Mr. Caton joined the Winnipeg Electric Company as electrical engineer, participating in the development of Great Falls and in the initial work at Seven Sisters Falls, now in the process of completion under his personal direction.

In 1933, he was made chief engineer of Winnipeg Electric Company and in 1936 became chief engineer and manager of power production, reporting direct to the president. In 1948 he assumed the title of manager of electric utility, in addition to that of chief engineer.

He is well known throughout Canada for his contributions to engineering organizations. He was president of the Canadian Electrical Association in 1946-47. He is also greatly interested in the Manitoba Electrical Association, of which organization he is a past-president. He is a member of the American Institute of Electrical Engineers and a past-president of the Association of Professional Engineers of the Province of Manitoba. He served on a special commission under the chairmanship of Dr. Emerson Schmidt set up by the Manitoba Provincial Government in 1942 to investigate rural electrification. He was appointed a member of the Manitoba Advisory Committee on rehabilitation training in 1944, of which organization he remains a member. He is a member, also, of the Water Power Engineering Board set up by the Government of Manitoba to advise on the development of the Pine Falls plant.

Mr. Caton joined the Institute in 1917; he was councillor for the Winnipeg Branch in 1925-26, and vice-president for the western zone in 1935-36.

William Allan Mather, HON. M.E.I.C., a railway operating officer of long experience, and an engineer graduate of McGill University at Montreal, became president of the Canadian Pacific Railway Company on March 8, 1948.

Before his election as the company's seventh president, the first civil engineer to reach that position, he had been operating vice-president at Winnipeg since 1942. He has been a railroader since he was 19, except for four years when he took time out to get his university degree.

In addition to his work for the C.P.R., Mr. Mather is chairman of Canadian Pacific Steamships, Limited; Canadian Pacific Air Lines, Limited; president, Canadian Australasian Line, Limited; president of the Seigniory Club Community Association Limited and the Scottish Trust Company; and alternates each year as president or vice-president of the Northern Alberta Railways Company, the Toronto Terminals Railway Company and the Vancouver Hotel Company, Limited.

He is a director of the Consolidated Mining and Smelting Company of Canada Limited, the Associated Screen News Limited, the Alberta Railway and Irrigation Company, Canadian Marconi Company, Canadian Pacific Express Company, Bank of Montreal, Royal Trust Company, and other companies.

Born in Oshawa, Ont., in September, 1885, he attended public and high school there before going to McGill. He graduated from University in 1908 and immediately entered the C.P.R. as an axeman. During the following year he received appointments as instrument man at Kenora, Ont., transitman at Lake Louise, Alta., and his progress since that

W. A. Mather, Hon.M.E.I.C.

time was steadily toward his present position.

He transferred from engineering to operating in 1912 as acting superintendent at Kenora, after two years as resident engineer at Winnipeg. From then until May of 1933, when he was appointed assistant to the vice-president of the company at Montreal, he served at Kenora as superintendent, at Vancouver as assistant general superintendent and at Calgary and Moose Jaw as general superintendent.

In September, 1934, after a year as assistant to the vice-president, during part of which period he acted as general manager of eastern lines, he returned west as general manager of western lines with headquarters at Winnipeg. From Winnipeg he returned to Montreal to the presidency.

Mr. Mather has always been interested in aviation and since the formation of Canadian Pacific Air Lines, he has made frequent flights throughout the north country. These included several trips to the Alaska Highway during its construction period.

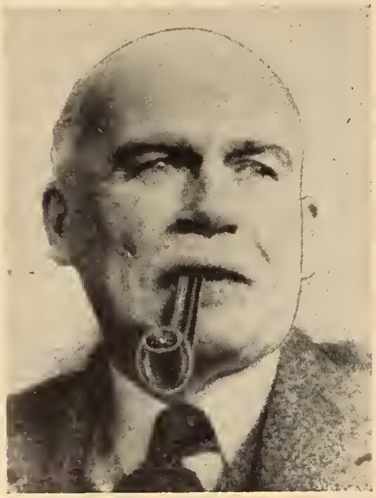
On the executive committee of the Railway Association of Canada, Mr. Mather also is a member of the advisory committee of the Canadian Standards

Association, a member of the Eastern Railroad Presidents' Association, and a director of the Canadian Forestry Association.

He is honorary president of the Montreal Division of the Navy League of Canada and is a former member of the Board of Trustees of the Winnipeg General Hospital in which he was chairman of the finance committee from 1942 to 1944. He is honorary chairman of the Canadian Paraplegic Association (Quebec Division).

Mr. Mather joined the Institute as an Associate Member in 1911 and was transferred to Member in 1920.

Wallace Rupert Turnbull, HON. M.E.I.C., was born in New Brunswick on October 16, 1870. Following his graduation in 1893 from Cornell University in mechanical and electrical engineering, he spent a year in post graduate work at Cornell and a further year at the University of Berlin. During the next five years, as research engineer with the



W. R. Turnbull, Hon.M.E.I.C.

General Electric Company at Harrison, New Jersey, he frequently corresponded with Dr. Samuel Langley who first formulated the theory of flight, with Otto Lilienthal who experimented with gliders in 1896, and with Gustav Eiffel of Eiffel Tower fame, who built the first wind tunnel.

In 1902 his interest in the subject of heavier-than-air flight led him to resign this position and to establish his own laboratory at Rothesay, New Brunswick Here fourteen years of brilliant progress in the field of aeronautical research won him recognition as a pioneer in this new science. Here he built the first wind tunnel in Canada in 1902, using it for tests on the properties of Aerofoils. Passing on to experiments with scow type hydroplanes driven by air propellers, he constructed a 375-foot experimental track for testing airscrews in the open; the first in aviation history in which power absorbed by the airscrew was compared with the power delivered by the airscrew in axial motion. The results, published in the *Scientific American* on April 3rd, 1909, won him a bronze medal and a Fellowship in the Royal Aeronautical Society.

He also conducted research on wing surfaces, patenting the double curvature wing surface, though he allowed this patent to lapse, thereby sacrificing a handsome return in royalties. But Turnbull's greatest contribution to flying, according to the experts, lies in the field of pure science, rather than in his inventions; for example, his two fundamental Laws of Aerodynamics, put forward in 1912. He gave the world new data on the principles of the flying machine, on the "lift of a wing", on "drag forces", and on "centre of pressure". Another discovery in the realm of pure science was announced in 1911. His "Laws of Airscrews", published in the *Aeronautical Journal* in London in January, 1911, announced the discovery of the now well-known laws of air propellers.

In 1914 he closed his laboratory and went to Britain, where he engaged in the design of various wartime devices such as air propellers, bomb sights, and torpedo screens. Returning to Canada in 1918, he continued his work on the development of a "controllable pitch" propeller, commenced in 1916 while he was overseas. His first idea of mechanical brake control attempted in 1923, turning out to be impracticable, he now sought a solution for changing the pitch of the blades by an electrical control. A second model working on this principle was developed and built by Canadian Vickers Ltd., and was successfully tested at Camp Borden in 1927. Patents on the Turnbull Controllable Pitch Propeller were taken out in Britain by the Bristol Aeroplane Co., and in America by the Curtis Wright Corporation.

During his four years in Britain he observed with great interest three small mills that operated with power produced from the tides. On his return to Canada in 1918 he set to work at once on a plan for harnessing the tides of the Bay of Fundy at the confluence of the Petitcodiac and Memramcook rivers, where they enter Shepody Bay. He worked out the whole design in detail, and found that while a full development would provide 200,000 hp., an initial development of say 90,000 hp. would be readily marketable and would cost some $122 per hp. at that time, while energy could be sold at rates varying between a quarter and a tenth of the rates then charged for steam power in the Maritimes.

Turnbull presented a paper on the subject before a general professional meeting of the Engineering Institute of Canada at Saint John, in September, 1919, which was published in the E.I.C. Journal for October of the same year, and which gained widespread attention. The late Samuel Insull of Mid-West Utilities was so impressed with the possibilities of this idea, that in 1929 he called for plans for spending over $50 millions for supplying power to the north-eastern states from tidal power at the Petitcodiac. A start on another tidal project at Passamaquoddy Bay was actually made by the United States Government in 1924 but the project was later abandoned. Today, however, interest is being renewed.

Mr. Turnbull joined the Institute as a Member in 1944.

Sir John Kennedy Medal

Awarded for outstanding merit in the profession—for noteworthy contribution to the science of engineering and to the Institute.

Dr. Clarence Richard Young, HON. M.E.I.C., was born near Picton, Ontario, and was graduated as bachelor of applied science at the University of Toronto in 1903. His early engineering work included structural engineering with Dominion Bridge Co., Toronto, York Radial Railways, Canada Foundry Company, and Smith Kerry, and Chace, consulting engineers, Toronto. In 1907 he became lecturer in structural engineering at the University of Toronto and in 1941 was appointed dean of the faculty of applied science and engineering. Dean Young has been active in engineering work, public and military affairs, and professional organizations. He has written engineering text-books, technical papers, and a host of non-technical works related to engineering education and professional development, in which latter subjects he has had a particular interest.

Always a supporter of the Institute. he is a past councillor and has served as chairman of the Toronto Branch. He was chairman of the Institute's Committee on International Relations, and has represented the Institute on the Committee for Professional Training of The

C. R. Young, Hon.M.E.I.C.

Engineers' Council for Professional Development. He has taken a prominent part in the work of the American Society for Engineering Education. He is a member of The American Society of Civil Engineers and has served on a number of their technical committees. His work as a committee chairman of the Canadian Standards Association has been notable, particularly in connection with the specification on concrete and reinforced concrete.

Dr. Young is past vice-president of the Royal Canadian Institute, a member of the Association of Professional Engineers of Ontario, The Newcomen Society of England, and the Polish Institute of Arts and Sciences in America.

Dr. Young was a member of the three-man commission on transportation which under the chairmanship of Mr. Justice E. R. E. Chevrier in 1937-38, investigated and reported upon the economics of commercial transport in Ontario and its relation to other forms of transport. He was chairman of the committee appointed by the Province of Ontario to report on matters arising out of the Paymaster Mines Disaster of February 2, 1945. He is a member of the Board of Governors of the Ontario Research Foundation.

member of the Ontario Research Commission, and a member of the Research Council of Ontario. He was awarded the medal of The Engineering Alumni Association of the University of Toronto for outstanding achievement in engineering; and the medal of the Ontario Association of Professional Engineers for meritorious work "in the service of man".

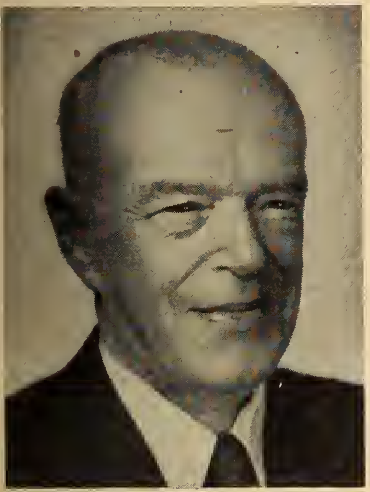
Dr. Young joined the Institute as a Student in 1903, transferred to corporate membership in 1908, and was made an Honorary Member in 1949. He was president of the Institute in 1942.

Julian C. Smith Medal

Awarded for "achievement in the development of Canada".

Lt. Commander Charles Peter Edwards, M.E.I.C., is the deputy minister for air services, Department of Transport of the Dominion Government, Ottawa.

In 1941 Commander Edwards received that appointment when the position was left vacant by the death of Colonel V. I. Smart, M.E.I.C., in the fall of 1940. Commander Edwards is chiefly known for his work in radio and wireless telegraphy, and played a large part in building up Canada's networks of radio and wireless facilities. A Welshman, he has spent the greater part of his life in Canada. He first entered the field of wireless communication in 1903 when Guglielmo Marconi erected a demonstration station at Chester, England, just over the Welsh border from Dodleston, Commander Edward's birthplace. Through his work with that pioneer wireless station he became a junior technical assistant on Marconi's staff, and in 1904 came to Canada to supervise the construction of stations at Camperdown, N.S., and on Sable Island. His appointment as radio director in the Marine Department came in 1909 and he took charge of all wireless and radio activities. Cmdr. Edwards has been the Dominion's representative at practically all the international and North American radio conferences held since 1912. He was chairman of the committee which drew up regulations for the compulsory equipment of ships with radio, at the International Conference for the Safety of Life at Sea in 1929.



C. P. Edwards, M.E.I.C.

As deputy transport minister he had charge of civilian aviation under the direction of Hon. C. D. Howe, Minister of Munitions and Supply, and in the transport division he operated under the authority of the transport minister. Since 1949 Commander Edwards has been deputy minister for air services, Department of Transport.

He joined the Institute as an Associate Member in 1916, transferring to Member in 1940.

Clement Matthew Anson, M.E.I.C., was born in England and moved to Australia at an early age and received his preliminary education there. The third generation of his family to be interested in the steel industry, he started to work in it at the age of 14 years and has been connected with it since that time. After obtaining experience in laboratories and rolling mills he worked through all jobs in the open hearth and became superintendent of an electrical steel making plant at the age of 18 years.

C. M. Anson, M.E.I.C.

Mr. Anson left Australia in 1920 for Canada to enter McGill University and five years later graduated with a B.Sc in metallurgy. In the year of his graduation he joined the Dominion Steel and Coal Corporation as a laborer at blast furnaces and in two years was made assistant superintendent. In 1928 he became assistant superintendent of rolling mills and later that same year assistant general superintendent. In 1931 he was made assistant general manager and in 1940 general manager of steel operations, which position he holds at the present time.

Mr. Anson joined the Institute as an Associate Member in 1931, becoming a Member in 1940. In 1946 and 1947 he was vice-president of the Institute for the Maritime branches.

Gzowski Medal

Awarded for the best paper of the medal year.

Frank S. Small, M.E.I.C., was awarded the Gzowski Medal for his paper on "A Plan for the Development of The St. Lawrence-Lachine Section", which was printed in the August issue of the *Engineering Journal* in 1950.

Mr. Small was born at Johnston, now Highfield, N.B., in 1877 and was educated at Mount Allison and McGill University, graduating from the latter as a B.Sc. in civil engineering in 1914. His first engineering job was with the Mond Nickel Co. on the construction of a smelter and accessories at Coniston, Ont., from 1910 to 1913. Since then he has been mainly, but not exclusively, on river work in various capacities. He joined Fraser-Brace Engineering Company Limited at Cedars, Que., in 1917, as office engineer and, with one rather extensive break, remained with them until 1948 when he retired.

F. S. Small, M.E.I.C.

He joined the Institute as a Student in 1907, becoming an Associate Member in 1917, transferring to Member in 1929.

John Galbraith Prize

Awarded for the best paper by a Student or Junior in Zone B, the Province of Ontario.

Charles Gordon Saunders, S.E.I.C., won the John Galbraith Prize for his paper on "Length-Stress Relationship of 65 ST

C. G. Saunders, S.E.I.C.

Specimens when Bowed in Fixed Length Holders for Stress Corrosion."

Mr. Saunders is a recent engineering graduate of Queen's University. He is now in the employ of the Department of Highways of Ontario, as assistant to the garage and equipment superintendent, at Toronto.

A native of Wolfville, N.S., he did one year pre-engineering at McGill. Later he served with the R.C.N.V.R. for 27 months as radio artificer, 5th class, and upon his discharge went to Queen's University and attended the mechanical engineering faculty.

He has worked, during two summers with the Aluminium Laboratories Ltd., where his prize winning paper was written and the work accomplished which it describes. The author acknowledges the assistance of J. C. Millson and A. C. Pue-Gilchrest, of the staff of Aluminium Laboratories. The paper was presented with the kind permission of R. H. Rimmer, director of Aluminium Laboratories, Kingston.

Ernest Marceau Prize

Awarded for the best paper by a French-speaking Student or Junior in Zone C, the Province of Quebec.

Jacques Barriere, S.E.I.C., was awarded the Ernest Marceau Prize of the Institute for a paper entitled "Viaduc et Trèfle à Quatre Feuilles sui Boulevard Curé Labelle".

Mr. Barriere was born in Montreal in 1924. He studied at Mont-Saint-Louis College and at the Montreal Technical

Jacques Barriere, S.E.I.C.

School where he followed a four-year course in machine-shop work and graduated in 1944. After having taken a year of pre-engineering, he continued his studies at l'Ecole Polytechnique, Montreal, where he graduated as civil engineer in 1950.

During his summer holidays, he worked on topographic surveys for the Quebec Stream Commission and the Sewage Service, for the Provincial Government. After graduation he worked first for Fabius Ruel, C.E., Q.L.S., and is presently employed with the Public Works Department of the City of Montreal.

Personals

News of the Personal Activities of Members of the Institute

Geoffrey A. Gaherty, M.E.I.C., the treasurer of the Institute for the year 1951-52, is president and director of Montreal Engineering Co., Calgary Power Ltd., Ottawa Valley Power Co., Calgary Water Power Co. Ltd., Calgary Investments Ltd., Maritime Electric Co. Ltd., and a director of the Demerara Electric Co. Ltd.

He received his engineering degree from Dalhousie University in 1909 and after a short period of engineering experience he joined the Canadian Garrison Artillery and later went to France. He was demobilized with the rank of captain and joined Montreal Engineering Company Limited in 1920 as a water power engineer and director. In 1922 he became chief engineer and he was appointed to his present position in 1933. In 1923 he had become chief engineer and general manager of Calgary Power Company Limited, in addition to his work in Montreal Engineering Company In 1928 he became president of that Company.

He was a recipient of the Julian C. Smith Medal for the year 1950. In 1939 he was awarded the Gzowski Medal for his paper "Drought a National Problem."

C. R. Young, HON. M.E.I.C., consulting engineer, Toronto, addressed the Engineering Society of Cincinnati, on May 17, on the subject of "Engineering Achievements in Canada".

E. A. Allcut, M.E.I.C., professor of mechanical engineering at University of Toronto, will attend the International Management Congress in Brussels, in July. Early in September he is to speak at the Management Conference at the University of Birmingham. From September 11 to 13, he will attend the General Discussion on Heat Transmission which is to be held in London. At that discussion he will present two papers giving the results of some work on heat transmission, notably that related to heat pumps, and he will be one of the five presiding officers from North America. He will sail for Canada on September 20.

Professor Allcut has been appointed chairman of the Power Test Codes Committee No. 16 of the American Society of Mechanical Engineers, dealing with producer gas.

A. J. Bonney, M.E.I.C., plant engineer for The Quaker Oats Co. of Canada Ltd., at Peterborough, Ont., is the chairman of the Peterborough Branch of the Institute.

Mr. Bonney was born at Oshawa, Ont. He graduated from Queen's University

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

in 1935 with a degree of B.Sc. in mechanical engineering. He joined the Quaker Oats Company in 1935 in the mechanical maintenance department, being engaged chiefly in draughting for one year. In 1936 he moved to the electric power department on electrical maintenance and repair, and to the steam power department in 1937. He obtained the Ontario first class stationary engineers certificate in 1943. Before receiving his present appointment as plant engineer, he was successively electrical superintendent, and chief steam engineer.

He joined the Institute as a Student in 1935, transferring to Junior in 1940, and becoming a Member in 1947.

J. L. Rannie, M.E.I.C., has retired from his position as Dominion geodesist and International Boundary Commissioner for the Department of Mines and Technical Surveys, Ottawa, Ont.

Mr. Rannie was born at Newmarket, Ont., and was educated there and at University of Toronto, graduating in civil engineering in 1908. He joined the Department of the Interior, Geodetic Survey of Canada, in 1907, and was made supervisor of triangulation in 1918. He received the appointment as Dominion geodesist in 1947, and that of Canadian member of the International Boundary Commission in 1950.

Mr. Rannie with his successor, J. E. R. Ross, will attend the Union of Geodesy and Geophysics, at Belgium, this year.

G. M. Brown, M.E.I.C., district engineer at Saint John, N.B., for the Department of Public Works of Canada is a member of the group which will study the possibility of obtaining 500,000 additional horsepower of electricity from the St. John River.

Three Canadians and two Americans man the work group which has been set up by the Engineering Board of the International Joint Commission. They are Dr. H. J. Rowley, chairman of the New Brunswick Resources Development Board; K. G. Chisholm of Halifax, district engineer of the water resources division, federal Department of Mines and Resources; Mr. Brown; Colonel H. J. Woodbury of Boston, of the U.S. Army Engineering Corps; and M. R. Stackpole of Augusta, Me., district engineer of the U.S. Geological Survey. A. E. Pare, chief engineer of the Department of Hydraulic Resources of Quebec will represent Quebec in the discussion.

Robert Onions, M.E.I.C., has been appointed vice-president and managing director of Canadian Broomwade Ltd., Toronto, Ont., the newly formed Canadian subsidiary of Broom & Wade Ltd., of England.

Mr. Onions is from Manchester, England, and a graduate of Manchester School of Technology. He came to Canada to join the staff of Laurie & Lamb, the Canadian representatives of Ruston & Hornsby. He was appointed manager of the branch office in Toronto in 1923. He has since then been active throughout Ontario in the sale of compressors, diesel engines and other equipment. In 1939 he was loaned by Laurie & Lamb to the British Government, and he served throughout the war in Canada and other theatres of naval construction work.

Mr. Onions is a past-chairman of the British Section, Toronto Board of Trade, of which he was one of the organizers.

D. D. Morris, M.E.I.C., has been appointed to the newly created position of manager of the Research and Development Division of the Consolidated Mining and Smelting Company of Canada Limited, at Trail, B.C., Mr. Morris had previously been serving as general superintendent of the division.

He first joined the Company's staff as an assayer in 1928. In 1936, he was transferred to research work in the chemicals and fertilizer department. Four years later, he became assistant general foreman of the ammonia group. He served as superintendent of the ammonia plant at the Alberta Nitrogen Department in Calgary from 1941 until 1943. In that year, he was appointed general superintendent of the Calgary plant, continuing in this position until his transfer to Trail, as general superintendent of the Research and Development Division, in 1949.

Mr. Morris attended the University of Alberta and received his degree of B.Sc. in chemical engineering in 1928. He is a fellow of the Chemical Institute of Canada and a member of the Association of Professional Engineers of Alberta.

D. D. Morris, M.E.I.C.

M. J. McHenry, M.E.I.C., director of consumer service, Ontario Hydro-Electric Power Commission; **E. V. Buchanan,** M.E.I.C., general manager, Public Utilities Commission, London, Ont.; and **Oswald H. Scott,** M.E.I.C., general manager Belleville Public Utilities Commission, have been granted life memberships in the Association of Municipal Electrical Utilities.

Illuminated scrolls were presented to them at a dinner on April 6, 1951. The Association's first president, **P. B. Yates,** St. Catharines, is the only other member of the A.M.E.U. to have received this honour, given to professional engineers for outstanding service.

W. A. Parker, M.E.I.C., has been promoted to the position of divisional engineer for the Department of Highways in Nova Scotia. Mr. Parker has been the assistant divisional engineer since 1937 and is assuming his new position on the retirement of **Mr. C. A. MacNearney,** M.E.I.C.

From 1920 to 1925, Mr. Parker was employed on survey work for both the Nova Scotia Department of Highways and the Nova Scotia Power Commission. From 1926 to 1933 he was employed, first with the Wayagamac Pulp and Paper Company in Three Rivers, Quebec, in timber surveys, and then with the Shawinigan Water and Power Company on the La Tuque Development.

Mr. Parker returned to Nova Scotia in 1935 as assistant resident engineer with the Department of Highways and in 1937 was appointed assistant division engineer with the same Department.

Mr. Parker is an active member of the Association of Professional Engineers of Nova Scotia and of the Halifax Branch of the Institute.

C. A. MacNearney has retired from the position of division engineer for the Department of Highways in Nova Scotia. He has been with the Department since 1914. He was field engineer, and county superintendent before being appointed division engineer in 1915.

Mr. MacNearney was born and educated in England. From 1908 to 1912 he worked as a draughtsman and instrumentman for the Trans Continental Railway in New Brunswick. In 1912 he was appointed a resident engineer for Canadian Northern Railway North Bay and in 1913 he was instrumentman for Canadian Pacific Railway.

C. D. Wight, M.E.I.C., who was a member of the Ontario Municipal Board, of the government of Ontario, in Toronto, is now director of planning for the city of Ottawa, Ont.

Mr. Wight graduated from Queen's University in 1928, receiving the degree of B.Sc. in civil engineering. He joined Ottawa's engineering staff in 1932. He was appointed assistant commissioner of works in 1942, and commissioner of works in 1949. In 1950 he went to the Ontario Municipal Board.

Herbert L. Wagner, M.E.I.C., has retired from the Hydro-Electric Power Commission of Ontario, for whom he worked for many years on supervision of design of power house structures and stations.

Mr. Wagner joined the H.E.P.C. in 1921, coming from the Toronto Steel Construction Company where he was chief draughtsman for nine years.

He had worked with other structural steel concerns after graduating from University of Toronto in 1905.

H. Crombie, M.E.I.C., is vice-president and treasurer of Dominion Engineering Works, Montreal. He was assistant to the president of the Company prior to his recent appointment. He has been associated with Dominion Engineering Works for many years, having joined the sales department soon after his return from service in World War I.

D. C. Borden, M.E.I.C., has been appointed sales manager of the wire and cable division of Northern Electric Company Ltd., Montreal.

D. C. Borden, M.E.I.C.

Mr. Borden is from Pugwash, N.S., and attended Mount Allison and McGill Universities, graduating from the latter with a B.Sc. degree in electrical engineering. Before joining Northern Electric in Toronto as a salesman in 1934, he devoted 12 years to design and engineering work with large electrical utilities in Canada and the United States. He also was concerned with independent electrical contracting.

K. W. Fraser, M.E.I.C., has been appointed general manager of B. F. Sturtevant Company of Canada, Limited, a division of Canadian Westinghouse Company Limited, in Hamilton, Ont. This was one of the effects of the recent concentration of Canadian Westinghouse operational departments into five new divisions.

Mr. Fraser graduated from the University of Toronto in 1927 with the degree of B.A.Sc. in electrical engineering, and following graduation, spent several years in Pittsburgh with the Westinghouse Electric and Manufacturing Company. He returned to Canada in 1930 for district office sales work in Montreal. He is also vice-president of Canadian Electrical Manufacturers Association.

Henry W. Burri, M.E.I.C.

Henry W. Burri, M.E.I.C., has been appointed assistant sales manager for the Canadian Carborundum Company with direct supervision of the Provinces of Quebec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland.

Mr. Burri joined the Company seven years ago as abrasive engineer and general salesman covering Eastern Quebec and the Maritimes and resided in Three Rivers, Quebec. Previously he worked for Mathews Conveyer Co. Ltd., Port Hope; Warden King Limited, Montreal; and Crane Limited, Montreal, in various engineering capacities.

He graduated from McGill University in 1935 with the degree of B.Eng. (mechanical) and is a member of the Corporation of Professional Engineers of Quebec. In his new position Mr. Burri will reside in Montreal.

Lt.-Colonel W. A. Capelle, R.C.E., M.E.I.C., is command engineer at Central Command Headquarters, Oakville, Ont.

During World War II, he served overseas with Royal Canadian Engineers. He was mentioned in dispatches for gallantry in action in 1945 and returned to Canada later that year. He was awarded the Croix de Guerre avec palme in January, 1946. On his return to Canada he was stationed at Ottawa as director of works and accommodation (technical engineering branch); and later as director of engineering development.

Before joining the army he was with the Department of Public Works of Canada.

J. K. French, M.E.I.C., assistant plant manager of Continental Can Company of Canada Limited, has been awarded a one-year Sloan Fellowship in Executive Development at the Massachusetts Institute of Technology, Cambridge, Mass., following nation-wide competition in the United States and Canada. The first Canadian to achieve this honour, he commenced his course on June 9, on one year's leave of absence from his Company.

Mr. French graduated from McGill University with the degree of bachelor of engineering in 1940. He joined Continental Can Company of Canada Limited in 1946. During the war he served on the staff of the deputy director of mechanical engineering, first Canadian Army overseas, with the rank of major.

The Sloan Fellowship is awarded annually under grant from the Alfred P. Sloan Foundation and provides instruction in executive development.

John K. French, M.E.I.C.

R. E. Potter, M.E.I.C., is with the Public Utilities Commission, Victoria, B.C.

Mr. Potter has been, for the past two years, the executive assistant to the Dominion Provincial Board, Fraser River Basin Commission, at Victoria.

M. S. Kennedy, M.E.I.C., is now employed by the Department of Public Works, Highway Division, St. John's Newfoundland. He was previously a project engineer with Eastern Rockies Forest Conservation Board at Calgary, Alberta.

E. G. Allwright, Affiliate E.I.C., has been transferred from Summerside, P.E.I., to Goose Bay, Labrador, as project engineer in charge of the stepped-up defence construction programme being carried out at the Goose Bay Airport. Previously he was with Central Mortgage and Housing Corporation, as construction supervisor at Summerside.

T. C. Elliott, M.E.I.C., who was technical assistant to the production controller of Imperial Oil Limited at Calgary, Alta., has transferred to the refinery, at Winnipeg, Man.

S. H. Lassman, M.E.I.C., is an electrical engineer for Mendel & Brasloff, electrical and mechanical consulting engineers, Montreal, Que. Previously he was with A. D. Ross & Co.

Mr. Lassman received a B.Sc. in electrical engineering from the University of New Brunswick in 1945.

L. P. Beaulieu, M.E.I.C.

L. P. Beaulieu, M.E.I.C., has been appointed manager of the engine, pump and electrical division at the head office of The Canadian Fairbanks-Morse Company Limited, Montreal, Que.

Mr. Beaulieu has been with the company since 1934, and since October, 1945, has been manager of the engine, pump and electrical department in Montreal Branch. For the time being he will also continue to direct the activities of the Department in Montreal Branch.

J. P. Stirling, M.E.I.C., formerly divisional engineer at the Pine Portage Development of the Hydro-Electric Power Commission of Ontario is now with the Ontario Paper Co. at Baie Comeau, Que.

H. C. Spence, M.E.I.C., has been appointed the purchasing manager in the manufacturing division of Canadian Pratt-Whitney Co. Ltd., Longueuil, Que. He has been with Central Mortgage and Housing Corporation in Western Canada for several years as manager of the Calgary and the Winnipeg Branches, and as loans manager, and contsruction engineer of the Prairie Region.

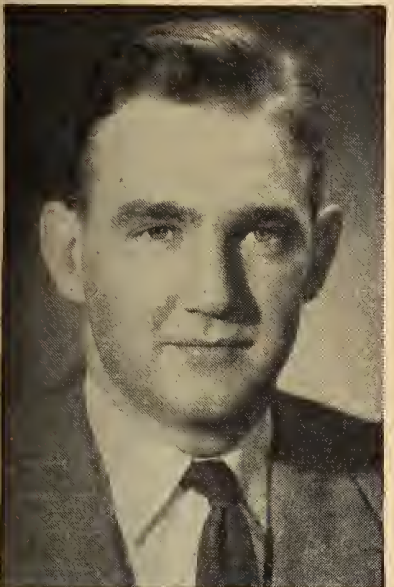
Lt.-Col. John T. Woolsey, M.E.I.C., is technical staff officer for Army Headquarters, at Ottawa, Ont.

Lt.-Col. Woolsey returned to Ottawa from the United States, where as a staff officer of the Canadian Army he worked with the ordnance department of the United States Army, at Falls Church, Virginia.

Col. Woolsey has been in the Army since his graduation from Royal Military College in 1933. He went overseas with the R.C.A. being promoted major in 1944 with the technical Liaison group. He returned to Canada in 1945, and was stationed at C.A.R.D.E., Valcartier, Que., before going to the United States.

C. P. Ronden, Jr.E.I.C., of Canadian Industries Ltd., has been transferred from the Toronto development laboratory of the paint and varnish division, to Windsor, Ont., as a technical sales engineer.

Mervin Rush, Jr.E.I.C., is design engineer for Canadian Industries Limited, at Shawinigan Falls, Que. Previously he was an operator for the Churchill River Power Co. at Island Falls, Sask.



R. A. Bowie, Jr.E.I.C.

R. A. Bowie, Jr.E.I.C., is on the sales staff English Electric Company of Canada Limited in Montreal. He is a graduate in electrical engineering of McGill University, class of 1948, and has been in the electrical industry since that time.

C. H. Chase, Jr.E.I.C., is a welding engineer for Sterling Engineered Welderies, Toronto, Ont. Previously he was employed by A. V. Roe, Canada as a development engineer.

Mr. Chase graduated in mechanical engineering from the University of Toronto in 1949.

A. C. de Lery, Jr.E.I.C., has recently joined the sales staff of the English Electric Company of Canada Limited. He will be attached to the Company's Montreal office, but will centre his activities in Quebec City. Mr. de Lery is a graduate of the Seminaire de Quebec and Laval University.

A. C. de Lery, Jr.E.I.C.

J. R. O'Brien, Jr.E.I.C., is with Associated Engineering Services Limited, at Edmonton, Alberta. Previously he was employed at Whitehorse, Y.T., by Main, Rensaa and Minsas, consulting engineers and architects.

N. Peters, Jr.E.I.C., is with the Dominion Department of Agriculture, P.F.R.A. at Saskatoon, Sask.

Mr. Peters graduated in civil engineering from University of Saskatchewan in 1949.

B. W. McCrae, Jr.E.I.C., is on the staff of Taylor, Forge and Pipe Works of Canada Limited in Hamilton, Ont. Previously he was with Polymer Corporation Limited, at Sarnia, Ont.

Mr. McCrae graduated from Laval University in mining in 1949.

P. H. Lavallee, Jr. E.I.C., who is with the Traffic Department for The Bell Telephone Company of Canada, has been transferred from Belleville to Kingston, Ont. Mr. Lavallee graduated from Laval University with a degree of B.Sc.A., in electrical engineering in 1946.

John S. Johnston, Jr.E.I.C., is with the Aluminum Company of Canada, at Arvida, Que. Previously he was design engineer for Cockshutt Plow Company, Brantford, Ont.

John G. Campbell, Jr.E.I.C., is with Canadian Johns-Manville, Company, at Matheson, Ont. He was formerly with the Falconbridge Nickel Mines.

A graduate of Queen's University, Mr. Campbell received a degree of B.Sc. in mining in 1948.

George Bird, Jr.E.I.C., is with Canadian Bitumuls Company Limited. Regina, Sask.

Mr. Bird graduated from the University of Toronto with a degree of B.A.Sc. in civil engineering in 1949.

R. F. Wheelan, S.E.I.C., is assistant engineer for the Foundation Co., at Fort Churchill, Man.

T. G. Troy, S.E.I.C., is with Southern Canada Power Company in the Operating Department, at Drummondville, Que.

F. J. Surroca, S.E.I.C., is quantity engineer for Fraser-Brace Engineering Company, St. Joseph d'Alma, Que. Mr. Surroca received a B.Eng. in civil engineering from McGill University in 1950.

Harry D. Smith, S.E.I.C., University of Toronto, B.A.Sc. (civil) 1950, is employed as an assistant engineer for the City of St. Thomas, Ont.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

W. R. Bonnycastle, M.E.I.C., prominent hydro-electrical engineer and past-president of the Association of Professional Engineers of British Columbia, died on March 7, 1951, at Riverside, California.

Mr. Bonnycastle was born in Louisville, Kentucky, in 1874, received his education at Virginia Military Institute, Washington and Lee University, and the Boston Institute of Technology. He was a veteran of the Spanish American War, and worked on various projects in the United States and Cuba. He came to Canada in 1905 as an engineer in charge of the consulting office of R. S. Kelsch of Montreal, and designed electrical projects near Fort William, Ont. He went to Vancouver in 1907 as designing engineer with the Stave Power Company. In 1911 he was engineer in charge of the western office of Smith, Kerry & Chace of Toronto, and, that year, went into practice for himself as a consultant hydro-electrical engineer. He gathered data for development of the Bridge and Indian Rivers as well as numerous other smaller projects throughout the province. He was responsible for the preliminary work on the Bridge River, installation of the tunnel and primary unit on Seaton Lake and the spotting of towers on the transmission line to Vancouver. This project was abandoned around 1929 for monetary reasons.

During the War years he was employed by the Department of Munitions and Supply as a resident engineer and was largely responsible for such plants as Boeing Aircraft (Sea Island) and Canadian Pacific Airlines Overhaul (New Westminster).

Latterly he was employed, in a consultant capacity, by Bloedell Stewart & Welsh in their Alberni pulp plant and by Columbia Cellulose of Prince Rupert. For a short period he was connected with Stadler Hurter & Co. of Montreal, on various projects.

Mr. Bonnycastle joined the Institute in 1917 as a Member, attaining Life Membership in 1948.

R. C. Moore, M.E.I.C., who was manager of the department of employee relations, of Imperial Oil Ltd., in Toronto, Ont., died on April 12, 1951.

Mr. Moore was born in Halifax in 1893. He took pre-engineering at Dalhousie University, and engineering at the Nova Scotia Technical College, being graduated in 1916 as a bachelor of science in civil engineering. He joined the Imperial Oil Company staff in 1921 as a draughtsman at Halifax, and served in various departments. From 1922-24 he was a designing engineer at Sarnia. He transferred to Toronto as assistant manager in 1925, becoming manager of employee relations in 1946. Prior to joining Imperial Oil he had worked for Foley Bros., Welch and Stewart, and later as chief draughtsman of the Nova Scotia Provincial Highways Board.

He joined the Institute as a Member in 1950.

NEWS of the BRANCHES

Activities of the Thirty-three Branches of the Institute and abstracts of papers presented at their meetings

Belleville

S. SILLITOE, M.E.I.C.
Secretary-Treasurer

The sixth meeting of the Belleville Branch was held May 21, at the Kiwanis Centre, with 30 members present.

Chairman F. F. Fulton called upon Mr. S. Sillitoe who gave a report on his trip to Montreal to represent the Belleville Branch at the Annual Meeting. The proceedings at the branch officers' meetings as well as the management and technical sessions were outlined to give the highlights of a very interesting three days.

The speaker of the evening, Dr. D. C. MacPhail, assistant director of the division of mechanical engineering of the National Research Council, Ottawa, was introduced by A. O. Drysdale. Dr. MacPhail's subject was **Some Modern Aircraft Gas Turbine Developments.** He began by showing the principles of the simplest reciprocating engines, explaining their advantages and limitations, and referred to the ideal theoretical heat engine. This led to a discussion of the simple jet engine known as a Ram Jet. In this engine there are no moving parts, the thrust being developed by the pressure of the hot gases pouring out behind. Unfortunately this engine is very inefficient until very high speeds are attained, and some other means must be provided to get an aircraft up to speed before this engine is of much use.

The development of the Whittle jet engine first brought this type of engine into a practical form. In this engine there is a vane type compressor driven by a turbine in the exhaust of the jet. The main difficulty in the way of successful development of jet engines has been to find suitable materials for the turbine blades and exhaust pipes of the jets which must withstand intense heats of the order of 800 deg. C. Two metals Nimonic 80, and Inconel X have been used successfully for the material of the turbine blades, which are the most critical item to manufacture. At the intense heat at which the materials operate the life of an engine may be anything from 100 hours to several thousand hours depending on the design.

Dr. MacPhail elaborated on the improvement in efficiency of jet engines that can be achieved with higher compression ratios, and by the principle of "after burning" which relieves the turbine of some of the heat. He illustrated by means of slides, the construction of various engines, and stated that expansion amounted to one inch in length necessitating very careful treatment of bearing design. He also showed the relation between the speed of an aircraft and the form of the airframe. The reason for the "critical speed" in the region of the speed of sound was clearly explained.

After a very interesting discussion period the appreciation of the meeting was expressed by Mr. C. R. Phillips.

Cape Breton

G. W. ROSS, M.E.I.C.
Secretary-Treasurer

S. G. NAISH, M.E.I.C.
Branch News Editor

On April 25th Dr. P. L. Pratley, M.E.I.C., addressed the Cape Breton Branch on the proposed **Straits of Canso Bridge.** He stated that his talk was prompted by erroneous statements in the local press.

Dr. Pratley went into considerable detail regarding the design of the bridge and the audience was left with considerable respect for the great scope of the investigation which Dr. Pratley had conducted. In spite of local criticism in the press, there were no questions, although they were solicited.

C. N. Murray, branch chairman, conducted the meeting. Dr. Pratley was introduced by Mr. M. R. Chappell, and a vote of thanks to him was proposed by C. M. Anson, seconded by H. H. Marshall. Rt. Hon. Angus L. McDonald, Premier of Nova Scotia, was present.

Dr. E. O. Turner, Maritime vice-president, started off the meeting. He asked all members to encourage prospective engineering students, as records indicated that there was going to be a real shortage of engineers in the near future.

The meeting was better attended than any previous meeting of the Branch, and due to the local interest in the subject, there were as many guests as members. Present were members of the Canso Crossing Association, Associated Boards of Trade, and the Mayors of surrounding towns.

Calgary

D. C. JONES, M.E.I.C.
Branch Secretary-Treasurer

FRANK TEMPEST, M.E.I.C.
Branch News Editor

The Annual Meeting of the Calgary Branch was held at the West Room of the Palliser Hotel at 3.00 p.m., March 10, 1951, under the chairmanship of W. A. Smith.

In the course of the meeting the secretary pointed out the increase in membership, particularly in the classification of Junior, and the satisfactory state of the Branch finances.

The Student Guidance Committee reported that four or five requests had been made for speakers to address student bodies.

The weekly Monday Luncheon Club has been an unqualified success this last year, having had an average of 35 members turn up at each luncheon. The luncheon chairman and his committee are to be congratulated on the interesting speakers which they were able to procure for the half hour talk after each luncheon. In this connection it was suggested that the Branch programme committee check with the luncheon committee for possible speakers at the general meetings.

Mention was made of the interesting activities of the Engineers' Wives Club. It was recommended also that new members of the Branch should be made acquainted with the Branch activities, and with the members and their wives.

Towards the end of the meeting Mr. Smith expressed his thanks to the executive and members for their support during the year, and introduced the incoming chairman, H. R. Hayes.

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On March 29th, at a combined dinner meeting of the Alberta Association of Professional Engineers and the Calgary Branch E.I.C. in the Ball Room of the Palliser Hotel, a panel of three speakers discussed.

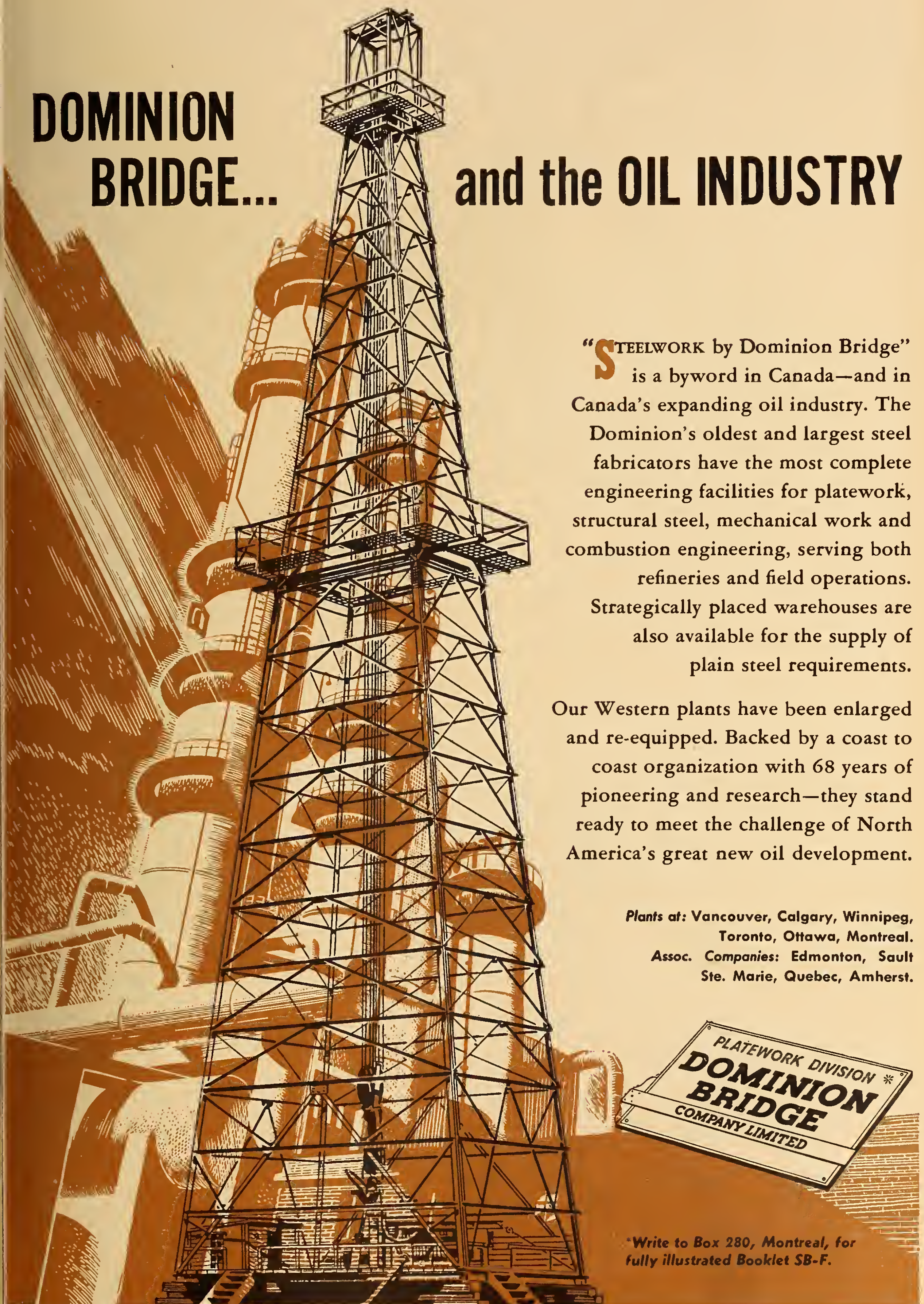
Robert J. Gibb gave a most interesting talk on the role which engineers have played in the development of Alberta and the west in general, and the struggle which engineers have experienced for official recognition as members of a bona fide profession.

Mr. William J. Dick in his talk spoke of the numerous and varied fields into which engineers have proved to be a most important part of industry.

Mr. C. A. Davidson gave a very amusing account of his early experiences when the Province was first opened up for settlement by white men. Many of his stories dealt with land trading with the Indians.

Mr. F. H. Peters, one of the original founders of the Association, was made an honorary member. Mr. Peters was not present to receive the award as he is now living in California.

On April 12th a joint meeting of the Military Engineers Association and the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Calgary Branch of E.I.C. was held in the Officers Mess at Mewatta Armouries. The speaker of the evening was Col. J. R. B. Jones of Ottawa, Chief Engineer of the Canadian Army Engineers.

Col. Jones gave many details of the Army Engineers organization which are not commonly known by civilians.

The work of the permanent force engineers in Canada "is directly related to what we think might happen in a theatre of war". Col. Jones also said, "The nearer you get to the front lines, the more complicated becomes the engineers' duty."

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On Saturday, May 19, 1951, about 55 members of the Calgary Branch motored to Banff, Alberta, to attend a dinner in the Mount Royal Hotel with members of the Institute located in Banff and district. Some of the members enjoyed a few rounds of golf after which everyone met in Muriel's room for refreshments before dinner.

After the dinner, prizes were awarded by Mr. W. A. Smith, immediate past chairman of the Calgary Branch, to those who excelled themselves in golf. The guest speaker, Mr. H. P. Swarthout of the General Electric Company, Schenectady, New York, was then introduced by Herman Hayes, chairman of the Calgary Branch.

Mr. Swarthout spoke on the subject of the gas turbine, its present status of development, principles of operation, and applications.

He described the three types of machines in which the General Electric Company are now in production, namely 3500-kw. simple cycle, 3500-kw. regenerative cycle, and 5000-kw. compound cycle, for industrial, locomotive and utility applications. Several of these machines are now in service and many more are on order.

It is expected that the Company will shortly be in production on larger compound cycle units, the first of which will probably have a rating of 15,000 kw.

Mr. Swarthout described the 3500-kw. simple cycle installation at the Oklahoma Gas and Electric Company as a typical example of a gas turbine application. This unit has now been operating almost two years on a practically continuous basis and has an excellent record. In the case of this simple cycle unit, heat energy is recovered from the exhaust gases and is used to heat feedwater in the existing steam plant thereby raising the plant efficiency.

The gas turbine equipment requires a relatively simple foundation and no basement. Where space and weight are of prime importance, such as in a locomotive, the gas turbine has a distinct advantage.

Cornwall

John A. Sarjeant, jr.e.i.c.
Secretary-Treasurer

A. A. B. McMath, m.e.i.c.
Branch News Editor

May 15th was "St. Lawrence Seaway" night for Cornwall Branch. Mr. Guy Lindsay, director of the Special Projects branch of the Department of Transport, spoke to an audience of more than 55 at the assembly room in Canada Mill, Canadian Cottons Ltd. The branch's guests for the evening included members of the Chemical Institute, as well as citizens from Cornwall and Morrisburg.

Considering the five divisions of the project—the Thousand Islands, the International Section, Lake St. Francis, Soulanges, and Lachine—Mr. Lindsay discussed technical aspects of the project, using lantern slides for illustration. Of particular interest to Cornwall and district, was his description of the power dam at the head of Barnhart Island, with a power house at the foot of this island. If Canada should tackle the project alone, a new ship canal would start at Mille Roches and re-enter the river above the Roosevelt Bridge.

Power available at Barnhart Island would be 2,200,000 horse power, at Beauharnois 2,000,000, and at Lachine 1,200,000. If power paid for the enterprise, Canada's share would be $20,000,000. If navigation was to cover the costs, this figure would be $126,000,000. Over the 5- or 6-year construction period, steel used on the Canadian side would total less than 2 per cent of Canada's total annual consumption. During this period 9,500 men would be employed on the Canadian side.

Mr. Lindsay was introduced by Fred Warner, and thanked by W. P. Nesbitt. P. H. Nasmyth described a proposed tour for the branch, at the National Research Council. H. W. Nickerson presided.

Kingston

J. T. Provan, jr.e.i.c.
Secretary-Treasurer

S. H. Rochester, m.e.i.c.
Assistant Secretary

On April 4, 1951, the Kingston Branch held a dinner at the LaSalle Hotel, Kingston, on the occasion of the visit of President James A. Vance and Mrs. Vance. An excellent attendance of members and their ladies was recorded, including some visitors from other branches.

After dinner, Chairman G. T. Andrews introduced distinguished guests and members occupying the head table, calling upon Dean D. S. Ellis to introduce President Vance.

The president commenced by expressing his pleasure at being present at the Branch dinner and passed on Dr. Austin Wright's regrets at being absent due to the press of Institute affairs. The president outlined his recent tour of E.I.C. branches throughout the Dominion, saying that great opportunities for the young engineer exist in Canada, since major developments are now taking place all over the Dominion. He urged engineers to consider well their opportunities before deciding to emigrate to the U.S.A. or other countries, explaining that many large industrial concerns are training young engineers in the various departments of their organizations to equip them for eventual top executive positions.

In speaking of the development of the Pacific Coast area, Mr. Vance mentioned the great need for power, and the progress being made in B.C. in this direction. In Alberta great progress is being made in the oil fields, culminating in the recent completion of the oil pipe line to the Lakehead and its loading into great tankers, such as the *Imperial Leduc*, for direct transportation of Alberta oil to Eastern Canada.

The President spoke of his visit to Johannesburg, South Africa, to attend the Commonwealth Engineering Conference, and stressed the importance of maintaining our associations with the British and American engineering institutions. He explained some of the history of these institutions.

Institute affairs were next discussed by the President, who congratulated the universities and student organizations on their interest in the Engineering Institute. The present membership approximates 14,000, the largest proportion of which are students and juniors. This creates new problems at headquarters and serious consideration has been given to the broadening of the work of Committees. The President praised the work of Colonel Grant, who, in his capacity as field secretary, has travelled far and wide in the interests of the Institute and its members, and who is the E.I.C. representative to the Engineers' Council for Professional Development.

The President was thanked by Mr. J. B. Cunningham on behalf of the members present, the meeting then being adjourned.

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On Tuesday evening May 1, 1951, the Kingston Branch held one of its regular meetings at the Faculty Club, Royal Military College. The meeting was in the form of a social evening with Major F. Maskill, R.C.E., as guest speaker. He presented an excellent essay entitled **Scientists Contribute to the Solution of Management Problems.** Since Major Maskill is attached to the Canadian Army Operational Research Establishment, he is well qualified to talk on this subject and his topic was a general discussion of the type of work and results of this Branch of the service.

The speaker was introduced by Major A. L. MacLean and thanked by M. G. Saunders.

Moncton

V. C. Blackett, M.E.I.C.
Secretary-Treasurer

On March 12th, Dr. P. L. Pratley, consulting engineer, of Montreal, addressed a dinner meeting of the branch, on the subject **The Strait of Canso Bridge.** The record attendance of over seventy members, guests and representatives of the press, gave evidence of the interest taken in the project under discussion. N. B. Eagles, chairman of the branch presided and introduced Dr. Pratley to the meeting.

In his opening remarks, Dr. Pratley referred to the campaign of criticism carried on by certain Maritime newspapers. Grossly inaccurate statements had been made in connection with the design of the structure and the difficulties to be overcome.

The 3,227-ft.-long, low level bridge to be built across the Strait of Canso, will connect Cape Breton Island with the mainland of Nova Scotia and will provide for both railway and vehicular traffic. The Strait is very deep, and maximum depth of water encountered at the bridge site being 185 feet. The real problem of the Canso Crossing is therefore the design of deep water piers. This problem will be solved by the use of the now well known prepakt concrete construction which does not require the unwatering of pier sites.

Dealing with ice conditions in the Strait, Dr. Pratley said the maximum area of ice floe reported was five acres,

This photo was taken when President Vance visited the Kingston Branch. It includes (l. to r.) R. D. Bennett and Mrs. Bennett, Mrs. J. Williams, Mrs. J. A. Vance, Major and Mrs. A. L. Maclean.

with a thickness not exceeding 30 inches. He had planned the piers to withstand the impact of 225 acres of ice. Each pier will be capable of destroying the momentum of ice 12 feet thick, travelling at 6 feet per second, in 100 seconds. Although there will be no tension in the piers, they will be anchored by steel piles extending 15 feet up into the pier and 15 feet down into the rock foundation. Contrary to general belief, no icebergs were ever seen in the Strait. Because of the psychology of fear which exists in the mind of the public with regard to the project, safety factors beyond the bounds of common sense, have been used in the design of the piers.

Following an open discussion, the thanks of the branch were extended Dr. Pratley by G. L. Dickson.

Niagara Peninsula

J. J. Miller, M.E.I.C.
Secretary-Treasurer

Geoffrey W. Ince, Jr.E.I.C.
Branch News Editor

On April 26, a large number of members turned out to meet President Vance at the annual president's dinner meeting, which proved to be very successful. There was an air of friendly informality throughout the meeting and many personal friends of the President were present to hear him report on Institute affairs at this, his last presidential branch visit.

Mr. Vance gave the branch many interesting high lights of his travels on

President Vance at the Niagara Peninsula Branch (l. to r.) J. J. Miller, branch secretary; P. E. Buss, councillor; L. F. Grant, field secretary; E. Grummitt, member of the branch executive; C. Climo, branch chairman; P. A. Pasquet, member of the branch executive; and President Vance.

Institute business, which took him to Africa, Cuba and across Canada. One deep impression was the difficulty that some other countries experienced in producing electric power, which we in Canada expect with the flick of a switch. Power in South Africa is a valuable commodity and in some parts, water is very scarce. It is interesting to note that one coal burning power generating plant mined coal on the site for about 50 cents per ton, but water for cooling had to be carefully preserved and re-cycled. Mr. Vance remarked how fortunate we are to have a fairly well balanced economy with so many natural resources, in the development of which engineers are playing a large part.

In order to develop our resources, such as oil, iron ore, aluminum and wood products, to mention only a few, the role of the engineer is important, and a lamentable shortage of engineers is developing. Mr. Vance expressed the opinion that Canada will feel the lack of engineers in the years ahead and that all possible should be done to encourage students of engineering.

In closing, the president stressed the importance of members being more interested and more active in Institute affairs. This would not only strengthen the Institute, but it would do much to advance the professional status of the engineer.

When the meeting was adjourned, many members lingered to chat with the president and members of his party. One group talking with the Field Secretary, Col. Grant, discussed the possibility of running a course of non-technical subjects for junior engineers in the Niagara Peninsula next winter. A similar course was very successful in Toronto last winter and should be very worth while to this branch.

Saguenay

F. E. Hogg, M.E.I.C.
Secretary-Treasurer

W. A. Armstrong, Jr.E.I.C.
Branch News Editor

On May 8, an assembly of twenty-five members of the Saguenay Branch was addressed by Mr. J. Craig, technical director of Canadian Refractories Limited.

Mr. Craig drew on his wide knowledge of refractories, gained during nearly a quarter of a century of experience in the industry, to describe the function of refractories from the physical or structural point of view rather than the chemical.

Acid refractories are made from either fireclay or silica, both of which materials are plentiful in North America. The use of silica brick, which has the property of retaining its shape under load almost to its fusion point, in metallurgical furnace arches was used as an interesting structural application.

Neutral refractories, characterized by the chrome constituent, and basic, characterized by magnesia, were next described. Their importance in the steel industry, as used in basic open hearth linings was explained. The Canadian supply of magnesia is a valuable contribution to this industry.

Mr. Craig explained the applications of different refractories, including mortar and insulating brick, in furnace design. Coloured slides were used to illustrate. One interesting application was the use of tamped magnesite paste in metallurgical furnace bottoms.

The speaker was introduced by Mr. B. L. Davis, and thanked for a most informative lecture by Mr. J. T. Nichols.

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On Saturday evening, May 19, the Saguenay Branch held their second annual mixed party at the Saguenay Inn. Seventy-five couples enjoyed the function and it seems assured of remaining an annual event.

Refreshments to suit the mood were in abundant supply, while dancing was in progress in the tastefully decorated assembly room. Lunch was served in the Grill, to bring a most enjoyable evening to a close.

The sincere thanks of all members and their ladies is extended to the committee, J. Mercier, F. H. Duffy, and B. L. Davis, for their efforts in organizing the party and making it a decided success.

Saint John

W. M. Brenan, M.E.I.C.
Secretary-Treasurer

S. V. Grisdale, M.E.I.C.
Branch News Editor

The Saint John Branch held a banquet in the Admiral Beatty Hotel, on the night of April 4, in honour of the fourteenth annual meeting of the Dominion Council of Professional Engineers which took place in the city during that week.

W. R. Godfrey, chairman of the Saint John Branch, presided at the dinner, honoured by the presence of the lieutenant governor of New Brunswick, Honorable D. L. MacLaren, Dr. A. W. Trueman, president of the University of New Brunswick, and Dr. Ira P. Macnab, president of the Dominion Council and president-elect of the Engineering Institute of Canada, and many other distinguished guests from coast to coast.

The guests were introduced by R. M. Richardson, of Saint John, N.B., the representative to the Dominion Council of Professional Engineers for this province.

The main address of the evening was delivered by Dr. A. W. Trueman, who gave a very interesting insight into the problems of financing a university.

The main theme of Dr. Trueman's speech was the question of how much liberal education should be included in an engineering curriculum.

Dr. Trueman pointed out that engineers literally changed the face of the industrial and social world, between the years 1750 and 1830, and are still doing so, to some considerable degree. That being so, we must be concerned not only with what the engineer can do technically, but with the kind of mind and philosophy with which he looks out on the world in which he plays so important a part.

The following evening a banquet was held at the Lord Beaverbrook Hotel in Fredericton.

D. J. Brewer of Fredericton presided at this dinner, and Dr. Ira P. Macnab was the principal speaker.

Dr. Macnab reviewed the history and development of the Dominion Council, and stated that its work at the present time is primarily that of co-ordinating the various provincial acts, so that a professional engineer registered in any province in Canada would be free to practise his profession in any other province. To accomplish this, the council has been working toward the preparation and acceptance by the various provincial bodies, of a uniform examination syllabus.

Another function of the Dominion Council is to watch all legislation relating to the engineering profession, whether provincial or federal. Dr. Nacnab stated that he was firmly convinced, that we as engineers keep our own house in order, remember that we must give first consideration to the protection of the public, and honestly follow that code of ethics to which we all subscribe, our professional status will be assured.

Vancouver

STUART S. LEFEAUX, M.E.I.C.
Secretary-Treasurer

H. T. LIBBY, M.E.I.C.
Branch News Editor

Members of the Vancouver Branch met on the evening of April 4, in the Faculty Club of the University of British Columbia to welcome home Christopher Webb, M.E.I.C., from a trip to the Near East. The meeting which took the form of a cocktail party and supper, was attended by approximately seventy members of the Institute including Colonel Grant, our genial field secretary from Headquarters. The Very Reverend Cecil Swanson offered the following Grace appropriate to the occasion:

For good deep snow and lots of water,
For Christopher Webb, his son and daughter,
For things that are good and things that are queer,
Including the parson and the engineer.
—Thanks be to God.

Christopher Webb, whose job is district engineer for the local Water Resources Branch, was chairman of a three-man commission appointed for the purpose of arbitrating a dispute over water rights of the Helmand River between Afghanistan and Iran. In opening his talk he mentioned his regret that he would be unable to deal with the engineering aspects of the case as the report of the Commission had not yet been presented. Then he took his audience on an interesting trip describing his arrival in the Near East and his progress through all the towns and villages on his route. The point which interested most of his hearers as engineers was the fact that the natives of the countries that he visited approached such colossal tasks as constructing miles of deep trenches and tunnels, earth dams, and large concrete buildings, with nothing but hand labour.

Mr. Webb completed his talk with a series of colour slides taken by the various members of the Commission, appropriate to various phases of his talk.

H. N. "Dutch" Macpherson, in thanking the speaker, briefly reviewed the genealogy of the Webb Clan in a manner which caused considerable mirth, concluded by welcoming Christopher Webb home again and thanking him for a most interesting and informative talk.

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The April meeting of the Vancouver Branch was held at the New Engineering Building at the University of British Columbia on April 18th, with Mr. J. E.

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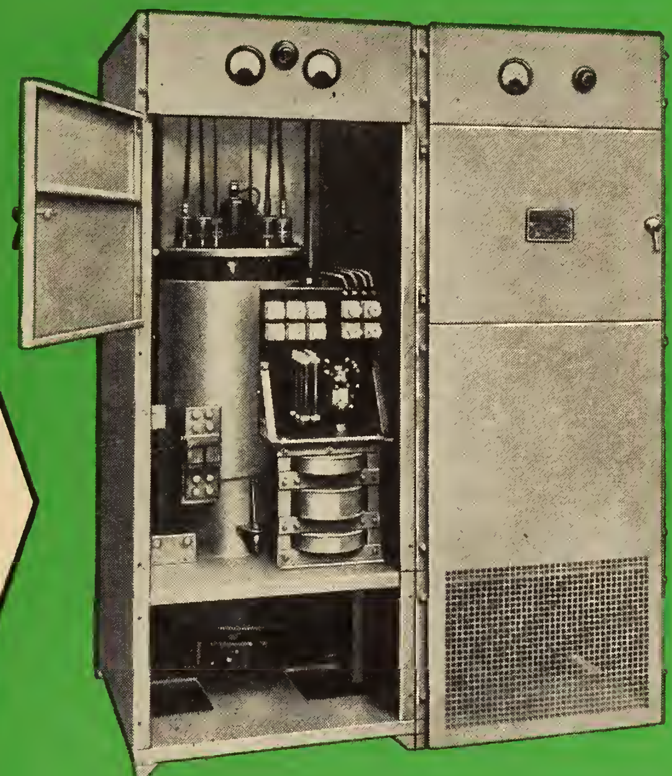

A typical 800 KW, 500 volt two-cubicle rectifier, with lower cover removed.

The pumpless, air-cooled, steel-tank rectifier has been developed to eliminate the maintenance and outages attributable in the past to vacuum pumping and water-cooling, but to retain the robustness of steel tank design. The resulting simplicity and reliability achieved by BT-H has already been well proven in Transportation, Industrial and Electro-chemical service.

The BT-H design conserves space and is inexpensive to install. The rectifier and its accessories is enclosed in a cubicle which is neat in appearance and protects personnel against accidental contact with live parts. Two or more cubicles may be installed side by side to operate in parallel from one transformer.

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Macdonald in the chair, and with members of the American Institute of Electrical Engineers and B.C. Engineering Society in attendance as invited guests. A total of 112 persons were present to hear a paper on **The Pitting and Cavitation of Water Wheels** presented co-operatively by C. G. Southmayd, manager of the Hydraulics Division of Canadian Allis-Chalmers Company at Lachine, Quebec, and J. F. Roberts, Allis-Chalmers representative from Milwaukee, U.S.A.

Mr. Southmayd opened his address by defining the word "cavitation" as vaporization which occurs in a stream of fluid moving with a high velocity.

An exceedingly interesting 16-mm. movie film gave pictorial evidence of the nature and effects of cavitation and actually showed the alternate formation and collapse of the cavitation bubbles. The film had been prepared by the U.S. Navy at the California Institute of Technology and employed film speeds of up to 20,000 exposures per second. Such rapid photography enabled use of extremely slow slow-motion to permit the observers' close study of cavitation effects. It was astounding to learn that 21 minutes of screen time was required to show what actually happened in one second.

Three types of pitting were observed in sample sections of a Francis turbine blade passed to the audience for inspection: (a) true pitting from cavitation; (b) corrosion by chemical action; (c) pitting by erosion from silt.

Mr. Southmayd posed the question, "Why are precautionary measures not taken to prevent pitting from cavitation?" In answer he stated that such prevention could be accomplished by either increasing fluid pressure or reducing fluid velocity but that in practice it was economically unreasonable to remove the cavitation effect. Present-day turbine design allows for the effects of reasonable cavitation, and the extent of "reasonable cavitation" is determined by R.E.M.A.

Laboratory tests have been devised to permit examination of the effects of cavitation on various materials. Normally the effects from cavitation do not become apparent until a given hydraulic installation has completed fifteen or twenty years of service. It was thought desirable to devise a machine which would produce rapid, accelerated cavitation. The first known accelerated-cavitation machine was introduced in the United States in 1932, and was of the double-weir-on-a-flat-surface type.

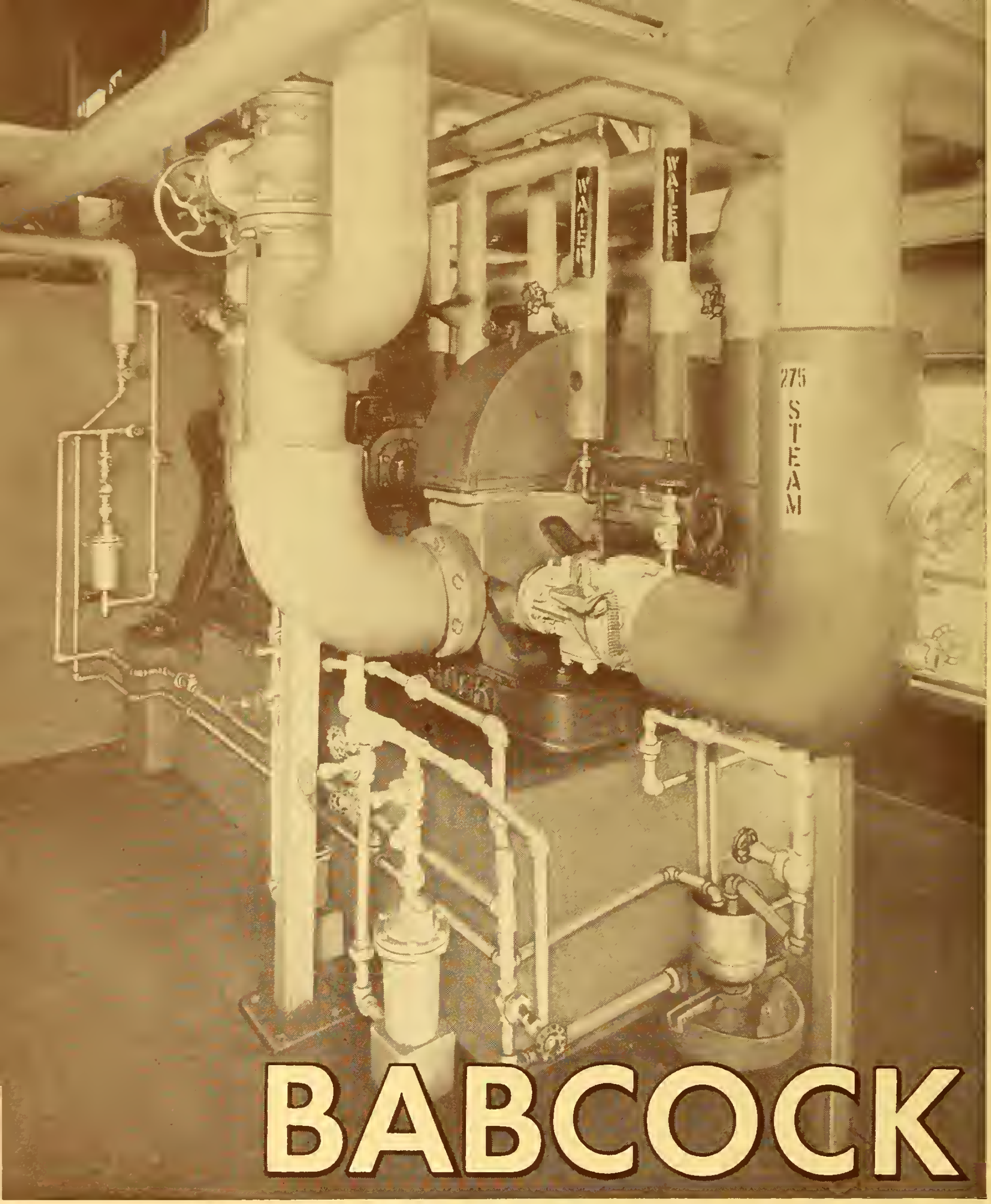
Mr. Southmayd described in detail the vibratory-type cavitation accelerator developed over recent years by the Canadian Allis-Chalmers Company.

At this point in presentation of the paper, Mr. Roberts proceeded to describe some of the results obtained from tests made by the cavitation accelerator. The following observations had been made:

(1) Brightly polished metal specimens have varying rates of initial pitting but after 120 minutes the rates are the same.

(2) A certain minimum force is required to produce cavitation in all materials.

(3) Acid water decreases cavitation effect (tests conducted with many types of liquids).



ASSURES EFFICIENCY

Lever Brothers Limited also employ 4 Babcock Turbines in this plant. Two are coupled to the forced-draft fans and two drive the induced-draft fans. These turbines feature an ingenious, but simple, two-velocity stage design that cuts operating costs. At the first stage the steam is directed at the single wheel with its single row of blades. Then the steam is caught in guide passages and redirected at the wheel. This second impact extracts the maximum remaining energy from the steam. Thus, Babcock Turbines give extra efficiency with low maintenance cost. If you plan to install Turbines, contact Babcock at once. They will be glad to discuss your problem and provide the most workable solution.

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See other side for further details of this installation.

(4) Resistance to pitting bears a direct relation to material hardness. A Brinnell hardness of 200-300 appeared to be the minimum hardness beyond which no appreciable decrease in cavitation occurs.

(5) Rolled plate steel resists cavitation better than cast steel.

(6) Pitting of turbine runners can be retarded by coating the carbon steel runner with two coats of weld—first coat to be mild-steel weld and the second to be a steel containing 18 per cent chrome and 8 per cent nickel. Commenting on this welding process, Mr. Roberts stated that when one metal is welded to a carbon steel the carbon will often enter the coating-metal and will reduce the anti-pitting effect, hence the use of the two weld-coatings.

Mr. Roberts further commented that Europeans have given up using an 18-8 stainless weld coating because such a steel did not absorb shock — it is not ductile—and is therefore subject to cracking. Europeans favour a 13 per cent chrome steel. However, 13 per cent chrome is difficult to weld.

During the question period, Mr. C. Arnott of the B.C. Electric Railway Company explained that a Francis runner of his Company had become badly pitted and had been coated first with mild steel and then with an 18-8 stainless steel. Following application of the second coating, the roughened runner surface was ground smooth on only two of the blades and the question was asked if this lack of machining on the remaining blades would result in worse pitting effects. Mr. Southmayd replied that experiments have shown that the considerable expense associated with grinding the weld surface is not warranted to gain the slight decrease in pitting effects.

At the conclusion of the question period Mr. J. P. Fraser moved a vote of thanks to Messrs. Southmayd and Roberts for their presentation of a very interesting and informative paper.

Student Branch

Vern McDonald, s.e.i.c.
Secretary-Treasurer

Prof. W. G. Heslop, m.e.i.c., associate professor in the Department of civil engineering of University of British Columbia, was elected honorary president of the Student Branch of the Vancouver Branch of the Institute, recently.

Executives of the Student Branch were elected on March 9, to serve for the term 1951-52. President is Stan Wilkinson; secretary-treasurer, Vern McDonald; advertising representative, Joe Perdue, and film controller, Doug Third. A vice-president and a recording secretary will be elected early in the fall term.

The Student Branch will hold the status of a major club on the U.B.C. campus, in two years' time.

Victoria

W. A. Bowman, jr.e.i.c.
Secretary-Treasurer

G. J. A. Kidd, s.e.i.c.
Branch News Editor

Dr. K. O. Wright, astrophysicist, from the Dominion Astrophysical Observatory, was guest speaker at the monthly meeting of the Victoria Branch on March 16.

The title of his address was **The Chemical Composition of the Stars.** His opening remarks pointed out that his address would be the first of two meetings, the second to consist of an inspection trip to the Saanich Observatory itself.

Dr. Wright went on to say that the work of the Saanich Observatory staff was entirely devoted to the physics of the stars, i.e., the size, temperature, pressures, densities and chemical composition, rather than the mapping of the heavens which is carried out by other observatories.

The Saanich Observatory was said to be the third best equipped observatory in the world, although the 73-inch telescope now ranks only about the sixth largest.

Dr. Wright fully illustrated his address with slides showing spectra, diagrams of energy levels for various chemical elements, mathematical tables and equations, photographs and so on. Dr. Wright showed how the size of stars could be determined by their brilliance and temperature. He explained how some stars the size of the earth could have a mass equal to the sun and yet be entirely gaseous. Some of the stars, he said, were as large in diameter as the orbits of some planets.

The chemical composition of the stars has recently been calculated to be about 96 per cent hydrogen, slightly less than 4 per cent helium, and the small remainder consisting of many elements.

At the close of the address Dr. Wright answered questions from the audience.

The field trip to the Dominion Astrophysical Observatory took place on April 21, 1951.

Dr. Wright conducted a tour through the observatory explaining the operation of the 73-inch telescope and other items of interest. Members were able to view the moon, Saturn, etc., through the telescope.

Winnipeg

G. W. Moule, m.e.i.c.
Secretary-Treasurer

Electrical Section

K. Hallson, jr.e.i.c.
Secretary

J. G. Dickinson
News Editor

Mr. W. H. Dickens, of the engineering department of Bepco (Canada) Limited, Montreal, presented a very fine paper on **Oil Circuit Breaker Testing,** at the general meeting, April 26th, of the Electrical Section of the Winnipeg Branch.

Mr. Dickens recently joined Bepco (Canada) Limited, after spending some time with Crompton Parkinson of England, where he was directly connected with circuit breaker testing. His talk was a description of the circuit breaker testing equipment of Crompton Parkinson in England. A number of slides were shown illustrating the equipment and including some oscillograms of typical tests on oil circuit breakers.

A rather lively discussion followed the meeting with various engineers of the Utilities taking part. It was brought out that the difference between British and American specifications was not as important as knowing precisely what testing was done and what was the significance of the results.

A second point of interest was that manufacturers' testing stations don't usually determine and set limits to length of time between energizing of the tripping coil and the moment of contact parting. This did not affect the circuit breaker capacity, but was very important to the utility's system.

The extent of carbonization in circuit breaker oil was briefly discussed, with the general concensus of opinion that this was not too much of a worry except possibly in special cases such as arc furnace duty in steel mills where the operations are extremely heavy.

As a matter of passing interest, mention was made that a suitable breaker had not been developed for d-c systems as yet.

The meeting closed about 10:30 p.m. Forty-three members were present.

Vancouver

Engineers' Wives Association

The first annual meeting of the Engineers' Wives Association was held on April 26, 1951, at a box luncheon in the West Vancouver home of Mrs. G. W. Allan. Mrs. Sidney Hogg presided and gave the annual report. The sum of $100 has been given to the Vancouver Branch of the Engineering Institute of Canada as a bursary for a University of British Columbia engineering student. The nominations report was given by Mrs. W. M. Kelly and officers elected for the 1951-52 season were: president, Mrs. G. W. Allan; past president, Mrs. Sidney Hogg; honorary president, Mrs. J. N. Finlayson; vice-president, Mrs. E. Hartley; secretary, Mrs. D. Rattenbury; treasurer, Mrs. J. Miller. Chairmen of committees are: programme, Mrs. W. P. Richmond; social, Mrs. A. Gordon; membership, Mrs. G. Bancroft; telephone, Mrs. A. Fletcher; publicity, Mrs. A. Peebles; ways and means, Mrs. C. Maartman.

Members present at the meeting included: Mrs. E. H. Jupp, Mrs. C. Scanlon, Mrs. D. Livingston, Mrs. H. W. McLeod, Mrs. T. Lees, Mrs. H. Fox, Mrs. J. Henry, Mrs. D. Jamieson, Mrs. E. Kolbeins, Mrs. J. Brandlmayr, Mrs. D. Reeve, Mrs. C. Deans, Mrs. A. Peiry, Mrs. E. Cray, Mrs. H. B. White, Mrs. F. Adams, Mrs. J. Ball, Mrs. A. Rhodes, Mrs. R. McLeod, Mrs. R. C. Robson, Mrs. W. Borwick, Mrs. H. Libby, Mrs. W. MacDonald, Mrs. W. M. Kelly, Mrs. R. A. McLachlan, Mrs. A. C. Smith, Mrs. John Michie, Mrs. J. L. Miller, Mrs. W. J. Tindale, Mrs. A. Gordon, Mrs. F. Crocker, Mrs. J. McPhail, Mrs. A. Wright, Mrs. F. Ives, Mrs. E. V. Hird, Mrs. J. P. Fraser, Mrs. H. Brownell, Mrs. A. Swanson, Mrs. E. Hartley, Mrs. N. Beaton, Mrs. W. Richmond, Mrs. J. Carswell, Mrs. M. Bancroft, Mrs. Sidney Hogg, Mrs. C. Maartman, Mrs. G. Sauer, Mrs. A. Wolfe, Mrs. R. Binnie, and Mrs. G. W. Allan.

Tentative plans were also made for the Annual Dinner Dance to be held on May 28 in the Stanley Park Pavilion when husbands will be guests of the ladies.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated. on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER or chemist preferably with eight to ten years' experience in the paint and lacquer industry. Applicant should be fully experienced in the formulation and development work of the above items. Location Ontario. Salary open. Apply to File No. 3052-V.

CIVIL

CIVIL ENGINEER for the design and layout of structural steel, reinforced concrete and general building work. Mechanical experience essential. Age 24 to 30 with at least 4 years experience in engineering. Location Ontario. Apply to File No. 3056-V.

CIVIL ENGINEER with experience in wharf and dock work required by contractor in Montreal. Salary open. Apply to File No. 3060-V.

ELECTRICAL

YOUNG ELECTRICAL ENGINEER to act as sales engineer for manufacturer in Montreal. Applicant should have some experience with public utility or cable manufacturer. Territory largely Eastern Provinces. Apply to File No. 3047-V.

ELECTRICAL ENGINEER, experienced, required by manufacturer in Ontario, of small transformers, such as those used in radio, television, automobile ignition coils and battery boosters. Applicant should be able to write specifications and prepare designs, as well as know something of manufacturing problems and have about 5 or 6 years experience. Apply to File No. 3049-V.

ELECTRICAL ENGINEERS REQUIRED by large organization in Montreal with university degree in electrical engineering, engineering physics or radio engineering. Non-graduates acceptable if equivalent training and experience have been obtained by other means. Intermediate and senior engineering positions are also available for men with two or more years experience in design and development of radar or radio communications equipment. Duties involve electrical design and development of radar and radio communications equipment for defence and civilian purposes. Salaries open. Apply to File No. 3064-V.

MECHANICAL

MECHANICAL ENGINEER required by architect's firm in Ontario. Applicant should be 30 to 45 years of age and a graduate mechanical engineer and have from five to ten years experience in the design of heating, ventillating, plumbing and electrical installations. Starting salary will be $4,500 to $6,500 depending on qualifications. Apply to File No. 3042-V.

MECHANICAL ENGINEER with several years experience in maintenance and plant engineering work. The position open is that of plant engineer at the Toronto plant of organization with headquarters in Montreal. Salary range $400.00 to $450.00 per month. Apply to File No. 3048-V.

TWO MECHANICAL ENGINEERS OR MECHANICAL DRAUGHTSMEN required for layout piping and general work in plant engineering and design. Age 24 to 30 with at least 4 years experience in engineering. Location Ontario. Apply to File No. 3056-V.

MISCELLANEOUS

ENGINEERS REQUIRED BY Canadian Armament Research and Development Establishment. Mechanical engineers or those from other branches, such as electrical or engineering physics whose interests or experience lead them to the mechanical design side. Aeronautical engineers, familiar with airframe structure design and stressing. Metallurgical engineers with either physical laboratory or design interests. Mechanical draughtsmen, with experience, capable of handling small sections in the drawing office and/or acting as checkers. Apply to File No. 3044-V.

THE CIVIL SERVICE COMMISSION invites applications for appointment to the hydrographic service of the department of mines and technical surveys. Successful candidates will be assigned to ships during the summer to assist with survey work involved in charting coastal and large inland waters for navigational purposes. Hydrographers spend the winter months at headquarters compiling charts. The minimum qualifications for the various types of positions are as follows: (a) graduation from a university or college of recognized standing or, (b) navigational experience or (c) surveying experience or (d) graduation from high school or technical school with an academic standing which would permit entrance to a school of applied science. Assignments will be made either at headquarters at Ottawa or at the Victoria Office of the Hydrographic service in B.C. All travelling expenses paid. Those at Ottawa will serve on the Eastern Seaboard and on inland waters, while those at the Victoria Office will be employed on western coastal waters. Allowance for sea duty will be paid for time spent on board ship while it is away from home port. Apply to File No. 3046-V.

MECHANICAL OR CHEMICAL ENGINEER with at least 7 years experience in either industrial construction or chemical plant maintenance. The position open is that of resident engineer on construction of new plant in Montreal East and the chief duties will be the inspection of all mechanical works during construction. When the plant has been completed, then this man, if suitable. will have the opportunity to take over the position of plant engineer. The tentative salary range is $400.00 to $500.00 per month. Apply to File No. 3046-V.

CHEMICAL OR MECHANICAL ENGINEER with operating and administrative experience to take charge, after suitable training, as works manager of small tar plant in Western Canada. Salary $300.00 to $375.00. Apply to File No. 3048-V.

MECHANICAL LAYOUT and design engineer and chemical design engineer required by large diversified chemical company in Montreal. Apply to File No. 3048-V.

SALES ENGINEER, wanted to manage Vancouver Office of American firm engaged in industrial sales to power plants, pulp and paper mills, municipalities, institutions, etc. Must be graduate mechanical engineer, Canadian citizen 30 to 40 years of age, with previous experience in similar work. Salary open. Apply to File No. 3050-V.

MAINTENANCE AND CONSTRUCTION ENGINEER required by an established metallurgical plant in Montreal. Permanent position offering opportunity for advancement. Apply to File No. 3053-V.

ENGINEERING ASSISTANT AND ESTIMATOR required for branch office in Toronto of large U.K. electrical manufacturers. Duties will be of a varied nature and applicants should have some previous experience. Apply to File No. 3055-V.

FINANCIAL ANALYST REQUIRED by large mining and manufacturing organization in Province of Quebec. Technical education such as engineering or science, plus knowledge of accounting, or preferably courses in accounting or business administration. Salary depends upon qualifications and will advance with experience. Apply to File No. 3057-V.

TWO ENGINEERS, electrical, mechanical or chemical, either newly graduated or with several years experience, required by large sugar refinery located in Montreal. Salary open. Apply to File No. 3058-V.

RECENT GRADUATE ENGINEERS required by large automotive industry in Ontario. Two electrical required for design work. Twelve openings in time standards and methods department. Apply to File No. 3061-V.

PROJECT ENGINEER required by organization in Montreal offering all modern employee benefits. Applicant should be chemical engineer with four to five years experience in design, construction or operation of petroleum and light hydro-carbon plants. Salary commensurate with experience. Submit full details of qualifications with recent photo. Apply to File No. 3063-V.

MECHANICAL ENGINEERS with M.E. degree or equivalent theoretical knowledge. For senior positions which are also available, three or more years experience in design or manufacture of electrical apparatus or similar products will be required. Duties: processing and preparation of manufacturing information required to manufacture and assemble complex radar and radio communication equipment. Salary according to experience and qualifications. Location Montreal. Apply to File No. 3064-V.

MECHANICAL DRAUGHTSMEN required by large machinery manufacturing firm in Eastern Townships. Knowledge of machine design. Salary commensurate with ability. Apply to File No. 3065-V.

MECHANICAL ENGINEERS required by large machinery manufacturing firm in Eastern Townships. Opportunity for recent graduates or experienced engineers. Apply to File No. 3065-V.

APPLICATIONS for the position of town engineer for town located in Manitoba, population 6,100, will be received up to July 7th, 1951. Commencement salary $330.00 per month plus car allowance. Engineer to have charge of construction and maintenance of streets and sidewalks and gravity water system with sewage disposal plants. Applicants will require to state qualifications furnish references and state the earliest Apply to File No. 3067-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMICAL ENGINEER required to head department of chemical technology in the Indian Institute of Science, Bangalore. Candidate should possess high academic qualifications in chemical technology, together with considerable research and teaching experience. Should have knowledge of design and operation of chemical pilot plants. No age limit is prescribed. Duties will involve instruction of personnel. This is the foremost research institute in India and has well established post-graduate departments of aeronautical engineering, electrical communication engineering, metallurgical engineering, internal combustion engineering, power engineering and electrical technology and chemical engineering and chemical technology. Post of head of chemical technology has been vacant for sometime. Apply to File No. 2077-V.

TWO CHEMICAL ENGINEERS required by paper company located in Province of Quebec. Applicants should have at least one year's experience in chemical laboratory work or related fields. Recent graduates of chemical engineering or general science will also be favourably considered. Apply to File No. 2098-V.

CHEMICAL ENGINEERS required by organization in Ontario. Plant experience preferred but not necessary. Salaries open. Apply to File No. 3015-V.

CHEMICAL ENGINEER required in central Ontario, with three to five years experience, preferably in a petrochemical industry. Salary open. Apply to File No. 3016-V.

CHEMICAL ENGINEER required for Ontario bleached sulphate pulp and paper mill. Pulp and paper experience desirable but not essential depending on age. Apply giving full particulars as to personal, education, experience, references to File No. 3029-V.

CIVIL

CIVIL ENGINEER with at least ten years experience in design and detail of steel and reinforced concrete structures for Montreal office of consulting engineering firm. Salary open and possibility of association to right man. Apply to File No. 2091-V.

CIVIL ENGINEER required by firm of consultants in Montreal with considerable experience in reinforced concrete and some pre-stressed concrete design work. Applicant must be capable of working with a minimum of supervision and be capable of taking charge of a design group. Apply to File No. 3001-V.

CIVIL ENGINEER 1949 or 1950 graduate required in Montreal with some experience in concrete design or construction. Salary open. Apply to File No. 3013-V.

PROFESSOR OF CIVIL ENGINEERING required by university located in Ontario. The person appointed will be required to take charge of courses in highway engineering and to assist in associated civil engineering courses. Applicants should have had not less than ten years practical experience, part of which must have been spent in highway engineering. They should have graduated from a recognized university and post-graduate study will be considered an asset. An interest in soil mechanics is desirable. Salary, according to qualifications, up to $5,000.00. Apply to File No. 3014-V.

GRADUATE CIVIL ENGINEER required as transitman for railway company located in Province of Quebec. Starting salary $250.00. Apply to File No. 3025-V.

CIVIL ENGINEER required with about six years experience on construction of all types, by young progressive organization located in Province of Quebec. Applicant must have good personality and be thoroughly bilingual. Excellent opportunities offered. Starting salary about $5,000.00. Apply to File No. 3031-V.

TWO GRADUATE CIVIL ENGINEERS with a few years experience in heavy construction, preferably with contractors and on power house construction, required by large public utility in Province of Quebec. Salaries open. Apply to File No. 3035-V.

CIVIL ENGINEER, experienced, required by city in Eastern Ontario to act as building and plumbing inspector and to assist in the engineering department. Full employee benefits, salary according to qualifications. Apply to File No. 3037-V.

ELECTRICAL

GRADUATE ELECTRICAL ENGINEER, required by firm located in Ontario. Applicant must be capable of both sales and development work. Development work would involve the preparation of schematic and actual wiring diagrams and field service work. Apply to File No. 1500-V.

THE PUBLIC SERVICE OF CANADA requires Electrical Engineers (electronics and communications). Appointments at Ottawa, Toronto and Montreal. Salaries up to $4,740.00 per annum. Details and application forms may be obtained by writing Civil Service Commission, Ottawa. Competition No. 50-158-B. Apply to File No. 2016-V.

ELECTRICAL ENGINEER with at least five years professional experience, a substantial part of which should have been in hydro-electric central station and substation design. Salary $325.00 to $400.00 per month depending on qualifications and experience. Location Victoria, B.C. Apply to File No. 2073-V.

ELECTRICAL ENGINEER required by large organization in Montreal with about five years experience in general electrical engineering, preferably in the transportation field. Salary range $350.00 to $400.00 per month. Apply to File No. 2074-V.

YOUNG ELECTRICAL ENGINEER with about three years experience required by manufacturer located in Montreal. Applicant would be obliged to do some mechanical work in general plant engineering. Apply to File No. 2075-V.

ELECTRICAL ENGINEER required to head the departments of power engineering and electrical technology in the Indian Institute of Science, Bangalore. Candidate should have a doctorate or master's degree in electrical engineering from a recognized university, 15 years' experience in a responsible position in large power project, experience in guiding research and in the execution of large power projects. No age limit is prescribed. Duties will involve instruction of personnel. This is the foremost research institution in India, and has well established post graduate departments of aeronautical engineering, electrical communication engineering, metallurgical engineering, internal combustion engineering, power engineering, and electrical technology and chemical engineering and chemical technology. Post of head of the power engineering and electrical technology departments has been vacant for some time. Apply to File No. 2077-V.

ELECTRICAL ENGINEER, who is familiar with and particularly interested in the application of control equipment and the producing of wiring diagrams, required by manufacturer of conveying machinery located in Ontario. Apply to File No. 2082-V.

ELECTRICAL ENGINEER, with at least 4 years experience in electrical field, preferably on substation layout and installation, required by P.U.C. with a total load of about 250,000 H.P. and operate their own generating stations. Location about 100 miles north of Toronto. State wages expected, age, etc. Apply to File No. 2096-V.

ELECTRICAL DRAUGHTSMAN, with at least 6 years experience required by P.U.C. of about 250,000 H.P. State wages expected, age, etc. Apply to File No. 2096-V.

EXPERIENCED ELECTRICAL ENGINEER, preferably between 28 and 35 years of age required by paper industry located in Ontario. Not absolutely necessary, but preferably with design and practical experience in pulp and paper mill. Apply to File No. 2083-V.

ELECTRICAL ENGINEER required in Ontario with experience in the application of electrical wire and cable, or electrical engineer who has had at least a few years experience in some aspect of the electrical cable industry, either with a cable manufacturer or in the distribution department of a public utility. Salary open. Apply to File No. 2097-V.

ELECTRICAL ENGINEER required in Ontario. Age 25 to 35 years. Duties include product design development and engineering of small AC and DC motors. Excellent starting salary and future prospects. Apply to File No. 3041-V.

ELECTRICAL ENGINEERS REQUIRED by large Canadian Manufacturer for application engineering and negotiation work on electrical apparatus to specialize in specific industries such as: Central Station, metal working, transportation, paper and pulp, rubber, mining and chemical, marine. Applicants should have high intelligence, commercial sense, sound engineering background, pleasing personality. Exceptionally interesting, well paid work for men with necessary high qualifications. Some travelling. Apply to File No. 3043-V.

ELECTRICAL ENGINEER required by large manufacturer in Montreal of power plant equipment. Applicant should have about 4 years experience in design of transformers. Salary open. Apply to File No. 3059-V.

MECHANICAL

MECHANICAL ENGINEER required by large firm in Montreal to act as railroad car engineer. Applicant should have 2 or 3 years (or more) of experience in the design of tank cars, as defined by the Association of American Railroads. Familiarity with the requirements of the A.A.R., the I.C.C., the Bureau of Explosives and the Board of Transport Commissioners is essential. Salary open. Apply to File No. 1600-V.

MECHANICAL ENGINEER required by large firm in Montreal. Applicants should have experience in the pulp and paper industry, particularly in the design and for operation of paper making machinery. One or two years experience desired. Salaries open. Apply to File No. 1600-V.

MECHANICAL ENGINEER required immediately for sales department. Large company requires the immediate services of a mechanical engineer, for its sales department, preferably bilingual. This is a permanent salaried position, with well established company. State age, education and outline all experience. All replies treated in confidence. Apply to File No. 1620-V.

MECHANICAL ENGINEERS required by large manufacturing firm located one hundred miles from Montreal. Excellent opportunities for experience and promotion in time study standards department eventually leading to shop management. Apply to File No. 1621-V.

CHIEF MECHANICAL ENGINEER or assistant chief mechanical engineer required by large firm of consultants in Toronto. Salary open. Apply to File No. 2068-V.

MECHANICAL ENGINEERS with experience in process layout, design of steam plants, water supply systems and sewage and industrial waste treatment facilities. Salaries commensurate with experience. Apply to File No. 2068-V.

MECHANICAL ENGINEER with at least two to three years' experience in the design and job fabrication of A.S.M.C. pressure vessels and heat exchangers required for design, estimate and inspection work by engineering company located in Montreal. Salary commensurate with ability. Apply to File No. 2070-V.

MECHANICAL ENGINEER required by engineering college, Guindy, India, to organize new department of production engineering and to train students for their master's degree in production engineering. Candidate should have a basic degree in mechanical engineering, a doctor's degree in production and industrial engineering, five years experience in a production workshop, five years experience in an engineering institution, preparing students for a standard degree and five years experience in directing research, leading to a master's degree in a recognized university. No age limit. Apply to File No. 2077-V.

MASTER MECHANIC required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidate should have considerable experience as a mechanic and have held responsible positions in the field of mechanical engineering. Age, about 45 years. Duties will involve supervision of the operation and maintenance of machines employed on river valley projects, such as the construction of large concrete, earth and other types of dams, large power houses and transmission systems and the excavation of canals. He will also be required to train Indian personnel working under him. Apply to File No. 2077-V.

SEVERAL 1951 mechanical engineering graduates required by pulp and paper industry located in the Province of Quebec. Apply to File No. 2081-V.

YOUNG MECHANICAL ENGINEER required by manufacturer of various types of machinery located in Montreal, for extensive design. Good opportunity to right man interested in this type of work. Apply to File No. 2092-V.

YOUNG MECHANICAL ENGINEER to act as expeditor in the purchasing department of organization in Montreal. Applicant should be between 30 to 35 years and be free to travel 50% of the time. Material handled would be all types of heavy equipment in connection with smelting plant. Apply to File No. 3019-V.

MECHANICAL ENGINEER required by organization in Montreal. Applicant should have had experience in production planning and the design and application of mechanical equipment to production operations. Duties will include research and the development of mechanical equipment for one of the primary industries. Preferably single and free to travel. Apply to File No. 3020-V.

MECHANICAL ENGINEER 1949 or 1950 graduate with some experience in heating or combustion engineering or ventilating and air conditioning, required by firm in Montreal. Apply to File No. 3021-V.

MECHANICAL ENGINEER required by firm of consultants in Montreal with some knowledge of heating and ventilating. Apply to File No. 3023-V.

MECHANICAL ENGINEERS 1950 graduates required by manufacturer in Montreal of heavy industrial equipment. Salary open. Apply to File No. 3030-V.

MECHANICAL ENGINEER, with 3 to 5 years experience in steam plant design and layout, required for draughting, design and project engineering in West Coast consulting engineers' office. Salary open. Apply to File No. 3040-V.

MECHANICAL ENGINEER required by architect's firm in Ontario. Applicant should be 30-45 years of age and a graduate mechanical engineer and have from five to ten years experience in the design of heating, ventilating, plumbing and electrical installations. Starting salary will be $4,500 to $6,500 depending on qualifications. Apply to File No. 3042-V.

MISCELLANEOUS

GRADUATE ENGINEER with three to four years welding experience in metal fabricating plant is required by a firm manufacturing gases and welding equipment. Position involves technical assistances to firms in the correct application of various welding processes. Salary commensurates with experience and qualifications. Apply to File No. 2071-V.

GEOLOGISTS: Two required by the engineering, geology and ground water division of the geological survey of India. One should be a specialist in ground water and the other in the investigation of dam sites. Duties will involve geological studies and investigations, assisting the director in coping with the large amount of work this division is called upon to perform. Ages, between 35 and 50. Apply to File No. 2077-V.

DESIGNING ENGINEER required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidates should have considerable experience in the design of high tension transmission lines and tower structures. Age 45 to 50 years. Duties will involve design of high tension transmission lines and tower structures, in connection with large hydro-electric projects. He will also be required to act in an advisory capacity on the design of transmission lines, and to train Indian engineers working with him. Apply to File No. 2077-V.

MASTER ELECTRICIAN required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidate should have considerable experience as an electrician and have held responsible positions in the field of electrical engineering. Age about 45 years. Duties will involve supervision of the operation and maintenance of electrical machinery employed on river valley projects, such as construction of large concrete, earth and other types of dams, large power houses and transmission systems. He will also be required to train Indian personnel working under him. Apply to File No. 2077-V.

WORKSHOP FOREMAN required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidate should have considerable experience in the management of large workshops, in the manufacture of gates for dams, spillways, canals, sluices, and in the manufacture of electrical transmission towers. Age, about 45 years. Duties will involve supervision of large workshops reqiured during construction of river valley projects and the instruction of Indian personnel working under him. Apply to File No. 2077-V.

POWERHOUSE FOREMAN required for central waterpower, irrigation and navigation commission, New Delhi, India. Candidate should have considerable experience in the erection and maintenance of large hydro electric power plants. Age, about 45 years. Duties will involve erection and maintenance of diesel power houses for the supply of power on river valley projects, together with the erection and maintenance of large power houses, in connection with hydro electric projects. He will also be required to train Indian personnel working with him. Apply to File No. 2077-V.

INDUSTRIAL ENGINEER required by firm of management consultants. Should be experienced in plant layout, production control, time studies, wage incentives, cost and budget controls. Age 35 to 60. Free to travel. Apply to File No. 2079-V.

ENGINEERS required in the manufacturing department of large electrical organization located in Ontario. Duties include the lineup of operations and tooling, to initiate cost reduction programmes, to lay-out departments, etc., on various products. Limited number of openings in production control, foundry work and in test work. Apply to File No. 2080-V.

PLANT ENGINEERS are required to do engineering work in connection with plant expansion and with plant maintenance, particularly along electrical lines. Location Ontario. Apply to File No. 2080-V.

DESIGN ENGINEERS required by large electrical organization in Ontario. Engineers are required to do both mechanical and electrical design but principally the latter on all types of electrical equipment. Specific experience is desired but not absolutely necessary. Apply to File No. 2080-V.

CIVIL OR MECHANICAL ENGINEER required by paper industry located in Ontario. Applicant should have design and practical experience, preferably five or six years in pulp and paper mill. Apply to File No. 2083-V.

MECHANICAL AND CHEMICAL ENGINEERS required in the control department of paper mill located in Newfoundland. Applicants must be interested in control and process work. Salaries open. Apply to File No. 2085-V.

RESIDENT ENGINEERS AND INSTRUMENTMEN required for work on the construction of the Quebec North Shore and Labrador Railway. Applicants should have some experience on highway work. Good working conditions. Salaries open. Apply to File No. 2086-V.

POSITIONS AVAILABLE with The Consolidated Mining and Smelting Company of Canada Limited, at Trail, B.C., for experienced mechanical, structural and electrical designers and draughtsmen, for work connected with the design and layout of equipment and buildings in our mining, metallurgical and chemical and fertilizer plants. Application should be made in writing giving full particulars on education, experience and stating approximate salary expected, to the manager, Personnel Division at the above address. Apply to File No. 2090-V.

MECHANICAL DRAUGHTSMAN with at least three to five years experience in equipment tool and jig work for Montreal office. Supply full details in first letter. Apply to File No. 2091-V.

STRUCTURAL STEEL AND REINFORCED CONCRETE DETAILERS for Montreal office with a minimum of five years experience in either field. State full particulars in first letter. Salary open. Apply to File No. 2091-V.

TOOL ENGINEERS and patent lawyer required by large automotive industry in Ontario. Apply to File No. 2094-V.

RESEARCH SCIENTIST to conduct research and development in food packaging and packing. This will involve work independently and in co-operation with manufacturers and other agencies on suitable container materials and methods of container fabrication and will require a knowledge of such materials as paper and paper products, plastic films, metal foils, metal cans, enamels, adhesives, inks, etc. Applicants should have a Ph.D. or M.Sc. degree in chemical engineering, organic chemistry, or physical chemistry and should have had some industrial experience with the container materials mentioned above. Upply to File No. 2095-V.

TOWN ENGINEER required in Ontario. Duties to commence any time after April 15, 1951. Apply to File No. 2099-V.

A MATURE GRADUATE ENGINEER with 10 years experience in the operation of ore dressing and hydrometallurgy plants is required, to take charge of hydrometallurgical ore treatment plant of 750 tons per day with ultimate capacity 1500 to 2000 tons. Position requires sound background in chemistry and chemical plant control equipment. The position offers excellent opportunities for advancement in a growing organization. Reply with full details of experience, educational background, marital status to File No. 3002-V.

WE ARE SEEKING a top quality business minded engineer with good executive drive for a new and modern coal mining operation in Alberta. Both strip and underground operations are involved. This man will work with the mine manager and be responsible to the managing director for all business aspects; planning, control, purchasing, etc. Underground mining experience is not a prerequisite but some experience in business administration and/or in dirt moving operations with heavy equipment would be desirable. Present accommodation is limited but the opportunity for other interests controlled by the same principals, is excellent. The salary is open. Apply to File No. 3004-V.

YOUNG GRADUATE ENGINEER, preferably two or three years experience in instrument process controls, sales and estimating work. Preferably bilingual but not essential. Salary depending on experience. Apply to File No. 3005-V.

ENGINEERS REQUIRED by firm of consultants in Montreal. Civil, mechanical, electrical and structural engineers and draughtsmen also petroleum engineer required with some experience. Salaries open. Apply to File No. 3007-V.

EXPERIENCED INSTRUMENT ENGINEER required in Montreal. Permanent appointment for a man between 25 and 35 years of age and A.I. medical category. He should be able to select proper equipment for new jobs also interpret results and calculate correction factors of instruments. He must have experience and ability to organize instrument maintenance and carry out normal repairs. Apply to File No. 3010-V.

WANTED RESEARCH SCIENTIST. Salary $5,850 to $6,850 depending on qualifications and experience. Duties to direct laboratory research and pilot plant development work in the chemistry of explosives and propellants. University graduates preferably at the Ph.D. level; five to ten years' experience in explosives or propellant research or in related fields: administrative experience. Canadian citizen. Apply to File No. 3011-V.

STRUCTURAL DESIGNERS AND DRAUGHTSMEN, familiar with structural steel and reinforced concrete work required by firm of consultants in Toronto. Apply to File No. 3012-V.

ENGINEERS REQUIRED by firm of consultants in Toronto capable of taking responsibility for phases of electronic and mechanical equipment sales and engineering, mining or industrial plant construction. Apply to File No. 3012-V.

DESIGN ENGINEERS, mechanical or chemical required in Ontario. Should have one or more years' experience in the chemical or allied industry. Salary open. Apply to File No. 3015-V.

SAFETY ENGINEER assistant, recent graduate in chemical or mechanical engineering with an interest in plant safety work. Location Ontario. Salary open. Apply to File No. 3015-V.

ELECTRICAL AND MECHANICAL ENGINEER required by electrical organization in Ontario, presently engaged in the conversion programme of industrial firms. Applicants should have some industrial experience. Apply to File No. 3017-V.

RESIDENT ENGINEERS required by firm of consultants in Ontario, for large construction projects. Applicants should be experienced and be thoroughly bilingual. Apply to File No. 3022-V.

ESTIMATOR, preferably graduate engineer experienced in quantity survey as relative to building construction. This is a permanent position with a good salary and the prospects for advancement would be excellent for the right man. Location Ontario. Apply to File No. 3026-V.

SALES & SERVICE ENGINEER in the water treatment field for manufacturer supplying chemicals and equipment to all types of industries throughout Canada. Engineering graduates with 2 or 3 years experience or 1951 graduates. Territory Quebec and Ontario with considerable travelling. Car provided, travelling expenses paid. Salary based on qualifications. Apply to File No. 3027-V.

JUNIOR ENGINEER with a knowledge of sanitary engineering required by large inter-municipal corporation in Western Canada. Duties include preparation of plans and specifications, to layout and supervise construction and maintenance, to make reports of investigations of special engineering problems. The immediate problems are additions to present facilities and enforcement of the regulations to industrial wastes. Salary open. Apply to File No. 3028-V.

SALES REPRESENTATIVE at Montreal & Toronto by British machinery and tool importers, experienced in pulp and paper making machinery of value but not essential. Apply to File No. 3033-V.

VACANCIES EXIST with major oil company having operations in several South American countries for:—District Electrical Superintendent, Electrical Engineer, Senior Chemist (refinery), Assistant Chief Chemist (refinery), Junior Mechanical Engineer. Interested parties should submit full details of qualifications. All replies will be held in the strictest confidence and should be addressed to File No. 3034-V.

OPPORTUNITIES for experienced technical personnel to enter the aircraft industry under a conversion training programme. Designers, draughtsmen and lofts men with two years or more experience in technical industry are urgently needed for training and assignment to our design staff. Five day week with paid overtime; expanding organization offering advancement; starting salaries dependent on background; promotions granted on basis of merit. Write giving resume of training and experience to File No. 3036-V.

THE PUBLIC SERVICE OF CANADA requires an engineer, a graduate in mining or metallurgical engineering with training in mineral economics $4272.00 $4896.00, for the department of mines and technical surveys at Ottawa. Details and application forms at Civil Service Commission Offices, National Employment Service Offices and Post Offices. Apply to File No. 3039-V.

GRADUATE ENGINEER required in Joliette, Quebec. No experience necessary. To take training course in the operation of steel foundry making a large variety of miscellaneous castings. Knowledge of French helpful. Salary open. Apply to File No. 3054-V.

ASSISTANT RESIDENT ENGINEER required in Vancouver, B.C., for Granville Bridge. Qualifications required are preferably university graduate in civil engineering or structural with a minimum of three to four years field experience in construction work, or equivalent. Interviews would be conducted with persons now in vicinity or those willing to go to location. Apply to File No. 3062-V.

Situations Wanted

GRADUATE PRACTICAL MECHANICAL ENGINEER with foremanship record, health, married, 39, bilingual, pilot, also experienced in aeronautics, civil, hydraulical and some electro-electronic engineering wishes serious assignment abroad in southern climate, preferably in British possessions. Apply to File No. 140-W.

ELECTRICAL ENGINEER, aged 36, 1st class honors degree, P.Eng., M.E.I.C., A.A.I.E.E., A.M.I.E.E. Apprenticeship and erection experience with large electrical manufacturing company and 10 years experience as electrical engineer for large industrial companies — all companies are of world renown. Two years Canadian experience. Desire post as electrical engineer for industrial company or other suitable post preferably in Southern Ontario or British Columbia. Available at short notice. Apply to File No. 391-W.

ELECTRICAL ENGINEER, S.E.I.C. graduate Nova Scotia Technical College 1950, married, veteran, 34, presently employed by large cable manufacturing company in Montreal as a junior development engineer in their electrical laboratory, desires position in Nova Scotia preferably Halifax area. Previous experience in surveying, communications, d.c. machinery. Willing to accept position in any branch of electrical engineering including sales. Available for interview in Montreal anytime and in Nova Scotia in July 1951. Apply to File No. 1325-W.

CIVIL ENGINEER, Jr.E.I.C., P.Eng. (Ontario) B.Sc (Hons) Birmingham, England 1948. Age 28. Single. Ex-Sapper, Field Engineers of Union Defence Force (South Africa). Presently employed in temporary position in Toronto. Seeks permanent employment where hard work and initiative will lead to advancement. Fifteen months experience in municipal roads and drainage work in South Africa, including surveying, design and supervision. Also eleven months with waterworks in Canada on design of steel and reinforced concrete structures and writing of specifications. Willing to work anywhere. Apply to File No. 1465-W.

MECHANICAL ENGINEER, M.E.I.C., U.B.C., 1936. Age 37, married. 3 years experience as designer in paper machinery department of large manufacturer. 5 years as senior officer in the A.I.D. of the R.C.A.F. engaged on technical and administrative duties. 6 years as engineer in the paper and saw milling industry on the west coast, engaged on the layout, design and installation of wood-handling plant and equipment, including considerable experience in the design and erection of timber, steel and concrete structures. Desires position as resident engineer or senior engineering position covering industrial planning and development. Apply to File No. 1965-W.

INDUSTRIAL AND CIVIL ENGINEER, B.A.Sc., 1939, M.E.I.C., Prof. Eng., age 42, married, thoroughly bilingual. Experience: all phases of production, sales, maintenance, construction. Available on short notice. Apply to File No. 2157-W.

WORKS MANAGER and administrator with experience in mechanical, electrical and civil engineering work open for appointment. Apply to File No. 2429-W.

ENGINEER, MECHANICAL, M.E.I.C., interested in position offering opportunity as representative, plant or assistant engineer. Experience includes twelve years design, construction and maintenance with pulp and paper industry. Age 40, married. Apply to File No 2642-W.

MECHANICAL ENGINEER, M.E.I.C., Queen's, 1936, age 38, married. Currently engaged in research work, 2½ years. Desire to return to industrial or commercial field in Toronto district. Have had the following experience since graduation: About 10 years diversified work in plant engineering embracing dust control, 2½ years; application of control to metallurgical processes (primary metal producers), 3 years; industrial ventilation and air-conditioning, 1 year; general plant maintenance, 3½ years; about 2 years steel forging experience in small plant covering purchase, installation, and operation of equipment. Would be available at reasonable notice to present employer. Apply to File No. 2936-W.

ELECTRICAL ENGINEER, S.E.I.C., B.A.Sc., P.Eng., Laval 1950. Age 24, bilingual, single. Experience: 3 summers in workshops of RCEME; electrical estimator; inspection, reports, recommendations on electrical installations of mines. Would accept position in any branch of electrical engineering including sales. 2 weeks notice. Apply to File No. 3276-W.

GRADUATE MECHANICAL ENGINEER, M.E.I.C., with extensive experience at draughting, designing and estimating of all types of plate, structural and machine work, now fully employed, desires part time work for evenings and weekends. Apply to File No. 3367-W.

MECHANICAL ENGINEER, Toronto, Jr.E.I.C., P.Eng. Age 29, married. Wishes to join a medium sized company to cooperate with management in reducing manufacturing costs by better production. Five years experience as chief engineer in charge of production and product design. Accustomed to working closely with shop and inspection department. Capable of acting as group leader and of assuming full responsibility relative to tooling, processing, and plant layout for increased productivity. Interested in working into management position. Apply to File No. 3361-W.

CIVIL ENGINEER, M.Sc., M.E.I.C., P.Eng. age 39. Practical experience since 1934 in design of reinforced concrete and steel structures (warehouses, factory buildings, power station, boiler houses, heavy foundations, hydraulic structures, oil refinery plants, gas plants, jetties) estimate and surveying. Seeks position in Ontario or Quebec. Apply to File No. 3369-W.

BRITISH DIESEL AND ELECTRICAL ENGINEER, A.M.I.E.E.; six years electrical officer R.N.V.R.; nine years commercial experience in U.K., Malaya and Ceylon in sales, contracts and servicing equipment ranging from generation to household appliances; accustomed to executive responsibility and currently chief engineer for leading British firm in Ceylon; has had brief experience of conditions in Canada and desires progressive position and permanency there Aged 36. Available July. Wife Canadian Apply to File No. 3398-W.

BRITISH CIVIL ENGINEER, 27 years of age, single. Graduate of Trinity College, Dublin, with B.A. degree geology; and B.A.I. in civil engineering. Technical officer with Royal Engineers, 5 years practical engineering experience. Presently employed in Canada. Desires position with a future, possibly administrative where academic training, technical knowledge and personal qualities may be combined. Willing to work hard and accept responsibility. Apply to File No. 3400-W.

GRADUATE ENGINEER, Jr.E.I.C., University of Saskatchewan, 1948. Age 25, single and in good health. Three years experience in farm implement design. Seeks employment in design or production engineering. Willing to undertake any required training. Presently employed but desires position leading to responsibility. Available on short notice. Apply to File No. 3472-W.

PLANT ENGINEER of medium sized company, Mechanical, McGill, 1948, Jr. E.I.C. Veteran, single, 27 years, desires affiliation with medium or large concern. Undertook and completed movement of two plants. Designed, costed and implemented major changes and installation of boiler house, air compressor house, air exhausting systems, electrical mains, instruments, heating and steam process mains. Staff of approx. 100, 20% licensed tradesmen. Collection of basic production machine data for time loading, scheduling, etc. Other studies and training courses. Excellent references. One month's notice. Apply to File No. 3476-W.

CIVIL ENGINEER, S.E.I.C., B.Sc., U.N.B., 1950. Navy veteran, age 26, married with one child. Have considerable experience in highway construction in N.B. References on request. Apply to File No. 3477-W.

CIVIL ENGINEER, Jr.E.I.C., B.Eng., McGill, 1949, age 26, married, presently employed by construction firm in Montreal, would offer services for part-time employment in designing, estimating, etc., related to varied fields of building construction, especially reinforced concrete, steel or timber structures and foundations. Apply to File No. 3480-W.

ELECTRICAL ENGINEER, Jr.E.I.C., 1949, graduate of the University of Manitoba, about to complete two year apprenticeship in England, seeks employment in Canada, as from August, 1951. Experience includes testing of instrument transformers, testing of A.C. and D.C. motors and generators, 6 months in D.C. machine design engineers office, 3 months in electronic development laboratory, 6 months erection of steel mill rolling equipment. Undergraduate experience includes summer employment as student engineer, in steel plant. Apply to File No. 3481-W.

GRADUATE ENGINEER, Jr.E.I.C., honors graduate, McGill 1949, married, overseas R.C.A.F. veteran. Varied experience in the field of production control and planning, methods analysis, time study, quality control and allied engineering subjects. Desirous of obtaining a position in the management sphere. Location, Toronto area. Available immediately. Apply to File No. 3482-W.

CIVIL ENGINEER, B.Eng., McGill 1944, M.E.I.C., P.Eng., married with two children, veteran R.C.E. Have had about ten years experience in construction, maintenance and industry including long-range planning, design and economic studies; also supervision and inspection as resident engineer. Familiar with general office routine and accounting procedures. Proven ability to handle labour, direct staff work and meet the public. Now enrolled in course on Modern Business with Alexander Hamilton Institute. Present employment highly responsible but wish to locate in Montreal area. Ambitious toward executive position requiring engineering and business training. Apply to File No. 3486-W.

CHEMICAL ENGINEER, B.A.Sc. Excellent background. 8 years experience. Presently employed on large scale production supervision. Seeks position of responsibility with promising future. Preferably in Ontario. Married, 3 children. Apply to File No. 3487-W.

ELECTRICAL AND MECHANICAL ENGINEER, S.E.I.C. Age 24. Experience 12 months powerhouse electrician (Des Joachims). Graduating end of May. Undertaking valuation of European power plants this summer. Available October 1st. Interested in power plant equipment and operation—diesel, steam or hydraulic. Apply to File No. 3488-W.

GRADUATE ENGINEER with qualifications and experience to handle positions as works manager or plant superintendent, extensive experience in connection with mechanical equipment, of mining and metallurgical industries as well as industries as well as in metal-working establishments. Presently employed in responsible position. Interested in either domestic or foreign assignment. Apply to File No. 3493-W.

MECHANICAL ENGINEER, Jr.E.I.C., Sask., 1949. Age 27, married, ex-R.C.A.F. One year in office of management engineering company dealing with electric public utilities and one year in diesel plant (10,000 H.P.) of a Canadian public utility operating in South America—acting as Junior Engineer, Chief Operator and in charge of cooling water testing and treatment. Desire work in Canada along similar lines or in diesel field. However am willing to consider other work that has good opportunities for person willing to take responsibility. Location Ontario or west. Apply to File No. 3494-W.

MECHANICAL ENGINEER Jr.E.I.C. Graduate University of Saskatchewan, 1950. Single, age 23. Have been employed in non technical work in the west. Desire position in maintenance or plant engineering work with an opportunity to gain experience and advancement. Type of position more important than remuneration. Apply to File No. 3495-W.

ELECTRICAL ENGINEER, M.Sc., Jr. E.I.C., completing a two year graduate training course with a large electrical manufacturer, seeks to better his position. Would consider professional employment with any progressive manufacturer or consulting engineer, however, prefer British Columbia or Alberta. Apply to File No. 3499-W.

ELECTRICAL ENGINEER: Sask., 1950. Three summers experience as electricians helper with industrial concerns. Also experienced in the installation of large power equipment. Desires position with consultant firm or in city engineering department. Available upon short notice. Married veteran with one child. Apply to File No. 3500-W.

MINING AND STRUCTURAL ENGINEER, M.E.I.C. and P.Eng. Married. With long experience in open pit and underground mining, in design and inspection of construction dwellings, mine and mill buildings, railway trestles and conveyor belt trestles. At present employed. Available September 1st, 1951. Apply to File No. 3507-W.

Attention, Members

Please telephone in advance and make an appointment if you propose using the Institute's Employment Department.

This will result in a better service to everyone concerned.

TELEPHONE PLateau 5078

Except in special cases all interviews will be arranged between the hours of 9 and 12.

SENIOR MECHANICAL ENGINEER, M.E.I.C. Four years' experience as chief engineer with small company. Nine years on board as designer. Sixteen years' total experience with medium to heavy machinery including hydraulic presses, forging machines, valves, pumps, controls, boilers, tanks, etc. Also in change plant services and maintenance. Organization and administration. Experienced writer and lecturer. Apply to File No. 3508-W.

ENGINEER, M.E.I.C., P.Eng., Quebec, University Sask. '26, with 25 years varied experience on construction, design and management of public utilities, public works and housing developments in all parts of Canada desires partnership in consulting firm or management position where experience can be of value. Initiative, good judgment and tact. Ability to organize effectively. Knowledge of legal and accounting aspects of construction. Available now. Apply to File No. 3511-W.

CHEMICAL ENGINEER, Prof. Eng. (Quebec) Jr.E.I.C. Three years experience in industry and presently employed. Bilingual. Worked on chemical control, industrial research. Also supervising experience. Would like position as engineer along following lines. Industrial research. Designing (chemical field). Consulting assistant. Applicant is mechanically inclined and has good creative imagination. Apply to File No. 3514-W.

GRADUATE MECHANICAL ENGINEER, Sask., 1948, Jr.E.I.C. Single, R.C.A.F. veteran. Experience in production control, method analysis, time study, cost control and industrial relations. Desires a change into a field of engineering that will give more opportunity to practice mechanical engineering. Willing to work for moderate salary to gain experience. Apply to File No. 3516-W.

EXPERIENCED ENGINEER, A.M.I.C.E., M.E.I.C., age 31. 14 years combined civil mechanical background. Design and construction in roadworks, water supply, sewage systems and large factory construction in U.K. Hydro-electric construction and investigation in U.K. and Canada. Geophysical investigation and deep well drilling and operation for water supply in N. Africa. Aircraft component design and machine shop practice in U.K. Require progressive position where experience may be utilized combined with aptitude for administration organization and production. Apply to File No. 3435-W.

BRITISH SUBJECT, chartered electrical engineer, apprenticeship trained, presently holding technical and commercial managerial appointment in branch works of one of the premier manufacturing electrical companies in England, wishes to contact Canadian principals with view to ultimate emigration to Canada or with Canadian subsidiaries overseas. Three years wartime experience of Canada. Canadian references. Six years commissioned Naval Service. Age 37. Married. Apply to File No. 3463-W.

ELECTRICAL ENGINEER, Sask., 1950, S.E.I.C., P.Eng., age 30, married, veteran. Desires permanent employment anywhere in Canada. Experience includes 4 years radar mechanic, one summer sales, several months practical experience on wiring and installation of transformer banks switch gear, motors, etc. Apply to File No. 3464-W.

AERONAUTICAL ENGINEER, Jr.E.I.C., graduate Mass. Institute of Tech., age 28, married, good health. Seven years experience with major airline on aircraft specifications and negotiations, mock-up, stress analysis, performance calculation, aircraft evaluation, detailed design, testing, report writing, correspondence, administration. Hard worker, willing to take responsibilities. Apply to File No. 3470-W.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

ABSTRACT

INSTITUTION OF ELECTRICAL ENGINEERS

The Automatic Monitoring of Broadcast Programmes:

H. B. Rantzen, F. A. Peachy and C. Gunn-Russell. (IEE proof No. R 1045).

The paper describes apparatus by means of which the British Broadcasting Corporation hopes to release for other services personnel who have been employed in keeping a listening check on the technical quality of its programmes. The apparatus performs its task not by judging from an absolute basis—as has so often been done by the staff employed for this purpose—but by comparing the content of the programme at a point where it has already been checked with that at a more distant point. Where it is impracticable to return the programme to the same point for checking purposes, it is synthesized into a band of information in which the factors to be judged are specially emphasized. The narrow band is transmitted for checking purposes over any convenient channel that can be derived from existing circuits.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Canadian Almanac and Directory for 1951:

Ed. by Marsh Jeanneret and Beatrice Logan. Toronto, Copp Clark Co., c 1951. 838 pp., $8.50.

Chemical Engineering Costs:

O. T. Zimmerman and Irvine Lavine. Dover, New Hampshire, Industrial research service, 1950. 419 pp., illus. $8.00.

Chemical Engineering Costs Supplement; Jan. 1950, v. 1, No. 1:

O. T. Zimmerman and Irvine Lavine. Dover, New Hampshire, Industrial Research service. 15 pp. (Being a quarterly supplement to "Chemical Engineering Costs," by the same authors. Yearly subscription $6.00.)

Civil Engineering Handbook; 3rd ed.:

L. C. Urquhart. Toronto, McGraw-Hill, 1950. 1022 pp., illus., $11.05.

Design of Prismatic Structures:

A. J. Ashdown. London, Concrete publications, c 1951. 65 pp., illus., $1.85.

Dimensional Analysis and Theory of Models:

H. L. Langhaar. New York, Wiley, c1951. 166 pp., $4.00.

Fourier Integral and Certain of its Applications:

Norbert Wiener. New York, Dover, 1951. 201 pp., $3.95.

Mathematical Methods in Electrical Engineering:

M. B. Reed and G. B. Reed. New York, Harper, c1951. 338 pp., $5.00.

Metal Processing; 2nd ed.:

O. W. Boston. New York, Wiley, c1951. 763 pp., illus., $7.50.

Oil for the World:

Stewart Schackne and N. D'Arcy Drake. New York, Harper, c1950. 128 pp., illus., $2.50.

Ordnance Production Methods; a Collection of articles published in "Machinery" describing manufacturing operations on rifles and small arms, machine guns, bullets, shells, cartridge cases, guns, bombs, tanks and other weapons of war:

Ed. by C. O. Herb. New York, Industrial press, c1951. 534 pp., illus., $10.00.

Organic Reagents for Organic Analysis:

Hopkin and Williams Research Laboratory. Brooklyn, Chemical Publishing Co., 1950. 263 pp., $5.00.

Pocket-book for Miners and Metallurgists; 5th ed.:

Compiled by F. D. Power. Toronto, Pitman, 1950. 545 pp., illus., $6.25.

Prefabrication of Houses; a study of the Albert Farewell Bemis Foundation of the prefabrication industry in the United States:

Burnham Kelly. New York, Wiley, c1951. 465 pp., illus., $7.50.

Pulse Techniques:

Sidney Moskowitz and Joseph Racker. New York, Prentice-Hall, 1951. 300 pp., illus., $6.65.

Quakers in Science and Industry: being an account of the Quaker contributions to science and industry during the 17th and 18th centuries:

Arthur Raistrick. New York, Philosophical library, c1950. 361 pp., illus., $6.00.

Radio and Television Receiver Circuitry and Operation:

A. A. Ghirardi and J. R. Johnson. New York, Rinehart, c1951. 669 pp., illus., $6.50.

Scholarship, Fellowships and Loans, v. 2:

S. N. Feingold. Boston, Bellman, c1951. 312 pp., $5.00.

Servomechanisms and Regulating System Design, v. 1:

Harold Chestnut and R. W. Mayer., New York, Wiley, c1951. 505 pp., illus. $7.75.

Silicate Melt Equilibria:

Wilhelm Eitel. New Brunswick, New Jersey, Rutgers University Press, c1951. 159 pp., illus., $5.00.

Tableaux, Abaques et Calculs Pratiques Relatifs aux Engrenages:

G. Henriot. Paris, Dunod, 1951. 160 pp., 1450 fr.

Technical Publications 1948 (of Standard Oil Company, New Jersey, and affiliate companies):

A. E. Becker ed. New York, Standard Company (New Jersey), c1950. 512 pp., illus.

Technique du Vide:

Maurice Leblanc. Paris, Armand Colin, 1951. 187 pp., illus., 200 fr.

Thermodynamics, 2nd ed.:

G. A. Hawkins. New York, Wiley, c1951. 563 pp., illus., $6.50.

Voltage Regulator Manual:

R. J. Everest. New York, Macmillan, c1951. 185 pp., illus., $3.25.

PAMPHLETS, TECHNICAL BULLETINS, ETC.

Cements Used in Chemical Plant Construction:

R. Ward. London, Doulton & Co., n.d. (Reprint from "The Industrial Chemist" Feb.-June, 1944, revised 1950).

Code for Dwelling Construction for Buildings Housing One or Two Families; minimum standards to regulate the erection and provide for the safety of buildings:

Ottawa, Associate committee on the national building code, National Research Council, 1950. 25c.

Metallic and Non-metallic Coatings for Gray Iron:

C. O. Burgess. Cleveland, Gray Iron Founders' Society, c1950. $1.75.

National Scheme for Certificates and Diplomas in Management Studies

(handbook of courses and examinations):

London, British Institute of Management, 1951. 6/3.

New Zealand Institution of Engineers; Proceedings 1950, v. 36:

Wellington, the Institution, 1950.

Public Ground-water Supplies in Illinois:

Compiled by Ross Hanson. Urbana, Department of registration and education, Division of the State Water Survey, 1950.

Report upon the Collection and Disposal of Refuse in the County Sanitation Districts of Los Angeles County, California:

Prepared by the Districts Joint Administrative Staff. 1950.

Stress Relieving and Fracture Strength:

D. Swan and others. Paper presented at the annual meeting of the American Welding Society, 1950.

Turn Controls in Urban Traffic:

Saugatuck, Connecticut, Eno Foundation for highway traffic control, 1951.

Vacuum—a review of developments in vacuum research and engineering, v. 1, n. 1, Jan. 1951:

Published quarterly by W. Edwards & Co., London.

Welding, Joining and Cutting of Gray Iron:

C. O. Burgess. Cleveland, Gray Iron Founders' Society, c1951. $1.50.

BOOK NOTES

Prepared by the Library
The Engineering Institute of Canada

BRITISH STANDARDS:

British Standards Institution, 24/28 Victoria St., London, S.W.1.

B.S. 148:1951 — Insulating Oil for Transformers and Switchgear. 6/-.

Oils having a tendency to excessive formation of acidity, are excluded from this revision. It has been considered unnecessary to provide a selection of oils having different temperature characteristics, and a maximum pour point of —25°F. (—31.7°C.) has been standardized as suitable for the majority of conditions.

B.S. 235:1951—Gears for Traction, 4/-.

In this revision, care has been taken to ensure that gears made to this new standard shall be interchangeable with those manufactured in accordance with the original 1927 standard. It includes, in addition to provisions for the marking of the gears and details of the basic rack, two tables setting out the preparations of straight spur gear teeth and helical gear teeth of 7.5° spiral angle.

B.S. 903: 1950—Methods of Testing Vulcanized Rubber, 21/-.

The various methods of analysis covered by this standard include: acetone extract, unsaponifiable matter in acetone extract, paraffin wax and ceresin, chloroform extract, alcoholic-potash extract, total sulphur, extractable sulphur, etc. Methods for physical testing for following are also included: accelerating ageing, density and specific gravity, tension stress-strain, tension set, compression stress-strain, hardness, etc., and for ebonite, the following: cross-breaking strength, impact strength, plastic yield, compression strength, etc.

B.S. 1161: 1950—Aluminium and Aluminium Alloy Sections. 5/-.

This is a revision of the 1944 standard, extending it to cover: Equal angle sections ¾ in. x ¾ in. to 9 in. x 9 in. Unequal angle sections 1½ in. x 1 in. to 12 in. x 6 in. Channel sections 3 in. x 1½ in. to 12 in x 4 in. I sections 3 in. x 1½ in. to 12 in. x 6 in. Tee sections 1 in. x 1 in. to 9 in. x 9 in.

B.S. 1501-1506: 1950—Steels for Use in the Chemical, Petroleum and Allied Industries, 12/6.

This publication covers, in effect, four separate standards which deal respectively with: 1. Plates, bars and sections (11 specifications). 2. Forgings (11 specifications). 3. Castings (12 specifications). 4. Bars for bolting material (16 specifications). An appendix explains a rational system of numbering which has been adopted, by means of which an indication can be provided of the type of steel, irrespective of the form.

B.S. 1600-1607: 1950—Wrought Steel Pipe for the Petroleum Industry. 10/6.

This document comprises seven standards, as follows: B.S.1600—wrought steel pipe for the petroleum industry (dimensional requirements and permissible stresses); B.S. 1601—electric fusion-welded carbon steel pipe for use in the petroleum industry (sizes 4 in. up to but not including 30 in.); B.S. 1602—electric fusion-welded carbon steel pipe for use in the petroleum industry (sizes 30 in. and over); B.S. 1603—electric fusion-welded carbon steel pipe for high-temperature service in the petroleum industry (sizes 18 in. and over); B.S. 1604—seamless carbon steel pipe for high-temperature service in the petroleum industry; B.S. 1605—seamless carbon-molybdenum alloy steel pipe for high-temperature service; B.S. 1606—seamless chromium-molybdenum alloy steel pipe for high-temperature service in the petroleum industry; B.S. 1607—seamless alloy steel pipe for high-temperature service in the petroleum industry.

B.S. 1701: 1950—Filters for Air Supply to Internal Combustion Engines and Compressors (other than aircraft). 4/-.

This standard applies to six types of filters, as follows: dry medium, centrifugal, viscous, oil bath, inertia, combination of any of the foregoing. It is mainly a performance specification and deals with the testing of these types of filters and although no dimensions are specified, certain constructional requirements are included.

AMERICAN SOCIETY FOR TESTING MATERIALS' PUBLICATIONS:

American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania.

Special technical publications:

No. 15-C: 1951—Manual on Quality Control of Materials. $1.75.

This new manual is divided in three parts. The first part essentially covers the presentation of data; the second presents the limits of uncertainty of an observed average; the third explains the control chart method of analysis and methods for presentation of data.

No. 90-A: 1950—1950 Supplement to the Metal Cleaning Bibliographical Abstracts:

In order to facilitate reference to the abstracts, they have been thoroughly indexed by subjects, authors, specifications and patents. This publication brings up-to-date the 1949 edition which covers the years 1893 to 1949.

No. 98: 1950—Symposium on Rapid Methods for the Identification of Metals.

The first three papers deal with the general principles of spot testing with chemical reagents, electro spot testing and electrograph analysis, and of modern instrumentation for the rapid identification of metals. In the following papers, specific applications of these methods are described.

LIBRARY REGULATIONS

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9 a.m. - 5 p.m.

Closed all day Saturdays.

Bibliographies and Literary Searches

Short subject bibliographies are compiled on request.

Extensive searches will be made at a charge of $3.00 per hour to members, and $5.00 per hour to non-members.

Please give as much detail as possible when requesting information of either type.

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Books, periodicals, photostats, translation, etc. may be borrowed for two weeks at a time. **A fine of 25c. per day will be charged for each day borrowed items are retained beyond this period.**

A library deposit of $5.00 at par in Montreal is required before items may be borrowed. Books, periodicals, etc. may be ordered by members through the library. All carrying charges are payable by the individual concerned. Except in the case of library deposits, please make **no payments in advance.**

Non-members may consult the library, but may not borrow material.

No. 101: 1951—Symposium on Ultrasonic Testing.

The ten papers and discussions included in this volume represent a summary of the history, theoretical aspects, basic principles of practical testing, and practical applications for the ultrasonic testing of materials. These papers were read at sessions of the Society between June 1948 and June 1950.

No. 107: 1950—Symposium on Plasticity and Creep of Metals. $1.50.

This symposium covers four outstanding phases of plastic deformation and flow of metals. The four papers presented are entitled: "Experimental exploration of plastic flow in sheet metals", "Forming parameters and criteria for design and production", "Use of creep data in design", "Super creep-resistant alloys".

No. 108: 1951—Symposium on Corrosion of Materials at Elevated Temperatures.

The eight papers presented cover coal ash corrosion, stress corrosion, oil ash corrosion, protective coatings, hydrogenizing effect of steam, creep as a surface dependent phenomenon, effect of environment on stress-rupture properties, and preliminary studies of the effect of oxidizing sulfurous atmospheres on the rupture strengths of Inconel "X" and Inconel.

No. 109: 1950—Physical Constants of Hydrocarbons Boiling Below 350°F. $1.00.

Six classes of hydrocarbons are covered in these tables, including paraffins, monoolefins, di-olefins, acetylenes and naphthalenes, and aromatics. Only compounds for which good freezing-point data was available, were tabulated. Bibliographical references included.

No. 110: 1951—Symposium on the Nature, Occurrence, and Effect of Sigma Phase. $2.50.

These eleven studies on sigma phase have brought into play all the methods available to the physicist and metallurgist, to determine what it is, under what conditions of composition, temperature and time it may form, how it forms and decomposes, how its presence may be detected and what may be its effects on the physical, chemical and mechanical properties of the metal.

No. 112: 1951—Symposium on the Role of Non-destructive Testing in the Economics of Production. $2.50.

Two general papers are presented, covering historical background, explanation of the various test methods and generalization on the types of structural irregularities that could be detected. Three additional papers deal with specific applications of various test methods. The final one includes a general summarization correlating the ideas expressed in the previous papers and presenting pertinent views relative to management utilization.

AGRARIAN SOCIALISM; THE CO-OPERATIVE COMMONWEALTH FEDERATION IN SASKATCHEWAN. A STUDY IN POLITICAL SOCIOLOGY:

S. M. Lipset. Toronto, Oxford University Press, c1950. 315 pp., $5.00.

Why and how did isolated prairie farmers in their virtual struggle for existence in the face of climate vagaries and crop failures, vote the CCF party into power in Saskatchewan? Almost wholly dependent on the wheat harvest, and also therefore vitally dependent upon some form of organization or government, who would most probably secure high prices for this crop, the Saskatchewan farmer indicates The Co-operative Commonwealth Federation to be the answer to this need.

Professor Lipset's views on this subject against a background of both American and Canadian mid-western political developments, make interesting and provocative reading.

HANDBOOK OF CORRECTIONAL INSTITUTION DESIGN AND CONSTRUCTION:

United States Bureau of Prisons, Washington, 1949, 317 pp., illus., $6.00.

Besides containing plans and illustrations of all types of correctional institution, this book also presents discussion from various angles of the basic problem of planning and construction, the prison as an agency of punishment, and the development and inter-dependence of correctional philosophy and construction.

The volume contains both table of contents and index, and is unusually well illustrated.

PRINCIPLES OF NUCLEAR CHEMISTRY:

R. R. Williams. New York, Van Nostrand, c 1950, 307 pp., illus., $4.85.

The rapid development of interest and study of nuclear phenomena has resulted in radiochemistry and nuclear chemistry courses in many university curricula.

Although Dr. William's book is entitled *Principles of Nuclear Chemistry*, and deals to a large extent with those Chemical phenomena related to nuclear properties and processes, some physics must of necessity be included in such a volume. The author himself gives two broad headings to the contents, namely, Nuclear phenomena and their Chemical consequences; and, the advantages of the study of classical problems through the ability to detect and distinguish the nuclear varieties of an atomic type.

The book is illustrated with charts throughout, has bibliographical footnotes and index, and appendices containing periodic tables of elements, and nuclide charts.

REPORT PREPARATION:

Frank Kerekes. Ames, Iowa State College Press, 1951. 449 pp., illus., $6.90.

The writing of reports is a necessary adjunct to almost every type of job carrying with it any responsibility or executive character.

Frequently, the people involved have had little or no training in this type of writing or of thought organization so necessary for such a task.

Report Preparation includes blank forms, suggested outlines, sample letters of reports, charts, tables, etc., as well as information on punctuation and grammatical structure. Letters of application for jobs, pointers for public speakers, writing of newspaper or periodical advertisements, in short, all aspects of industrial writing seem to have been included. This book should prove a boon to many of our readers.

RUDIMENTS OF MATHEMATICAL PHYSICS:

James Bain. Montevideo, the author, 1950. 92 pp., illus.

Subtitled "including the original monograph *The Lost Dimension* or *The True Principle of Relativity*, this "law of universal cubes contains within itself", claims the author "the only true principle of relativity".

"There exists between every pair of particles, urging each towards the other a force directly proportional to twice the product of the masses of the particles, and inversely proportional to the cube of the distance between them".

The writer claims this to be the true law, upsetting the theories of both Newton and Einstein. We leave it to our readers for judgement and consideration.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

ALTERNATING-CURRENT CIRCUITS.

R. M. Kerchner and G. F. Corcoran. 3rd ed. New York, Wiley, 1951. 598 pp., illus., $5.50.

Intended for students majoring in power or communication work, this book covers the theory and practice of the subject with particular emphasis on fundamentals. Changes in this third edition include material on the loss and phase characteristics of elementary four-terminal networks; material pertaining to the Q of electrical circuits is revised, and the nodal method of circuit analysis is used; an additional method of wave analysis is introduced; a method of designing tuned coupled circuits is included; and the three-origin vector diagram of a polyphase circuit is added. The end-of-chapter problems are revised and new problems included.

APPLIED NUCLEAR PHYSICS.

E. C. Pollard and W. L. Davidson. 2nd ed., New York, Wiley, 1951. 352 pp., illus., $5.00.

The book covers practically all phases of nuclear science including the basic facts of nuclear particles and radiations and methods of accelerating them, transmutation, natural and artificial radioactivity, isotopy, and nuclear fission. In addition to incorporating material covering the progress in the field since the first edition in 1942, a new chapter on nuclear chain reactions has been added. Special sections devoted to pile theory, neutron diffraction, cross sections, and cosmic rays are also new. Detailed instructions on laboratory experiments are now included, and the tables of nuclear data are brought up-to-date.

DIESEL-ELECTRIC LOCOMOTIVE HANDBOOK—Electrical Equipment. 290 pp.

DIESEL-ELECTRIC LOCOMOTIVE HANDBOOK: Mechanical Equipment. 262 pp.

G. F. McGowan. New York, Simmons-Boardman, 1951., illus., $4.95 each.

Basic reference books for enginemen, maintenance men, and other railroad personnel engaged in operating and maintaining diesel-electric locomotives, these books provide a survey of the theory and equipment used in this field. As indicated, one deals with aspects of electrical equipment and the other with aspects of mechanical equipment. Direct information is given on the products of the major manufacturers.

DYNAMIC MOTION AND TIME STUDY.

J. J. Gillespie. Brooklyn, N.Y., Chemical Publishing Co., 1951. 140 pp., illus., $3.75.

Relating work activity to work psychology, this book offers a solution to the problem of increasing efficiency without evoking the antagonism of the operator Principles of motion study are included which provide a dynamic technique of motion simplification. A list of references is included at the end of the book.

EFFECTS OF ATOMIC WEAPONS, prepared for and in co-operation with the U.S. Department of Defense and the U.S. Atomic Energy Commission.

New York, McGraw-Hill, 1950. 456 pp., illus., $3.00.

Prepared under the direction of the Los Alamos Scientific Laboratory, this book summarizes present knowledge about the effect of atomic explosions. The nature of the explosion and its blast and radiation effects on people and property are considered in detail. Nuclear radiation measurement, decontamination, and protection of personnel are also among the topics discussed.

ELECTRIC CIRCUITS FOR ENGINEERS.

E. K. Kraybill. New York, McMillan, 1951. 212 pp., illus., $3.85.

In this book a broad picture of steady-state electric circuit theory is presented by the logical combination of a.c. and d.c. relationships into an integrated and unified whole. Special features are a correlation of electric phenomena with related phenomena in the general scientific field; use of standard terminology, definitions and symbols; and use of actual values in the problems. A working knowledge of elementary differential and integral calculus and physics are essential.

INDIUM 1863-1949 Inclusive.

Compiled by M. T. Ludwick. New York, Indium Corporation of America, 1950. 276 pp., illus., $7.50.

Essentially an annotated bibliography of periodical and patent literature covering the years 1863-1949, this book also contains a general discussion of the discovery, occurrence, extraction, properties, electrochemistry, analysis, and alloys of the metal indium. Phase diagrams, photomicrographs and various charts are also included as well as a history of The Indium Corporation of America.

INDUSTRIAL SOLVENTS.

I. Mellan, 2nd ed. New York, Reinhold, 1950. 758 pp., illus., $12.00.

An organized compilation of the literature on the more important industrial solvents. This edition retains the original organization with only minor changes in format. It includes many recently developed solvents and uses. The chapters on plasticizers and on graphic expression and interpretation are eliminated. A new chapter on the safe handling of solvents is added, and selected bibliographies are included.

INSTITUTE of PETROLEUM ELECTRICAL CODE, Part I.

London, Institute of Petroleum, 1950. 99 pp., 26/-.

Prepared by a committee of experts, this loose-leaf compilation is the first part of a model code of safe practice for the petroleum industry. It carefully defines the circumstances in which special precautions should be taken, assesses and classifies the risks incident to various grades of petroleum and similar products, and develops effective methods of protection. The effects of static electricity are considered. The code ends with a series of rules of good practice.

MATHEMATICAL ENGINEERING ANALYSIS.

R. Oldenburger. New York, MacMillan, 1950. 426 pp., illus., $6.00.

Intended for use as a text in courses on engineering analysis and industrial physics, this book is written to aid those who need to express physical situations in the form of equivalent mathematical relations. It develops the basic laws of engineering from a minimum number of assumptions so that the reader can obtain a logical physical and mathematical picture of the fundamental concepts of engineering in common use. With this as a background, the various techniques for making simplifying assumptions in treating physical problems are then illustrated. A knowledge of advanced calculus, especially those aspects concerned with line, surface and volume integrals, is assumed.

PUBLIC HEALTH ENGINEERING, Vol. 2.

E. B. Phelps and associates. New York, Wiley, 1950. 213 pp., illus., $4.00.

The second in a two-volume work, this book illustrates those principles of sanitation which, applied to the production, handling and distribution of food, have direct public health significance. Two foods, milk and shellfish, are treated in detail, and the general principles of food handling and serving are illustrated by a consideration of sanitary practices in public eating and drinking places. Rodent control and the handling and disposal of garbage, refuse and municipal wastes are also discussed.

THEORY AND APPLICATION OF ELECTRICAL ENGINEERING.

E. W. Schilling. Scranton, Pa., International Textbook Co., 1951. 402 pp., illus., $6.50.

Placing special emphasis on circuit theory and machinery, this text covers more topics than are usually contained in a fundamental treatment of this subject. Among the features of the book are unbalanced three-phase load coverage; motor selection for duty-cycle operation; a mathematical discussion of the current growth in an L-R circuit; discussion of radio interference; coverage of automatic starters for d-c motors; and instruction on rate structures. Electronics, illumination, and storage batteries are also considered.

WELDED DECK HIGHWAY BRIDGES.

Edited by J. G. Clark. Cleveland, James F. Lincoln Arc Welding Foundation, 1950. 247 pp., $2.00.

This book is devoted to information obtained from the designs entered in the "Welded Bridges of the Future, 1949 Award Program." The rules of the program limited each exhibit to an all-welded design for a two-lane deck highway bridge supported on two end piers 120 feet apart. Wide variations exist in the basic structural type of the primary longitudinal members and the kind of floor systems used. The material is divided into chapters on structural types, floor systems, etc., to permit a comparison of the designs.

Headworks Gantry

Through an error, the photograph which should have accompanied the item on page 456 of the May issue was omitted. It is reproduced here together with a condensation of the item. Ed.

The photograph shows a 25-ton electric gantry crane on the headworks of the Des Joachims development of The Hydro-Electric Power Commission of Ontario. It is used for handling trash racks, emergency stop logs and head gates, and incorporates an auxiliary high-speed hoist for lifting the trash rack cleaners.

Business & Industrial Briefs

A Digest of Information received by The Editor

Appointments and Transfers

Canadian Broomwade. — Broom and Wade Limited, of High Wycombe, England, one of the world's leading producers of compressed air equipment, have incorporated a Canadian subsidiary, Canadian Broomwade Limited, with head office in Toronto.

President of the new Canadian company will be Harry S. Broom, chairman of the English firm, and Robert Onions, M.E.I.C., will be vice president and managing director. (See Personals)

Robert Onions, M.E.I.C.

Broom and Wade Limited was founded in 1898 by Harry S. Broom and has grown from a very small concern into a Company which now has on its payroll more than 12,000 people. Estimated output of the Company is 75% of the total British production of portable compressors up to 500 c.f.m. During World War II they built 1,500 Churchill tanks for the British Army.

Current line of manufacture includes portable air compressors from 60 to 500 c.f.m., all of the larger sizes being deisel driven. Stationary compressors are manufactured from 5 to 2,000 c.f.m. There are several hundred Broom & Wade stationary compressors now in operation in Canada, but, to date, the Company has not made any concentrated effort to sell portable compressors or air tools.

The following companies will represent Canadian Broomwade Limited in Canada. Laurie & Lamb Limited, Montreal and Toronto; Medland Machinery Limited, Winnipeg, and branches; B.C. Equipment Co. Ltd., Vancouver. The head office of the new Canadian company is at 15 Dundas Street West, Toronto.

●

English Electric Changes.—The English Electric Company of Canada Limited has announced the appointment of

R. G. Bell

R. G. Bell, R. A. Bowie, Jr.E.I.C. and W. H. Hopper to its sales staff in Montreal. (For further information on Mr. Bowie see "Personals".)

●

Hughes Owens Purchased.—The Sperry Gyroscope Company of Canada Limited has purchased The Ontario Hughes Owens Company Limited, Ottawa, Ontario. Arrangements have been made to retain the name The Ontario Hughes Owens Company Limited.

Inquiries normally directed to The Ontario Hughes Owens Company Limited, with the exception of those pertaining to drawing instruments, artists and laboratory supplies, and equipment manufactured by Kelvin & Hughes Limited, Kelvin, Bottomley & Baird Limited, Smiths of England, and Wallace & Tiernan, should now be directed to Sperry Gyroscope Company of Canada Limited, 225 International Aviation Building, Montreal, Quebec.

●

W. V. Vincent. — W. V. Vincent has been appointed manager of the Montreal branch of Atlas Steels Limited. George Cook has been named manager of the Windsor Branch. He succeeds Mr. Vincent in that position.

●

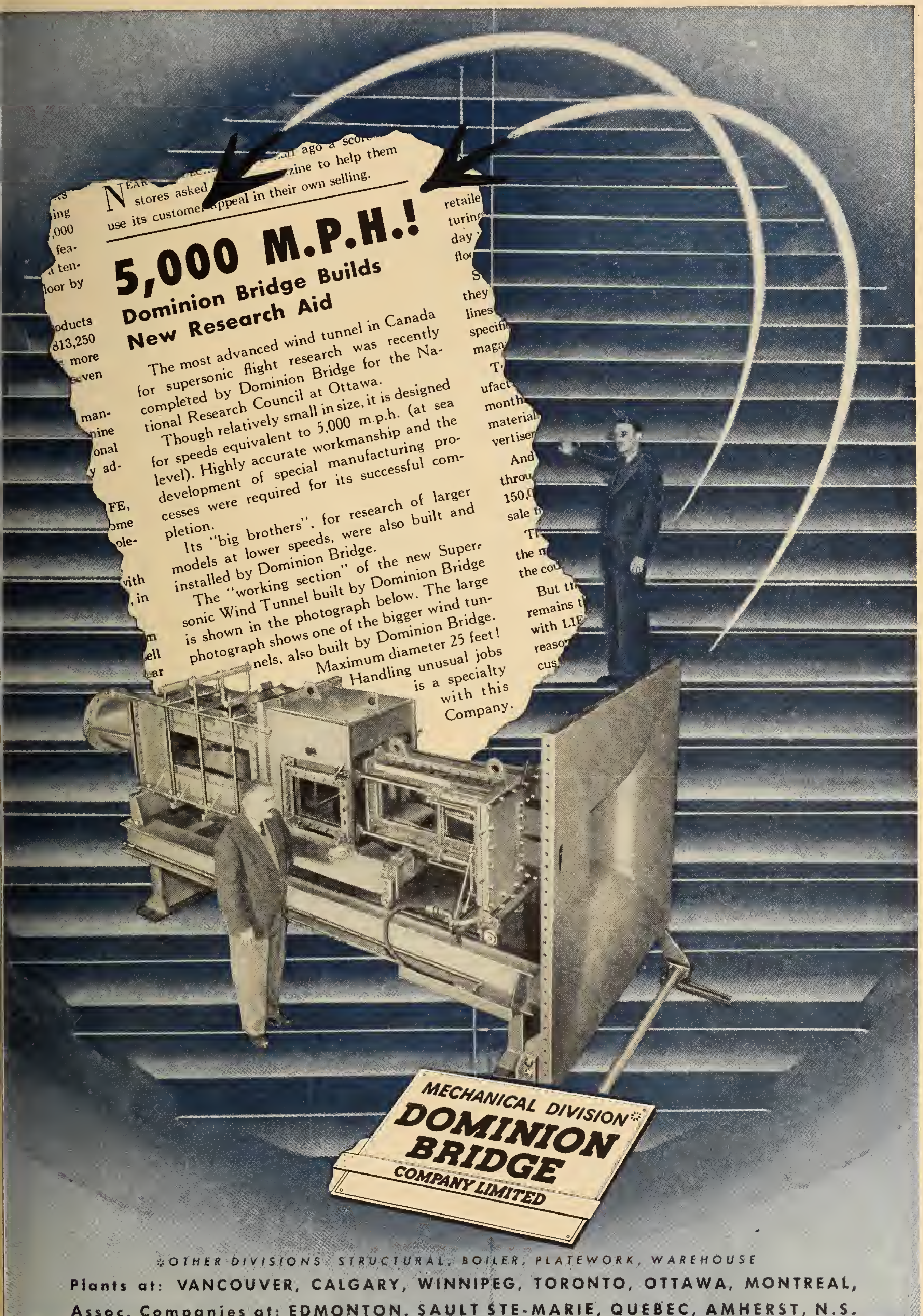
R. M. Davis.—Richard M. Davis has been elected a director of Atlas Steels Limited.

●

W. H. Hopper

R.C.A. Victor Changes.—Changes and promotions in the engineering products department of the RCA Victor Company Limited have been announced.

R. B. Lanskail, formerly sales engineer in the Company's British Columbia and Alberta territory, is now sales man-


5,000 M.P.H.!
Dominion Bridge Builds New Research Aid
The most advanced wind tunnel in Canada for supersonic flight research was recently completed by Dominion Bridge for the National Research Council at Ottawa.
Though relatively small in size, it is designed for speeds equivalent to 5,000 m.p.h. (at sea level). Highly accurate workmanship and the development of special manufacturing processes were required for its successful completion.
Its "big brothers", for research of larger models at lower speeds, were also built and installed by Dominion Bridge.
The "working section" of the new Supersonic Wind Tunnel built by Dominion Bridge is shown in the photograph below. The large photograph shows one of the bigger wind tunnels, also built by Dominion Bridge.
Maximum diameter 25 feet!
Handling unusual jobs is a specialty with this Company.
MECHANICAL DIVISION*
DOMINION BRIDGE
COMPANY LIMITED
*OTHER DIVISIONS STRUCTURAL, BOILER, PLATEWORK, WAREHOUSE
Plants at: VANCOUVER, CALGARY, WINNIPEG, TORONTO, OTTAWA, MONTREAL,
Assoc. Companies at: EDMONTON, SAULT STE-MARIE, QUEBEC, AMHERST, N.S.

ager at the Head Office (Montreal) engineering products department. He joined the Company in 1935.

John A. Collins has been appointed manager of the electronic apparatus sales division of the engineering department. He has been with the Company for the past 10 years.

Ralph Marsh, who has been a service engineer engaged in combined sales and service work in the Vancouver district office, has succeeded Mr. Lanskail in that city.

H. C. Thompson of the Calgary office, has been transferred to Edmonton as a sales engineer.

●

Evans Newcomb and Roy W. Keeley.—The Canadian Minnesota Mining & Manufacturing Company, Limited, has announced the appointment of Evans Newcomb as general sales manager, abrasives and related products division, and Roy W. Keeley, as general sales manager of the tapes and related products division.

Mr. Newcomb has had over 30 years of experience in the abrasives field. During the past 20 years he has been with Canadian Durex Abrasives Limited, latterly as sales manager of the abrasives division. Mr. Keeley has been associated for over twenty years with Canadian Durex Abrasives Limited, and for several years has been sales manager of the tapes division of the Company.

●

W. H. Dickins.—W. H. Dickins has succeeded R. V. Kovacs, JR.E.I.C., as Winnipeg manager for Bepco Canada Limited. Mr. Dickins was trained at the Crompton-Parkinson Works in England. For the past few years he has been on Bepco's engineering staff.

●

Northern Electric Changes. — K. P. Macpherson has been appointed to succeed L. P. Stiles as manager of Northern Electric's central district when the latter goes on leave of absence prior to retirement at the end of this month. Mr. Macpherson's successor will be D. C. Borden, M.E.I.C., assistant sales manager of the wire and cable division. (See "Personals")

●

Canadian Durex Abrasives Changes.—At appropriate ceremonies held recently in Brantford, Ontario, Behr-Manning Corporation of Troy, New York, took over the entire plant and physical assets of the coated abrasives business of Canadian Durex Abrasives Limited. The Company will continue to manufacture and sell Canadian-made sandpapers and other coated abrasives under the name of Behr-Manning (Canada) Limited.

Key people of the coated abrasives staff, executive, manufacturing and sales, of Canadian Durex, are continuing with the new Company.

●

L. T. Sylvester.—Leonard T. Sylvester, president and general manager of Mathews Conveyer Company Ltd., Port Hope, Ontario, was recently elected senior vice president of the parent company, Mathews Conveyer Company, Ellwood City, Pennsylvania. Mr. Sylvester joined the Mathews Canadian organization in 1912, and was elected treasurer and managing director in 1925. He became president and managing director in 1949, the office which he holds today, in addition to his new office in the parent Company.

●

Address Change.—Minneapolis-Honeywell Regulator Company Limited, announce change of address of their London Office from 426 Richmond Street to 94 Hamilton Road. H. M. Wilton remains branch office manager at the new address. The telephone number is unchanged. It is FAirmount 8237.

●

New Company.—A new company, Parmelee Ltd., has entered the safety equipment distributing field in Toronto. Parmelee Ltd. will serve as exclusive distributors of eye protection, salt tablet, and other safety equipment manufactured by the United States Safety Service Company, which formerly operated a sales branch in Toronto.

R. A. Bell, formerly representative for the United States Safety Service Company, is general manager for Parmelee Ltd. The address of the Company is 11 Watkinson Avenue, Toronto.

●

Roy L. Brown.—Roy L. Brown has been elected vice president and general manager of Canadian Westinghouse Supply Company Limited. He was formerly eastern district manager of the Westinghouse Electric Supply Company in the United States. The Canadian Westinghouse Supply Co. Ltd. is a new subsidiary of the parent company and it will be equipped with new warehouses and distributing arrangements to serve Canada from coast-to-coast. In addition to appliances, a complete line of electrical supplies including items not manufactured by Westinghouse, such as cable, conduit and fittings, will be available at these outlets to contractors, builders, commercial and industrial establishments.

●

W. S. Cowell.—W. S. Cowell has been appointed general sales manager of Atlas Asbestos Company Limited. Mr. Cowell has headed the Ferodo Division of Atlas, with which he will continue to maintain close contact. He was recently elected president of the Canadian Automotive Wholesalers and Manufacturers Association and he is past chairman of the Montreal section of the Society of Automotive Engineers.

●

Crane Appointments.—G. Ross Gustin, Ernest J. Laidlaw, and Frederick D. MacNaughton have been named vice-presidents of Crane Limited and subsidiary companies.

Mr. Gustin will be in charge of the operation of all manufacturing divisions, Mr. MacNaughton will be in charge of all sales for Crane Limited and its subsidiary companies, and Mr. Laidlaw will be responsible for the operation and management of Crane Limited's branch organizations.

Other Crane appointments are as follows. Frank H. Meyer was re-elected as vice-president and will be in charge of finance and control divisions of the Company and its subsidiaries. J. Ewart Gillespie was re-elected secretary-treasurer, Alan Birmingham, Ivor E. Jones, and K. L. Karr were appointed assistant secretary-treasurer, assistant treasurer, and assistant secretary, respectively. J. A. Dwyer, F. F. Elliott, and H. H. Bunchman were elected directors of the Company, and the following gentlemen were re-elected to the directorate: L. H. T. Clegg, F. H. Meyer, R. C. Holden, J. L. Holloway, E. J. Laidlaw, G. R. Gustin, F. D. MacNaughton, and V. P. Rumley.

●

Westinghouse Reorganization.—Canadian Westinghouse Company has concentrated its operational departments into five new divisions and re-allocated executive responsibility. The changes, necessitated by Westinghouse's rapid growth and diversification, will, it is believed, put the Company in a superior position to meet increasing defence and domestic demands.

The five operating divisions cover all engineering, manufacturing, sales, and associated activities according to types and classes of products. The divisions and their managers are: apparatus—A. P. Craig, vice-president and general manager; appliance-electronics—with an acting general manager; lamp-tube-lighting—L. A. McCalpin, general manager; air brake—R. H. Williams, general manager; B. E. Sturtevant Company of Canada Limited—K. W. Fraser, M.E.I.C., general manager.

●

J. H. Dunphy.—J. H. Dunphy has been appointed to the aviation section of Canadian General Electric Company's Toronto district office. He will be responsible throughout southern Ontario for the sales engineering of the wide range of C.G.E.'s aviation products such as instruments, electrical systems, controls, radio communications, wire and cable.

●

David Brown (Canada) Ltd. — The David Brown Corporation Limited, an engineering combine in Great Britain, announces the formation in Canada of a new subsidiary, David Brown (Canada) Limited.

Formed in March of this year, the David Brown Corporation Ltd., now controls a group of eighteen works and subsidiary companies employing over 7,000 people and covering an engineering field which ranges from gears, gear-cutting machines, steel and bronze castings, and precision tools, to agricultural tractors and automobiles. Fifteen of these subsidiaries are in the United Kingdom, two in South Africa and the Corporation has branches, representatives, and agents in practically every country in the world.

David Brown (Canada) Ltd. will be temporarily located at an address on Wellington Street, Toronto.

●

J. W. Williams.—J. W. Williams, a former wire and cable specialist, has been appointed manager of wire and cable sales for Northern Electric's Pacific district.

●

Alliance Electric Appointment.—Alliance Electric Works Limited, 141-153 Bates Road, Montreal 8, Quebec, have recently been appointed Quebec representatives for Canadian Sterling Electric Limited, Hamilton, Ontario. They will distribute and stock the standard motors manufactured by their principals as well as their gear head 'Slo-Speed' motors and variable speed motors.

Alliance Electric have announced that they are now in the process of preparing a 52 page catalogue, which will describe and list the companies they represent and the products they manufacture, as well as products maufactured by themselves. Copies of the catalogue may be obtained by applying to the Company.

●

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

High Vacuum Equipment. — Scientific Exports (Great Britain) Ltd., Odeon Building, 20 Carlton Street, Toronto 2, Ont., are Canadian distributors of the literature published by W. Edwards & Co. (London) Ltd., manufacturers of high vacuum equipment for industry, research, and education.

Two publications currently offered to Journal readers are "A Digest of Edwards High Vacuum Equipment — No. 1/50 and a technical paper "High Vacuum Technology" by A. S. D. Barrett, technical director of W. Edwards & Co. (London) Ltd.

●

Floor Maintenance. — The Tremco Manufacturing Co. (Canada) Ltd. of 57 Bloor Street, West, Toronto, Ontario, have just released an attractive brochure (12 pages) entitled "Floor Maintenance".

This publication gives information on ways and means of preserving and cleaning floors of wood, concrete, terrazo, linoleum, tile, etc. Points discussed include wear resistance, appearance, sanitation, cleanliness, light reflectance; the use of sealers and hardeners, burnishing and buffing, waxing; the painting of concrete floors on, above, or below grade. Copies may be obtained by applying to the Company.

●

Precision Instruments. — Abrams Instrument Corporation, 606 East Shiawassee, Lansing 1, Michigan, have recently published a pocket size catalogue, "Precision Photogrammetric Instruments". The products covered in the catalogue include stereoscopes, contour finders, height finders, photogrammetric computers, radar cameras, recording cameras and similar scientific apparatus. Copies may be obtained by applying to the Company.

●

Heat Treating Aircraft Components.— Surface Combustion Corporation, Toledo, Ohio, has released a new illustrated bulletin presenting heat treating furnaces for the aircraft industry. For convenience, this bulletin is divided into separate sections which are devoted to the basic aircraft components: steel tubing and assemblies, aluminum and light metal assemblies, jet and reciprocating engine parts, propeller blades, and miscellaneous aluminum forgings. To obtain copies of this bulletin, Sc-152, write direct to Surface Combustion Corporation.

●

Clutch Pamphlet. — The Automatic Clutch Corporation of Canada, 165 Spadina Ave., Toronto, Ont., offers a 12 page two-colour brochure "BLM Automatic Centrifugal Clutch." Added, an insert in the bulletin, is a large size chart of decimal equivalents of fractions of an inch. To obtain copies write to the Company.

●

(*Continued on page 636*)

"Autumn Day at Bic", by Thomas A. Garside, A.R.C.A., captures the charm and picturesque peacefulness of rural Quebec blended with the vast perspective of the lower St. Lawrence. This is one of a series of paintings by contemporary Canadian artists being reproduced by Canada Wire. A reprint of this painting, suitable for framing, can be obtained by writing Canada Wire and Cable Co. Limited, Postal Station "R", Toronto 17, stating the name of this publication.

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ELECTRICAL WORKS LIMITED

TYPE CB* CARBON* BLACK CABLE

IS THE BEST SHIELDED POWER CABLE

A DISTINCT IMPROVEMENT IN SHIELDED PAPER INSULATED POWER CABLE AND EXCLUSIVE TO PHILLIPS IN CANADA

VOLTAGE RANGE:
9 KV. TO 69 KV.

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because the CARBON BLACK tapes
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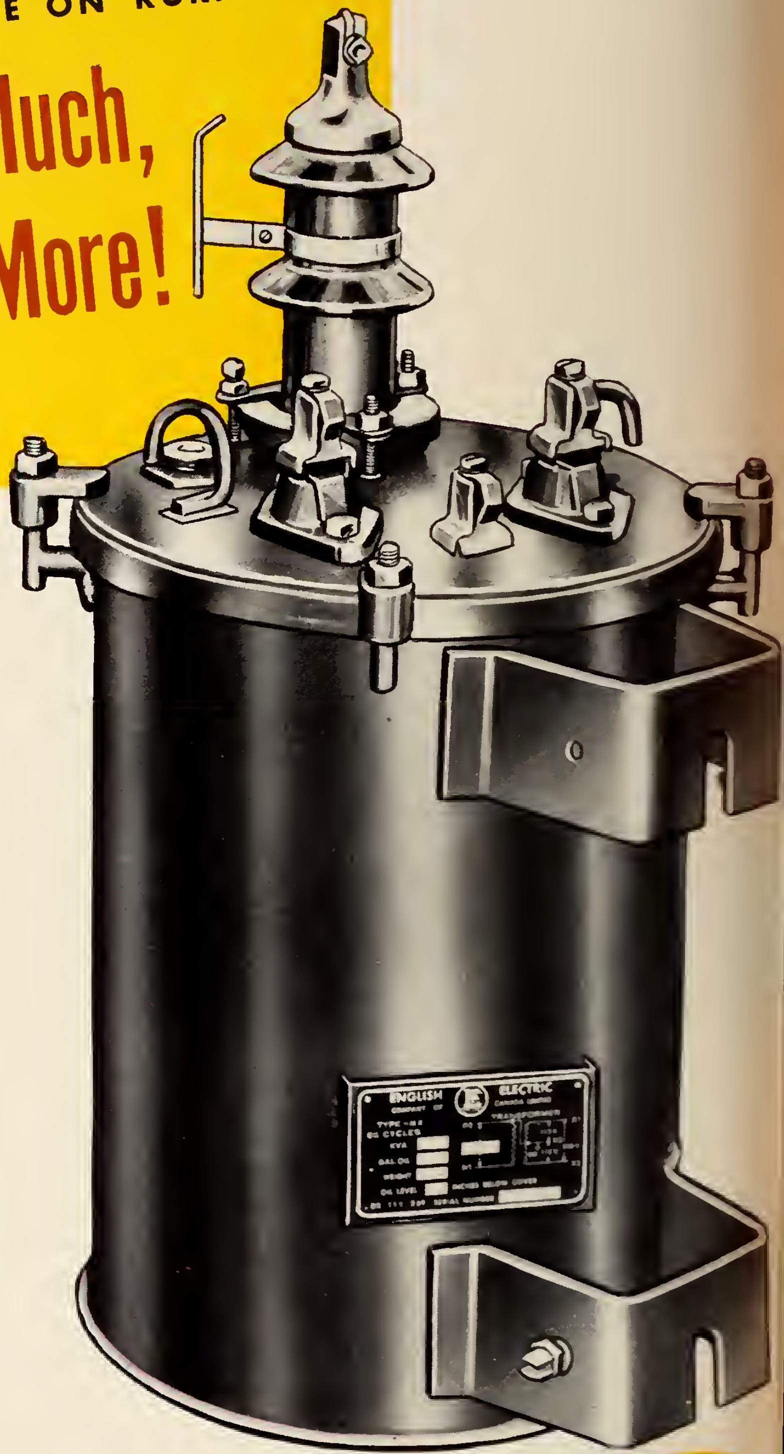

FIG. B-268

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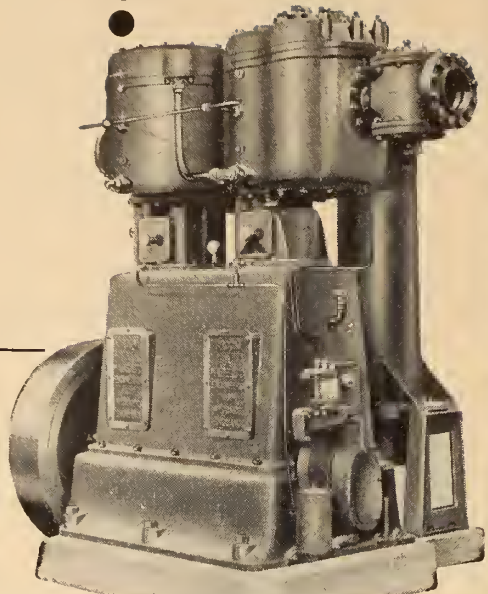


"BROOMWADE" Type TS2X 2-Stage Double Acting Air Compressor 1000 cu. ft. Free Air per min. 100 lbs./sq. in. 420 R.P.M.

BROOMWADE air compressors

Check the EXTRA features of any "BROOMWADE" Air Compressor and you'll understand why they are used so extensively throughout industrial Canada.

Our many years of experience in the air compression field can help solve YOUR problem — whether your needs run to a stationary type air compressor as illustrated or a famous "BROOMWADE" patent Sleeve Valve Portable Air Compressor. We maintain a modern warehouse with complete facilities to assure you reliable service at all times.

Why not make use of our extensive air compression knowledge and experience — WITHOUT OBLIGATION on your part. Write for further information.

Canadian "BROOMWADE" Limited

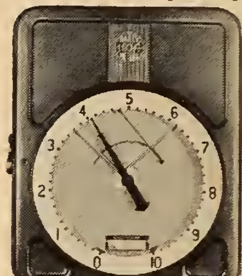
50 DUNDAS STREET WEST, TORONTO

Sold and serviced in Canada at
MONTREAL — Laurie & Lamb Ltd., 512 Transportation Building
TORONTO — Laurie & Lamb Ltd., 284 King St. W.
WINNIPEG — Medland Machinery Ltd., 576 Wall St.
VANCOUVER — B. C. Equipment Co. Ltd., 551 Howe St.

RECORDERS

OXYGEN
TEMPERATURE
AREA

Bailey Oxygen Recorder



The Bailey Oxygen Recorder continuously measures the oxygen or excess air content of a gaseous mixture. Exceptional speed is obtained by the use of catalytic combustion on a noble metal filament which forms part of the measuring circuit. On typical installations, changes in oxygen content are indicated in about 10 seconds, readings stabilize within 30 seconds.

This instrument has a minimum full chart range of 5 per cent oxygen and a maximum range of 25 per cent. It is sensitive to changes of less than .05 per cent oxygen and has a sustained accuracy within one-quarter of one per cent of actual oxygen content.

It may operate air controls or high and low alarm contacts.

For complete information write for Bulletin 151-A.

Bailey Pyrotron Resistance Thermometer

You can use the Bailey Pyrotron to indicate, record and control temperatures between −300°F. and +1200° F. It gives you from one to four continuous records on one circular chart.

With the Bailey Pyrotron you can control temperatures in these three ways:

1. Air-operated control.
2. On-Off electrical control.
3. Modulated electronic control.

Get the full facts about this accurate, sensitive and extremely fast electronic resistance thermometer.

Write for Bulletin No. 230-C.

Fuel-Oil Meters (Area Type)

BM-11

The Bailey Fuel-Oil Meter eliminates the need for primary elements and connecting piping. Installed directly in the fuel line, it transmits measurements to standard Bailey electronic receivers.

For return type burners, measurement of fuel burned is accomplished by an electrical circuit which subtracts return line rate of flow from supply line rate of flow.

Write for Bulletin 233.

Bailey Meter Company Limited

Head Office: 1980 Clremont Ave., Montreal

BRANCH OFFICES: HALIFAX • TORONTO • WINNIPEG • VANCOUVER

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When writing to our advertisers please make specific mention of

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The ability to trace the results of an advertisement assists the advertiser in the writing and design of future advertisements and prompts him to renew the contract with the publication concerned.

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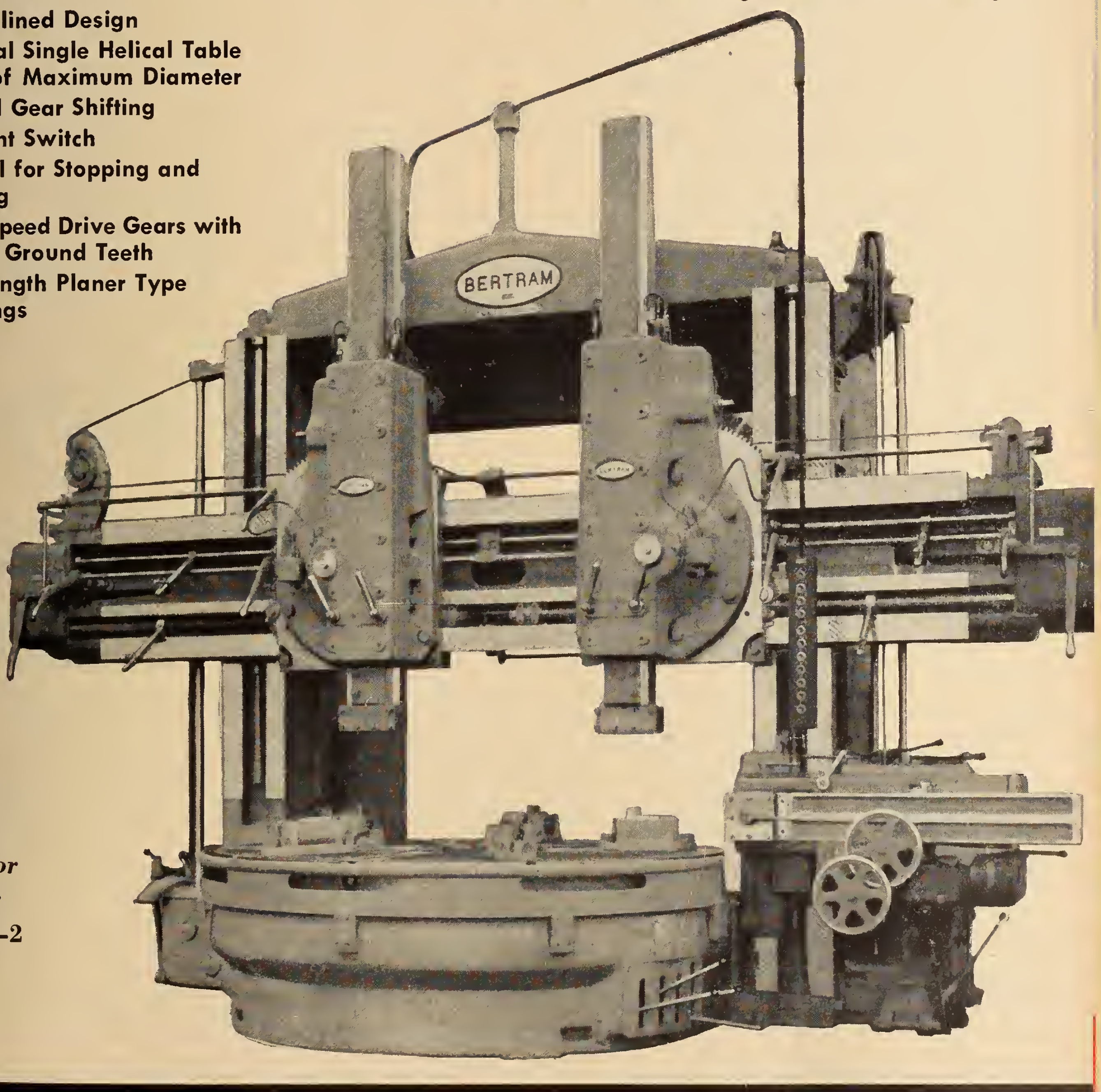

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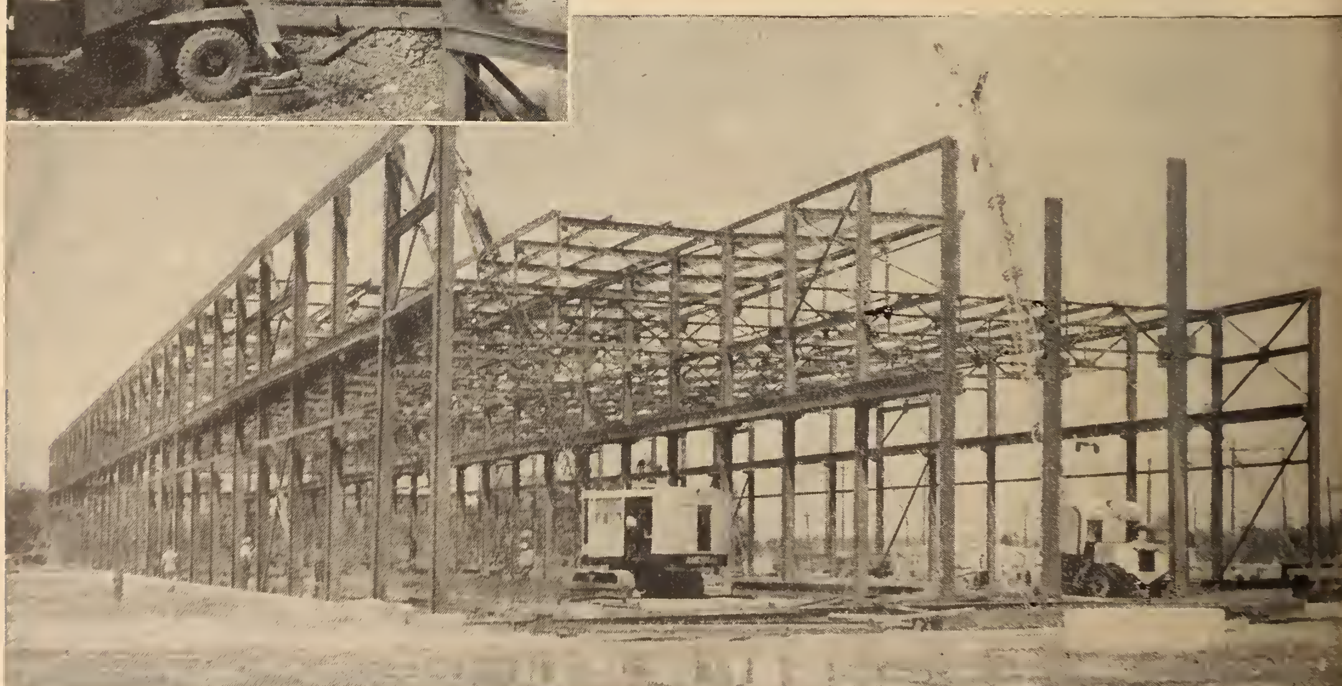

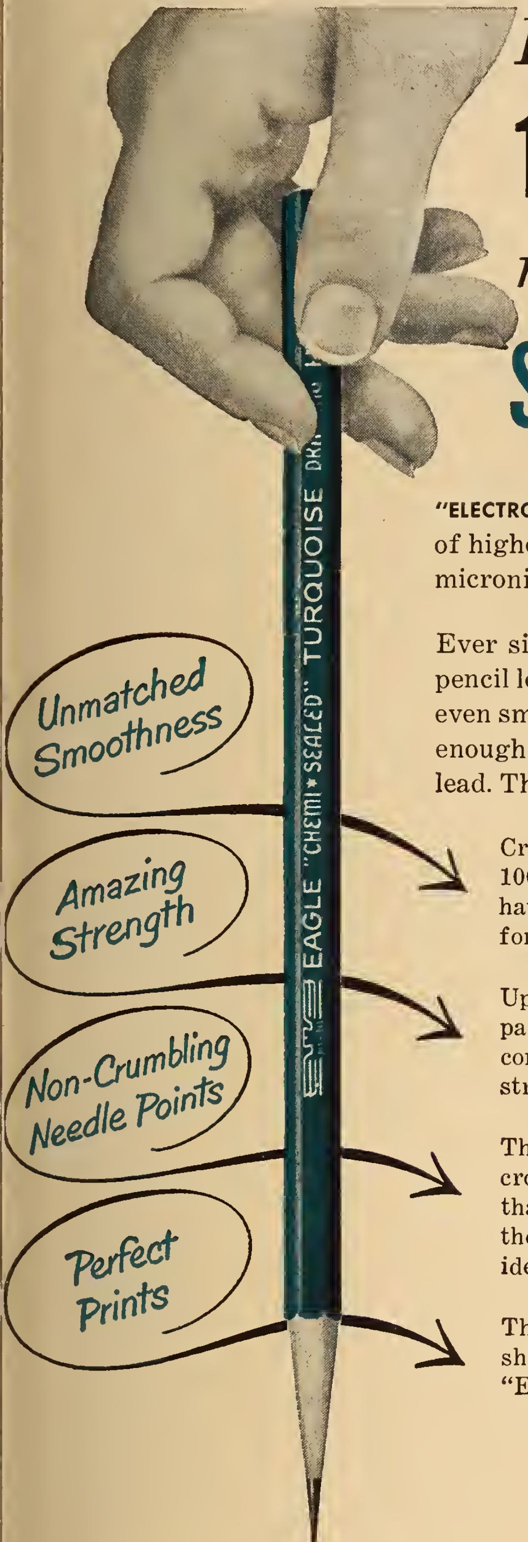

Here's why

100% "Electronic" Graphite

makes the new Turquoise

Serve You Still Better

"ELECTRONIC" is Eagle's trade name for a blend of crystalline graphites of highest purity from Madagascar and Ceylon, reduced to particles of micronic fineness in our patented Attrition Mill.

Ever since we tested our first pound of "Electronic" graphite in fine pencil leads and found how much they were improved by the addition of even small amounts, we have planned for the day when we could process enough of this super-graphite to use it 100% in every TURQUOISE lead. That day has come! Here's what it means on your drafting board:

Crystalline graphite is nature's perfect lubricant. Leads made with it 100% have a frictionless, smooth-gliding quality impossible in leads having the usual content of amorphous graphite which contains harsh foreign materials.

Upon reduction, the graphite crystals break down into microscopic particles of infinitely varied, close-interlocking shapes. The clay binder completes an extremely dense ceramic structure . . . the strongest lead structure ever achieved.

The particles of "Electronic" graphite are so fine that millions more crowd into the air spaces in the lead, producing a richer, tighter lead that deposits more particles, more evenly, at every stroke. That's why the new TURQUOISE lead holds a needle point better than ever and is ideal for long, even lines.

The finer the particles of crystalline graphite, the blacker, denser and sharper is the line deposited on the paper. Drawings made with 100% "Electronic" graphite reproduce to perfection.

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PROVE IT YOURSELF

Order TURQUOISE today from your dealer. Or write us for a sample in any degree you desire.

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*®

WITH 100% *"ELECTRONIC" GRAPHITE

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 616*)

Bearing Catalogue. — Shafer Bearing Corporation, 801 Burlington Ave., Downers Grove, Illinois, has recently issued a 56 page catalogue covering the bearings manufactured by the Corporation. For copies of this publication write to the Company. Ask for Catalogue No. 51.

●

Induction Heater.—An improved electronic type 20-kw. induction heater, featuring a nonventilated, dustproof, NEMA Type 12 enclosure, is available from Canadian General Electric's Industrial Heating Section.

For use in high-speed annealing, brazing, hardening, and soldering, the new heater is designed so that only the control and accessories required for a particular heating application need be purchased.

The totally-enclosed steel cabinet is equipped with felt-gasketed and bolted doors to protect the components from dirt, grit, or oily vapours, thus reducing the need for maintenance, and providing a minimum of "downtime".

In addition to water cooling, blowers recirculate air within the enclosure to cool seals of the oscillator tube and bases of the rectifier tubes. Oscillator, control, and rectifier panel, as well as other components are located within the cabinet so as to be easily accessible for maintenance. Long-scale, switchboard type instruments provide improved readability, enabling the operator to determine operating characteristics quickly and accurately. The heater is available in two models—with or without variable power adjustment—weighs approximately 3,600 lbs. Units are available for operation on 230, 460, or 550 volt, three-phase, 60 cycle power supply.

Additional information on the new G-E 20-kw. induction heater is contained in publication, GEA-5594. This may be obtained from Canadian General Electric Company, 212 King Street West, Toronto.

●

Piping Manual. — Thirty-six pages of practical data and illustrations are contained in a remarkably comprehensive booklet "Piping Pointers", published by Crane Limited, 1170 Beaver Hall Square, Montreal.

The publication will be of great use to the trainee and will be appreciated as a refresher course for the more experienced operator.

Companies are welcome to quantities of these manuals for training purposes, apprenticeship classes, and for distribution to plant designers, operators, and maintenance men.

Briefly the publication contains the following information: names of parts of basic valve designs; the principal function of valves; basic valve designs widely used in piping systems; valve discs; variations in stem operation; the different types of bonnet joints; check valves; end connections on valves and fittings; materials of which valves and fittings are made; the choosing of valves best suited to do the job most efficiently; types of valves; the diaphragm valve; pipe fittings; how to read and order reducing fittings; how to make up a screwed joint; how to assemble a flanged joint; welded pipe joints; hints on installing valves; maintenance; facts on gaskets and packing; pipe hangers; pressure regulating; how to use automatic air vent or water drain valves; steam traps; installing safety and relief valves; union fittings; the handling of piping materials, wrenches; vises; how accessories help step up piping efficiency; all the do's and don'ts for better piping service. Accompanying the above information are 316 illustrations which will clarify points which may not be too clear to the beginner.

●

Nozzles, Necks and Flanges. — Taylor Forge and Pipe Works P.O. Box 485, Chicago 90, Ill., has recently released a most comprehensive and attractive catalogue covering nozzles, welding necks, and large diameter flanges. Also included in the catalogue are data covering standards of the Tubular Equipment Manufacturers Association (TEMA Standards). It will be of particular value to engineers having a specific interest in pressure vessel work. For copies apply to the Company. Ask for catalogue No. 501.

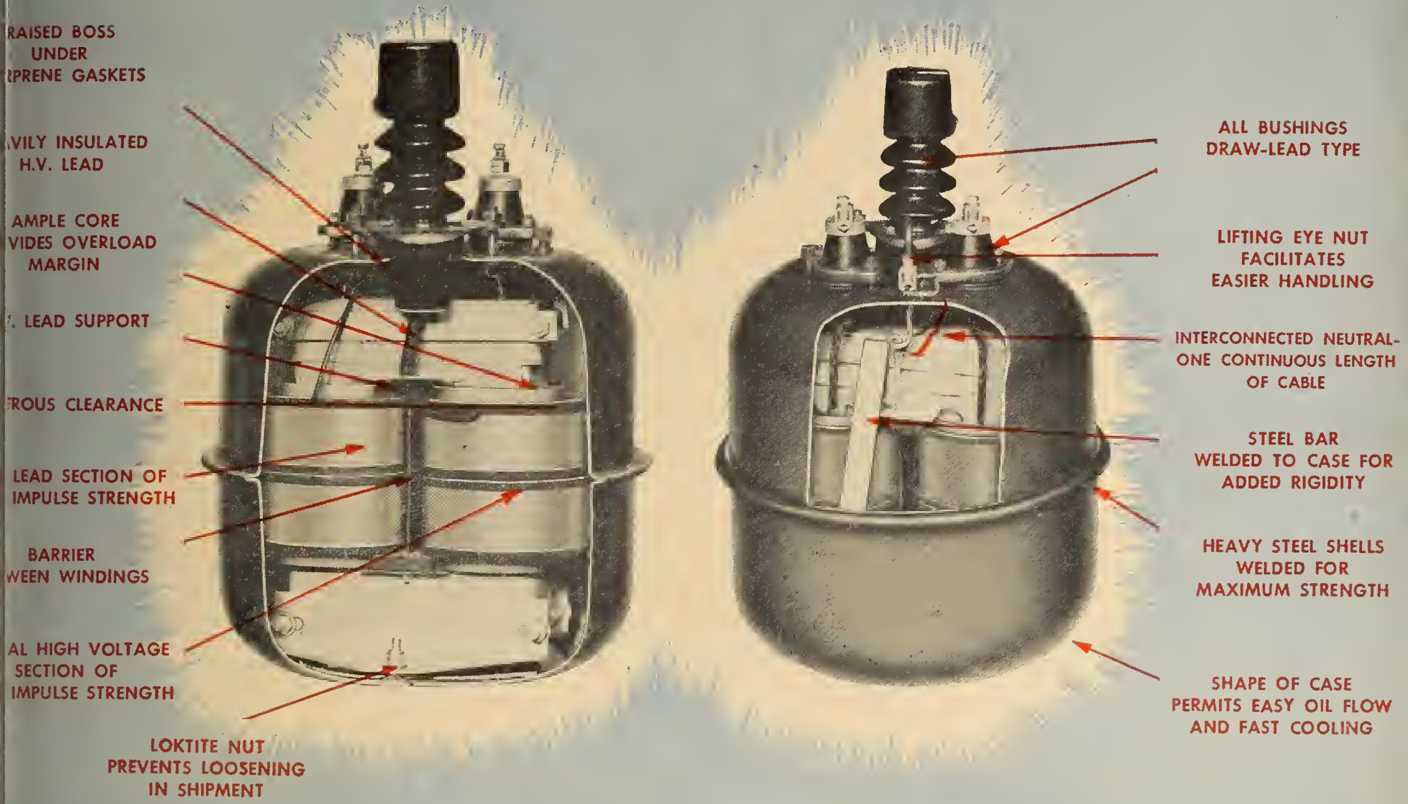
●

Amplifier System. — Technical details on the operation and application of the Brown servo amplifier system are covered in a 4 page pamphlet issued by Minneapolis-Honeywell Regulator Co. Ltd., Leaside, Toronto 17, Ont. Consisting of a converter, amplifier, and two-phase fractional-horsepower motor, this system is especially adaptable to the detection and correction of error signals and operation of null-balance systems. Ask for instrument data sheet 10.20-3. Apply to the Company at the address given above.

●

(*Continued on page 643*)

Electricity for the Farm



e Inside Story of the Improved "*Smooth-a-Surge*" Patented ALED UNIT RURAL PIVOT TYPE TRANSFORMERS

(CANADIAN PATENTS NO. 440845, 440846, U.S. PATENTS PENDING)

nost rural power systems perhaps the most important and costly item tep-down transformer that supplies the farm from the high voltage line. e Power Supplies Ltd., of Mimico, Ontario, have developed a Transformer cd) of very simple design.
cross arms are required.
plified mounting—a one-man installation. All connections made on the ide of the transformer.
h pressure testing after complete assembly (15 lbs. per square inch).
ot mounting.
l-proof spill-gap.
h impulse surge strength.
ly and quickly replaceable in the event of trouble.
-tested for positive elimination of radio interference.

Core and Coils (see illust.)

core and coils of this transformer are made up in what is known as the e design. This design has been used for similar service by Supreme Power s Ltd. for many years, and has proven to give good regulation, low exciting low core losses, and equal distribution of voltage stresses. This is known "Smooth-a-Surge" Transformer.
coils are wound on a rectangular form. The highest grades of insulation l between core and coils. The coil is dried by the vacuum process, and the dipped in a suitable varnish which has a very high dielectric strength of lts per mill, has a high melting point, and is absolutely impervious to hot ny temperature that the transformer will be operated.
primary coils are wound separately from the secondary, and are taped tton tape at right angles to the winding. This ensures a maximum mech- trength to the windings. An adequate cooling duct is placed in the second- ding.

Tanks (see illust.)

tank of this transformer is unique. To give low cost production and ical rigidity, the tank (patented) is made of two half shells pressed out of 14 gauge steel (.083). (Will actually stand a pressure of 35 P.S.I. without distortion).

One of the principal features of this *tank is that it is the only transformer on the market whereby such a high pressure test can be given after the transformer is completely assembled. This absolutely ensures against oil leaks.*

A mounting bracket is provided as a separate unit to support the transformer on the pole. (See illustrations).

Temperature and Oil

The transformers have a guaranteed temperature rise not exceeding 50°C. when operating at full load measured by the rise of resistance of the windings. Typical overload curves are shown opposite.

All oils used in S.P.S. transformers meet the requirements of the Canadian Standards Association.

Bushings (see illust.)

All S.P.S. bushings are made from special high strength, wet process porcelain. Both the High Voltage and the Low Voltage bushings are of the draw lead type, that is, the lead is pulled up inside the bushing to a short stud connected to the special connector at the top. This is sound construction, as it gives a relatively small expansion with temperature changes of the bushing and the stud. All bushings are easily removable from the outside of the tank. The High Voltage bushings have Flashovers of 70 K.V. r.m.s. dry, and 30 K.V. r.m.s. wet.

All bushings are equipped with a connector for either a wrench or screw driver.

Testing and Shipping

All transformers are tested in accordance with Canadian Standards Association requirements.

This type of transformer is suitable for package shipment, and is shipped to the customer completely packed in a wire bound crate specially designed to ensure safe shipment. This packaging ensures that the transformer will be received in good condition, ready for immediate use.

SUPREME POWER SUPPLIES LIMITED

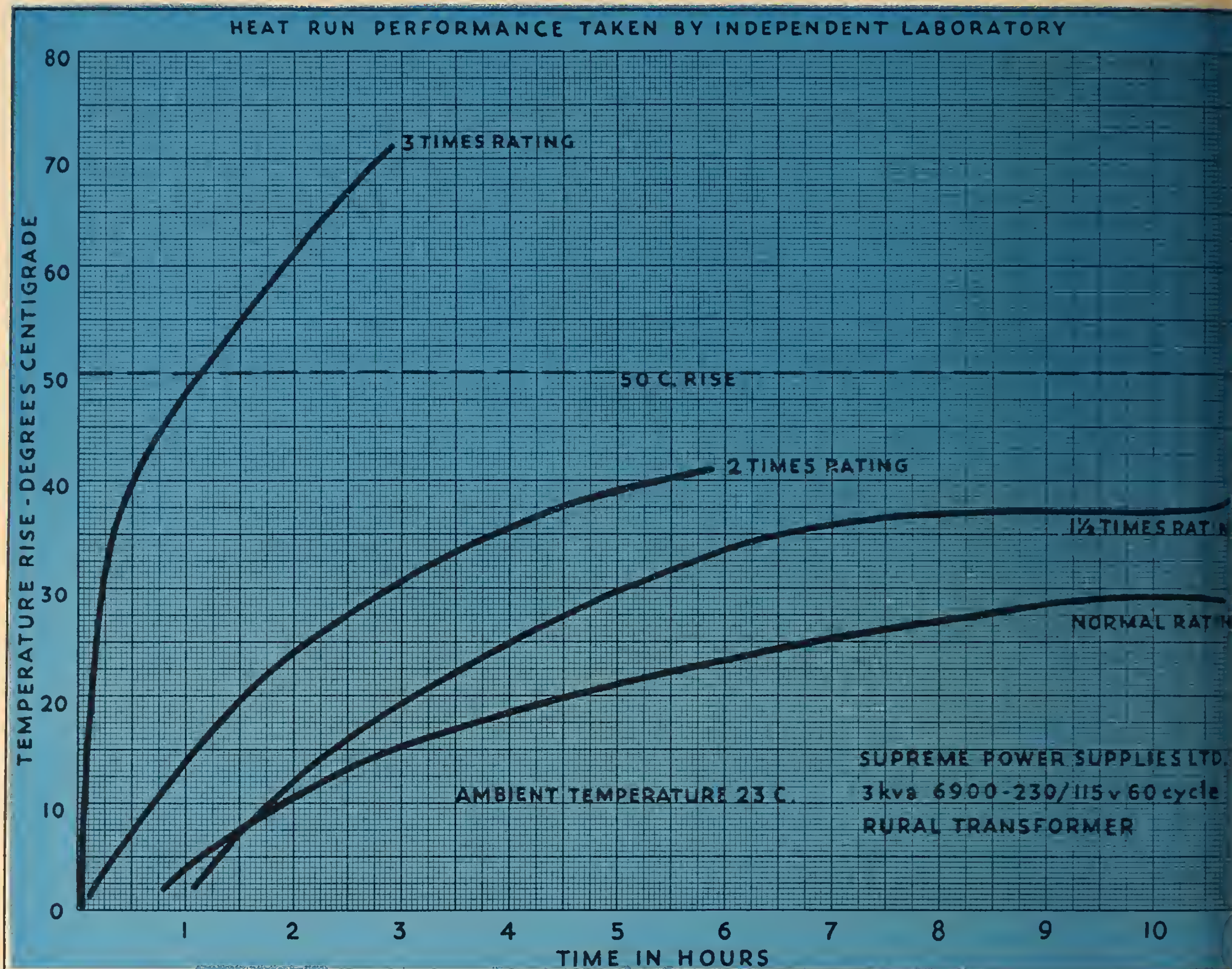
MIMICO, ONTARIO, CANADA

Telephones - LYndhurst 5488-9 New Toronto 3866


3
Supreme

Electricity on the Farm

AMAZING TIME-TEMP PERFORMANCE



WEIGHTS AND DIMENSIONS

K.V.A.	H.V.	Dia. of tank	Hght. of tank	Hght. of tank plus bus.	Shpg. Wght.
3	4600	15	14½	22½	212
3	6900	15	14½	22½	212
3	7620	15	14½	22½	212
5	4600	15	14½	22½	250
5	6900	15	14½	22½	250
5	7620	15	14½	22½	250

(Note: Dimensions and weights approximate.)

SUPREME POWER SUPPLIES
LIMITED
MIMICO, ONTARIO, CANADA
Telephones - LYndhurst 5488-9 New Toronto 3866

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BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 636*)

Nickel Publications.—A newly-released technical bulletin discusses age-hardening of Inco nickel alloys. The five wrought alloys "K" Monel, "KR" Monel, Duranickel, Permanickel, and Inconel "X"—and the cast alloy "S" Monel, are corrosion-resisting materials which can be hardened to high levels of strength and hardness by aging at moderate temperatures. This bulletin, "Age Hardening Inco Nickel Alloys" indicates the mechanical properties obtainable in various forms and tempers, and explains in detail the thermal treatments, conditions and fabricating procedures necessary for satisfactory results.

"Engineering Properties of Duranickel" is the subject of a technical bulletin which examines every aspect of this wrought, non-ferrous slightly magnetic alloy which has the higher strength found in the heat-treated alloy steels, and not offered by other corrosion-resisting alloys available at comparable cost.

Copies of both bulletins may be obtained from The International Nickel Company of Canada, 25 King Street West, Toronto.

●

Darling Bros. Catalogue. — Darling Bros. Limited have issued a new catalogue of their various types of industrial and commercial equipment for fuel oil pumping and heating, with accessory valves and strainers. Fully illustrated and described are their factory-assembled twin fuel oil pumping and heating sets—most economical of space because of the combination of usually separate units—and the individual units themselves, including steam-driven and electric fuel oil pumps, and Whitlock-Darling fuel oil preheaters. Complete data on relief valves, and suction and discharge strainers is given. Discussion of fuel oil preheating, with a viscosity-temperature chart, is included. This catalogue is designated as No. 60. It is available in either French or English and may be obtained by applying to the Company.

●

Drysdale Bochure. — Drysdale and Company Ltd., Yoker, Glasgow, W.4, Scotland, have recently released an interesting three colour brochure in which is described the "The Drysdale Patent Pneupress System" which is designed for efficient water supply in modern ships and buildings. The publication is beautifully produced and most informative. For copies apply to the Company at the address given above and ask for catalogue No. P.N. 1.

●

British Exhibition.—The British Engineers' Association 32, Victoria Street, London, S.W.1, England, has available copies of the official bulletin of the exhibits of the Engineering, Marine, and Welding Exhibition, which will be held in Olympia, London, between August 30th and September 13 of this year.

It is claimed that the exhibition will be the biggest display of engineering products in the world. Copies of the official bulletin of exhibits, and details regarding the exhibition, may be obtained by applying to the Association at the address given above.

●

(*Continued on page 648*)

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BUSINESS AND INDUSTRIAL BRIEFS

(Continued from page 643)

Trane Ducting Calculator.—Trane Company of Canada Ltd., 4 Mowat Ave., Toronto 3, Ont., has recently designed and produced a device to save engineers much time in duct designing. Known as the "Trane Ductulator", this calculator is designed to assist the engineer in the design of duct system. If the user knows his air volume and velocity, or noise level requirements he can find: friction loss per 100 feet of duct; dimensions of rectangular ducts that will carry his air load; diameter of round ducts that will carry his air load. These may be determined by one setting of the "Ductulator". A nominal charge of $1.00 is being made for this useful device. Apply to the Company, enclosing $1.00, if a Ductulator is required.

●

Thread Inserts.—A new 16-page two-color bulletin covering design data on helical-wire thread inserts and the use of these inserts in the protection and repair of tapped holes is offered by the Heli-Coil Corporation, 47-23 Thirty-fifth Street, Long Island City 1, N.Y.

Detail drawings and text explain how these inserts are used as original manufacturing components to protect tapped threads in aluminum, magnesium, plastics, iron, steel and wood against stripping, wear, corrosion, seizing and galling.

Also covered are the uses of these Heli-Coil screw thread inserts in production salvage operations. For copies of the publication apply to the Corporation at the address given above.

●

New Equipment and Developments

Ferro-Alloy Plant.—Plans for a 40 per cent increase in the capacity of the ferro-alloy plant of St. Lawrence Alloys and Metals Limited, Beauharnois, Quebec, have been announced by A. R. Turnbull, Vice-President.

Mr. Turnbull said that the Company has undertaken this expansion programme, which will cost approximately $3 million, to take care of the increased demand for ferro-alloys in Canada and the United Kingdom. Most of the increased capacity will be used for ferro-silicon production. This alloy, and other ferro-alloys produced by the plant, are essential ingredients of steel, iron, and certain non-ferrous metals.

Ground has already been broken for a new furnace building, in which will be installed two large covered electric furnaces. Each of the new furnaces will have a capacity of 12,000 kilowatts. At present, 13 smaller furnaces are in use. A mix-house extension will also be built. The expansion programme is expected to be completed in the spring of 1952.

●

C.M. & S. Co. Expansion.—The Consolidated Mining & Smelting Co. of Canada Ltd., Trail, B.C., has announced its intention of spending $30,000,000 on the construction of a power plant on the Pend-d'Oreille river. This represents the largest single project undertaken in the 45-year history of the Company. The dam, which will be approximately 200 feet high, will be situated close to the point where the Pend-d'Oreille river empties into the Columbia River at Waneta, approximately eleven miles south of the metallurgical and chemical fertilizer plants at Trail. The power plant will have provision for four units. Two will be installed initially while the third and fourth may follow in the fairly early future. The two units will have a maximum output of 205,000 h.p., equal to about half of the Company's present power supply from five hydro-electric plants on the Kootenay River.

Completion of the project is scheduled for the end of 1953. The plant will provide power for new projects announced recently by the Company and for future development. Stone and Webster have been retained for the design and construction of the project. The dam site has already been located and construction work, to begin shortly, will employ about 1,000 men at the peak.

The announcement of the Pend-d'Oreille power plant brings Cominco's developments now under way to a total of $62,800,000.

●

Vaporization Systems.—A vaporization system, which provides even distribution of the fuel injected into a combustion chamber, has been developed at A. V. Roe Canada Limited by F. D. M. Williams.

Further details of the vaporizer are available from Avro Canada or from Canadian Patents and Development Limited of Ottawa.

●

Bull-Moose Cranemobile. — Canadian Mobile Co. Ltd., P.O. Box 159, North Vancouver, British Columbia, has introduced a completely new series of "Bull Moose" Cranemobiles. The new models are designated as HC-1036, HC-1536 and HC-2036, with lifting capacities of 10,000, 15,000 and 20,000 lbs. at 36" load centres. Complete information may be obtained from the Company.

●

Westinghouse Expansion.—Immediate construction on two new manufacturing buildings, in Hamilton, Ontario, will be undertaken by Canadian Westinghouse Co. Ltd. as part of an expansion programme which will cost over 10 million dollars.

The Company recently completed a new plant at Three Rivers, Quebec, an office and service building in Edmonton, Alberta, and new facilities will be erected in Montreal.

The multi-million dollar additions are designed to produce electrical apparatus, electronic equipment and supplies for the armed services and for the defence preparedness programme as well as for defence-supporting Canadian industry.

The new buildings in Hamilton will provide an additional 300,000 square feet of floor space. With the present three plants in Hamilton, one at Etobicoke, one at Three Rivers and a subsidiary company at Galt, Westinghouse will have manufacturing floor area in excess of 2¼ million square feet.

The new Hamilton buildings will require an additional 1,300 employees and will increase the payroll by approximately 3½ million dollars.

●

Trans-Canada Highway. — Since the Trans-Canada Highway Agreement was signed last year, federal and provincial engineers have jointly inspected over 4,000 miles of the designated route. Federal supervising engineers of the department of resources and development have been appointed for each province. Inspecting engineers, who assisted them, worked closely with provincial departments of highways and public works. Contracts have been awarded for 575 miles of grading and 190 miles of paving. Completion of Canada's first coast-to-coast highway, scheduled for 1956, will provide a road built to uniform standards linking British Columbia with Newfoundland.

●

Gas-Liquid Dispersions. — A compact and efficient, yet simple, means of producing intimate gas-liquid dispersions has been developed by Shawinigan Chemicals Limited. Circulating Liquid passes through two centrifugals in series —a pressure centrifugal and a mixing centrifugal,—and gas is drawn or injected into the liquid stream between the two. The first centrifugal provides the pressure head necessary to maintain gas and liquid flows while the second serves to intersperse the gas and liquid.

On a small scale, this contactor coupled with a holding tank gave much higher reaction conversions than a more complex and expensive glass-lined and jacketted reactor equipped with an agitator and a porous diffuser. In addition, dispenser, agitator and stuffing gland were easily accessible for repairs or replacement. Temperature control was more sensitive with forced circulation through an external heat exchanger than with a jacketted reactor and required less surface. Dispersion efficiency was good over a reasonable range of liquid and gas rates. Industrially, a Karbate contactor has been used to disperse several hundred pounds per hour of chlorine gas in a hot, corrosive mixture of organic liquids, water and hydrochloric acid. Reaction of chlorine with the organic liquid occurred largely in the contactor and a subsequent heat exchanger, and conversion per pass was almost complete. Temperature control was very uniform.

This contactor has broad application to gas-liquid reaction systems. It may be of value in gas absorption and scrubbing problems and to other operations where a maximum contact between gas and liquid is desirable.

●

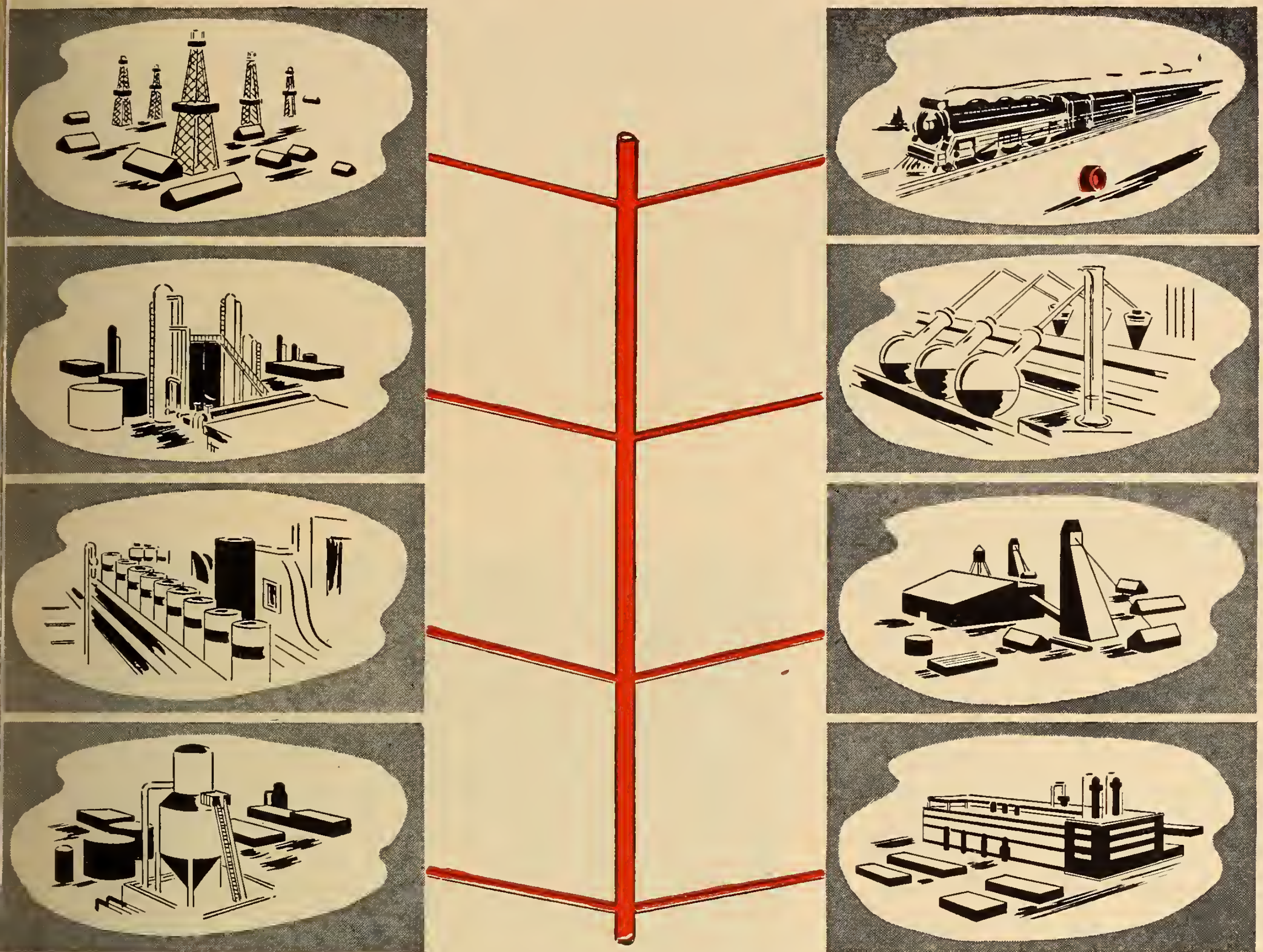
New Pile Driver.—A new pile-driver that cuts labour costs and reduces the time factor substantially, has just been acquired by the Franki Compressed Pile Co. of Canada Ltd. An example of this interesting new equipment was recently in operation at the C.N.R.'s Bonaventure Freight Yards now under reconstruction.

Instead of being mounted on the conventional wheels and track equipment, with their concentrated pressures, the new Franki machine is based on a rigid circular platform, 8 feet in diameter, giving a low average pressure, evenly distributed on the soil. An hydraulic double-acting jack, working at the centre of the platform, permits lifting the machine whilst the latter rests on the ground.

The new machine was developed and patented by Franki engineers.

●

Subway Signals.—The role played by British engineers in the development of railways outside the United Kingdom



has been emphasized recently by the allocation of a contract for signalling equipment on the Toronto subway.

The contract for this signalling equipment, which is valued at $1,200,000 was awarded to the Siemens and General Electric Railway Signal Co. Ltd., of London. The contract will be carried out in conjunction with the Company's Canadian representatives, Radio Engineering Products Limited, of Montreal, who will be responsible for the installation under the supervision of British engineers.

This is the first railway signalling contract to be secured by a British firm in Canada. The main items of equipment to be supplied will comprise automatic colour-light signals, electric switch machines, electrically-operated train stops, and relay interlocking panels for the control of signals and switches from signal boxes.

Recording Technique. — A technique for recording simultaneously both the radioactivity and rock strata resistance in underground drilling operations and for other industrial and scientific applications has been announced by Minneapolis-Honeywell Regulator Co. Ltd.

Commenting on this system, Clement C. Roberts, industrial engineer for Honeywell's Brown Instruments Division said "The new system consists of an electronic recording instrument for obtaining, in a single operation, data of great value in searching or drilling for oils, minerals and water. The same device may also be used for spectrometer analyses and in meteorology for recording wind velocity and direction and to measure tide levels and currents simultaneously."

"Previously," Roberts said, "separate measurements have had to be taken for two sets of data by making two 'passes', one up and one down. Now a two-pen electronic recorder enables drillers to get the same results at greater speed and with a saving in manpower." For complete information on this subject, communicate with Minneapolis-Honeywell Regulator Co. Ltd., Toronto, Ontario.

New Chain Hoist.—McKinnon Columbus Chain Limited, St. Catharines, Ont., have announced the introduction of a new piece of hoist equipment — high speed hand operated chain hoists—which are claimed to be 96 per cent mechanically efficient.

Light weight is one of the features of these hoists. Through the use of steel and aluminum alloys, the weight of the hoists has been reduced to a point where they are claimed to be nearly 63 per cent lighter than standard hoists of comparable capacity. The 1-ton capacity Cyclone Model M weighs only 35 lbs.

It is claimed that the cyclone Model M hoist has 42 per cent fewer parts than current hoists of the same capacity. All rotating parts are fitted with precision ball bearings with double sealed-in lifetime lubrication.

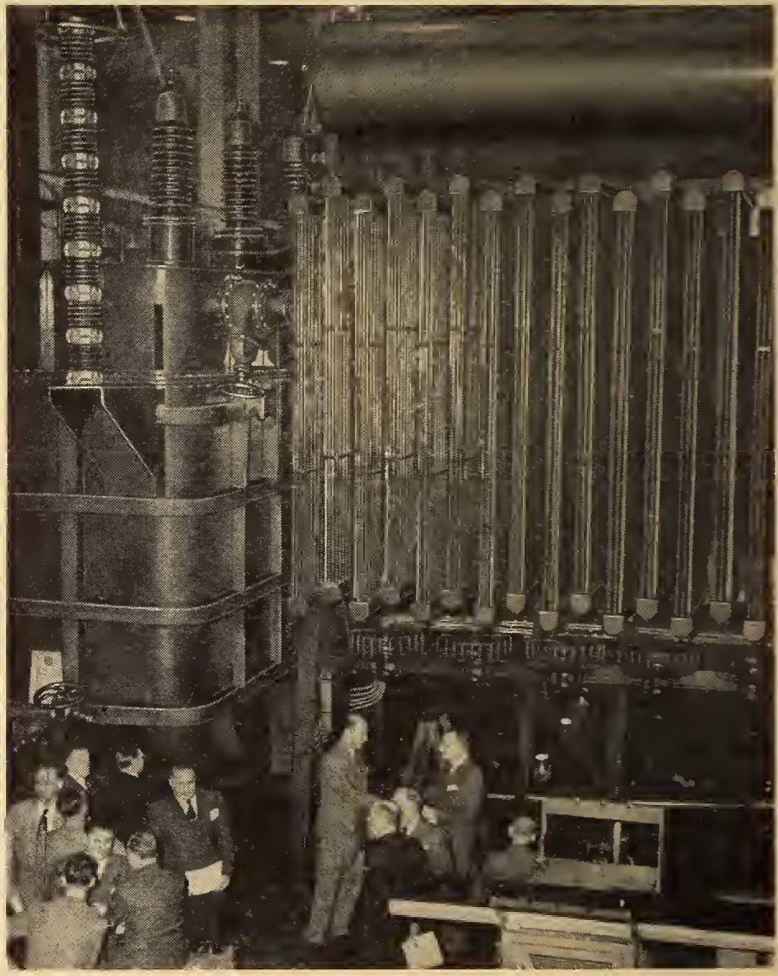
This new high speed hoist is available in standard capacities of ¼ ton, ½ ton, 1 ton, 2 tons and up to 10 tons. All models are equipped with "Herc-Alloy" steel chain, also produced by McKinnon Columbus Chain Limited. Complete literature describing the hoist may be obtained from the McKinnon Columbus Chain Limited, St. Catharines, Ontario.

Metal and Alloy Controls. — The Rt. Hon. C. D. Howe, M.E.I.C., minister of defence production, announced recently that primary and wrought aluminum, primary copper, brass mill products, copper wire rod and wire, will be under direct allocation and inventory limitation by the non-ferrous metals division of the Department of Defence Production.

Provisions covering the sale and purchase of primary and wrought aluminum are contained in Order NFM-2; those for copper wire rod and wire in NFM-3; those for brass mill products in NFM-4; and those for primary copper in NFM-5. Copies of these orders may be obtained from the Department of Defence Production, Ottawa.

Metal Supply. — "Canadian Metals should soon be in better supply for the essential needs of Canadian industry." This is the opinion of C. E. Macdonald, manager of Canadian sales and development, The International Nickel Company Ltd.

Mr. MacDonald said: "For the last six to nine months, we have been filling the pipelines in our defence industries. Once this pump-priming has been accomplished, which should be soon, more metals and alloys will be available for the needs of essential industries, such as the petroleum industry. Nickel deliveries in Canada are four times greater than in any pre-war year," he said, "and greater than at any time except one year of all-out war production."



CANADA'S LARGEST TRANSFORMER

This photo shows the largest transformer ever made in Canada, which was completed recently at the English Electric Co. of Canada's plant in St. Catharines. 1,500 persons saw the huge piece of electrical equipment and toured the factory to see the wide range of other products manufactured by the firm. The transformer has a capacity of 100,000 k.v.a., and is the first of six to be constructed by the English Electric Company for the new Richard L. Hearn Ontario Hydro station at Toronto. Pictured above in the centre foreground, shaking hands, and dwarfed by the transformer, are Crawford Gordon Jr., president of English Electric Company of Canada, and A. W. Manby, assistant general manager of administration, Hydro Electric Power Commission of Ontario. Chatting in the left foreground are A. S. Robertson, manager, Niagara Region H.E.P.C., G. Stauffer, president, Thompson Products Ltd., T. M. Medland, executive director of the Association of Professional Engineers of Ontario, and T. J. Cook, president and general manager of McKinnon Industries Ltd.

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CONTENTS

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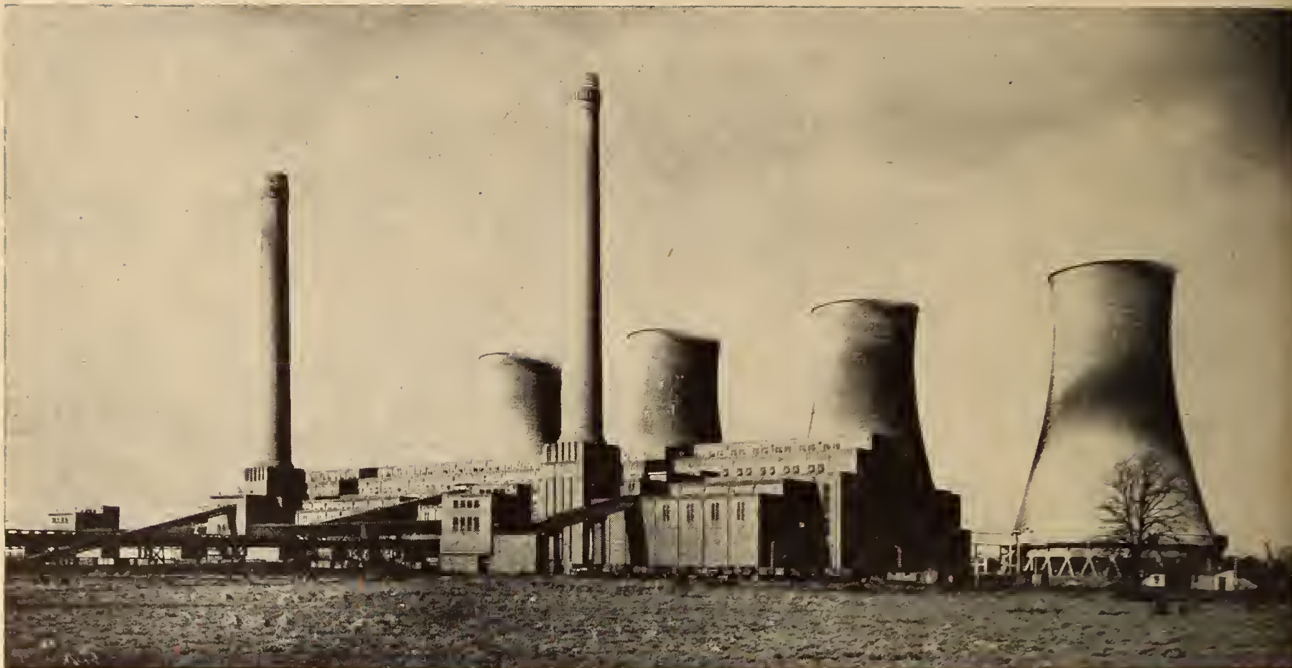


Fig. 1. Hams Hall generating station. General view of the exterior.

THE BRITISH GRID SYSTEM

by

C. W. Marshall, M.I.E.E.

Deputy Chief Engineer, in charge of Research,
British Electricity Authority, London

A paper presented at the 65th Annual General and Professional Meeting of The Engineering Institute of Canada at Montreal, May 9, 1951.

Interconnection of British generating stations used for public supplies was brought about as a result of the 1926 Electricity Supply Act. The main purpose of the resulting interconnecting network, known as the Grid, was to pool the generating resources of the whole country. The scheme involved standardization of frequency at 50 cycles, there being important non-standard systems in S.W. Scotland and Birmingham (25 cycles) and in the Newcastle-on-Tyne area (40 cycles). The cost of the enterprise was of the order of 30 million pounds for the interconnection, with a further 20 million pounds for standardization of frequency.

Prior to the 1926 Act, interconnection had been practised on a relatively small scale in point of physical magnitude, but a pioneer interconnected system, namely the N.E.S. Co., had provided a convincing example for all supply undertakings. Each municipal undertaking had normally one generating station, and underground cable transmission and distribution were the rule. It was exceptional for a municipality to have any important degree of interconnection with adjoining power company-owned systems. All such technical parochialism was swept away by the establishment of the Grid system, which was designed, constructed, and put into operation between 1927 and 1932.

A measure of the magnitude of the system can be gathered from the following data:—

1. Number of Generating Stations 293
2. Total Installed Capacity of Generators ....(k.w.) 13,800,000
3. Total Installed Capacity of Grid Transformer ..(k.v.a.) 15,380,00
4. Total length of 132 kv. Transmission Circuit (circuit miles) 4,80
5. Number of 132 kv. Line Circuits 28

The largest British generating station, Hams Hall, has an installe plant capacity of 570,450 kw.

British hydro developments ar of interest in Canada mainly be cause of their variety and thei value as technical prototypes. Th largest station is Sloy, with capa city 120,000 kw., which forms pa of the North of Scotland Hydr Electric Board system, which ha already projected schemes to total of over 3 million kw.

The outstanding feature of th transmission system is that it com bines all the nationally owne generating stations, with a tot installed capacity of 13,800,000 kw

The author, a leading authority on high voltage transmission, recounts the main assets evolved from the British Grid System during its first quarter century of operation. Outstanding advantages include co-ordinated control, rapid discriminative protection, solution of circuit making and breaking problems, economical outdoor insulation, and freedom from influence on radio and TV services.

A peep into the future discloses advances such as superimposed H.V. circuits, development of H.V. d-c transmission, cooling towers to save water, gas turbine standbys and underground transmission, and predicts continuation of a-c transmission for another decade.

British electrical engineers have boldly pioneered in attempting economies in energy distribution. The grid's splendid record of performance under intense air bombardment calls for careful study by power engineers of this continent in these days of half-war.

Initially this system was designed mainly for pooling purposes, and only relatively small proportions of the power and energy involved were transmitted over the transmission lines. In emergency conditions, however, the lines and cables could be used for large scale transmission, 50,000 kw. per circuit normal capacity, 90,000 kw. per circuit emergency capacity, based on thermal ratings.

The war brought practically every component of the system into full use, due to displacement of population and industry towards the north and west of the country under attack from the east, and due to the losses of plant and circuits caused by bombing and defensive military actions. This paper gives a personal account of some of the features of British experience which are in certain respects special, and so may point the way to improved practice in similar circumstances.

The outstanding basic fact is that the integrated power supply system has proved of the utmost value to Britain, supply and manufacturing interests, and the general public having all benefited to an extent which can be realized fully only by persons who have seen the progress with a technical eye, or who have analysed the costs of electricity at appropriate stages.

Overhead Lines

Under individual development an almost perfect standard of continuity of supply had been reached in the large cities. This was due to the fact that their transmission and distribution was done by means of underground cables, working at voltages of 11 or 33 kv. The few faults which did occur could be cleared rapidly and discriminatively by differential relay systems, in conjunction with conservatively rated circuit breakers. The 132 kv. interconnecting system had, therefore, to be extremely reliable under all conditions, in order to maintain the standard of continuity of supply to which all major electrical undertakings had been accustomed.

British weather has defied scientific definition, and although every precaution was taken by the engineers responsible for design which successfully covered wind, snow loading, and the like, one component, namely fog, combined with atmospheric pollution, caused such frequent flash-over troubles on the insulators in certain industrial areas, that the original provision of insulation of overhead lines had to be drastically modified

The detailed story of our early struggles to prevent flash-over in fog deserves the attention of all who have to deal with outdoor high-voltage insulation in humid polluted atmospheres. Here, it must be condensed into a statement of the practical solutions which have withstood the test of time in situa-

Fig. 2. Staythorpe Generating Station. Exterior view from across the river.

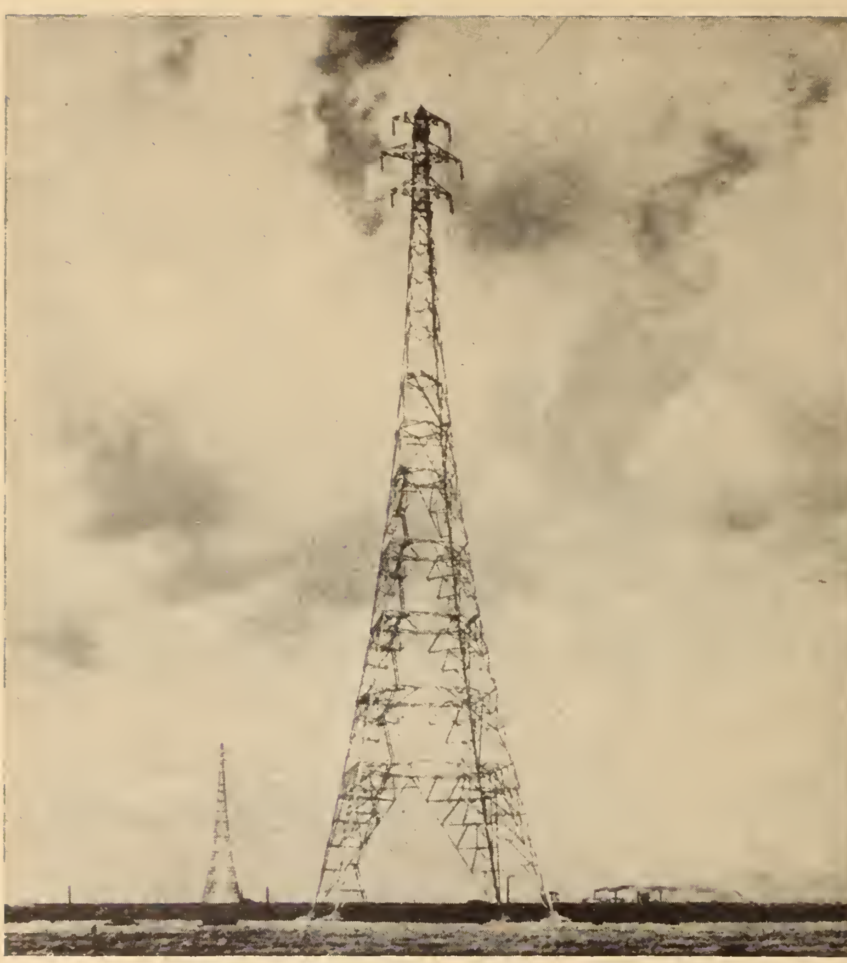


Fig. 3. Thames crossing at Dagenham.

tions such as Glasgow, the Manchester region, Bradford, Sheffield, and sea-board areas where salt-laden atmosphere can be particularly troublesome to insulation.

There, anti-dirt insulators have made it practicable to reach a standard of continuity of supply satisfying the most exacting requirements. A rough measure of that standard is provided by the fact that only 9 flash-overs due to fog or atmospheric pollution were recorded in the last year of operation. As there are over 100,000 insulator chains, at least 10 per cent of which are frequently subject to something approaching the worst fog conditions, it may justifiably be claimed we successfully solved British transmission problem No. 1.

These same atmospheric conditions are also inimical to exposed metals. Aluminium, which serves so well in most areas, must be specially treated where the lines are in damp chemically-laden atmospheres. The attack is normally slow and insidious. It is occasionally rapid, notably near the south west and southern sea-boards, where dangerous corrosion necessitated S.C.A. conductor replacements within five years of erection. The remedial measure which has been adopted in these danger areas is to coat the conductors with corbula grease.

In the densely populated and over-built areas, we had to adopt numerous special constructions, which exercised the versatility of our constructors. Examples are lines in the Glasgow region, which illustrate the difficulties encountered in traversing industrial areas, and the Thames Crossing at Dagenham, which ranks among the most spectacular of our achievements in overhead line construction.

Underground Cables

Where it was impracticable to provide overhead line connections, 132-kv. cables were adopted, and 67 circuit miles are now in service. The original oil filled types, two types of internal nitrogen-filled cables, and two types in which nitrogen pressure is applied externally, have been in service for periods up to 20 years.

These cables assure service in key positions of the Grid. Some technical difficulties, notably with oil and sheaths, were encountered in bringing them to the prevailing standard of almost perfect reliability. However, all defects have been systematically removed, and the concluding note regarding 132-kv. cables is that their application is limited by economic reasons only.

Switching and Transforming Stations

Most experienced engineers now pursue at least one common technical objective in designing switching stations, namely, to reduce to a minimum the number of circuit breakers. The designers of the Grid system had, in 1927, particularly strong reasons for attending to that factor. In addition to the ever present need for economy, they knew that breaking performance was an extremely doubtful factor. "Three-circuit-breaker" stations were therefore adopted on a major scale. In one region, South West England and South Wales, several "one-circuit-breaker" stations were used because of the low load density and the pessimistic views then held as to future growth of load in the area. The broad lesson after about 19 years' of experience, is that the policy of using the minimum number of circuit breakers is amply justified.

Outdoor 132-kv. stations were standardized in 1927, and remain the prevailing type. One noteworthy attempt was made by the late H. W. Clothier, a great switchgear pioneer whose name should be respected by everyone interested in switchgear, to bring metal-clad switchgear into competition with open type gear. A three-circuit-breaker metal clad station was built at Tongland (Dumfriesshire) which has established its technical position by some 16 years of operation that have endeared it to the local maintenance engineers. Price considerations have delayed further developments at that voltage, but there are signs of renewed interest for applications in large cities.

The Poplar (London) station, in which indoor switchgear is used, was the second break from conventional outdoor practice. This change was caused primarily by space restrictions. The general design is based on that of the majority of the London 66-kv. semi-indoor stations, which have a remarkable record of trouble-free low-maintenance-cost, service. The author knows of only one case where major repairs were required on that type of switchgear. That was when the Germans registered a direct hit on the West Ham station with a heavy bomb during the early stages of the war, when there was no adequate defence against aerial attack.

Circuit Breakers

Attention has been drawn to the fact that in 1927 the making and breaking performance of circuit breakers was doubtful. The British Electrical Research Association (E.R.A.) had indeed done excellent pioneer small scale researches, which had pointed the way to scientific development.

The initial circuit breakers for the 132-kv. system were, however, all of the large oil volume dead tank type. They were of three broad types, all purporting to break 1,500,000 kva. One class used two so-called explosion pots per phase, a second used four open type contacts per phase, and a third used six open type contacts per phase. All did their duty reasonably well in practice insofar as clearing faults was concerned. It was, however, evident that their rupturing capacity was certainly not overrated. Variability of arc clearance times made it impossible to guarantee discriminative action of protective equipment, apart from differential types based on the celebrated Merz-Price system, in which pilot cables are essential.

The leading British switchgear manufacturers rose to the occasion. They built powerful circuit-breaker testing plants and rapidly decided the modifications required to enable them to render the fault clearing performance of their breakers completely reliable, and sufficiently rapid to ensure discriminative action of the protective gear.

All the initial types, when modified, converged into a broad class having two arc-controlled breaks per phase. These remodelled circuit breakers were in action in time for the most intense period of aerial attacks. They thus experienced numerous unrehearsed field tests, from which they emerged with great credit. Short circuits were particularly frequent in and around London. The reliability of switchgear of all classes, when maintenance standards had to be relaxed, materially assisted in pro-

Fig. 4. Anti-fog type insulator.

viding reliable electricity supplies during these critical times. The old-fashioned large oil volume circuit-breaker thus earned a reprieve, when the trends in development at 132 kv. and above had all been towards low oil volume and air blast types. Today, the circuit breaker situation remains fluid.

It is necessary, in a brief review such as this, to confine illustrations to 132-kv and 275-kv, but even with that restriction, dead tank, small oil volume, and air blast types have their informed and influential protagonists. The air blast breaker leads the way when judged by test performance. On the other hand the oil types have qualities in every-day service which render it imprudent to standardize on one type for the 275-kv. Grid.

Illustrations show some of the more advanced prototypes. British manufacturers, with their wealth of practical experience and unequalled testing facilities, are in a sound technical position to supply fully tested and guaranteed switchgear for any required voltage or rupturing duty. The service record during the war, when up to 2,200 faults per annum were reliably cleared, constitutes the most convincing evidence in support of this claim.

Discriminative Relaying

All elements of the Grid system operate continuously in parallel. It is accordingly imperative that every fault shall be cleared from the system as rapidly and discriminatively as possible. Measured by the most exacting standard, namely, that any fault clearance which is accompanied by discrimination of a sound circuit is registered as incorrect, the Grid protective gear has for many years shown an efficiency figure around 93 per cent. Balanced systems, whether of the wire pilot or carrier current types, give almost 100 per cent, and "distance" protection about 91 per cent.

In view of these figures the trend of practice is towards balanced protection systems, but economic considerations make it impracticable immediately to standardize on these. Meanwhile, distance protection, like the large oil volume circuit breaker, is retaining a place on even the most important circuits. The phase comparison principle, instead of the more usual current comparison, is also attracting attention and has

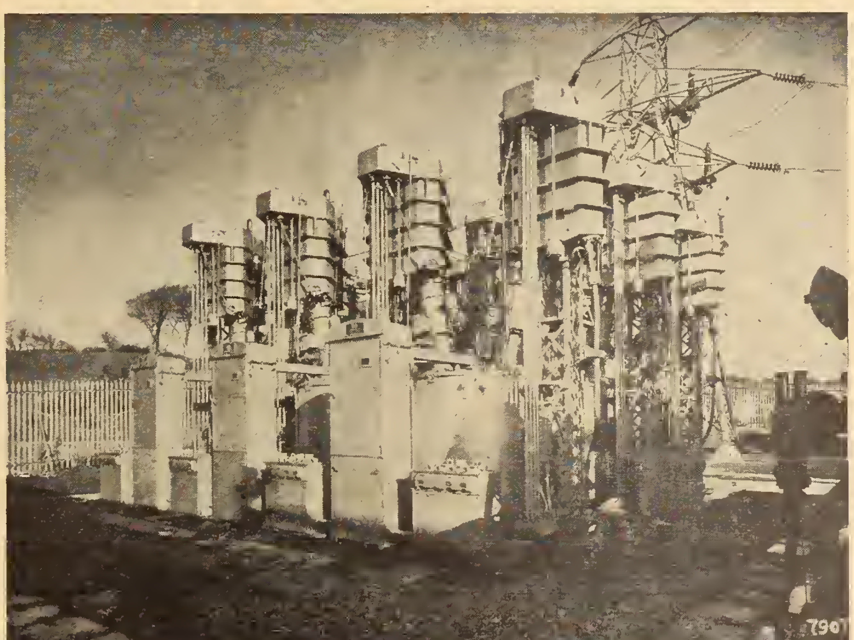
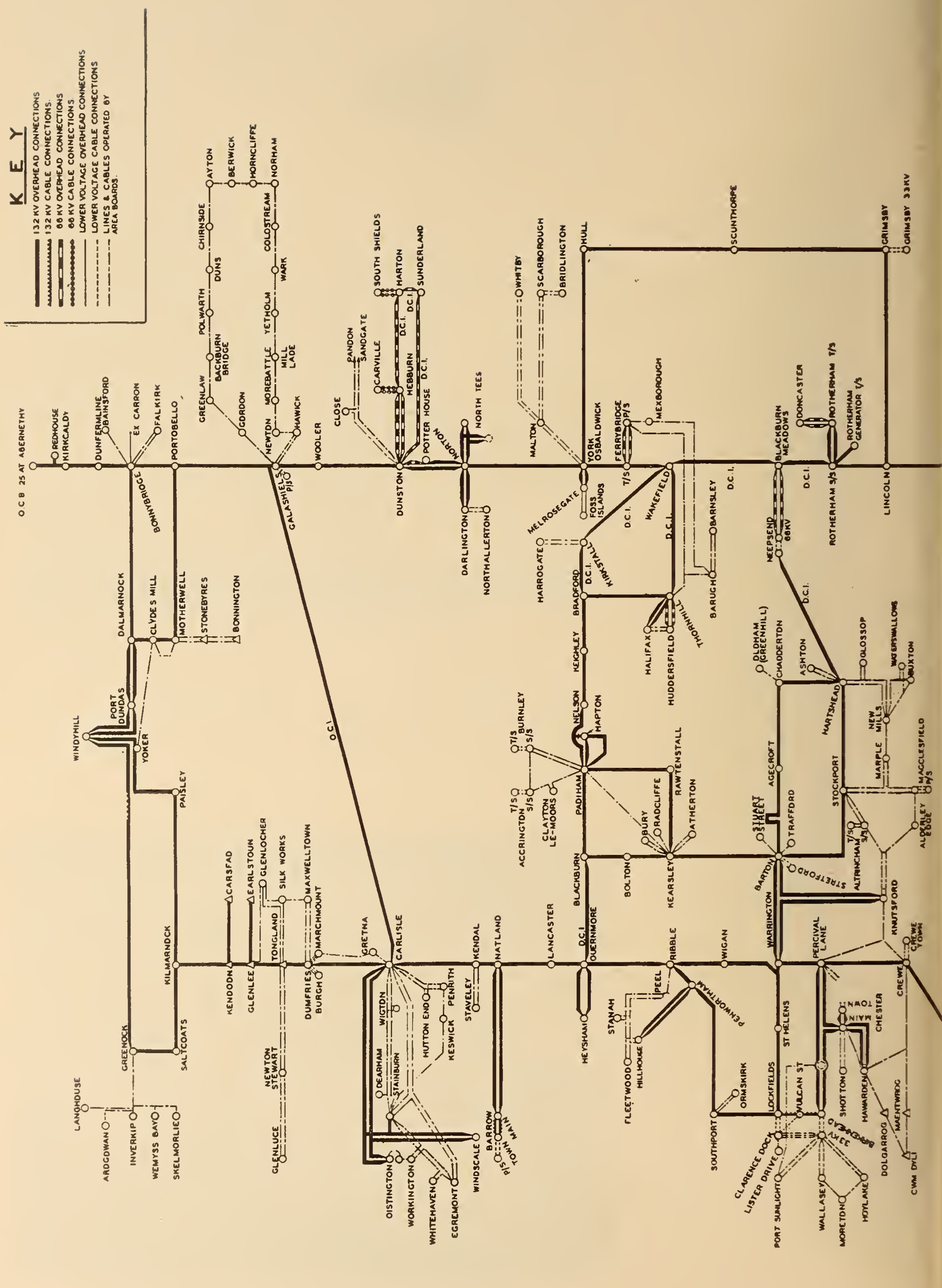
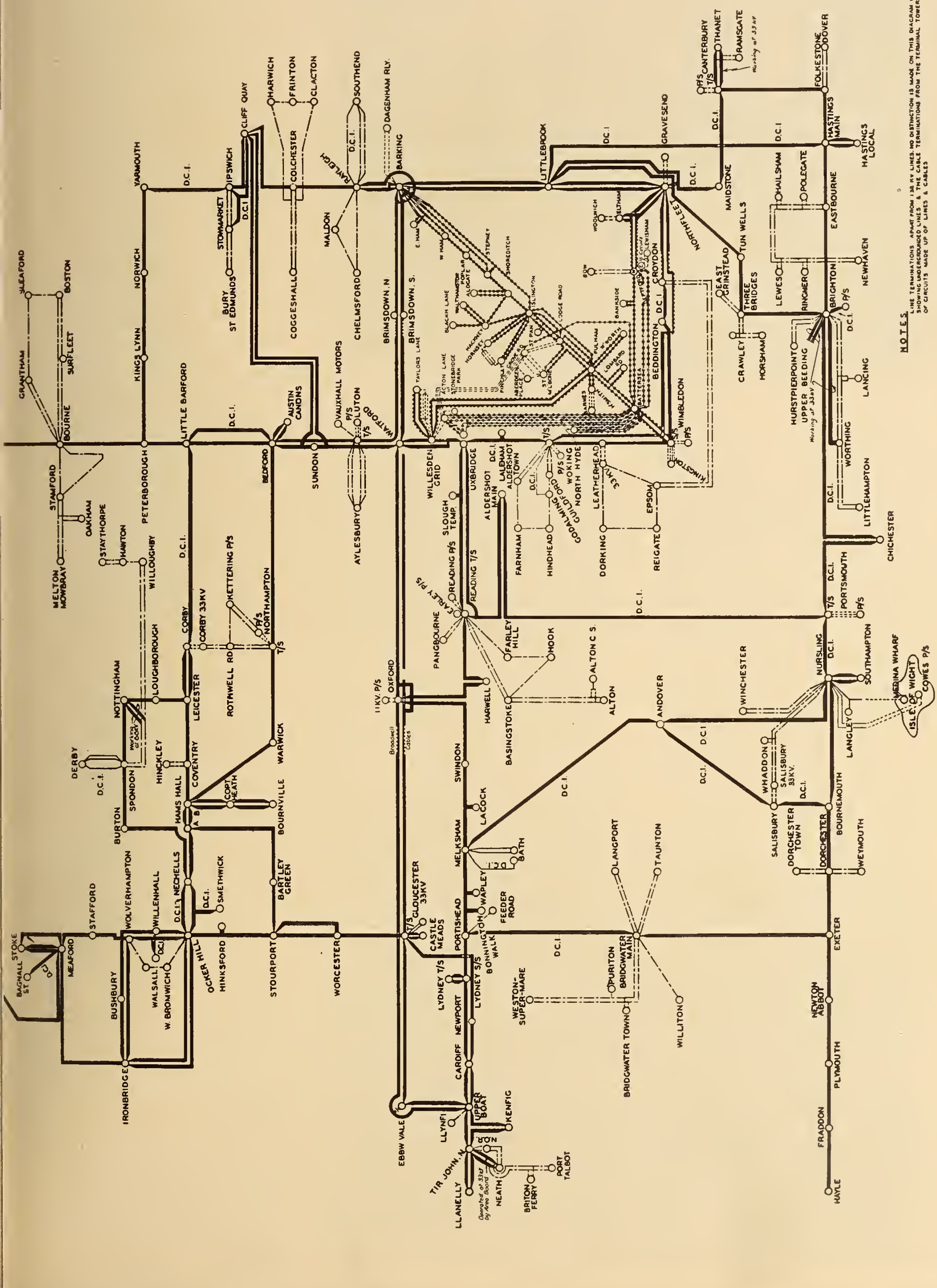


Fig. 5. Tongland substation. Reyrolle 132-kv. switchgear.

Fig. 6. Diagrammatic layou



f the British grid system.



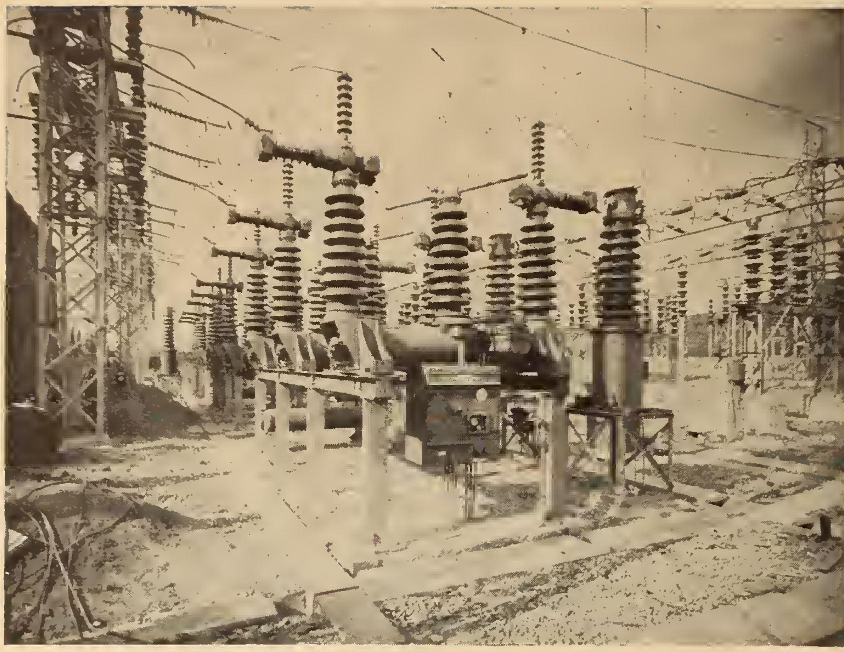


Fig. 7. A group of Metropolitan-Vickers 132-kv. air-blast circuit breakers at Cliff Quay.

been successfully applied, especially to bus-bar protection.

Even these brief notes will indicate that the end of protective system development is still distant. The difficulty of the protective gear problem is indicated by the fact that few firms in the world have attempted to solve it in a general or complete form. Two British manufacturers now have testing equipment, with which complete systems can be fully investigated under all possible fault conditions. Protective gear is thus being brought into line with circuit breakers as regards precise and scientific development.

The success of complete interconnection at 132 kv. makes it justifiable to envisage all British networks, of whatsoever voltage, operating continuously in parallel. All who are concerned with the problem of providing large scale electricity supplies will be able to appreciate the great economies which could be made by wholesale parallel operation.

Transformers

Despite the need for maximum reliability, and in face of the example then prevailing in the U.S.A. and Canada, only five banks of single phase transformers were installed on the original Grid system. Subsequently all transformers have been of the three-phase type. All have on-load ratio changing equipment incorporated in the main units. All have their 132-kv. neutrals directly earthed and their insulation graded accordingly. The transformers are, therefore, of minimum cost and occupy minimum space. They have, except in the case of the earliest units, no self-contained provision for transport in the form of wheels or rollers.

There are no repair facilities at the transforming stations. All this spartan economy of design and construction indicated great faith in the reliability of British transformers. The experience on which that faith was founded was limited to units of about 20,000 kva. capacity and up to 33 kv. On-load ratio changing was a recent and practically untried innovation, confined to a few small transformers. Now we have transformers up to 100,000 kva. capacity at 132 kv. We have every reason to be satisfied with the results achieved.

There were, indeed, experiences of a chastening nature in the early stages. Lightning revealed the necessity for impulse type tests, which led to greatly increased surge strength of insulation. External short circuits showed that meticulous attention must be given to mechanical strength of windings and their supporting structures. Surge voltages in ratio changing gear showed that even such a small detail as the tap reactor could cause trouble if incorrectly designed.

High voltage bushings likewise called for some attention, but this one time notoriously treacherous component has, on the whole, given almost perfect service. I am specially pleased to record this fact, since in 1927 we had reason to expect a much lower standard of performance.

The porcelain protective shells of bushings have to be of the anti-fog type whenever the transformers are situated in places subject to fog or atmospheric pollution. This precaution, combined with systematic cleaning at times determined by readings of surface leakage current indicators, has preserved the transformers from bushing flash-over troubles. These were, in the early stages, unduly frequent in industrial situations.

Transformer noise caused some annoyance in residential areas, which abound in Britain. It has therefore been necessary to study transformer noise most intensively. The manufacturers soon recognized the need for correspondingly close attention to the relevant constructional factors. We are now satisfied that noise levels can be kept within the bounds dictated by conditions in which the transformers are situated. Interference with broadcasting and television services has been practically negligible.

Operation of the Grid System

Nearly three hundred power stations operate in parallel through the Grid system. Their capacities vary from over 500,000 kw. down to a few hundreds of kws. The degree to which they are used depends mainly on their economic efficiency. In the prevailing conditions of shortage of plant, every available machine is brought into service during the peak periods. and in emergency. Even now, about 150 stations generate 95 per cent of the energy used by the consumers.

There are seven control areas:—Scotland; N.W. England; Merseyside & North Wales; North East and Mid East England; Central England; S.W. England and S. Wales; and London. The London "Area" is so large and complex that it has been subdivided for control purposes into approximately equal parts. forming sub-areas North and South of the Thames.

The maximum demand actually supplied by the generating plant in 1950 was 10,760,000 kw., and the estimated potential demand was 12,280,000 kw. Under normal conditions the rate of rise of load reaches 6 million kilowatts per hour. Sudden changes in weather conditions and other exceptional circumstances may cause even greater local rates of rise. Flows of power, energy, and vars, therefore occur, which are outside the planned programme of these interchanges between areas.

These transient flows have to be accommodated by the flexibility of the power system. They have maximum effect as between groups of areas. For example, the system as a whole may be sub-divided as between north and south. (Fig. 6) by a line drawn east and west passing through Luton. The load and plant capacity north and south of that line are roughly equal, so that there may be up to about 5,000,000 kw. on either side of the line. Two 132-kv. lines of normal capacity (natural 50,000 kw., overload 90,000 kw.), each assure the interconnection between these power groups.

The habits of people, the nature of industry, and the weather vary materially between the groups. It will thus be recognized that the two N.S. interconnectors can remain in action only if the control engineers exercise their functions with great efficiency. Each tie line has a thermal rating of only about 2 per cent of the plant capacity on either side of the N.S. frontier. Even with two such fragile links, stability is maintained in a satisfactory manner. This is because of the short length of the ties, and because the control engineers have by long experience acquired intimate knowledge of the load characteristics of component control areas.

Load Control

The process of load control has been developed gradually. As the Grid was constructed, one area after another came into action. Each area operated independently until it could help, or be helped, by interconnection with a neighbourhood area or areas. Finally, the whole system was interconnected as a normal condition.

When faults occur, control engineers must depend on the action of the discriminative protective equipment. It must act sufficiently rapidly and sensitively to clear the system without causing instability. Any three-phase fault on the 132-kv. system at points of large power concentration is liable to reach a value of 1,500,000 to 2,500,000 kva. It will thus be realized that there is an extremely heavy degree of responsibility on the relays and circuit breakers. This is liable to throw doubts on the wisdom of interconnecting on such an extensive scale.

Our experience in such matters is extensive. The consequences of faults on large power systems are sufficiently serious to justify extreme precautions to avoid them. We have found that provided a 132-kv. fault of 1,500,000 kva. is cleared from our system within one second, no serious disturbance will ensue.

Our war experience provided justification for making a series of short circuits at 132 kv. The main feature of these staged tests was that no controls, outside the area in which the tests were made, noticed that anything exceptional had occurred. Within the area a few low voltage trip devices operated, but there was no disconnection of sound major circuits.

The main Control Station is situated in Central London. Day to day operation of the system under present conditions, in which overloading during the peak hours is the normal state, throws the broad responsibility for maintaining stability on the operating engineers. Instability in its most general sense may be caused by the loss of tie lines between areas. This causes sections which are importing at times of such losses to fall in frequency. Since the frequency may be 4 per cent below normal initially, the generating plant as a whole becomes less able to meet the load, and the effects are cumulative. Local load shedding must then be resorted to. This enables the generators to return to a stable regime.

Probably the most difficult situation to be faced is that in which the interconnecting capacity between two large sections of the system is reduced by the loss of a component line. This leaves the two components connected by a high impedance tie, and the two sections then get out of step.

The advent of the superimposed 275-kv. Grid is occasioned for over-all economic reasons. It will have the important merit of greatly reducing emergency control difficulties, such as the one described, by reducing the number of components which have to be controlled centrally.

The technical provisions for ensuring stability are few and comparatively simple. The alternators, which have short circuit ratios of the order of 0.55, are automatically regulated, but have no field forcing devices. Discriminative high speed (total clearance time < 1 sec.) fault clearance equipment is fitted to all circuits. Relaying times are generally less than 0.1 sec. On the super-

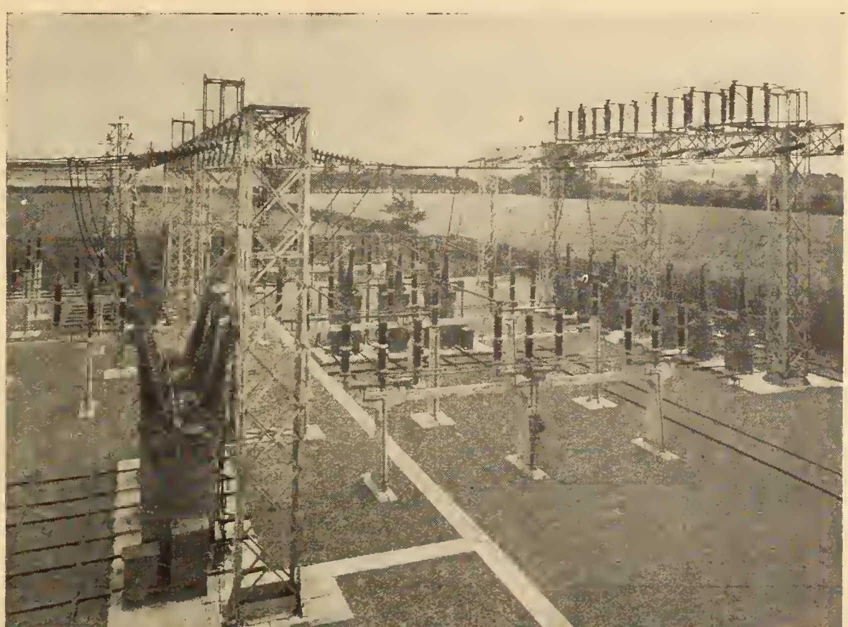


Fig. 8. Bourne 132-kv. substation.

imposed 275-kv. Grid, the relaying time will be about 0.02 sec. and the total fault clearance time about 0.1 sec.

Neutral Point Earthing

When the Grid was designed, the controversy as to whether neutrals should be earthed or insulated constituted one of the most debatable technical points relating to power supply. America tended towards earthed neutrals; Germany, notably under extreme pressure from the communication side, had adopted the insulated neutral system.

In the intervening 23 years, the justly renowned Petersen coil system of neutral earthing was introduced, and widely used in Germany and throughout Europe. We succeeded, with great difficulty, in obtaining permission to earth all 132-kv. neutrals in face of the darkest forebodings from the Post Office. Postal authorities envisaged great troubles to their telephone and telegraph system under normal operation, from harmonic earth current, and from normal frequency induction during earth faults.

It will readily be understood that in a crowded island such as ours, there are inevitably many close proximities between communication and power lines. Since the trunk lines follow largely the same routes, longitudinal voltage must be induced in some of the G.P.O. lines under certain conditions of fault, which may endanger plant and personnel. The G.P.O. estimate that some 5,000 miles of their lines are so exposed.

On our side, the experience may be measured in line miles $\times$ years, and amounts to something like 60,000, during which the G.P.O. have been, to all intents and purposes, trouble-free as far as interference from the power system is concerned.

We have enjoyed the benefits of great capital economies arising from reduced insulation of all components, and a far greater degree of freedom from flash-over in fog than would have been possible with any other system. We have also had remarkable immunity from voltage surges due to switching, and accurate discriminative clearance of faults by comparatively simple means.

There is inevitably another side to the question. The large powers involved in all 132-kv. faults have made it necessary to provide correspondingly strong mechanical construction in transformer windings, this has accentuated the need for high speed fault clearance. Taking everything into account, in my judgment, the choice of the directly earthed neutral system for the British Grid system has been well justified.

Future Developments

As already indicated, the British Electricity Authority has accepted a plan for superimposing a 275/300 kv. system of interconnection and transmission lines over the existing 132-kv. system. It is therefore appropriate to consider future technical developments on the basis of the superimposed system.

The basic principles of design remain as for the 132-kv. system, and are the same as have long been accepted in Canada. Changes of scale, however, bring us into scientific regions which have not yet been fully explored. The most important of these is that determined by voltage. It has so far proved impossible to project voltages upward other than on an empirical basis, and the settlement of insulation for the new system has depended on long term experiments.

Insulation exposed to the atmosphere is the component about which the greatest degree of uncertainty exists. The 132-kv operating experience has shown that with conventional cap and pin insulators of the types illustrated, a ratio of about 2 between the chain length and the minimum "air gap" to withstand the switching surges is required. We are progressing towards a degree of control of voltage gradient on the component units of chains, and also along the surface of bushing shells by resistance. This should justify some reduction of the above ratio.

Underground cable development, which is much more amenable to theoretical examination and laboratory works, is likewise proceeding, and cables for 275/300-kv are ready for use in any situation where they may be required. As far as I can judge, conventional a-c. practice will be followed for the next ten years.

Costs of switchgear, overhead lines, and cables, however, increase rapidly with voltage and capacitance. Compensation likewise becomes a more formidable item of cost, so that alternative methods of dealing with the overall problem of assuring the national supplies of electricity come into the picture.

Two main lines of procedure are indicated. First, by modification of generation methods, and secondly by development of d-c. transmission.

Thermal generation has already been adapted to our conditions in a major respect by the development of cooling towers, which enable us to site stations near their loads, even when the amount of cooling water is very restricted.

Oil consuming gas turbine peak load plants, 3 of which are approaching completion, are pre-

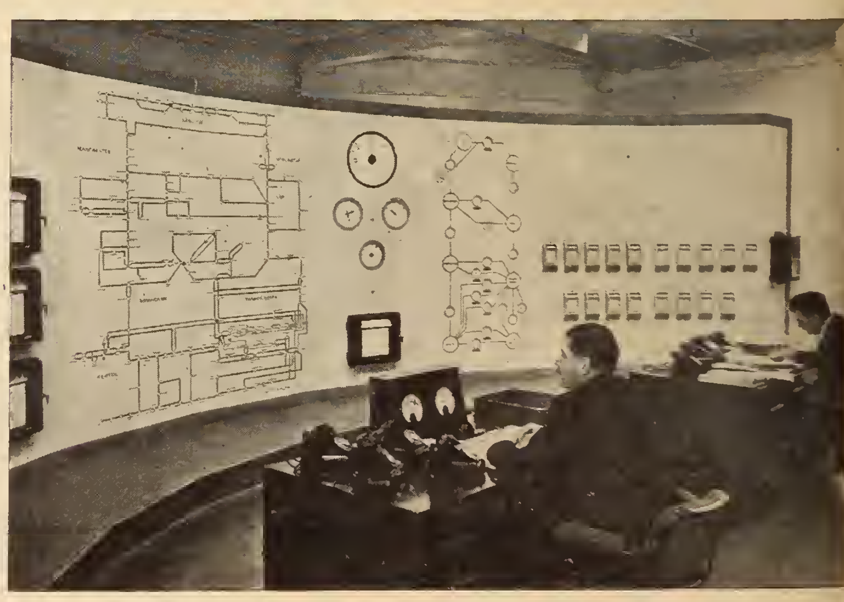


Fig. 9. National control centre, Paternoster Square.

cursors of a development which assists even more in respect of reducing the water demand. They must, however, be adapted for coal burning, and greatly increased in unit capacity before they will be able to take a really important part in supplying the demand.

The steam/gas cycle is prominent in the scientific picture, and has manifest advantages, especially if it can be combined with thermal outlets such as industrial or district heating. This development is in the embryonic stage, and major expenditure would be needed to realize it. Meantime, the gas and steam/gas projects are having the beneficial effect of accelerating progress along more conventional steam boiler and turbine lines.

High voltage d-c., a prevision by Lord Kelvin, realized in part by E. A. Thury, almost brought about by Highfield and Calverley, and intensively developed in Germany, Switzerland and Sweden, has not been neglected in Great Britain. On the theoretical and laboratory scale sides we are well up to date. We are considering a commercial scale experimental research to enable us to assess the feasibility of large scale d-c. transmission at home and abroad.

The possibilities are, in many respects, attractive. Underground cable transmission using aluminium cables would eliminate the uncertainties and hazards of overhead systems, and would remove what many consider to be a defacement of the country. Rectifying and undulating devices are, however, not yet available in a convincing form, and hardly any progress has been made towards solving the high voltage high power d-c. switching problem. The more urgent problems of immediate self-preservation are also perforce taking precedence over all long-term speculative developments for civil purposes.

In conclusion, it appears that the electricity supply system, which has been evolved since 1927, will serve with appropriate extensions for the next twenty years. All the 275-kv. components are fully developed, at least to the tested prototype stage. We can look forward hopefully and confidently to providing the cheap and abundant supplies of power and energy required for our national well-being. √

Air Sanitation

by

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A paper presented before the 65th Annual General and Professional Meeting of The Engineering Institute of Canada, at Montreal, May 1951.

The nature and prevalence of various forms of atmospheric pollution are examined and their effects on health, vegetation, combustion efficiency, etc., are discussed. The methods of measurement employed, the limits of pollution allowable in various situations, the various factors affecting distribution and the available means of reducing pollution are then considered. Means of control now employed are described and some suggestions are made to the end that the problem may be attacked more effectively.

Dirt is usually defined as "matter in the wrong place" and, if this matter is obnoxious or dangerous, its removal is called "sanitation". It follows, therefore, that the problem of air sanitation is that of preventing the accumulation in the atmosphere of quantities of "dirt" sufficient to cause a nuisance, or to be detrimental to health, property or vegetation. In other situations, sanitation is taken as a matter of course. Yet its importance in air is frequently overlooked, in spite of the fact that the weight of air consumed per person is from 5 to 7 times the weight of food and drink consumed. A man can live for days without food or water but, if deprived of air, his life is to be reckoned in minutes.

The pollutants which are discharged into the air respect neither municipal nor provincial boundaries. This was exemplified in September 1950, when smoke from forest fires in Alberta darkened the skies of Ontario, and was still quite dense when it reached the Atlantic seaboard. It is important that the nature and effects of the various pollutants be appreciated by a sufficiently broad and influential section of the population, so that preventive action may be taken in good time. Recently, a new hazard has been added to those with which we have had experience. This is the possible accidental escape of radioactive matter into the air, or its deliberate addition by hostile agents. This possibility may demand the use of new techniques in detecting and avoiding such pollutions.

The presence in the air of smoke and other industrial products has frequently been considered as an outward and visible sign of industrial activity and civic prosperity; on the other hand, its consequences, human, material and financial are so widely recognized that concerted attempts have been made for centuries, on both municipal and national levels, to abolish these nuisances. Nevertheless, it must be realized that total abolition is impracticable and that, in establishing limits of pollution, the *possible* must be distinguished from the *ideal*. The authorities responsible must never forget that our civilization depends for its very existence on industrial activity. The determination of permissible limits, therefore, is an important factor in the effective control of atmospheric pollution.

The Prevalence of Atmospheric Pollution

The most obvious, though not necessarily the most dangerous form of pollution is that resulting from combustion. As this matter was considered by the author in detail in 1947,(1) the evidence given at that time will not be repeated here. A complete bibliography on the subject, covering the years 1661 to 1949, and listing some 240 papers on atmospheric pollution, was published in 1950(2). To this, readers interested in further detail are referred. Probably the most systematic series of observations was reported by the Atmospheric Pollution Research Committee of the Department of Scientific and Industrial Research (England) in 1949(3). This compilation followed the publication of a report on "Atmospheric Pollution in Leicester" (1945) which described exhaustively an investigation of over three years' duration, made in that city.

The length of time required to make such a survey indicates the difficulties of ascertaining the pertinent facts. Yet, without this information the problem cannot be attacked scientifically or successfully. The more comprehensive report referred to above,(3) covers the whole of the industrial area of Great Britain and (for certain areas) deals with the thirty year period from 1914 to 1944. This period includes two world wars and the figures obtained may be governed to some extent by that circumstance. The annual, weekly and daily cycles are considered in that report and characteristic values of the mean (arithmetic) rates of solid deposit are given in Table 1.

Section (A) represents areas of heavy pollution, in which some reduction occurred in 1939-44 as compared with 1934-9. In the areas listed in Section (B), which also relates to dirty cities, the amount of pollution increased. In Section (C), there is shown, by way of contrast, the weights of deposits in relatively clean places. Observations were made in 85 areas and increases of pollution occurred in 27 instances. Some of these variations were caused by changes in the degree of industrialization, or in the kinds of fuel burned. The comment is made that a high proportion of the insoluble matter is deposited near the source, while much of the soluble matter is deposited a long way from the source. Consequently, the latter tends to become more widely disseminated, and is spread more evenly than the former.

It is also noted that slight changes in the location or in the method of using a deposit gauge may cause significant differences in the readings obtained. After allowing for other variables, such as the effect of rainfall, air raids and other factors, it would appear that, in Great Britain, there has been an appreciable increase in the degree of pollution since the 1920's but that the amount of soluble matter present in the deposits has decreased and the amount of insoluble matter has increased.

In 1935, a Royal Commission on the Coal Industry in Great Britain estimated that three million (long) tons of soot were discharged into the air every year — a quantity equivalent to three days' coal output for the entire country. Also, in 1936 Dr. J. S. Owens showed that, in clear winter weather, the air of London contained about 65,000 to 82,000 particles of soot per cubic inch, the concentration increasing to between 1.3 and 1.6 millions in foggy weather.

A similar survey of conditions in the city of Toronto was started in 1951. The preliminary indications are that the situation there has not changed markedly since 1933,(1) but more extended studies may modify that conclusion.

Consequences of Pollution

The influence of sulphur dioxide on the corrosion of metals, fabrics and building materials, of soot on cleaning and other costs, and of their combined influences on vegetation and health are well known. Indeed, they were considered in an early Canadian report issued by the Commission of Conservation some 38 years ago,(4) so that the detailed evidence will not be repeated here. Indeed, the indirect costs are difficult to assess, though they are known to be heavy.

The effect of smoke on health has been a matter of controversy for many years, but most medical men appear to hold the view that the tolerance of the human body enables it to become accustomed to low levels of pollution in most instances.(5) Nevertheless, there is some evidence to indicate that the incidence of respiratory diseases is related, at least partially, to the prevalence of fogs which are frequently produced by the presence of smoke in the atmosphere. When a concentration of toxic agents occurs, however, a more serious condition may arise. Such a situation is usually created by a "temperature inversion" which inhibits the vertical air currents (turbulence) that are the principal agents in the removal of fine dust and gases from the atmosphere, and the means of dispersing them in diluted form over a wide area.

An instance of this kind occurred in the town of Donora, Pennsylvania, in October 1948, when there was very little air movement and the "smog" consequently accumulated in the river valley. Over 40 per cent of the population, or 5,910 persons were affected (1,440 of them severely) and 18 died. The incidence of "smog affection" was influenced relatively little by sex, race or occupational status, but both incidence and severity were greatest in the age category of 65 and over, of whom 60 per cent were affected.(6) A test made afterward by Government scientists revealed the extent of atmospheric pollution produced during periods of normal industrial activity in this comparatively small community (Table 2). Subsequently, a total of 131 lawsuits were filed against the American Steel and Wire Company, and damages were paid amounting to $219,942 (April 1951).

Similar conditions, prevailing along the Meuse Valley (Belgium) in December 1930 caused 30 deaths; and recently the New York Times reported a poisonous smog on November 24, 1950, over a suburb of Poza Rica, an Eastern Mexican oil town, resulting in the deaths of fifteen persons and the illnesses of others. These are extreme cases of poisonous concentration. But undesirable conditions, which probably result in widespread damage to health, doubtless occur periodically

TABLE I

Mean Rate of Solid Deposits in Tons per Square Mile per Annum

Great Britain		1934–39	1939–44
(A)	Birmingham (Gt. Charles St.)	476	331
	Glasgow (Central)	369	353
	Kingston upon Hull	372	330
	London (Archbishop's Park)	372	273
	St. Helen's (Claughton St.)	441	364
	Stoke on Trent (Longton)	333	311
(B)	Halifax (Wade Street)	320	364
	Leeds (Park Square)	411	430
	Liverpool (Cambridge St.)	334	398
	London (Westminster)	320	346
	Sheffield (Attercliffe)	402	500
	Southampton (Andrews Park)	207	428
(C)	Edinburgh (Glencorse)	100	93
	Godalming (King Geo. V. San.)	92	75
	Loggerheads (Cheshire Joint San.)	63	68
	Sheffield (Dore)	121	120
	Southport (Hesketh Park)	118	103

(D) *Other comparative figures* (from Katz "Modern Sanitation" June, 1950)

Chicago (1947)	734 tons/sq. mile/annum
Detroit (1945)	680 tons/sq. mile/annum
Cincinnati (1946)	408 tons/sq. mile/annum
Los Angeles (1948)	400 tons/sq. mile/annum

TABLE II

Air Pollution in Donora, Pa.(6)

Constituent	Total pollutants emitted Pounds per Day	
	Test Period	Curtailed Production
Total particulate matter	42,500	20,800
Zinc	24,400	12,200
Lead	100	100
Cadmium	220	100
Sulphur	2,300	900
Chloride	5,000	1,850
Fluoride	trace	0
Arsenic	4	4
Sulphur dioxide	560	560
Carbon monoxide	54,400	54,400
Carbon dioxide	600,000	*600,000

*Estimated from the results of three gas analyses, which average 0.13 per cent by volume.

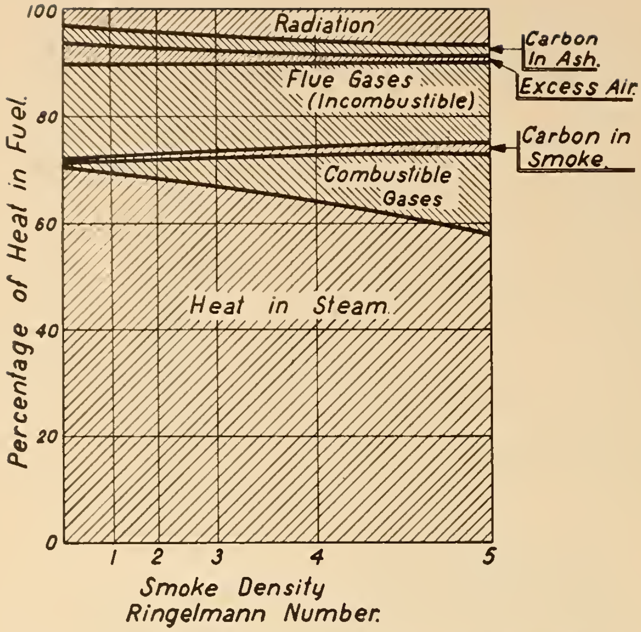

Fig. 1. Influence of smoke density on heat balance of boiler.

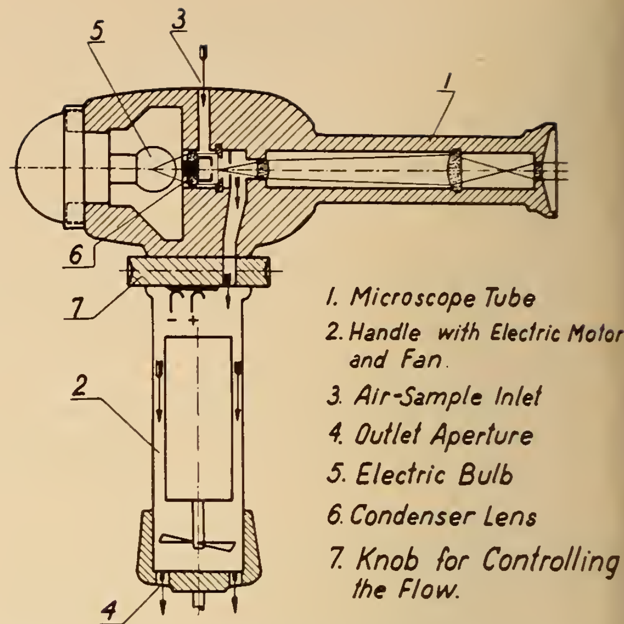

Fig. 2. Schematic sectional view of the Aerosol Indicator. (Engineers Digest).

in many other localities. The smog condition in Los Angeles, for example, is too well known to require further comment. This has been shown to be due to weather conditions, and its incidence can be predicted to some extent.(7)

Damage to vegetation along the Columbia River Valley, caused by sulphur dioxide emitted by the smelters in Trail, B.C., resulted in international legal action and the award of damages amounting to $78,000. About $13,000,000 was finally invested by the company concerned, to recover waste material and convert it into marketable by-products. A new operating schedule was also set up, involving the use of a "Thomas" continuous sulphur dioxide recorder, which indicates the times when excessive concentrations occur and the number of roasting furnaces in operation is then modified accordingly.(7)

The effect of smoke and soot on the efficiency both of combustion in, and heat transmission from furnaces is well known and its influence on the losses in a boiler is illustrated by Fig. 2. This analysis indicates the small proportion of the loss that is due to solid carbon, even in the densest smoke, but it shows that the unused heat in combustible gases increases rapidly with the smoke density.

The question of odours has also received a good deal of attention, as there is a widespread belief that offensive odours cause disease. This is not generally true, save in the case of some noxious gases. But odours may, and do, cause loss of sleep and appetite, and in that event they constitute a nuisance from which relief may be sought. The difficulty in such instances is to determine the limiting intensity beyond which the odour may be termed "offensive". This question was considered at length by the Committee on Atmospheric Pollution in Canada (1951) and the definition adopted was:—

> "'Unpleasant odour' means any annoying, objectionable or undesirable stimulation of the sense of smell in a reasonable person with normal olfactory responses, when exposed to one or more atmospheric pollutants."(27)

This definition admittedly, depends on opinion rather than measurement, but no satisfactory standard is available for measuring odours and, therefore, its effectiveness must await the test of the law courts. This, however, is the fate of most laws!

Allowable Limits of Pollution

It has already been pointed out that the extent of the possible danger to health depends on a combination of the degree of concentration and the duration of exposure for the person concerned. For instance, people may be exposed to the action of fumes, gases or dusts inside a manufacturing or chemical plant for a total period of eight hours a day, whereas they are exposed to general pollution at all times. Also, plant employees are usually sound and healthy people between the ages of 18 and 65. The general community, however, consists in part of old and sickly people and young children, who are most susceptible to illness from this cause (as was demonstrated at Donora).

Also, in an industrial plant, the nature of the pollutant is generally known but, in a municipality, there may possibly occur combinations of pollutants that are more dangerous than individual substances. Moreover, some materials (e.g. fluorine) are stored and concentrated by grasses and leaves, causing diseases in the cattle that feed on them.(10) "Modern Industry" (Sept. 1949) reported that two companies on the West Coast of the U.S.A. were being sued at that time for $2,500,000 for losses caused by "fluorosis".

It is not easy, therefore, to decide what limits should be imposed on the emission of solids, liquids and gases from stacks and vents. The difficulty is still greater in the case of open piles of materials, where no method of measurement is available. In instances such as these, the only feasible remedy is to fall back on a general nuisance clause, somewhat as follows:—

> "'Nuisance' means a condition deemed to interfere with common rights, or to be materially disadvantageous, or to cause physical or mental damage in the opinion of a reasonable person of good will, supported by fellow citizens of like mind."(27)

Or, more simply, a thing is a nuisance when you and the neighbours agree that it is!

When fixing the limits for the

emission of solids from the chimneys of boiler plants, the Canadian Committee decided to adopt the standard schedule proposed by the Sub-Committee of the Smoke Prevention Association of America.[8] In this schedule the maximum dust output per hour is expressed in terms of the weight of steam generated. The limiting unit employed varies for plants of different sizes, as the report states that "it did not seem proper to us that the plant with one large size(d) boiler on a stack should be required to conform to more rigid dust limits than a plant generating the same amount of steam in several smaller boilers connected to a single stack". Apart from this requirement, the limiting smoke density is indicated by the Ringelmann Chart in the usual way. The objections to the use of this chart are recognized,[1] but no other satisfactory method is presently available by which an inspector, located outside a plant, can keep a continuous check on smoke density.[9] Even this method is not available at night, when much soot blowing is done.

For sulphur dioxide, the limit is set by the Canadian Committee at 0.20 per cent by volume of the gases present, calculated to 68 deg. F. and 30 inches of mercury and with a CO_2 content of 12 per cent. The maximum concentration of sulphur dioxide at ground level for a period of one hour is not to exceed 0.5 parts per million. Maximum stack concentrations for other gases, fumes and vapours are given whenever the pertinent information is available.[27] This principle is similar to that adopted by Los Angeles County which, in 1949, adopted a series of limitations on the allowable discharge of solids per hour, based on the weight of material processed.[10]

The possibility of enforcing these limits, however, depends on the availability and acceptance of standard methods of sampling and measurement. The solid and liquid particles, of which representative samples have to be taken, are of many sizes, ranging roughly from 0.01 to 50 microns or more in diameter or from $\frac{1}{2,500,000}$ inch to over $\frac{1}{500}$ inch. Particles over 10 microns in diameter tend to settle to the ground and those smaller than 1 micron remain suspended indefinitely, while gases diffuse in all directions.

Sizes of Particles

The limits of size for smoke, fumes, dust and fly-ash as defined by the Canadian Committee are shown in Table 3, which also contains the range of sizes given by Munger [11] as characteristic of various kinds of pollutant.

TABLE III

Particle Sizes of Pollutants

Pollutant	Diameter Limits (microns)	Range of Volume Ratios (approx.)
Committee on Atmospheric Pollution in Canada		
Smoke	less than 0.1	—
Fumes	0.1 – 1.0	1,000
Dust	more than 1.0	—
Fly-ash	more than 1.0	—
Munger		
Carbon black	0.01 – 0.12	1,700
Zinc oxide fume	0.01 – 0.3	27,000
Metallurgical fumes	0.01 – 2.0	8,000,000
Sulphur trioxide mist	0.5 – 3.0	200
Oil smoke	0.03 – 1.0	37,000
Alkali fumes	0.1 – 5.0	125,000
Metallurgical dusts	0.5 – 100.0	8,000,000
Pulverized coal fly-ash	1.0 – 15.0	3,400
Foundry dusts	1.0 – 1000	1,000,000,000
Cement dust	5.0 – 200	64,000
Separators (Munger) *Effective ranges*		
Settling chambers	80 – 1000	2,000
Gas washers	2.0 – 1000	125,000,000
Centrifugal separators	8.0 – 1000 possibly down to 0.5	1,960,000
Special gas washers	0.1 – 100 possibly down to 0.01	1,000,000,000
Bag house filters	0.1 – 50 possibly down to 0.06	125,000,000
Sonic agglomerators	0.05 – 50 (range doubtful)	1,000,000,000
Electrostatic precipitators	0.01 – 10 possibly down to 0.006	1,000,000,000

The approximate ranges of particle size that may be handled satisfactorily by different kinds of separator are also given. What is probably a better way of indicating these ranges of size is the list of volume ratios in the third column of Table 3. These illustrate the undesirability of expressing the efficiency of cleaning devices by means of weight percentages.

A cyclone, for example, may have an "efficiency" of 90 per cent when expressed in terms of total weight of solids removed from the gas but, if many large particles are present, it may still be ineffective as a cleaning device, because most of the small particles of dust may not be removed. It is necessary, therefore, to know, not only what weight of pollutant is present, but also its size distribution. These variations of particle size illustrate the difficulty of getting representative samples. Table 4 indicates the variations of size distribution in different samples of fly-ash leaving boiler furnaces, as reported by Mr. J. T. Doyle of the Thermix Corporation.[12]

Much work has been done and many papers have been read on instrumentation and measurement. [7][11] So far, however, no standard methods or instruments have been generally agreed upon and, until this has been done it will be difficult

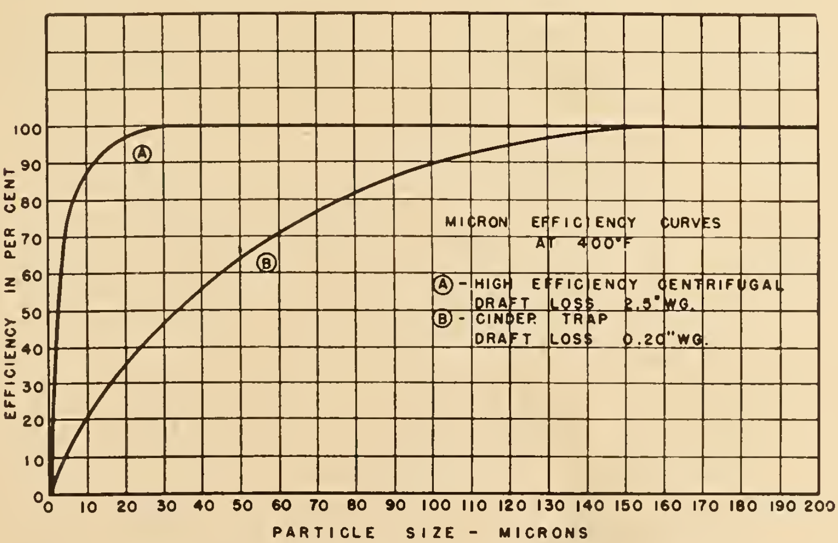

Fig. 3. Efficiencies of mechanical precipitators at various particle sizes. (Thermix corporation).

to compare results obtained by different means in different areas. Probably more experience in this regard has been gained in England than elsewhere. Therefore, wherever possible, the tendency is to adopt the methods used by the Fuel Research Station at Greenwich and described by Dr. A. Parker ⑩ and others.⑦ They are, respectively, (1) the standard deposit gauge, which measures the total monthly deposit, (2) the lead peroxide instrument for monthly determination of sulphur dioxide, (3) the volumetric smoke apparatus, (4) the volumetric sulphur dioxide apparatus (both of these for daily average concentrations), (5) the automatic recording air filter, (6) the jet dust counter and (7) the thermal precipitator.①

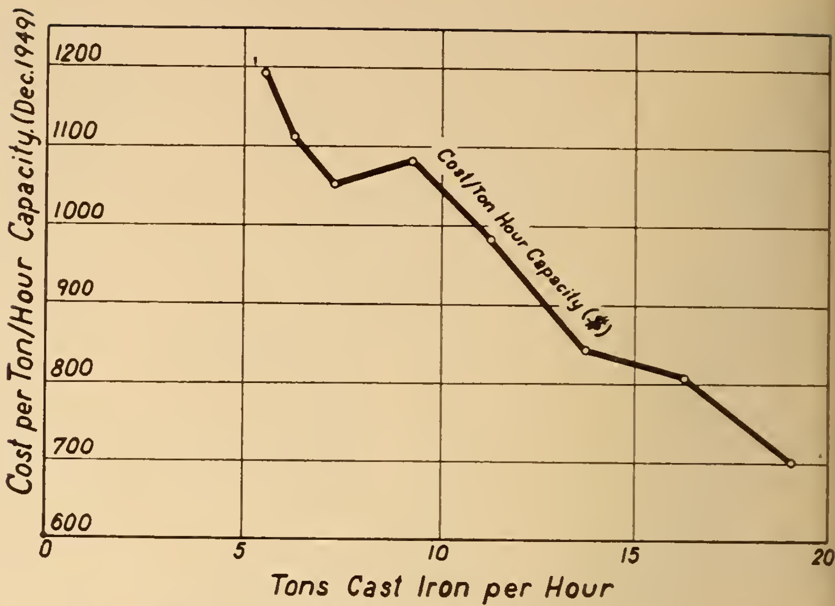

Fig. 5. Cost of grit washers for foundry cupolas.

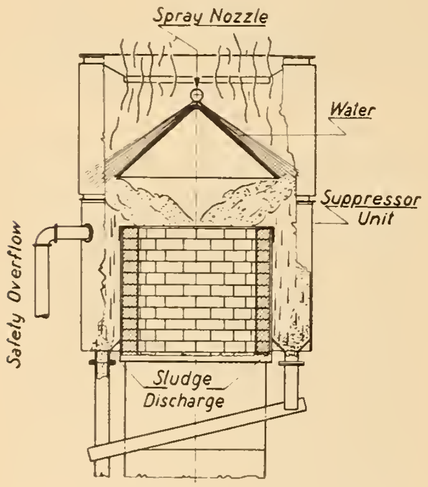

Fig. 4. Grit washer on foundry cupola.

It was reported in "Smokeless Air" (Winter, 1949) that there were 70 authorities co-operating with the Fuel Research Station in making daily and monthly observations. More than 500 instruments were in use for measuring the different variables. All of the above, again, indicate the need for co-ordinating such work on a national or international scale. At the United States Technical Conference in Air Pollution (1950)⑩ there were discussed 96 papers in 13 different categories.

Detection of Source

The distribution of pollution is affected by a number of factors, notably local topography, the extent of industrial activity and the direction and velocity of prevailing winds. Coarse particles tend to settle near to the point of emission① but the use of high chimneys causes gases and fine dust to be carried away from the point of emission and to be distributed more evenly over the countryside in an attenuated form.⑤⑦ Bosanquet⑮ has recently investigated the spreading of gaseous or smoke plumes from chimneys. His conclusions throw considerable light on the distribution of pollutants derived from industrial processes. However, it must be remarked that the height of the chimney cannot be increased in proportion to the generating capacity of the plant,⑧ both for economic reasons and on account of increasing aircraft hazards.* Also, irregularity of terrain and heights of nearby buildings may make it difficult to determine what figure to use for the effective chimney height.

A detailed study, such as that described above, usually indicates the chief offenders, but the procedure involved is lengthy and expensive. Spot checks, combined with analyses of the deposits, or of samples of the gases in various localities, may provide pertinent information. Munger ⑪ mentions a directional dirt fall collector which is expected to give some indication of the sources of pollution. This device has not yet reached the stage of commercial development. Sticky paper and aluminum foil coated with vaseline may be used in the field to collect samples of dust, but these can only be used in dry weather.

*A chimney 611 feet high has recently been erected at El Paso to reduce atmospheric pollution at ground level. (A.S.T.M. Bulletin May 1951).

TABLE IV

Size Analyses of Fly-Ash

Size Range Microns	Average Particle Size (Microns)	Size Distribution — Percentage by Weight		
		Pulverized Fuel Fly-Ash	Stoker Fly-Ash A	Stoker Fly-Ash B
+60	60	1.0	78.0	41.0
+40 – 60	50	5.0	2.0	11.0
+30 – 40	35	7.0	2.0	S.0
+20 – 30	25	10.0	3.0	10.0
+15 – 20	17.5	10.0	3.0	7.0
+10 – 15	12.5	21.0	3.0	6.0
+ 7.5– 10	8.75	15.0	2.5	5.0
less than 7.5	3.75	31.0	6.5	12.0
	Total.......	100.0%	100.0%	100.0%

Ljunggren and Wilmer [13] de-scribe a portable instrument through which the air is drawn by an electric fan (battery driven). In it the solid or liquid particles are illuminated from the side by very intense light against a dark background. The flow of gas can be stopped at will and the number of particles are then counted or estimated (Fig. 2). It is claimed this instrument makes it possible to observe particles down to 0.5 microns, suspended in the air. Other techniques such as filtering,[11] colour photometry,[14] electrostatic precipitators,[10] Venturi scrubbers,[11] and sonic determinations [10] have been employed and the mere enumeration of them serves to illustrate the importance and difficulty of the general problem.

Munger [11] lists eighteen subjects upon which research is now proceeding, and eleven more in which investigation is necessary. A summary of the standard methods used nine years ago was published by the United States Bureau of Mines in 1942[16]. In view of the new techniques now available, it is evident that some more precise and definite procedures should be devised, so that offenders may be detected and brought to book in the shortest time and at the least expense.

The Reduction of Pollution

It is evident that the best way of reducing pollution is not to emit pollutants, but this is a counsel of perfection when and where industrial processes must be carried on, buildings must be heated and mechanical transport is necessary. Some degree of amelioration can be obtained by limiting the volatile content of fuels used (e.g. in St. Louis). This procedure is not always possible and even if it is, the solution is only a partial one. For instance, "smog" causes considerable trouble in Los Angeles, though oil fuel is used almost exclusively, and most fuels in common use elsewhere produce appreciable amounts of sulphur dioxide. The use of air jets [1][17] to provide turbulence and secondary air in combustion chambers, greater attention to the regulation of air supply, and better design and maintenance of furnaces have resulted in some improvement. These changes, which are not unimportant, must usually be supplemented by other preventive devices.

The pollutants to be removed may be in solid, liquid or gaseous forms, or in any combination thereof. The principal processes employed may be classed functionally as mechanical, chemical, electrical or sonic.

(1) *Mechanical separators* depend on one or more of the following principles:

(a) Passing the gases through small openings, as in filtration.[5] Generally, the resistance of the filter increases with its effectiveness but, with this proviso, it is claimed that such filters are effective down to a particle size of 0.1 micron (Table 3).

(b) The use of a sudden change of direction, combined with a reduction of gas velocity and/or the employment of centrifugal force, as in a cyclone. The relative efficiencies obtained on particles of various sizes in the simple cinder trap and in the cyclonic types are shown in Fig. 3. It must be noted that the draft loss in the latter case is more than twelve times that in the former.

Within a certain range, reduction in the diameter of a cyclone gives a higher degree of efficiency at the design point and a flatter efficiency curve and, for this reason, multi-cyclone elements of 3 to 9 inches diameter are now frequently used [5][7][12]. The theory of gas flow in the cyclonic type of dust collector has been investigated by Prof. Ter Linden.[18] He notes the undesirability of guaranteeing total efficiency unless the dust has a constant composition, or contains only a few grains smaller than 10 microns.

(c) Washing or scrubbing with a liquid. This may take place in towers, cyclones or venturi scrubbers.[5][10] The last named is claimed to have high collection efficiencies down to a diameter of 0.2 micron, and good absorption of some acid gases and odours. One of the most difficult problems in practice is that of preventing the escape of large quantities of grit from foundry cupolas.[19] Probably the most effective way of improving this situation is by using a wet scrubber, as shown in Fig. 4. The approximate cost of this equipment (without erection) per ton of iron melted per hour is shown in Fig. 5 (Toronto, 1950).

(2) *Chemical separators* are used mostly to remove gases or vapours, though in some instances certain solids may be absorbed by washing.[5] Another principle employed is that of adsorption, in which the pollutant is attracted to the surface of the adsorbing substance but does not penetrate it. In the former, a large area of contact is required, and therefore the absorbing fluid is either sprayed into the gas or is distributed over a large wetted surface. Adsorption is both rapid and complete, usually the material may be re-activated and the process may be made automatic at a reasonable cost. Some substances used in this way are activated carbon, silica gel, activated alumina and activated bauxite.

Both processes must be operated at comparatively low temperatures, preferably below 100 deg. F. These appliances are useful, moreover, in the suppression of odours [11] which may, alternatively, be removed by heat, incineration or filtration.[10] Transformation of pollutants into non-objectionable substances [5] or into marketable by-products is also possible by these means.

In spite of the fact that there is a shortage of sulphur* and lead, huge quantities of these useful materials are thrown away every day. It is estimated that 822 tons of sulphur dioxide are wasted daily in Los Angeles alone. At Trail, B.C., extensive remedial measures were undertaken, resulting in the production of sulphuric acid, ammonia, phosphoric acid and fertilizers.[14] In 1940, the daily recovery at this plant was 600 tons of sulphuric acid and 140 tons of sulphur. Elsewhere, it has been shown that fly-ash has peculiar advantages when used as an ingredient of concrete.

(3) *Electrical precipitation* is probably the most effective way of removing very small particles of liquid or solid. It operates by charging the suspended particles by means of gaseous ions or electrons, transporting the particles to the collecting electrode, discharging the particles and removing the particles from the collector.[5][7][10] The precipitator may be wet or dry, the surfaces composed of tubes or plates, and the flow may be either horizontal or vertical. (Fig. 9). The effectiveness of this method depends on the electrical conductivity of the material to be collected, on the velocity of the gases and on the cohesiveness of the particles. Critical velocities vary from 2 to 20 feet per second in the cases of carbon black and liquid films respectively, so that proper distribution of the gases is essential.

Its main objections are high initial cost, heavy weight and high maintenance cost to maintain peak efficiencies.[12] High efficiencies may be obtained by using in series a multi-cyclone to take out the coarser particles and an electrostatic precipitator to collect the very fine dust. The collected material is removed as a sludge, in the wet type of installation and by rapping in the dry type. In the latter case, care must be taken that the collected material is not returned to the gas

*"Time", April 23, 1951.

stream; this may be achieved by the use of dampers in cases where more than one unit is employed.

(4) *Sonic precipitators.* When high frequency sound waves are passed through a gas containing suspended particles, rapid agglomeration of the particles occurs, due to a combination of (a) vibration of particles, (b) hydrodynamic forces, (c) radiation pressure.(7) These agglomerations of particles may then be separated from the gas by mechanical means so that a high efficiency is obtained. The sound may be produced by electromagnetic vibrations, or by rapid pulsations of compressed air or gas.(5) This process is still more or less in the pilot plant stage, but enough has been learned about it to indicate its effectiveness in removing very small particles.

The best frequency range varies with the size of particle, ranging from 1 kilocycle for 10 micron particles to higher frequencies for particles as small as 0.01 micron. The sound intensity required is of the order of 150 decibels. It is claimed that this method may be used over a wide range of temperatures, from below zero (F) to over 1000 deg. F., without impairing its efficiency.(7) In this case, as in those previously described, the efficiency of the dust separating apparatus is preferably determined, wherever possible, by the use of the appropriate Test Code of the American Society of Mechanical Engineers.(20)

Limitation and Control of the Degree of Pollution

It is the right of every citizen to have the air that he must use come to him with its quality not unreasonably impaired. This right is perpetually being infringed by interested parties for economic reasons. Voluntary action on their part is therefore not to be expected, nor is it usually forthcoming. It is true that the common law may be invoked by individuals, or groups of individuals, to abate a nuisance. Relief from this source however is liable to be uncertain, owing to the difficulty, already mentioned, of proving specific damages from identified sources.(7)

Local politics also have a bedevilling effect on the situation, as industries are welcomed in most communities, owing to their influence on local revenues. Moreover, those industries, if attacked, may threaten to move to other locations, thus causing trouble in governmental circles. Most cities and industrial communities have passed pollution control ordinances, under one name or another, which are expected to be effective and, therefore, should be immune, as far as possible, from political meddling. Yet, in the great majority of the 46 smoke abatement ordinances cited by the American Municipal Service (21) the principal smoke officer is under the control of the local Health, Property, Building or City Planning Department, or some combination thereof. In one or two cases only is the pollution control vested in an independent body.

A model smoke regulation ordinance has been issued by the American Society of Mechanical Engineers (22), and most of the ordinances examined conform to this general pattern. An analysis of the 46 ordinances enacted by cities in the U.S.A. (21) reveals the following facts:

75 per cent use the Ringelmann Chart as the standard of measurement,

74 per cent require permits when new fuel burning equipment is installed,

39 per cent require fuel burning

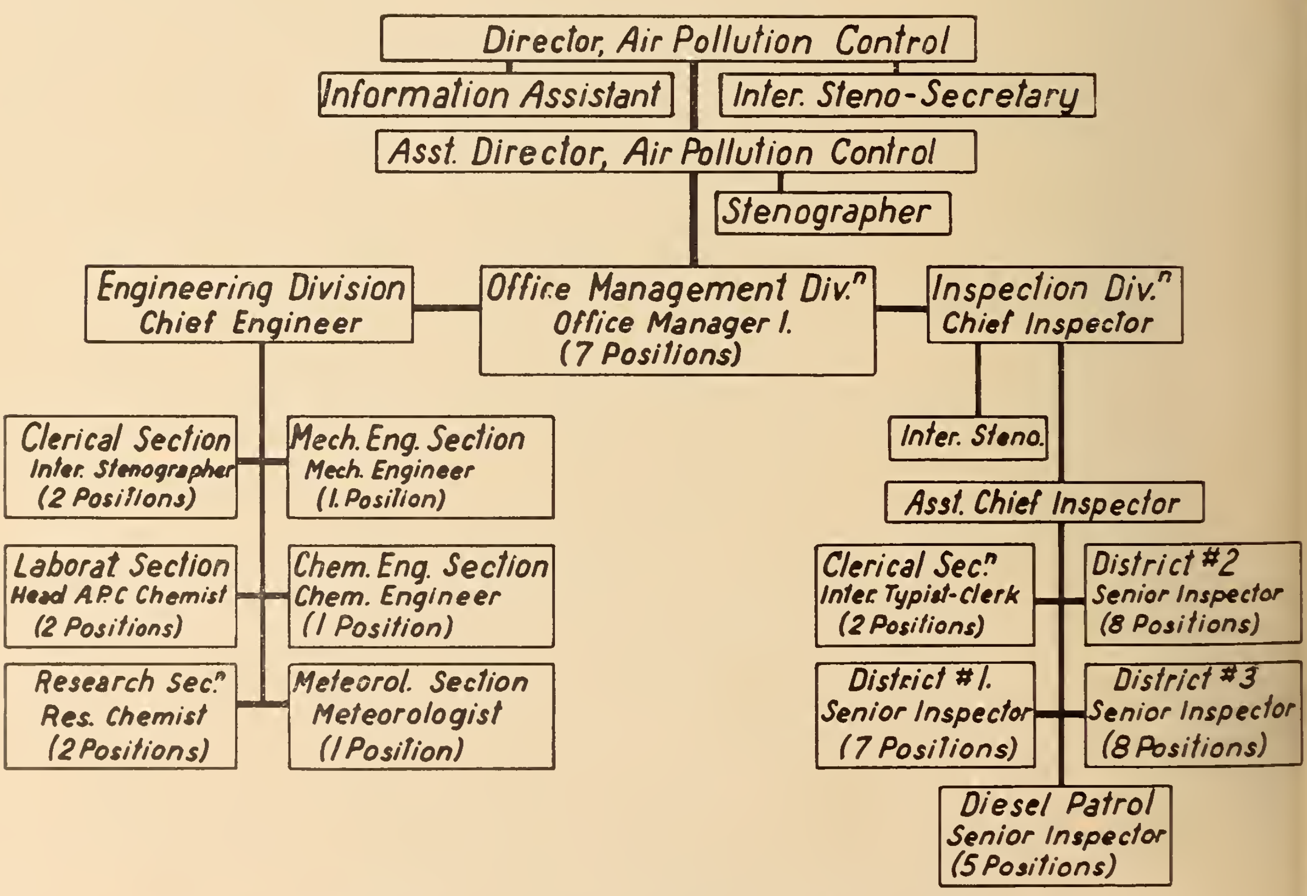

Fig. 6. Pollution control organization in Los Angeles County.

equipment to be inspected annually or quarterly,

35 per cent specify smokeless fuel control,

48 per cent provide for Appeal Boards,

26 per cent provide for Advisory Boards,

39 per cent give authority to issue rules and regulations regarding the dimensions and specifications of fuel burning equipment.[23]

In most instances, cognizance is taken of the fact that, when starting up or cleaning a fire, the emission of smoke cannot be prevented. The usual allowance for this purpose is not more than 6 minutes per hour, but this figure varies somewhat in different places. In 76 per cent of the cases examined there are some provisions for limiting the emission of fly-ash. In 59 per cent of them there are regulations regarding fumes and noxious gases.

The penalties for non-compliance (first offence) vary from a nominal fine to a maximum, in one city, of $299 or six months in jail. The penalties contained in most of the Canadian by-laws are mild by comparison! It is frequently stipulated that, after three or more violations of the ordinance in the course of a year, the offender shall appear to show cause why his equipment should not be sealed. Fees are usually prescribed in appropriate cases for permits and inspections. In some instances the revenue from these provides a substantial part of the cost of administration, varying from 34 per cent to 122 per cent in individual cases. In other ordinances the fees are nominal.

Many ordinances have failed to be effective and, where this situation exists, the usual reasons are (a) intermittent enthusiasm or public indifference, (b) inefficiency or wasted effort, (c) unwillingness to pay the price, and (d) the desire to see results in an impossibly short time.[21]

Organizations for Pollution Control

It should be recognized that no law can be effective if it is not accepted as necessary or reasonable by the public and, therefore, the administration of such ordinances should preferably be by education rather than coercion. An extensive educational campaign, sufficient staff and authority and concentration on the worst offenders are the primary requisites. Above all, civic and public institutions generally must set the example of compliance with the ordinance.[25]

In view of the fact that pollution crosses municipal boundaries, the provision for air pollution control districts by the State of California (1947) and the subsequent consolidation of the 28 or more municipalities of the Los Angeles County into such a district [26] is an obvious move which appears to have worked out satisfactorily in practice. The organization and staff employed are shown in Fig. 6. Similar areas exist in a few other parts of the United States.[7] The Committee on Atmospheric Pollution in Canada,[27] recognizing the diversity of ordinances that exist in various parts of the Dominion, recommends a similar type of organization. It should preferably come under the jurisdiction of the provincial government concerned, for the better control of pollution generally and for the introduction of some degree of consistency into the control pattern.

If a nation-wide educational programme is to be undertaken, a national organization must be formed, similar to the Air Pollution and Smoke Prevention Association of America or the National Smoke Abatement Society of Great Britain.

The industrial air pollution problem could be reduced somewhat by proper zoning or town planning, and by the greater use of central heating or heat pumps. These devices, however, are outside the scope of this paper and, indeed, are of sufficient importance to demand another paper to deal with them adequately.

There is no royal road to air sanitation, and no miracles are to be expected. The price of cleanliness is eternal vigilance.

Acknowledgment

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The Engineer and His English

An address presented at the Annual General and Professional Meeting of The Engineering Institute of Canada, at Montreal, May, 1951.

by
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Mr. Chairman, Mayor Houde, ladies, gentlemen, and guests: I appreciate the honour of the opportunity to stand here this afternoon before such an audience to talk upon a topic which I think has a reasonable degree of importance for the life of our community as a whole.

Of course, we all know that anything we say or do today is under the blackening sky of an impending human doom. But of that, on this occasion, nothing further.

We have had a good lunch. While the digestive juices dissolve the food gobbets—and I suppose that is one aspect of internal engineering—let's get on with the business in hand.

You, ladies and gentlemen, are about to appraise a post-luncheon address and I, Heaven help me, am about to provide you with that address. But may I say at once that I love this occasion; I mean, apart from the normal speakers' trepidation, I love this occasion. A mere professor of English—from the innocent, innocuous, impractical, soft department of university life—to come here and have the downright, hard-beaded, solid, practical fellows at his disposal for 18 or 20 minutes. Oh, boy, what an occasion!

But what am I going to do with my occasion? You have heard the topic — "The Engineer and his English." (Parenthetically, I hope what I have to say will have equal bearing for those of you whose heritage is in another tongue. My topic might be "The Engineer and his French," though the phrasing would be modified slightly to get the same flavour.) I wonder how important such a topic seems to you? I won't assume I know what is in your minds, at this moment, but let me tell you what is in my mind.

First let me say that I have always liked to teach English to science men and engineers, making that a broad category; that is, to non-arts men as such; you know, the outsiders, the tough babies! Basically the engineers are poets and, unless we thwart them or put them off, they come to literature—particularly great and enduring prose and poetry—naturally. The engineers—I am talking about their essence now, their potential — the engineers are creators, shapers, builders, — makers, if you like to go back to Aristotle for a comment on the poet.

Even in the more superficial aspects of poetry, for instance, the engineers are often adept, with an ear for rhythm and a sense of rhyme. From my Toronto days as an emaciated arts man, I remember the power, the magical power, and the thundering might — when it came at me—of "We are, we are, we are the engineers; we can, we can, demolish forty beers." And I remember how my friend Austin Wright lorded it over me in those days when we were carrying candy and other things to the same houseful of girls, because, after all, I was only an arts man.

Well, be that as it may, the engineers, it seems to me, are naturals for literary study, because, further, they are not only instinctively creators, makers, builders, but they are, as well, good critics. They have a sense of order and form and they like things well designed and clear and functional. They are against blur and blah.

Further, the engineers, it may be stated, are potential philosophers. They are always aware of some of the essentials of scientific procedure and they must constantly have the universe under examination through its laws—the laws of truth in a design, in a functioning part of any whole, in the integrated tensions of a total organism. The scientist and the engineer operate out on the frontiers of the elemental powers. They are always, as it were, catching up with the universe in its fundamental aspects. See that student at work above his bunsen burner! It may be only a bit of litmus paper turning colour; the universe is under his hands. See that man bending over a drafting board, getting it right, knowing it has to be *right!* See that girl working out a formula; or making a formula demonstrate itself Boulder Dam, or a jet engine, or the curve of sound, or that spring water under that road allowance it is all one. It is the mind and imagination of man in contact with his universe. The poet Yeats the Irish poet, put the whole thing down for us:

"For the elemental beings go
About my table to and fro."

Yes, I like teaching English to engineers. I think, Heaven help me, I can teach Keats's "Ode on a Grecian Urn" both as art and as engineering; I think they are really one and the same thing.

What have I been saying? This; that the creative, critical, imaginative processes are one and indivisible. Every good artist is part engineer; every good engineer is part artist. Each of them, in his essence, is a builder and a maker. Old Roger Ascham, the man who wrote a treatise on cock-fighting and taught Queen Elizabeth Greek, said: "We must not make two parts to a man."

Now I think all this has a sharp and imperative bearing on my topic "The Engineer and his English."

There exists sometimes the dangerous assumption that English is not for engineers, at least not English as literature and art. English as a tool, as English composition, for reports, for memoranda, yes, but not English as literature. The engineer should be taught to spell, to make sentences, to speak clearly and adequately, but he doesn't need all that folderol about the Elizabethan lyrists and Shakespeare and Milton and the romantic and the modern poets and the great expository prose and novels and dramas of yesterday and today. He does not need that; he can do without that. So it is sometimes argued.

All this sums itself up to saying that the engineer is a mechanical moron; an intellectual and aesthetic nit-wit, neither creative nor imaginative. I say that the minds of those who preach that sort of doctrine show some deficiency, because, in my book, that is just unmitigated, absurd nonsense. When applied in practice, as most engineering faculties tend to apply it, it is a disastrous denial of the engineer's humanity.

I set a paper at Christmas time for our engineering first year students at McGill where, thank God, the engineers are not as yet isolated as cultural morons. On the paper, just for fun, or for a bit of devilment, I asked the question: "What do you consider this English course should do for you (a) as an engineer; (b) as a human being?" Many of the men said quite seriously and, within limits, properly, that they thought the composition part of the course should help them in their practical assignments and that the literature part should educate them by giving them knowledge of other minds and times. Within its limits, that was a proper observation. But some students did what I hoped they would do. In more or less felicitous language they told me to go to hell for setting such a question. An engineer and a human being, they were forthright to observe, were one and the same thing. They were right, of course.

I know what I am talking about when I make this emphasis on the integrated oneness of literature and composition, and of man in all his parts and capacities. I know the half-bashful hunger in the attempts of science and engineering students to get out from under the assumption made concerning them that they are really only mechanical professionals. I know their bashful hunger to get out from under that assumption.

Let me illustrate: In some years we teach Shakespeare's "Macbeth" to freshmen. Now the story of Macbeth is the story of a man who, to further his ambition for the crown, murdered his King, who was his guest. It is the story of a dirty deed, but it is also the story of the inside of the man who did the deed and of his terrible and magnificent wife who egged him on. After the deed is done, Macbeth comes unsteadily from the death room and looks at his hands. For Elizabethan Englishmen, aware of the tumbling green sea stretching away to horizons from all shores of their little island, Shakespeare put in the mouth of the murderer who had thought he could do the deed and get away with it, a tremendous metaphor. Macbeth says:

"What hands are here? Ha! they pluck out mine eyes!
Will all great Neptune's ocean wash this blood
Clean from my hand? No, this my hand will rather
The multitudinous seas incarnadine.
Making the green one red."

That is literature in action. There, for any man, Elizabethan or modern, is the idea of the untrammelled consequences of a dirty deed, built in the mind of all of us in its terrible, inescapable essentials. Macbeth at that moment is Everyman for all of us.

Or take "King Lear." Sometimes we put "King Lear" into the literature course. King Lear's irascible foolishness has made him the victim of cruel and calculating daughters. He is driven into the storm on a wild night, his old white head under the pelting of the pitiless storm. He is purged of his despotic insolence and brought level with common humanity. He cries:

"Poor naked wretches, whereso'er you are
That bide the pelting of this pitiless storm.
How shall your houseless heads, and unfed sides,
Your loop'd and window'd raggedness, defend you
From seasons such as these? O, I have ta'en
Too little care of this! Take physic, Pomp;
Expose thyself to feel what wretches feel,
That thou mayst shake the superflux to them,
And show the heavens more just."

Literature in action, again There is the drama of the event in its own time in that. But there is more. Once again literature does its creative and imaginative office. It broadens our minds and extends our sympathies. It rebukes all complacent luxury. In it, in modern terms, is the whole of the Four Point Programme and the Colombo Plan. In it is more than pig wheat out of Canada for men in India.

Or take something so deftly built, so sharply turned, so full again of the truth of human life as this; out of the early seventeenth century, by Sir John Suckling:

"Why so pale and wan, fond lover?
Prithee, why so pale?
Will, when looking well can't move her,
Looking ill prevail?
Prithee why so pale?

Why so dull and mute, young sinner?
Prithee why so mute?
Will, when speaking well can't win her,
Saying nothing do't?
Prithee why so mute?

Quit, quit for shame! this will not move,
This cannot take her;
If of herself she will not love
Nothing can make her!
The devil take her."

I say that young men come to me shyly and hungrily for more of that because they know it expands them into being men. Those who cry "Engineers don't need literature; only composition for engineers," are taking away the engineers' birthright.

Let me now, in conclusion, be concrete and try to show you just where I have been going. I want to offer three propositions with a brief comment on each.

(1) English for the engineers should be what it should be for all freshmen, an exposure through literature to the life of the imagination.

On that point, this:

It is true, I think, that in an English-speaking university (and the case would be parallel in a French-speaking university), acquaintance with great literature in the mother tongue is the student's nearest, most available, most direct approach to the world of art. Take from the student the opportunity for that acquaintanceship and you deprive him of contact with what should be to him an enduring heritage.

(2) English should be taught as a skill and a tool for engineers, as for all students.

In all I have said I have not been discounting what is called English composition, as such. Even though I believe that literature can, as T. S. Eliot says, communicate when it is not understood; at some point, for practical purposes, there must be understanding. An awareness of the niceties and exactitudes of grammar, spelling, punctuation, sentence structure, (there's an engineering word!) is not only of practical service; ultimately it is necessary for full literary appreciation. For some students there must be for a period, almost blind drill; for all, analytical knowledge of the means and processes of verbal communication. Think, for instance, how important the innocent, often unobserved little comma can be. Suppose I give you the sentence: "Dr. Austin Wright says the speaker is a fine figure of a man." I am modest and I demur at once. I say put in two commas, one after "Wright" and the other after "speaker." The sentence then reads: "Dr. Austin Wright, says the speaker, is a fine figure of a man." You see? We must go in for commas and the whole box of tricks of what we call in our jargon "the mechanics of writing."

All that box of tricks and all those mechanics are, after all, only a system of symbols which clarify and elucidate the inner thinking, the process and movement of thought and feeling. The thought and feeling is the primary thing. I think the greatest aid in clearing up a freshman's composition is to get him thinking clearly on his own about his material. That is why, I think, if I had to choose, instead of a course in composition as such, I would try to teach "Hamlet" as literature, feeling that students would, in the main, pick up the fundamentals as they went along. I think the "Hamlet" people would win out every time, even in terms of composition, and you would never hear them use a double negative!

Let me be emphatic. Composition as such, the mere drill in mechanics, is never, alone, enough. Isolated, it can mean a kind of mental dearth. Actually, ultimately, you cannot isolate either composition or literature. They are mutually inclusive, in my opinion. To look at the matter from two sides; only undiscerning minds think that literature is unnecessary. Only undiscerning minds think that composition as such is sufficient.

(3) Literature, or cognate subjects such as philosophy or history, should be made accessible to engineering students at all grade and year levels.

I know I run up against vested interests here. You graduates of engineering schools, or those of you who may have to do with engineering curricula, say, "But there is no time for anything outside of our specialization. Our students are too pressed as it is." In the light of what I have said, I plead with you to reconsider that view on behalf of the best interests of your ultimate professional standing, that body corporate of yours that is of such tremendous importance in the local community and in the country as a whole. I could covet for our Canadian Schools of Engineering a reputation for retaining for their graduates throughout their strenuous studies, closer rather than more and more tenuous contacts with man's world of the creative imagination.

Creative and imaginative man man the builder and maker, is always conscious of a responsibility toward this complicated, exquisite, magnificent piece of engineering we call Man himself, and his universe. Whitman said:

> "And the narrowest hinge of my hand puts to scorn all machinery,
> And a mouse is miracle enough to stagger sextillions of infidels."

That, to me, is both art and engineering.

Brakes for Turbo-Propellers

Deck-landing experience with naval aircraft powered by propeller gas turbines has revealed a rather unusual difficulty—the engines run too smoothly.

When units of carrier-borne aircraft return from operations, each aircraft must be cleared from the flight deck immediately after landing to make room for the following machines. As soon as a piston-engined aircraft lands, the engine can be switched off and the propeller stops in a few revolutions. It has been found, however, that the gas-turbine-driven propeller will windmill for nearly a minute after the engine is shut down—in fact, if the carrier is headed into a strong wind, the propeller will continue to spin indefinitely. This presents a considerable hazard to the deck crews who must stow the aircraft immediately after its landing.

It seems it will be necessary to correct this trouble by fitting a brake to the propeller shaft similar to the conventional aircraft or automobile wheel brake. The development of such a brake will present no serious problem to aero engineers, but its additional weight and mechanical complexity will be accepted reluctantly in aircraft where every additional pound of weight and item requiring maintenance must be subject to the closest scrutiny.

INSTRUMENTATION
of a
TYPICAL CHEMICAL PROCESS

by

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Fischer & Porter (Canada) Ltd.,

and

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A paper presented at the 65th Annual General and Professional Meeting of The Engineering Institute of Canada, at Montreal, May 11, 1951.

This paper outlines the application and design of instruments for control of a chemical process. Starting with a "flow sheet", the authors show how process and instrumentation engineers co-operate to this end. The successive steps necessary in the analysis of the process are described. A few of the common problems encountered by processors are posed by one of the authors, representing the owner-processor, while their possible solutions are given in the form of replies by the co-author, representing the instrument supplier.

The greatest benefit derived by employing an instrument engineer in a company is the advantage of having an instrument specialist in intimate contact with new chemical processes. He is involved in the development of a process from the time it emerges from the laboratory until the equipment is installed and operating satisfactorily. In companies having sufficient volume of work to justify an instrument engineer, the chemical process is almost completely instrumented before the instrument suppliers are contacted. This paper outlines briefly the steps taken in providing instrumentation in a chemical process.

The application of a control instrument to a process must be justified by one or more of the following considerations:

(i) Reduction in operating hazards.
(ii) Operation of a process extremely difficult to operate manually.
(iii) Improvement in the quality of the product.
(iv) Reduction in capital or operating costs.

Automatic control technology has reached the point where, as a general rule, any operation that can be carried out manually can be made to operate automatically. However, an uneconomical tendency to eliminate all manual operations must be repressed. For safety reasons, it is generally unwise to attempt to reduce the number of operators in a plant to less than two. There is nevertheless a strong tendency to limit the number of operators to this minimum of two.

The selection of instruments for a proposed chemical process is most effectively carried out as a unified effort of the process and instrument engineers. As a rule, an initial conference on the general scope of the work is held as early as possible in the development of the process. The instrument engineer thus has an opportunity to become familiar with the basic process involved. As soon as a flowsheet has been prepared, the instrument and process engineers make a preliminary study together to determine the type of installation which seems feasible and justifiable. This paper will consider a chemical flow diagram and discuss it as would be done in the selection of the basic instrumentation.

Part of a process for the manufacture of liquid sulphur dioxide has been selected as a typical flowsheet for this demonstration (Fig. 1). This process has been chosen because it requires the installation of most common instruments, as well as some of the more unusual ones. The process as it will be outlined and instrumented, was evaluated some time ago with a view to replacing sulphur for sulphite pulp manufacture. The current shortage of sulphur has created more interest in the large scale use of liquid sulphur dioxide. C-I-L is now engaged in the detailed design of such a plant, and construction is to commence this year. For the purpose of this demonstration, the process has been simplified to some extent.

There is at Copper Cliff, a plant manufacturing sulphuric acid from waste smelter gases containing 2-10% sulphur dioxide. A new smelting process being installed by the present gas supplier will result in a by-product gas containing 70-90% sulphur dioxide. While additional quantities of acid could be made from this gas, the high SO_2 content renders it relatively easy to liquefy.

A plant is to be designed, therefore, to produce liquid sulphur dioxide. The off-gas from this plant will contain about 50% sulphur dioxide and will be sent to the acid plant for conversion to sulphuric acid.

The initial stage of the process will be the drying of the waste smelter gas to render it non-corrosive to steel and to permit the use of standard steel pipe and fittings in the remainder of the new plant. This paper will deal with the instrumentation for this drying operation since it involves all the usual variables.

As far as instrumentation is concerned, it should be pointed out that the gas filters and the drying system are to be located in a building adjacent to the acid plant. A considerable sum can be spent on instruments in this part of the plant if they will eliminate the necessity for an operator being in attendance. However, as this part of the plant is to be located near the existing acid plant, the acid plant operator can be made available for short periods of time. The rest of the plant will be about 1,000 feet distant from the drier building.

Analysis for Instrumentation

In the selection of instrumentation for the process, the procedure outlined in Fig. 2 will be followed. A scheme of this type should be employed in analysing any process for instrument application so that no features of the process operation are left unconsidered.

First: the process is broken down into unit processes. *Second:* each of these is considered individually with regard to the variables which affect the operation and which are possible points of instrument application. These variables may be broken down into five main classifications: temperature, pressure, flow, liquid level, and composition. *Third:* each variable of significance to the process in question is reviewed individually, and its instrument requirement classified as:

(1) automatic control

(2) indicating, recording, or totalization

(3) alarm for warning of emergency conditions. *Fourth:* the various components of the instrumentation for each variable are chosen. In the case of an automatic controller the primary measuring element, a transmission means from this element to the control instrument proper, a controller mechanism, and a control valve are necessary. Where indicating, recording, or totalization functions alone are required, the primary element and a transmission system are selected. Instrument equipment for alarm purposes requires a primary measuring element and an audible or visible signal.

The liquid sulphur dioxide process under question has been divided into the following:

(1) Gas Pumping
(2) Gas Filtration
(3) Gas Drying
(4) Gas Compression
(5) Gas Liquefaction
(6) Acid Plant Supply System
(7) Liquid Storage

Instrumentation for sections 1 to 3 inclusive requires special consideration in this case since the control room will be remotely located and a minimum of operator's time is available for the operation.

For the second step in the analysis, the 3rd section, the Gas Drying System, will be studied. Time will not permit us to instrument the entire process. The Gas Drying system has been selected for discussion, since it involves all variables classified and also most common types of instruments. Further, in the drying system, full advantage must be made of instrument equipment available in order to provide an automatic system requiring manual operation for start-up only.

In the drying process, the incoming sulphur dioxide gas is dried by means of strong sulphuric acid. We have chosen sulphuric acid as a drying medium, because this plant will be located at an existing acid plant. Actually, the acid plant produces 98 per cent sulphuric acid in the absorption towers, but because of the peculiar freezing point curve of sulphuric, almost all our shipments are made in the form of 93 per cent acid. Under present conditions the plant must dilute the product prior to shipment. If we use the acid for drying sulphur dioxide gas, the acid will absorb the moisture in the gas and we will, in effect, be diluting the acid.

The acid circulating system includes an acid pump tank, a circulating pump and a cascade-type cooler to remove the heat of dilution from the circulating acid. The strength of the circulating acid will be 93 per cent, and we propose to maintain the circulating acid strength by the addition of 98 per cent acid received from the acid plant. A portion of the circulating acid will be drawn off from the circulating system as product acid.

The variables outlined in Figure 2 will now be considered.

Temperature

Problem

(a) *Control:* There are no gas temperatures to be controlled in this portion of the plant. The only temperature with which we are concerned is that of the circulating acid and in this instance, we only wish to attain the minimum temperature consistent with the cooling water available. No control is necessary.

(b) *Indication and Record:* If the temperature of the acid should exceed about 150° F., there is some danger of corrosion in the steel and cast iron circulating system. In addition, the efficiency of drying would decrease slightly as the temperature of the circulating acid increased. Therefore we wish to measure and record the temperature of the circulating acid at two points,—as it leaves the acid pump tank to indicate excessive heating in the drying tower, and at the exit of the acid cooler to indicate poor cooling efficiency We would like to have both these temperatures recorded in the acid plant control room about 150 feet distant.

Suggested Instrumentation

The most suitable primary elements for this application would be thermocouples, or alternatively resistance type thermometers. The connections from the point of measurement to the recorder for either of these are electrical leads which are initially inexpensive, convenient to install, and easy to repair. A filled thermal system, on the other hand, requires armoured capillary tubing to connect the temperature-sensitive bulb to the instrument case and, where several hundred feet of this capillary are required, the filled system becomes initially uneconomical in addition to its awkward installation and high maintenance cost.

The transmission to the recorder in the control room is electrical.

A multipoint printing type of instrument would be employed to record both temperatures, a further advantage of this type of temperature measuring equipment. In addition, other plant temperatures can be grouped conveniently on this one recorder, with the consequent economy of recorders and panel board space.

Problem

(c) *Alarm:* If the cooling water supply should fail for any reason, the temperature of the circulating acid may rise beyond the prescribed minimum. Since the acid plant operator will not be able to direct his attention solely to the gas drying plant, we would like to draw his attention to the circulating acid temperature if it exceeds 150° F.

Suggested Instrumentation

The primary element and secondary instrument for temperature measurement could also be used to actuate the warning light on high acid temperature. A switch can be incorporated in the recorder and actuated by the recording mechanism at the high temperature limit.

Pressure

Problem

(a) *Control:* There are no pressures to be controlled in this portion of the plant.

(b) *Indication and Record:* Under this heading, the only pressure measurement required is the pressure drop in the gas stream through the tower. Our experience with this type of tower has indicated that a certain amount of sludge and dirt accumulate in the tower over a period of time, even if the acid and gas streams are clean. The most convenient method of determining the existence of such conditions in the tower is the resulting gradual increase in pressure drop. We therefore wish to measure and record the pressure drop in the gas stream passing through the tower. If convenient, this measurement should be recorded in the acid plant control room. The maximum pressure drop will not exceed about 10 or 12 inches of water.

Suggested Instrumentation

A simple mercuryless manometer element, of all stainless steel, would be recommended here in view of the corrosion problem. A purge should be employed to ensure that manometer lines are kept clear of particles from the gas stream. Maintaining a continuous purge would not be critical with the stainless steel meter element.

Pneumatic transmission is employed as a standard feature of several mercuryless manometers manufactured, providing a compact packaged manometer and transmitter unit. The transmitter output is at 3 to 15 p.s.i. pressure, varying linearly with the pressure differential range of the manometer. The recorder in the control room is essentially a recording pressure gauge, calibrated from 3 to 15 p.s.i. in terms of pressure differential, to correspond with the output of the transmitter.

(c) *Alarms:* Since the rate of increase in pressure drop is slow, no alarm would be required.

Flow

Problem

(a) *Control:* Basically there are no streams to be controlled in this portion of the plant, although subsequent consideration of other variables will result in the application of instruments which actuate flow control valves.

(b) *Indication and Record:* In this particular portion of the plant we are not concerned with the gas flow rate, but we are interested in the flow of acid in the circulating system. This type of tower has a "minimum wetting" rate, which by definition is the minimum rate of liquid flow which will wet the entire surface of the ring packing. If the rate of acid flow is less than the required minimum, "wet" sulphur dioxide gas could pass through the acid free portions of the tower unchanged. This would result in "wet" gas entering the subsequent portions of the plant and causing serious corrosion.

This particular drying tower has a minimum wetting rate of 50 GPM, and we wish to measure the acid circulating rate. This measurement need not be recorded. It should indicate the acid flow near the valve controlling the discharge of the pump, so that an operator can adjust the discharge accordingly. The pipe line would be about 2 in. size.

Suggested Instrumentation

A rotameter is suggested for this application. The simplicity of the rotameter over the orifice and manometer flow meter makes the former ideally suited for handling corrosive fluids. The rotameter has a lower installed cost than the differential manometer flow meter. Further, in pipe line sizes under 2 in. an individually calibrated orifice plate is required to provide reasonably accurate flow measurement using a manometer. In this instance the metering element serves as the indicator since the measurement is required only at the process location.

Problem

(c) *Alarm:* Serious corrosion will result if "wet" sulphur dioxide reaches the steel piping and equipment following the drying tower. Our experience has been such that we are confident of obtaining a "bone dry" gas if there is strong acid circulating in the tower. Therefore, since acid circulation is so critical, we would like to sound an alarm if the acid circulation rate drops to less than 50 GPM. The acid plant operator could then take steps to remedy the situation, or order an immediate plant shutdown.

Suggested Instrumentation

The measuring element for the low flow alarm would be the rotameter discussed under (b). This secondary function is incorporated into the rotameter by the addition of a magnetic extension on the float and housing. This extension trips a mercoid switch at any set rate of flow. An over-extension should be used, since an under-extension would tend to collect particles carried in the acid stream. The switch would be connected electrically to its signal light on the control room panel board.

Liquid Level

Problem

(a) *Control:* The acid pump tank has sufficient capacity to hold all the acid in the circulating system. However, as we are adding 98 per cent acid to maintain our circulating acid strength at 93 per cent, we must bleed off a portion of the circulating acid to maintain a certain maximum quantity of acid in the system. We intend to accomplish this by transferring to storage a portion of the discharge from the circulating acid pump. Essentially, then, we wish to maintain a constant liquid level in the acid pump tank.

Suggested Instrumentation

The measurement of the acid level should be made by means of an open air-bubbler system, or a diaphragm type element fitted

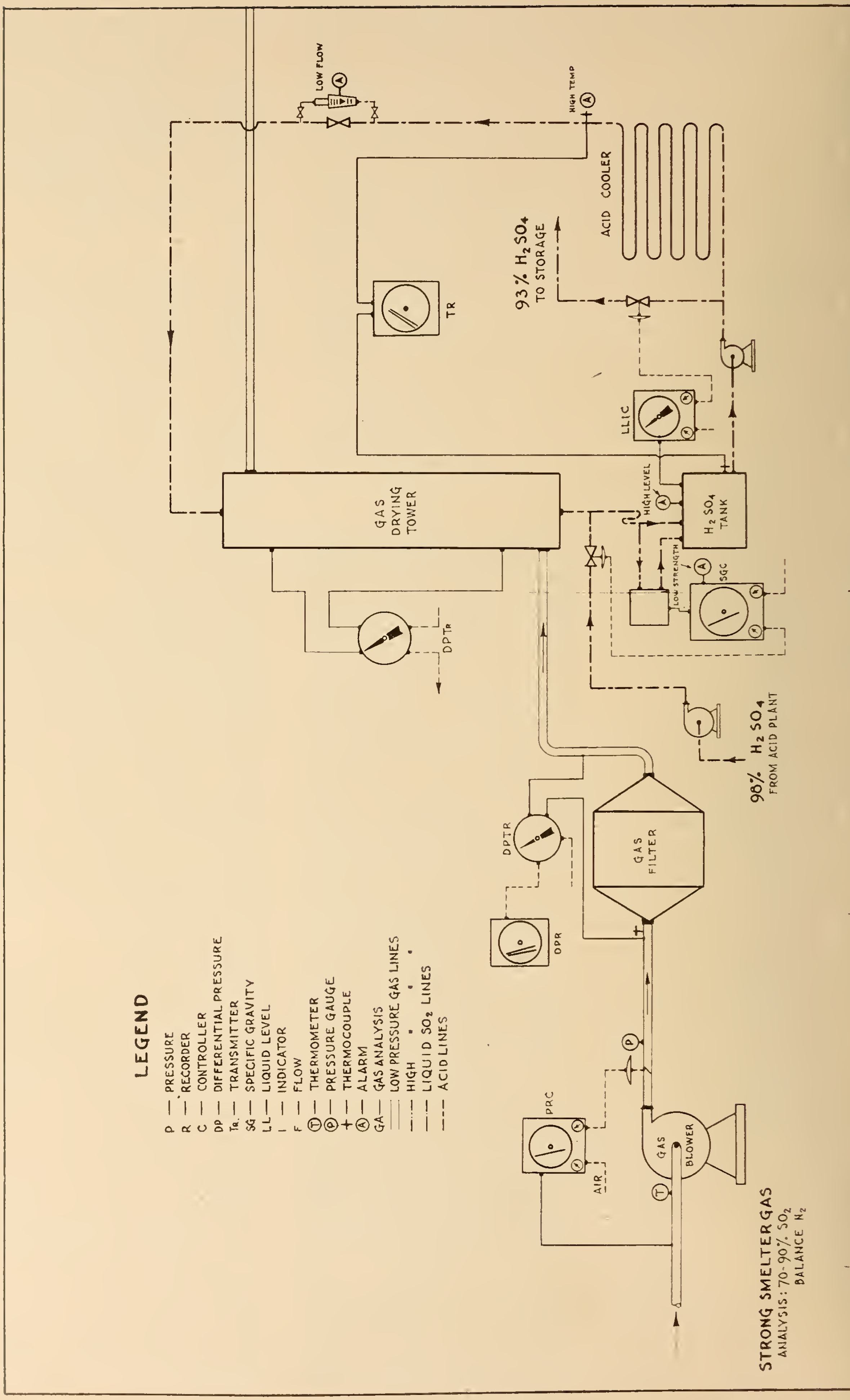


Fig. 1. Sulphur dioxide liquefaction plant. Gas drying section.

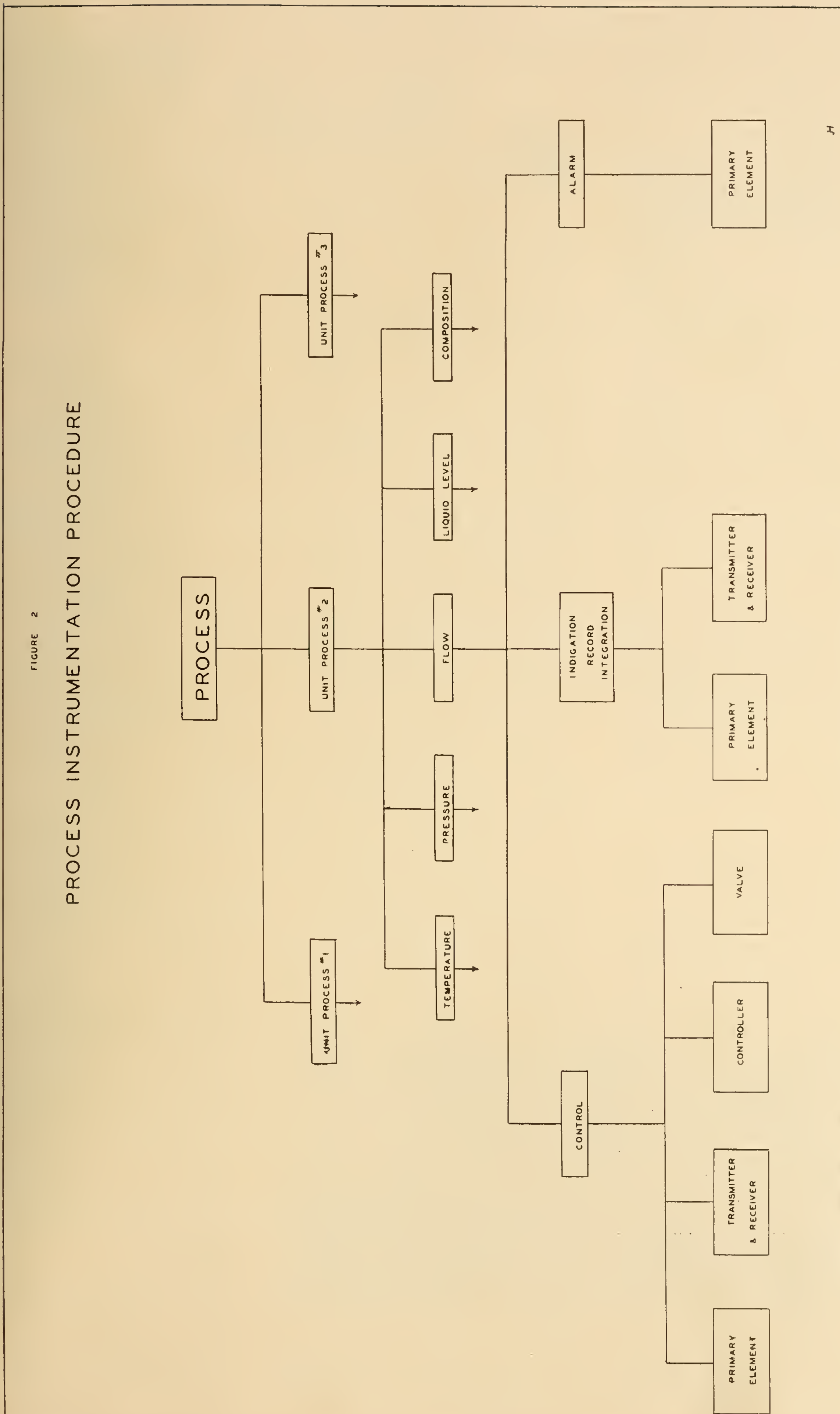


Fig. 2. Process instrumentation procedure.

near the bottom of the tank and actuating an air pilot. These are selected because they require the simplest components in contact with the tank contents; in the first case a length of ½ in. pipe, and in the second a diaphragm of suitable material, flange-mounted to the side of the vessel.

The measuring and controlling instrument could be mounted conveniently at the process, since the desired level at which the tank is operated will not require adjustment. A simple pressure gauge, calibrated in feet and inches of liquid level, would provide an indication of the actual level in the control room. If the controller is to be mounted remotely, the diaphragm element, which is inherently a pneumatic transmitter, should be used to avoid excessive measuring lag to the control room.

With reasonable tank capacity and the small process lags, a proportional controller with narrow band adjustment would be adequate for this application. A Saunders type packless control valve should be employed, since it is less susceptible to plugging and eliminates the difficulties experienced with packing gland deterioration and friction, which is detrimental to control. A standard valve with Teflon packing and valve positioner would be an alternative.

Problem

(b) *Indication and Record:* There are no liquid levels to be measured or recorded.

(c) *Alarms:* If the liquid level controller failed for any reason, the acid tank would overflow as further quantities of 98 per cent acid were added to the system. How could we design the system so that the 98 per cent acid pump would stop if the liquid level in the tank exceeded a prescribed minimum? It would be an advantage if the acid plant operator's attention were drawn to this condition at the same time.

Suggested Instrumentation

As an independent element for alarm purposes, an electrical probe type of signal device should be employed. The probe is simple and only under emergency conditions is it in contact with the acid. When the acid level reaches its high limit and contacts the probe, the alarm circuit is completed and the panel board signal light is operated. Through a relay, this switching action could also shut down the acid pump.

Composition

Problem

(a) *Control:* As far as gas composition is concerned, we are only interested in low moisture content at this point in the process. We feel this has been adequately covered in the consideration of other variables.

Since the circulating acid strength will be such that it will be shipped as product without further strength adjustment, we wish to maintain the composition as closely as possible to 93.2 per cent H_2SO_4. We intend to achieve this by the controlled addition of 98 per cent acid received from the acid plant. The quantity of 98 per cent acid required will vary directly as the quantity of water removed in the drying tower. The latter is a function of gas flow rate and water content. Normally the flow of 98 per cent acid will be 3 GPM, but under certain conditions will be as high as 14 GPM. Could an instrument be provided to measure and control an acid strength of about 93 per cent?

Suggested Instrumentation

A specific gravity instrument is required here to provide a measurement of acid concentration. Conductivity measurement is not suitable in this case, since the conductivity curve immediately below 93 per cent H_2SO_4 is extremely flat. Measurement of pH is similarly inadequate for this application. Specific gravity is commonly measured by an air bubbling system and manometer, or a hydrometer with electrical transmission. The latter has the advantages of higher accuracy, sensitivity, and reliability. Automatic temperature compensation of the measurement is required for this application, since temperature will fluctuate with gas flow and water content.

The sample should not be taken from the tank, nor the control agent added to the tank unless the vessel is well agitated. The sample could be drawn from the tower outlet line and the control agent, strong acid, added part-way up the tower, if a packed tower, or to the outlet line ahead of the sampling point if a pipe line mixer is installed. Sampling and acid addition points that provide the minimum lag obtainable with adequate mixing, are desired.

The measuring cell would be located at the process, and the electrical recorder remotely placed in the control room. For close control a proportional controller with automatic reset and rate action would be used. The rate action is most effective in counteracting deadtime inherent in the sampling type of measuring system. The control valve, which would be of the packless type to handle this corrosive material, should be located as close to the point of strong acid addition as possible.

Problem

(b) *Indication and Record:* There are no acid or gas analyses falling into this classification.

(c) *Alarms:* As the drying tower system is removed from the acid plant operator, he may not detect failure of the 98 per cent pump or of the 98 per cent acid supply for some time. Continued dilution of the circulating acid would result. The specification of the product acid would not suffer, since the liquid level controller would shut off the product stream, but corrosion and poor drying would be encountered if the dilution process were carried to an extreme. We would therefore like to have some device, such as a signal light, to indicate low circulating acid strength.

Suggested Instrumentation

The low acid strength alarm would be built into the acid specific gravity recorder. This recorder is of the automatically balanced electrical bridge type and the switch is operated from the balancing mechanism.

Summing Up

After selection of the instruments for each unit process, the over-all instrumentation is reviewed to avoid conflicting controls and insure smooth operation of the complete process as a unit. From this basic process instrument design, details, sizes, estimates and complete specifications may be prepared. The process and instrument engineers originally involved should follow the project through the specification lay-out and plant start-up stages.

This procedure for process analysis and instrument selection, as outlined in Fig. 2 and illustrated by this discussion of the liquid sulphur dioxide plant, is suggested as a logical system for determining optimum process instrumentation.

From Month To Month

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

A.S.M.E.-E.I.C. International Council

Back in 1943 the American Society of Mechanical Engineers and the Engineering Institute of Canada drew up an agreement which was to put into writing, ideas on co-operation which had been talked about for some time. This document was revised from time to time in the light of experience and to take advantage of developing opportunities, and recently an entirely new wording of the agreement has been under discussion.

The new draft was presented first at a meeting of the joint group held in Montreal during the course of the annual meeting of the Institute. A revised version was submitted to a postponed session of that meeting which took place in Toronto during the summer meeting of the A.S.M.E. on June 14th. At that meeting a final version was agreed upon. This version was approved by the Council of the Institute at a regional meeting held in Toronto on June 16th.

Eventually the agreement will be printed in full in the *Journal* but is being withheld now until the board of the American Society of Mechanical Engineers also approves it. This will be some time in September.

This agreement is rather a unique document and indeed is the record of a unique effort of co-operation between two engineering groups. Its main purposes are to provide for an exchange of privileges between the members of each society and also between the student members.

It allows the members of one to attend the meetings of the other on the same basis as their own members. Also it permits student members of one to become junior members of the other on the same advantageous basis as is available to their own student members. Publications also are available at special rates both for corporate members and for students.

The membership of the committee is made up of four representatives from each organization. The A.S.M.E. representatives are:

A. G. Christie, Chairman—Baltimore
A. C. Pasini—Detroit
T. E. Purcell—Pittsburgh
H. G. Thompson—Toronto

and for the Institute:

O. W. Ellis—Toronto
J. G. Hall—Toronto
G. N. Martin—Montreal
W. A. Newman—Montreal.

At the meetings it is customary for the president and other senior officers of both organizations to sit in. In this way the activities of the Council are tied in closely to the affairs of the societies.

One of the great advantages which the Institute will receive from the recent developments of this policy of co-operation is the representation which they are to have on certain technical committees of the A.S.M.E. It will be a rare opportunity and privilege to be associated with them in these extremely important studies.

The Institute is fortunate in having such splendid relationships with all the American engineering societies but these good relationships are pointed up rather prominently by the conclusion of an actual written agreement with one of them. The officers of the Institute are indeed grateful to the officers of the American society for their kindnesses and for their helpful understanding of the Canadian situation.

The A.S.M.E.-E.I.C. International Council in session during the recent summer meeting of A.S.M.E. in Toronto. From left to right are: O. W. Ellis, H. G. Thompson, J. G. Hall; E.I.C. president I. P. Macnab; A. G. Christie; Calvin Brown and C. E. Davies, president and secretary of A.S.M.E.; R. J. S. Pigott, president-elect of A.S.M.E.; A. C. Pasini. Standing: Professor S. H. Graf, vice-president of A.S.M.E.; E.I.C. secretary L. Austin Wright; and Ernest Hartford, assistant secretary of A.S.M.E.

Two New Technical Papers

Under the provisions of the Institute's fund for technical publications, two new papers have been issued as follows:

No. 4: Graphical Solution of Partial Differential Equations, with Engineering Applications: by Prof. F. M. Wood, M.E.I.C., Queen's University. Prof. Wood has developed a simple, almost automatic method for the solution of equations relating to water hammer, impact, and other common engineering problems. No special knowledge of higher mathematics is required for the use of the proposed method and it permits hydraulic, structural, and machine designers to use accurate methods of analysis which have hitherto been avoided because of their complexity. The price is $3.00.

No. 5: Economy in Rigid Frames: by T. A. Monti, M.E.I.C., Montreal district engineer, Canadian Institute of Steel Construction. This paper proposes a simplified method with charts and diagrams for the rapid preliminary design of the common types of rigid frames. The method eliminates the cut-and-try procedures formerly necessary before final analysis of such structures. This paper will be of particular value to structural engineers. Its price is $1.00.

Orders for these and other technical papers (see page 663) should be addressed to headquarters and should include a remittance to cover payable at par in Montreal.

Cover Photo

New Montreal Oil Refinery

An important new feature which has been rising on the industrial skyline of Montreal East during the past two years was officially completed a few weeks ago when, after appropriate dedication ceremonies, Finance Minister D. C. Abbott unveiled a 1/60 scale model of the expanded refinery facilities of the Shell Oil Company of Canada Ltd.

The multimillion dollar expansion programme included construction of a modern catalytic cracking unit of 10,000 barrels daily capacity, together with additional storage capacity, steam generating plant, electrical distribution system, maintenance shops, staff and administration facilities and additional refinery units, to increase the plant's total output to almost a million gallons daily of various petroleum products.

The accompanying photograph shows the new catalytic cracking unit. The large column on the right side is the main fractionating tower. The pent house and elevator tower are to the immediate left of the fractionating tower and the vacuum flashing unit is at the extreme left.

On the cover is a close-up view of the main fractionating tower which gives a particularly vivid impression of the almost unbelievable complication (to the layman) of petroleum refinery equipment.

(Photo by Dwight E. Dolan, Montreal.)

A Prize for the *Journal*

Once again the *Journal* has won international recognition for editorial excellence. On June twenty-seventh, in New York, E. J. Blandford, our publications manager, received on behalf of the Institute the original of the bronze plaque reproduced on this page.

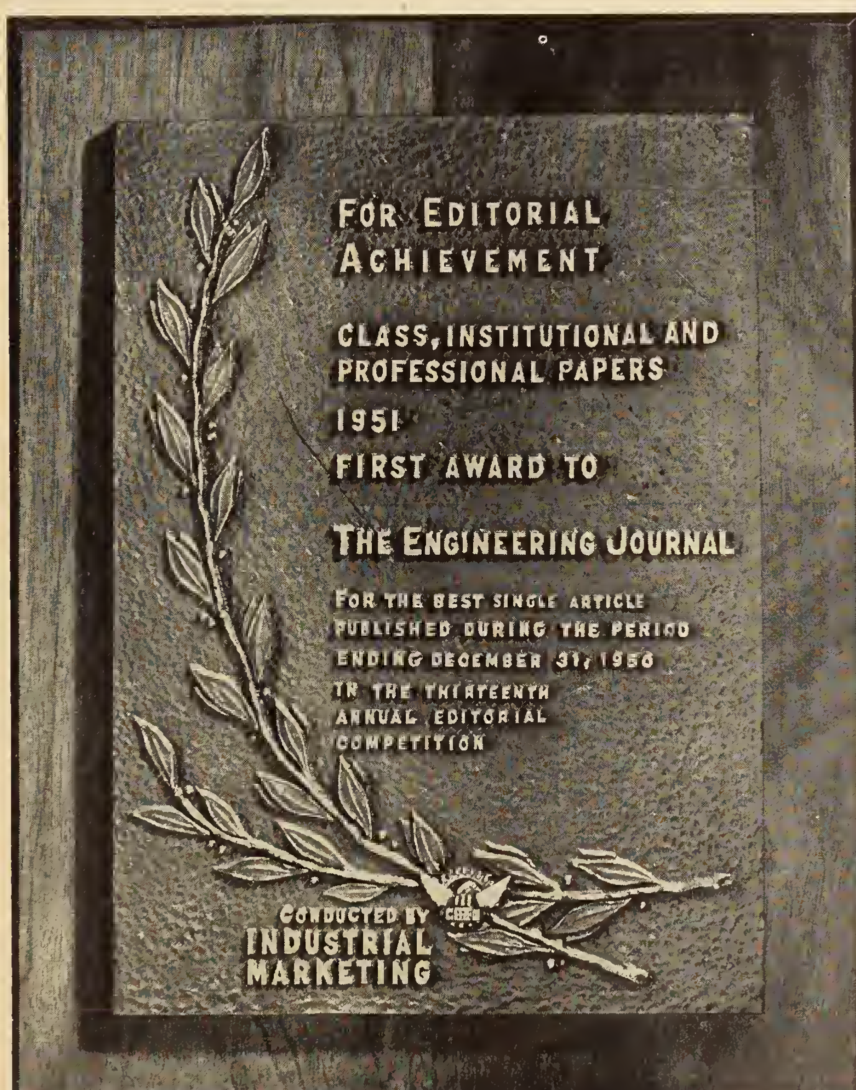
In the thirteenth annual editorial achievement competition conducted by "Industrial Marketing"—the magazine which serves industrial publishers and advertisers in the United States and Canada—the *Journal* was awarded first place for "the best single article among class, professional, and institutional publications".

Among the 600 entries from the United States and Canada, the panel of 24 judges selected the *Journal* as the only Canadian publication to receive an award.

The paper which achieved this important recognition was "Design Development of the Avro Jetliner" by J. C. Floyd of A. V. Roe Canada Ltd. It appeared in the *Journal* for January, 1950 after its presentation by Mr. Floyd at the 1949 Annual Meeting of the Institute at Quebec City in May, 1949.

The plaque has been suitably mounted in the foyer of Institute Headquarters and an appropriate photograph will be presented to Mr. Floyd.

Top: Representatives of first place award-winning publications, photographed during the 29th annual meeting of the National Industrial Advertisers Association. Left to right, first row: Robert McLaren, Aero Digest; Charles E. Whitney, Interiors; Robert W. Armstrong, Electrical Merchandising. Second row: Karel Wogkamp, Mining World; Emerson Goble, Architectural Record; Jerry Gerwitz, Jewelry; Harry Lee Waddell, Factory Management & Maintenance. Back row: E. J. Blandford, The Engineering Journal; Bob Aitchison, Industrial Marketing (donor of awards); G. F. Nordenholt, Product Engineering; Fred Hamlin, Aero Digest; T. C. DuMond, Materials and Methods; C. C. Luhnow, Trusts and Estates; Godfrey M. Lebhar, Chain Store Age; R. G. Macdonald, Tappi; W. C. Platt, National Petroleum News; and Bernard Dolan, of Peter A. Frasse & Co., who presented the awards.



Bottom: The *Journal's* first place plaque which now hangs in the foyer at Headquarters.

"The Cost of High Living"

(From the Canadian Chamber of Commerce "News Letter", April, 1951.)

We are indebted to one of our correspondents for bringing to our attention an editorial in the *Globe and Mail* with the above provocative title. This article reports that back in 1947 the town of Danbury, Connecticut, provided a $300,000 housing project for veterans. The state paid half the cost and the town met the other half by voting a bond issue. Forty homes were built and placed under a five-man Town Housing Authority. According to the report 31 of the 40 tenants are now in arrears. Although the rents are low — $43 a month — the 5 members of the Town Housing Authority, all veterans themselves, have resigned in disgust because it appears that while the majority of tenants cannot afford to pay their rent they can afford to buy television sets.

"The Danbury incident," comments the *Globe and Mail*, "draws attention to an important aspect of human nature. People dislike paying for the necessities of life, such as food and shelter. That is why they are always demanding that the price of these necessities should be controlled or that they should be subsidized out of taxes. On the other hand, they like buying for luxuries, such as liquor and television. Rarely if ever is it suggested that the price of luxuries is too high."

The *Peterborough Examiner* some time ago noted the case of an unemployed automobile worker at Windsor who applied to his union for relief. The social worker sent to look into this case found six hungry children running around in their underwear. There were no coal or groceries in the house but there was a brand new $400 television set being purchased on the instalment plan—at $45 a month.

Recently the Department of Commerce at Washington issued statistics showing that the American people, last year, spent 29 times as much on clothing accessories and jewellery as they spent on religion and welfare; 3 times as much on tobacco as on private education and research and 2½ times as much on drink as on medical care. Here in our own country statistics show that in 1949 more money was spent on tobacco, alcoholic beverages, drugs, and cosmetics than was spent on household operations and utilities. This latter item includes rents, electricity, gas and domestic service.

Without in any way minimizing the hardships which inflation imposes on certain individuals, particularly those on small fixed incomes, there can be little doubt that the great mass of Canadians could quite easily afford life's necessities simply by cutting down on their luxury spendings. Never before have Canadians had so much money — even taking into account the depreciation of the dollar—and never before have they spent so much on things that are not essential.

The *Globe and Mail* concludes that "it is not the high cost of living that is causing most of the trouble today but the cost of high living."

The *Globe and Mail* points out that involved in all this is an economic distortion which brings about a scarcity of necessities because they cannot demand a good price while luxuries become plentiful because they demand practically any price. "But there is also a moral distortion which is far more harmful. As luxury takes precedence over necessity, so pleasure takes precedence over duty, and 'rights' over responsibilities. That is a road which has only one ending."

Canadian Highway Research

The new pilot study committee of the Canadian Good Roads Association met in Toronto recently to plan its initial programme. It was agreed that, during the next few months, the committee will study all aspects of road and transportation problems in Canada and make recommendations to the annual meeting of the Association in November for the establishment of a national road research institute.

Dean R. M. Hardy, M.E.I.C., of the University of Alberta, is chairman of the committee. The members are D. O. Robinson, M.E.I.C., chief engineer, Canada Cement Company; Dr. N. W. McLeod, asphalt technologist, Imperial Oil Limited; Philippe Ewart, chief traffic engineer, Quebec Department of Roads; Dr. C. G. Stogdill, chief, mental health division, Department of National Health and Welfare; Alan K. Hay, M.E.I.C., superintendent and chief engineer, Federal District Commission; W. A. Bryce, director, division of public safety, University of Toronto; C. W. Gilchrist, managing director, Canadian Good Roads Association. (See Personals, page 689.)

Members of the pilot study committee of the Canadian Good Roads Association who met recently in Toronto. Left to right are: R. A. Draper, secretary of the committee; Alan K. Hay, M.E.I.C.; Colonel W. A. Bryce; C. W. Gilchrist, managing director of C.G.R.A.; Dr. C. G. Stogdill; D. O. Robinson, M.E.I.C.; Dean R. M. Hardy, M.E.I.C.; Dr. Norman W. McLeod; Philippe Ewart.

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J. TUTECKY D. K. CAMPBELL
(Ex-Officio), E. R. EATON C. O. MADDOCK
Sec.-Treas., W. S. BLACK,
Box 185, Falconbridge, Ont.

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D. G. GEIGER C. B. HAMILTON
Sec.-Treas., F. E. WELLWOOD,
236 Avenue Road, Toronto, Ont.

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C. SCRYMGEOUR F. R. ADAMS
R. WALKEM J. A. WEBSTER
(Ex-Officio), G. W. ALLAN J. N. FINLAYSON
P. B. STROYAN S. HOGG
Sec.-Treas., STUART S. LEFEAUX,
975 Lagoon Drive, Vancouver, B.C

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Executive, D. A. MacLEAN J. A. W. IZARD
G. W. C. LAKE A. W. LASE
W. G. McINTOSH
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Sec.-Treas., W. A. BOWMAN,
1280 Kings Road, Victoria, B.C.

WINNIPEG
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Executive, E. S. KENT T. L. WOODHALL
D. M. STEPHENS J. L. CHARLES
J. G. HORSBURGH T. E. STOREY
G. E. COLE L. A. BATEMAN
J. C. TRUEMAN D. W. LAIRD
(Ex-Officio), T. H. KIRBY
J. W. SANGER
Sec.-Treas., C. S. LANDON,
P.O. Box 21, Winnipeg, Man.
Assist. Sec., G. W. MOULE

ONTARIO DIVISION
Chairman, W. L. SAUNDERS
Vice-Chair., W. A. T. GILMOUR
Treasurer G. R. TURNER
Board of Management, E. A. CROSS F. R. POPE
C. P. WARKENTIN
Secretary, L. C. SENTANCE,
c/o Canadian Westinghouse Co Ltd., Hamilton, Ont.

Elections and Transfers

At the meeting of Council held at the Royal York Hotel, Toronto, Ontario, on Saturday, June 16th, 1951, a number of applications were presented for consideration and on the recommendation of the Admissions Committee the following elections and transfers were effected:

Members:

J. C. Annesley, *Montreal*
A. F. Barr, *Montreal*
A. H. Boehm, *Montreal*
F. G. Braithwaite, *Calgary*
K. W. Campbell, *Arvida*
H. W. A. Dawson, *Saskatoon*
F. C. Doak, *Rimouski*
S. W. Faliszewski, *Montreal*
G. D. Floyd, *Toronto*
H. N. Halland, *Austin, Texas*
F. B. E. Hare, *Montreal*
U. A. Harm, *Port Arthur*
G. R. Johnston, *Trinidad*
E. W. King, *Fernie*
C. La Prairie, *Montreal*
A. J. S. Lewis, *Toronto*
H. L. Macklin, *York Mills*
A. D. Margison, *Toronto*
F. Ness, *Montreal*
E. J. Ollerton, *Hamilton*
J. H. Pettit, *Gardenvale, Que.*
R. Pocock, *Toronto*
R. W. Richardson, *Calgary*
E. J. Robertson, *Toronto*
J. H. Smith, *York Mills*
D. B. Strudley, *Stratford*
A. A. Swiderski, *Asbestos, Que.*
R. J. Tomson, *Montreal*
J. A. W. von Heyden, *Montreal*
G. M. Warren, *Vancouver*

Juniors:

H. D. Archibald, *Edmonton*
M. R. Blackadar, *Devon, Alta.*
G. B. Boylan, *Montreal*
W. L. Cary, *Arvida*
J. J. Dietrich, *Montreal*
R. M. Fillon, *London*
J. W. Howard, *Dryden, Ont.*
W. J. MacKay, *Montreal*
J. H. McCullough, *Arvida*
W. A. McKee, *Edmonton*
S. J. J. Medwadowski, *London, Eng.*
G. M. Nakashiba, *Hamilton*
V. A. Pakalniskis, *Malartic, Que.*
L. D. Pritchett, *Arvida*
T. W. Reade, *Cardinal*
A. R. M. Reid, *Montreal*
Z. L. Szeliski, *London, Eng.*
F. E. Thouret, *Trenche, Que.*
L. E. Trynor, *Moncton*
S. F. Ujjainwalla, *Montreal*
A. A. N. Vezina, *Montreal*
E. P. Walsh, *Grand Falls*
J. Wartena, *Montreal*
G. D. White, *Arvida*

Affiliate:

A. B. Pyper, *Toronto*

Transferred from the class of Junior to that of Member:

S. E. Acker, *Montreal*
A. A. Bishop, *Calgary*
J. A. W. Izard, *Victoria, B.C.*
T. A. Jull, *Montreal*
G. R. K. Lye, *Hamilton*
T. M. Riley, *Moscow, Idaho*
W. J. Staples, *Montreal*
W. G. Stinson, *Malone, N.Y.*
H. B. White, *Vancouver*

Transferred from the class of Student to that of Member:

C. W. Pidgeon, *Ottawa*

Transferred from the class of Student to that of Junior:

P. A. Anetil, *Montreal*
T. G. Cundill, *Port Colborne*
D. F. Kirk, *Halifax*
J. K. Long, *Trinidad*
J. H. Macdonald, *Winnipeg*

The following Students were admitted:

G. Aiello, *Windsor*
E. Babiak, *Winnipeg*
E. F. Freeman, *Edmonton*
T. R. Gaudet, *Sydney*
D. L. Jones, *Windsor*
H. F. Lawson, *Clinton, Ont.*
J. J. Lazurko, *Atikokan, Ont.*
L. F. Marwood, *Sarnia*
C. E. McAvoy, *Toronto*

Applications Through Associations

By virtue of the co-operative agreements between the Institute and the Association of Professional Engineers, the following elections and transfers have become effective:

Alberta

Members:

L. E. Easton, *Calgary*
R. S. Graham, *Calgary*
R. W. Lister, *Edmonton*
J. E. Mallabone, *Edmonton*
S. H. Matheson, *Edmonton*
J. L. Reid, *Edmonton*
H. F. Yeomans, *Calgary*

Juniors:

B. E. Brown, *Daysland, Alta.*
J. C. Clark, *Calgary*

Student:

B. E. Howlett, *Edmonton*

Junior to Member:

R. M. Jeffries, *Calgary*
H. N. Lukes, *Calgary*
J. H. Peatfield, *Banff*
D. R. Sutherland, *Edmonton*

Saskatchewan

Members:

S. Block, *Saskatoon*
J. Lakenskas, *Regina*
D. Maksymiuk, *Saskatoon*

Student:

M. R. Jones, *Brock*

Junior to Member:

J. Bortolotto, *Rosetown*
V. D. Thierman, *Saskatoon*
M .W. Thompson, *Regina*
V. G. Ulrich, *Regina*

Student to Junior:

D. H. Eckford, *Prince Albert*
N. G. Tribe, *Saskatoon*

Manitoba

Members:

J. S. Campbell, *Winnipeg*
A. H. Harris, *Winnipeg*
R. E. Taylor, *Winnipeg*

Junior to Member:

H. Willms, *Winnipeg*

New Brunswick

Member:

W. E. Petersen, *Dalhousie*

Junior to Member:

J. A. Rioux, *Fredericton*

Nova Scotia

Junior to Member:

R. T. Nolan, *Halifax*

Correspondence

French Engineering Schools

Montreal, May 24, 1951.

Dear Mr. Editor:—

The *Engineering Journal,* in its January 1951 issue, printed a short article on the "Ecole Centrale des Arts et Manufactures" representing it as "France's Oldest Engineering School."

This is unfortunately an inaccurate statement. As a matter of fact, having been founded in 1828, it is one of the youngest among the principal French Engineering Schools. The "Ecole Nationale Supérieure des Mines de Paris" was founded in 1795, and the "Ecole des Arts et Métiers" in 1793.

The oldest of all is the "Ecole Nationale des Ponts et Chaussées", founded in 1747 by Daniel Trudaine, Intendant des Finances, and first organized and directed for 47 years by Perronet, who himself was the builder of several beautiful bridges and of a thousand miles of highways.

Since that date, it has been training generations of "Ingénieurs des Ponts et Chaussées", forming the Corps of Engineers in charge of the State Department of Bridges, Highways and Public Works, and also generations of Civil Engineers, mainly concerned with the Construction Industry.

I wonder if you would find place in one of your next issues for this little correction.

Very truly yours,

G. M. Demarque, M.E.I.C.,
Ville St-Laurent, Que.

June 15, 1951.

Dear Mr. Editor:—

Your letter of June 1st with regard to the article about the Central School for Constructive and Manufactured Works has caused me some confusion. It is very rarely that we receive a letter questioning the authenticity of the facts in an article; but an investigation of the question indicates that Mr. G. M. Demarque is correct.

Of course the "Ecole Nationale Supérieure des Mines de Paris" and the "Ecole Nationale des Ponts et Chaussées" are both specialized schools; but I am afraid that the "Ecole des Arts et Métiers" does have it over the central school our article spoke of.

I am very sorry for this inaccuracy. It is so rare that an inaccuracy of date occurs in these articles that they are usually sent out from our office unquestioned.

Yours sincerely,

SERVICE D'INFORMATION FRANCAIS,
Ottawa.

News of Other Societies

The **Building Research Congress 1951,** centred in the Institution of Civil Engineers, London, England, sponsored by British professional institutions, and organized by the Department of Scientific and Industrial Research, will convene in London, England, on September 11th, 1951, for nine days.

Over 80 papers will be presented in three divisions in concurrent sessions covering respectively:—engineering and structural aspects of building; building materials; and factors influencing comfort and efficiency of people using the buildings.

The Division of Building Research of the National Research Council, at Ottawa, correlating Canadian participation, will provide additional details.

For the **General Discussion on Heat Transmission,** London, England, September 11-13, 1951, The American Society of Mechanical Engineers (29 West 39th Street, New York) is co-ordinating details of the extensive North American participation. British Commonwealth, and European engineering organizations will also participate. The representative of the Engineering Institute will be E. A. Allcut, M.E.I.C., of the University of Toronto.

The **Royal Aeronautical Society,** London, England, and the **Institute of the Aeronautical Sciences** (2 East 64th St., New York 21, N.Y.) will sponsor jointly the third international aeronautical conference, to be held at Brighton, Sussex, England, September 3-7.

The Pacific general meeting of the **American Institute of Electrical Engineers** (33 West 39th St., New York) will be held at the Multnomah Hotel in Portland, Oreg., August 20 to 23.

Personals

News of the Personal Activities of Members of the Institute

Two members of the Engineering Institute received honorary degrees at the annual convocation in June, of Bishop's University, Lennoxville.

Receiving the honorary degree of doctor of civil law were the **Rt. Hon. C. D. Howe, P.C.,**, Hon. M.E.I.C., Minister of Trade and Commerce and Defence Production; and **William Allan Mather,** Hon. M.E.I.C., president of the Canadian Pacific Railway.

A graduate of the Massachusetts Institute of Technology, C. D. Howe is a consulting engineer by profession, a former professor of civil engineering at Dalhousie University and former chief engineer for the Board of Grain Commissioners for Canada.

He was elected to the House of Commons in 1935 and became Minister of Railways and Canals and Minister of Marine. He has been re-elected at every election since then and has been Minister of Transport, Minister of Munitions and Supply, Minister of Reconstruction and Supply and Minister of Trade and Commerce. In June, 1946, in recognition of his work as wartime Minister of Supply, he was appointed to the Privy Council of the United Kingdom.

Mr. Mather, who was elected president of the C.P.R. in 1948, is a graduate in engineering of McGill University. Born in Oshawa, Ont., he joined the C.P.R. after graduation in 1908. He is president of the Esquimalt and Nanaimo Railway and a director of the Royal Trust Company, the Bank of Montreal, the Great West Life Assurance Company and the Calgary and Edmonton Corporation.

He was elected an honorary member of The Engineering Institute this year.

E. V. Caton, Hon. M.E.I.C., who received honorary membership in The Engineering Institute during the recent Annual Meeting, was recently appointed a director and elected vice-president of the Winnipeg Electric Company.

Dr. Paul E. Gagnon, M.E.I.C., president of the graduate school of Laval University, Quebec, was awarded the honorary degree of doctor of science, at the recent convocation of McMaster University.

Dr. Gagnon, who is also head of the department of chemistry at Laval, holds a Ph.D. degree from Laval, that of D.Sc. from University of Paris, and that of D.I.C., from the Imperial College of Science and Technology in London, England. He joined Laval's staff in 1931, and was appointed a professor in the faculty of science in 1935. Later appointments were, director of the department of chemistry (1938) director of the department of chemical engineering (1941).

He is a governor of Laval, and a past-president of the Canadian Chemical Association and of the Chemical Institute of Canada. He is a past-councillor of The Engineering Institute. He is a Fellow of The Royal Society of Canada.

He has served on the National Research Council, the Atomic Energy Control Board, the Defence Research Board, and the Fisheries Research Board.

Dr. T. H. Hogg, M.E.I.C., of Toronto, and **John B. Carswell,** M.E.I.C., of Vancouver, B.C., have been appointed to the board of directors of Vulcan Iron and Engineering Ltd., Winnipeg, Man.

A member of the Senate of the University of Toronto, Dr. Hogg is a former chairman of the Ontario Hydro-Electric Commission, a past-president of the Engineering Institute, and is consultant to the Federal Government on hydraulic matters and western water problems. He has been actively engaged in the study of power development in Manitoba and is a member of the Lake of the Woods Control Board.

Mr. Carswell was formerly president of the Carswell Construction Co. and of the Burlington Steel Company of Hamilton. During the war he served as representative of the Department of Munitions and Supply at Washington, D.C., following which he became president of War Assets Corporation. In 1947 he was appointed chairman of the Fraser Valley Dyking Board and is now chairman of the Greater Winnipeg Dyking Board. Mr. Carswell is also chairman of the Western Advisory Board of the Guaranty Trust Company of Canada.

W. P. Dobson, M.E.I.C., was awarded the honorary degree of doctor of science by Queen's University at the convocation on May 19.

Mr. Dobson, the research director for the Ontario Hydro-Electric Power Commission, delivered the convocation address. Mr. Dobson is a past-president of the Dominion Council of Professional Engineers, and of the Association of Professional Engineers of Ontario. He has been for a number of years, until early this year, chairman of the Approvals Council of the Canadian Standards Association. He is a past-vice-president of the American Institute of Electrical Engineers.

Mr. Dobson joined the Ontario Hydro in 1914, after receiving a masters degree in applied science from University of Toronto.

N. R. Crump, M.E.I.C., recently received a doctorate of engineering from his alma mater, Purdue University, Lafayette, Indiana. Shortly after, on June 13, he was awarded an honorary membership in the American Society of Mechanical Engineers.

The citation accompanying the honorary membership read, "Distinguished engineer, eminent executive, so endowed with the cardinal virtues of life that he rose from a humble beginning to a position of high prominence in Canada. He is one of his country's foremost citizens and an inspiration to young engineers in all lands."

Mr. Crump is vice-president of the Canadian Pacific Railway Company.

Dr. R. S. Jane, M.E.I.C., has been elected vice-president of the Chemical Institute of Canada.

Dr. Jane is vice-president in charge of research and development, and also a director of Shawinigan Chemicals Limited, Montreal, and is a director of Shawinigan Resins Corporation, Springfield, Mass., and Canadian Resins and Chemicals Limited, Montreal.

Born in England, he was educated in Vancouver, B.C., graduating from U.B.C. in 1922. He received a Ph.D. degree at McGill University in chemistry in 1925 and attended London University for the following two years on a Wembley Scholarship.

Dr. Jane worked with Canada Carbide Company, Shawinigan Falls, from 1927. The company later became Shawinigan Chemicals Limited, a wholly-owned subsidiary of The Shawinigan Water and Power Company. In 1943 Dr. Jane joined the latter company in charge of the newly created Industrial Research Department and was recalled to Shawinigan Chemicals in 1946 to his present position.

He is a member of the Society of the Chemical Industry, and of the Compressed Gas Manufacturing Association.

Dr. R. S. Jane, M.E.I.C.

D. M. Stephens, M.E.I.C., is the new chairman of the five-man Hydro-Electric Development Board of Manitoba.

Mr. Stephens has been deputy minister of the Manitoba mines and natural resources department since 1938, and has been on the staff of the Manitoba Government since his graduation in 1933 from the University of Manitoba.

He is the representative of the province on the Western Water Board, and on the Greater Winnipeg Diking Board.

Hugh Crombie, M.E.I.C., vice-president and treasurer of Dominion Engineering Works, Montreal, has been elected president of the Canadian Manufacturers Association.

Mr. Crombie is a past chairman of the Montreal Branch of C.M.A., and of the Province of Quebec section, and he was the C.M.A. representative for two years on the city council of Montreal.

He joined the Dominion Engineering Works two years after his graduation in 1918 from McGill University as a mechanical engineer. He was assistant to the vice-president and general manager for many years, and received his present position several months ago.

He is a past-president of the McGill Graduates Society.

C. E. Webb, M.E.I.C.

Christopher E. Webb, M.E.I.C., district engineer for the British Columbia and Yukon District of the Water Resources Branch, Department of Resources and Development, has retired after 38 years service with the federal government.

He recently headed the international commission which enquired into the Helmand River Delta problem between Iran and Afghanistan. After a visit last November and December to the countries concerned, to study conditions on the ground, the Commission spent some time in Washington, D.C., preparing their report.

Mr. Webb was chairman of the Canadian sections of the International Columbia River Engineering Committee, the International Osoyoos Lake Board of Control and the International Kootenay Lake Board of Control. He was a member of the Dominion-Provincial Board, Fraser River Basin, and acted on many other water boards.

Born in Granton, Ontario, Mr. Webb graduated from the University of Toronto in 1909. After a short period on railway location in Ontario he moved to British Columbia in 1911 as resident engineer on railroad construction for the Canadian Northern Railway. In 1913 he joined the federal service and was appointed to the position of district engineer in 1925. He is a life member of the Engineering Institute and served as a councillor in 1943.

Good Roads Committee

Ottawa headquarters of the Canadian Good Roads Association has announced that six leading authorities will serve under **Dean R. M. Hardy,** M.E.I.C., of the University of Alberta on a pilot study committee which has been asked to lay down a plan for a Canadian highway research institute. (See February Journal 1951, page 106.)

It includes two members of the Engineering Institute, **D. O. Robinson,** M.E.I.C., a member of the Ontario Research Council highways advisory committee, and chief engineer, department of sales, Canada Cement Company; and **Alan K. Hay,** M.E.I.C., chief engineer of the Federal District Commission.

Mr. Robinson graduated in civil engineering from Queen's University, Kingston, Ont., in 1923, with the degree of B.Sc. He took employment with the Dominion Construction Co. in connection with yard construction for the Michigan Central Railroad at St. Thomas, Ont., later becoming resident engineer on the St. Thomas sewage-disposal plant. For two sessions he served as demonstrator at Queen's University, and then went to the United States where, in turn, he was designing engineer with E. Aldinger, Detroit; designing engineer with the Detroit City Gas Co.; construction engineer for the city of Pontiac; superintendent of Shaefer-Thompson Construction Co.; Chicago. In 1930 he left the latter company and joined the Canada Cement Co. as technical engineer. In 1947 he was promoted to the position of chief engineer, department of sales. Mr. Robinson is a member also of the Ontario Association of Professional Engineers.

Alan K. Hay, who has been chief engineer of the Federal District Commission in Ottawa, his native city, since 1944, was educated at McGill (B.Sc.) and during the First World War served with the Royal Canadian Engineers. Following that, he was for two years with the Ontario Department of Highways and from 1920 to 1944 served with the Ottawa Suburban Roads Commission and as special consultant of the Federal District Commission.

J. E. Cranswick, M.E.I.C., Edmonton branch manager of Canadian Westinghouse Co. Ltd., has been appointed central region sales manager (Ontario) with headquarters at Toronto.

Mr. Cranswick is a graduate of the University of Manitoba, where he received a B.Sc. in electrical engineering in 1929.

J. E. Cranswick, M.E.I.C.

He followed the Canadian Westinghouse student apprentice course in Hamilton, and was transferred in 1931 to the Edmonton branch office. He worked in sales in Edmonton and Calgary, and was placed in charge of Edmonton Branch in 1942. In 1945 he became branch manager.

Mr. Cranswick is the immediate past-councillor of the Edmonton Branch of the Institute.

E. E. Orlando, M.E.I.C., Montreal, Quebec district manager for Canadian Westinghouse Co. Ltd., has been appointed eastern regional sales manager covering Quebec, the Maritimes and Newfoundland.

Mr. Orlando graduated from Nova

E. E. Orlando, M.E.I.C.

Scotia Technical College in 1927 with a B.Sc. degree in electrical engineering, and joined Canadian Westinghouse soon after. He served successively as sales engineer, manager of the apparatus sales division, and manager of central station sales, before his appointment as Quebec district manager in 1948.

Mr. Orlando is a member of the Publication Committee of the Engineering Institute.

Hydro-Electric Appointments

The Quebec Hydro-Electric Commission has announced the formation of a new department to take over the designing and construction activities of power development. The new department, to be known as the Power Development Division, will devote its activities to the study of new sources of power and to the design and construction of dams, reservoirs and generating stations to best meet the power requirements of the Province.

The new department will be operated under the following personnel: consulting engineer, **M. V. Sauer,** M.E.I.C., formerly chief engineer of the hydraulic division; chief engineer, **C. G. Kingsmill,** M.E.I.C., formerly assistant to Mr. Sauer; hydraulic engineer, **C. H. Pigot,** M.E.I.C.; chief designing engineer, equipment and structures, **H. F. Abbott,** M.E.I.C.; general superintending engineer of construction, **F. Rousseau,** M.E.I.C.

E. V. Gage, M.E.I.C., president of A. F. Byers Construction Company Limited, was elected to head the Montreal Builders' Exchange at a meeting of the group in March.

Mr. Gage is a past-vice-president of the Engineering Institute, and a past-councillor of the Montreal Branch.

Mr. Gage became president of his Company in 1942. He had joined the firm in 1915, after his graduation from McGill University in civil engineering.

G. B. Moxon, M.E.I.C.

George B. Moxon, M.E.I.C., of Aluminum Company of Canada, Limited, has been promoted in charge of the extension to the drawing office of the general engineering department located in the Dominion Square Building, Montreal.

Mr. Moxon was at Arvida, Que., in the plant engineering department from 1936 to 1943 when he was transferred to the head office in Montreal.

Mr. Moxon was elected vice-chairman of the Saguenay Branch in 1943 and has served as chairman of the Student Guidance Committees in both the Arvida and Montreal Branches and is now serving as the Institute representative on the Guidance Committee of the Engineers' Council for Professional Development. He is an associate member of the Institution of Civil Engineers of England.

Dr. Lyle G. Trorey, M.E.I.C., consulting engineer of Vancouver, vice-president and chief engineer of Photographic Surveys (Western) Limited, was recently elected to the board of direction of the American Society of Photogrammetry.

Dr. Trorey is the author of a standard text book on air survey. During the recent war he commanded the Canadian Air Survey Company, Royal Canadian Engineers.

A. P. Shearwood, M.E.I.C., has been appointed vice-president in charge of sales by National Steel Car Corporation Limited in Montreal.

Mr. Shearwood was employed by the Dominion Bridge Co. Ltd., in 1927 and 1928, and by the Canadian Pacific Railway in 1929 and 1930. He graduated from McGill University in arts in 1930 and engineering in 1932, and joined the National Steel Car Corporation, Limited at Hamilton in June 1932, in the engineering department. He moved to the Montreal office in 1934, becoming mechanical assistant to the president in 1939 and general sales manager in 1947. He is a member of the Corporation of Professional Engineers of Quebec.

A. P. Shearwood, M.E.I.C.

Dudley H. Stratton, M.E.I.C., president of the Stratton Engineering Co. Ltd., of Winnipeg, Man., was recently elected chairman of the Prairie Roadbuilders section of the Canadian Construction Association.

Daniel O. Wing, M.E.I.C., of Ormstown, Que., retired recently after 30 years of uninterrupted service with the gas department of the Quebec Hydro-Electric Commission and its predecessors.

A native of Campden, Ont., and a graduate from the University of Toronto, Mr. Wing joined the staff of Montreal Light, Heat and Power Consolidated in 1921, managing the coal mine it operated in West Virginia. Recalled to Montreal in 1923, he performed successively the duties of construction engineer, assistant superintendent and distribution engineer of the gas department prior to his appointment as consulting engineer a few years ago.

R. S. Everall, M.E.I.C., who had been town engineer in Dauphin, Man., since 1948, has accepted the position of town engineer of Flin Flon, Man. He graduated from the University of Manitoba with a B.Sc. in civil engineering in 1947. He worked with the Department of Public Works of Manitoba before going to his position at Dauphin.

S. H. Hawkins, M.E.I.C., is resident engineer for the Defence Construction Limited, at Penhold, Alberta.

Mr. Hawkins worked for many years for the irrigation department of the Alberta Department of the Interior. He was district engineer for Prairie Farm Rehabilitation Act, of the Department of Agriculture, at Eastend, Sask., and at Swift Current, Sask. He has been a project engineer on P.F.R.A. irrigation work in Calgary, until his recent appointment.

Hermann L. Eberts, M.E.I.C., of Canadair Limited, Montreal, has been appointed to the post of purchasing agent. Mr. Eberts' previous position with the company was assistant purchasing agent.

He is a graduate of the Royal Military College, Kingston, Ontario, and of McGill University, from which he graduated as a bachelor of science.

Mr. Eberts has been with Canadair since 1949. Prior to that he was connected with the General Electric Co., Schenectady; Montreal Tramways Co.; Small Electric Motors (Canada) Ltd., where he served as factory manager and personnel director; Stevenson and Kellogg Ltd., as a senior engineer; and Federal Electric Manufacturing Co., Ltd., as work manager, and later as director of sales and engineering.

Herman L. Eberts, M.E.I.C.

He is a member of the Corporation of Professional Engineers of the Province of Quebec, and of the Society of Automotive Engineers, and the Purchasing Agents Association.

F. S. Bestwick, M.E.I.C., is an assistant project engineer for Canadian Industries Limited in Montreal. He was an application engineer with English Electric Company of Canada Limited in Montreal, Que., and at St. Catharines, Ont., for several years.

J. W. Forster, M.E.I.C., is with Canadian-Brazilian Services Ltd., in Toronto, Ont. Formerly he was in Brazil, a hydraulic engineer in the hydro electric construction department of the Companhia Brasileira Administradora de Servicos Tecnicos, in Sao Paulo.

Harry Jomini, M.E.I.C., who was with the Demerara Bauxite Company Limited in MacKenzie, British Guiana, is now in Montreal with the Aluminum Company of Canada Limited.

Claude Gliddon, M.E.I.C.

Alan Brown, M.E.I.C.

Claude Gliddon, M.E.I.C., who was chief engineer of the Gatineau Power Company, Ottawa, has been appointed vice-president and chief engineer; and **Alan Brown,** M.E.I.C., formerly general manager of distribution, has become commercial vice-president of the Company.

Mr. Gliddon was appointed chief engineer in 1935. Mr. Brown was made general manager of distribution in 1946.

L. W. Geake, M.E.I.C., has joined the Dominion Tar and Chemical Company in Toronto, as plant engineer for the phthalic anhydride plant. He graduated from University of Saskatchewan in 1941 with a degree of B.Sc. in mechanical engineering.

Mr. Geake has been for several years with Price Brothers at Kenogami, Que.

John Zabinski, M.E.I.C., of Toronto, is with Dow Chemical Co. Ltd., in Montreal, Que.

Mr. Zabinski was associated for some time with National Heating Products

Leonard Medal Award

Dr. O. W. Ellis, M.E.I.C., has been awarded the Leonard Medal of the Engineering Institute and the Canadian Institute of Mining and Metallurgy.

The paper meriting the Leonard Medal, "A Study of Some Alloys of Titanium in the Manufacture of which Commercial Titanium Hydride was used", was written by Dr. Ellis in collaboration with Mr. H. V. Kinsey, of the physical metallurgy division, Mines Branch, Ottawa; and Mr. W. E. Kuhn, of the titanium alloy manufacturing division, National Lead Company, Niagara Falls, N.Y., and it was published in the February, 1950, issue of the C.I.M.M. "Bulletin".

Dr. Ellis is the director of the department of engineering and metallurgy of the Ontario Research Foundation. He has on previous occasions been the recipient of Institute awards: the Plummer Medal for 1940 and the Duggan Medal for 1941.

He came to Canada from England in 1910 and worked for the Canadian Pacific Railway. He returned to England a year later, and studied at the University of Birmingham, receiving a B.Sc. degree in metallurgy in 1914. During the years 1914-18 he was a metallurgist in the Royal Ordnance Factories. In 1916 he received the degree of M.Sc. from the University of Birmingham. At the end of the First World War he was appointed chief metallurgist at the Royal Laboratory department of the Royal Ordnance Factories, and in 1920 he was called upon to reorganize all the metallurgical laboratories of the Factories.

In 1921 he returned to Canada as an assistant professor of metallurgical engineering at the University of Toronto, a position which he retained until 1925. Then he was appointed an industrial fellow at the Mellon Institute of Industrial Research, University of Pittsburgh, where he carried out work on metals for bearings. From 1926 to 1929 he was in the research department of the Westinghouse Electric and Manufacturing Company. In 1929 he was appointed director of metallurgical research at the Ontario Research Foundation.

O. W. Ellis, M.E.I.C.

in Montreal and Toronto. He was assistant general manager for the firm in Toronto.

P. B. McCaffary, M.E.I.C., is district manager for Alliance Electric Works Ltd., in Toronto, Ont. He was previously sales engineer for the Commonwealth Electric Corporation Ltd., in Montreal.

W. M. Wood, M.E.I.C., is construction superintendent for the Winnipeg Supply & Fuel Co. Ltd., Winnipeg, Man. Previously he was resident engineer for Burns & Co. Limited, in Kitchener, Ont.

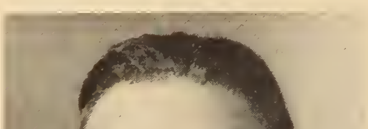
Walter Murray, M.E.I.C., is employed with Defence Construction Limited in Montreal. Previously he was associated with the Foundation Company of Canada Limited, in Montreal.

Maj. E. A. Marshall, M.E.I.C., is director of ordnance services, at Army Headquarters, in Ottawa, Ont.

After graduating in civil engineering from University of Manitoba in 1936, he worked as a mining engineer in Western Canada before joining the Royal Canadian Ordnance Corps as a lieutenant in 1937. In 1938 he was at Ottawa in National Defence Headquarters. During 1940 he was deputy assistant director of ordnance services with the first Canadian Division in England, with the rank of major. He served with the rank of lieutenant-colonel overseas as officer commanding the Canadian Ordnance field parks and technical stores. He was later officer commanding the first Canadian Army ammunition company overseas, and on his return to Ottawa he was appointed chief inspecting ordnance officer of the Canadian Army at Ottawa, with the rank of major. He was stationed at the Staff College, at Kingston, and at the Montreal Central Ordnance Depot before receiving his recent appointment.

W. M. Kellett, M.E.I.C., is with Defence Industries (1951) Limited, in Valleyfield, Quebec.

Mr. Kellett was in Toronto, on industrial engineering for the Coleman Stove and Lamp Co. Ltd.



E. F. Carson, Affil.E.I.C.

E. F. Carson, Affiliate E.I.C., former wire and cable manager of the eastern district of Northern Electric Company, Limited, has been appointed wire and cable manager of the general sales division.

Mr. Carson joined Northern Electric in 1929, as a junior clerk in the wire and cable sales department in Montreal, and was appointed a wire and cable field specialist in 1933. Two years later, he was transferred to Toronto, where he occupied an equivalent post, and in 1938 he became a salesman at Kirkland Lake.

Mr. Carson was appointed manager of the company's Val d'Or branch in 1941, and the following year was loaned to the Department of Munitions and Supply, Naval Branch. Upon his return in 1943, he was made manager of London branch, and held that position until last year, when he was transferred to Montreal as wire and cable manager of eastern district.

Mr. Carson is a member of the Illuminating Engineering Society. During his stay in London, he was a member of the London Chamber of Commerce, the London District Electrical Maintenance Association. He is a past-president of the London Rotary Club.

Hugh J. T. Young, Jr.E.I.C., is in the Flight Test Section of A. V. Roe Canada Limited engaged upon the reduction of performance data.

He has worked as a graduate trainee with A. V. Roe since his graduation from the University of Manitoba in mechanical engineering in 1949.

Walter D. Watt, Jr.E.I.C., is a maintenance engineer with the Weyerhaeuser Timber Co., pulp and paper division, Springfield, Oregon. He was previously with the Diamond Match Company's Pulp and Paper division at Plattsburg, N.Y. He graduated from McGill University in electrical engineering in 1949.

D. M. Stewart, Jr.E.I.C., is with the Canadian Comstock Company in Seaforth, Ont. He is a graduate of the University of Saskatchewan, where he received a B.Sc. in electrical engineering in 1949.

J. Soucy, Jr.E.I.C., is a sales engineer with Lyman Tube and Bearings Ltd., in Montreal. Previously he was with Canadian Industries Limited at Shawinigan Falls, Que. He received his engineering degree from Ecole Polytechnique in 1948.

R. H. Smith, Jr.E.I.C., is an engineer with the Department of Transport, Special Projects Branch, at Ottawa, Ontario. Mr. Smith received a B.Sc. degree in civil engineering in 1949 at University of Manitoba, and that of M.A.Sc. at University of Toronto in 1951.

T. Sakellariou, Jr.E.I.C., who was previously with the Howard Smith Paper Mills, central engineering department in Montreal, is now with the Shell Oil Company (Canada) Limited at the Montreal Refinery. He graduated from McGill University in 1950.

Ross A. Ritchie, Jr.E.I.C., is with the Aluminum Company of Canada Limited, in Montreal. Previously he was project engineer for the Columbia Cellulose Company Limited, in Prince Rupert, B.C. He is a graduate of McGill University where he received a degree in mechanical engineering in 1943.

James A. McLachlin, Jr.E.I.C., is in the industrial engineering department of the Anthes-Imperial Company Limited, in St. Catharines, Ontario. Previously he did time study work for J. D. Woods & Gordon Limited, in Toronto, Ontario. He received a B.A.Sc. from the University of Toronto in 1948.

S. A. Humeny, Jr.E.I.C., who was formerly with the State Highway Department at Bismarck, N.D., is now working for the Poole Construction Company Limited, in Regina, Sask. He graduated in civil engineering from the University of Saskatchewan in 1949.

William E. Heuft, Jr.E.I.C., is working for the Aluminum Company of Canada at their plant in Etobicoke. He graduated from the University of Saskatchewan in mechanical engineering in 1950.

John A. Gurnham, Jr.E.I.C., is working with the St. Lawrence Power Company Limited in Cornwall, Ont. He was previously employed by the Cornwall Street Railway, Light and Power Company. He graduated in electrical engineering from McGill University in 1949.

G. Gascon, Jr.E.I.C., is a job engineer for the Foundation Company of Canada in Montreal.

Mr. Gascon was the recipient of the Ernest Marceau Prize of the Institute for 1948. That year he graduated from Ecole Polytechnique with a B.A.Sc. in civil engineering, and worked for the Inland Steel Company.

J. C. Cringan, Jr.E.I.C., who was formerly with Canada Packers Limited, has joined the staff of Canadian Business Service, investment counsellors, in Toronto, Ont. He graduated from the University of Toronto with a degree of B.A.Sc. in 1948.

A. J. McIntyre, Jr.E.I.C., is sales engineer for Vulcan Iron & Engineering, in Winnipeg, Man. A graduate of the University of Manitoba, he received a B.Sc in electrical engineering in 1947.

C. P. Lentz, Jr.E.I.C., has returned to Division of Applied Biology, National Research Council in Ottawa, Ontario. He attended University of Toronto during the past year on a National Research Council studentship in physics.

Norman J. Howes, Jr.E.I.C., is a mechanical engineer in the plant engineering division of the National Research Council in Ottawa. He is a graduate of the University of Saskatchewan Class of 1949.

J. Albert Clement, Jr.E.I.C., is with Victoriaville Furniture Limited, as director of production control, in Victoriaville, Quebec. Previously he was industrial engineer for the British Rubber Company of Canada Limited, in Lachine Quebec. He graduated from Ecole Polytechnique in 1944.

R. I. Davis, Jr.E.I.C., is assistant meter and relay engineer for the Hydro-Electric Power Commission of Ontario, in Belleville, Ontario. He was previously at Campbellford, Ontario, a junior engineer for the H.E.P.C. He graduated from Queen's University in electrical engineering in 1949.

G. M. Boissoneault, Jr.E.I.C., is working with Shawinigan Water & Power Co., in Montreal. He graduated from McGill University with a B.Eng. degree in electrical engineering in 1949.

R. H. Vickerman, Jr.E.I.C., is with Haddin, Davis & Brown Limited in Calgary, Alta. He is a graduate of University of Alberta, where he received a B.Sc. in civil engineering in 1949.

R. A. Carter, Jr.E.I.C., is a junior mechanical engineer for Canadian Refractories Limited, at Kilmar, Quebec. He graduated from the University of Manitoba with a B.Sc. in mechanical engineering in 1949. He was formerly with Duplate Canada Limited, at Oshawa, Ontario.

N. B. Breen, JR.E.I.C., is a junior engineer on plant maintenance for Canadian Locomotive Company, at Kingston, Ontario. He was previously with Montreal Engineering Company. He graduated from the University of Saskatchewan with a B.Sc. in mechanical engineering in 1949.

H. H. L. Pratley, JR.E.I.C., has returned to the firm of P. L. Pratley, M.E.I.C., consulting engineer, Montreal, from the Maritime Steel and Foundry, at New Glasgow, N.S., where he has worked for the past year.

W. David Jamieson, S.E.I.C., is one of three Canadians to be selected for the Royal Commission for Exhibition of 1851 scholarship to Cambridge University. It is tenable for two years.

During the scholarship he will study physical chemistry leading to a Ph.D. degree. He has just received his master of science degree from Dalhousie University.

While attending high school at Queen Elizabeth in Halifax he was awarded the Nova Scotia Fisheries scholarship to Dalhousie. While studying under that award he received a bachelor of science degree and diploma of engineering.

The Exhibition of 1851 scholarship is open to all British subjects who have been students of science for three years.

P. I. Woodruff, S.E.I.C., (University of Toronto, aeronautical engineering, 1951) is with Canadair Limited in Cartierville.

J. M. Willcock, S.E.I.C., is with Stokes-Rees Corporation in Montreal. He graduated from McGill University in 1950 with a B.Eng. in electrical engineering.

Jack B. Bodtker, S.E.I.C., is working for Procter & Gamble Company of Canada, in Hamilton, Ontario, in the mechanical department.

Mr. Bodtker graduated from McGill University with a B.Eng. (honours) in mechanical engineering in 1950.

A. W. Lund, S.E.I.C., is a designer on the staff of C. D. Howe Company in Montreal. He graduated from the University of New Brunswick with a B.Sc. in civil engineering in 1950.

F. M. Braybrooks, S.E.I.C., is employed at the St. Mary-Milk River Development in Southern Alberta. He graduated from the University of British Columbia in 1950, with a degree of B.A.Sc. in agriculture.

R. J. DiCicco, S.E.I.C., (McGill University, B.Eng., mechanical, 1951) is a woodlands mechanical engineer for Consolidated Paper Corporation Ltd., at Grand'Mere, Quebec.

J. G. Doyle, S.E.I.C., is working for Canadian General Electric Company, in Montreal, in the refrigeration department. He is a graduate of the Nova Scotia Technical College where he received a B.Eng. in mechanical engineering in 1950.

G. H. Dash, S.E.I.C., is an instrument engineer for the Hudson Bay Mining and Smelting Company in Flin Flon, Man. He graduated from the University of Saskatchewan in electrical engineering in 1950.

Jean-Paul Dionne, S.E.I.C., (Ecole Polytechnique, 1951) is a field engineer for the Quebec North Shore & Labrador Railway Company at Seven Islands, Que.

H. P. Beaulieu, S.E.I.C., is a field engineer for Angus Robinson Company on a power project at Baie Comeau, Quebec. He graduated from the University of New Brunswick in 1950 with a B.Sc. degree in civil engineering, and worked as a resident engineer for the New Brunswick Department of Public Works, highway division.

A. J. Wade, S.E.I.C., (B.Eng., McGill University, engineering physics, 1951), is a junior engineer with Canadian National Telegraphs, in Toronto, Ontario.

H. M. Steeves, S.E.I.C., (Queen's University, B.Sc. 1951) is a junior engineer for the Spruce Falls, Power and Paper Company in Kapuskasing, Ontario.

N.R.C. Scholarships

The National Research Council, Ottawa, has announced the award of scholarships for the academic year 1951-1952.

Members of the Institute receiving N.R.C. awards are:

K. J. Keeping, JR.E.I.C., who graduated from McGill University, a fellowship to continue work at McGill.

K. V. Gow, JR.E.I.C., graduate of Toronto University, received a postdoctorate overseas fellowship to work at Birmingham University.

L. Wiseblatt, JR.E.I.C., graduate of McGill University, a studentship to work at the University of Saskatchewan.

Dick Quan, JR.E.I.C., of University of British Columbia, a special scholarship to study at the California Technical College.

J. S. Greenberg, S.E.I.C., of Montreal, Que., a graduate of McGill University, a studentship to continue work at McGill.

R. Tremblay, S.E.I.C., a graduate of University of Montreal, a studentship to continue work at University of Montreal.

D. W. Clarke, S.E.I.C., a graduate of McGill University, received a bursary to continue work at McGill.

L. J. Kusak, S.E.I.C., a graduate of Queen's University, a studentship to work at University of Toronto.

R. E. Chamberlain, S.E.I.C., a graduate of McGill University, a bursary at McGill.

K. L. Pinder, S.E.I.C., a graduate of McGill University, a bursary to continue work there.

L. W. Vigrass, S.E.I.C., a graduate of University of Saskatchewan, a bursary to continue at Saskatchewan.

L. W. Gold, S.E.I.C., graduate of the University of Saskatchewan, a bursary at the University of Toronto.

T. R. Recsor, S.E.I.C., University of British Columbia received a studentship, to continue work at U.B.C.

A. J. Szabo, S.E.I.C., a graduate of McMaster University, a studentship to work at the University of British Columbia.

G. R. Piercy, S.E.I.C., and **J. A L. Thomson,** S.E.I.C., of University of British Columbia, receive bursaries at University of British Columbia.

Headquarters Records

Each time the *Journal* or other Institute mail is dispatched we are advised of undeliverable items due to incorrect addresses. Our records staff must follow up these changes and the regular service to members suffers thereby. *Please* advise headquarters when your address or occupation changes. The form below can be completed, clipped, and mailed to headquarters in a few moments.

Please Print

Name...

Surname Given names

Home Address.. ☐

Employer..

Employer's Address.. ☐

(Check address to be used for Institute mail.)

Product or Service..

Position or Title...

Degree, Year & College..

Advise Headquarters Promptly of Changes

H. L. Snyder, S.E.I.C., is with C. D. Howe Company, in Montreal. Previously he was at Thetford Mines, Que., employed by the Shawinigan Engineering Company Limited. He graduated from McGill University in 1950 with a degree of B.Eng. in civil engineering.

Marcel P. Simon, S.E.I.C., is with the Northern Electric Company Limited. He received a B.Eng. degree from McGill University in 1950.

Masao Saito, S.E.I.C., is with the Canadian Hydrographic Service in Ottawa, Ontario. He graduated from the University of Manitoba in 1950 with a degree of B.Sc. in civil engineering.

James McGown, S.E.I.C., (McGill University, B.Eng., mechanical, 1951) is a locomotive fireman and engineer for the Canadian Pacific Railway in Kamloops, B.C.

W. J. Mosley, S.E.I.C., is an electrical engineer for Alliance Tool and Motor Company Limited, in Toronto, Ont.

Mr. Mosley graduated from the University of Toronto in 1950 with a B.A.Sc. degree in electrical engineering.

Stanley Mazure, S.E.I.C., is an engineering assistant in the nylon division of Canadian Industries Limited, in Kingston, Ontario. He graduated from Queen's University with a B.Sc. in electrical engineering in 1950.

D. C. Lambert, S.E.I.C., has been transferred from Vancouver, B.C., to Montreal, to work in the communication engineering office of the Canadian Pacific Railway as assistant engineer in the outside plant department. He is a graduate of the University of British Columbia, where he received a B.A.Sc. in electrical engineering in 1950.

T. H. Lackie, S.E.I.C., has completed a post graduate course in public health engineering at the University of Toronto and is now employed with the firm of Underwood & McLellan, consulting engineers in Saskatoon, Sask. He graduated from University of Manitoba with a B.Sc. degree in civil engineering in 1950.

J. A. Lemelin, S.E.I.C., is an electrical engineer for Canadian Fairbanks-Morse, in Montreal. Formerly he was with the Department of Mines. He graduated with a B.A.Sc. degree in electrical engineering from Laval University in 1950.

John Henry, S.E.I.C., (University of British Columbia, 1951) is employed by Canadian Industries Limited as an engineering assistant in the nylon plant in Kingston, Ont.

Benjamin Froman, S.E.I.C., is with A. F. Byers Construction Company, in Montreal. Previously he was process engineer for Fraser-Brace Limited in Montreal. He graduated from McGill University with a B.Eng. in civil engineering in 1950.

R. H. Dunn, S.E.I.C., (McGill University, B.Eng., civil, 1951) is an engineering draughtsman for Fraser-Brace Engineering Company, in Montreal.

G. A. Coslett, S.E.I.C., (McGill University, B.Eng., mechanical, 1951) is an engineer-in-training with A. V. Roe (Canada) Limited, Toronto.

J. D. Carmichael, S.E.I.C., (University of British Columbia, B.A.Sc., 1951), is with Canadian Industries Limited in the cellophane division at Shawinigan Falls, Quebec.

John Douglas Barber, S.E.I.C., (University of Toronto, B.A.Sc., 1951), is a structural draughtsman for Stone & Webster Engineering Corporation in Boston, Mass.

R. P. Baronet, S.E.I.C., is supervisor of heat treating for Singer Manufacturing Company, at St. John's, P.Q. He was previously production engineer with the Company. He graduated from McGill University with the degree of B.Eng. in mechanical engineering in 1950.

Lt. Brian R. Bourke, S.E.I.C., (McGill University, B.Eng., civil, 1951), is at the R.C.S.M.C. in Chilliwack, B.C.

J. Diteman Archibald, S.E.I.C., (McGill University, B.Eng., electrical 1951), is with the Canadian Comstock Company in Sudbury, Ontario.

S. W. Grossmith, S.E.I.C., (McGill University, B.Eng., electrical engineering, 1951) is a junior engineer on a technical training course with Canadian Westinghouse Company, in Hamilton, Ontario.

John Daniel Richards, S.E.I.C., was appointed junior engineer for Dominion Structural Steel, Ltd., Ottawa, after graduating from Queen's University this year.

D. S. Moyer, S.E.I.C., is with the International Resistance Company, Toronto. Ont.

Arne J. Lamminmaki, S.E.I.C., is field engineer for A. D. Ross and Company. During the summer of 1950 he worked as electrician for the Hydro-Electric Power Commission of Ontario.

R. M. Harry, S.E.I.C., is civil engineer with Bennett & White Calgary Limite[d] general contractors in Calgary, Alta.

F. Bourassa, S.E.I.C., is field engine[er] for Anglin-Norcross, Montreal, Que.

H. B. Stewart, S.E.I.C., University [of] Manitoba, B.Sc. (mechanical) 1950, [is] with Fiberglas Canada Limited. Sarni[a], Ont. Previously he was employed wit[h] Ford Motor Company of Canada, [in] Windsor, Ont.

VISITORS TO HEADQUARTERS

R. F. P. Bowman, M.E.I.C., Bassan[o], Alta., May 4, 1951.

Paul E. Gagnon, M.E.I.C., Quebec, Que[.], May 29.

M. Grant, S.E.I.C., Bathurst, N.B., Ma[y] 31.

J. W. Gill, Cornwall, Ont., May 31.

H. V. Koring, Lachute, Que., May 3[1].

J. O. Dineen, Fredericton, N.B., May 3[1].

E. W. Montgomery, M.E.I.C., Sorel, Que[.], June 6.

H. N. Burgess, Hamilton, Ont., June 6.

S. R. Hayden, Jr.E.I.C., Hamilton, Ont[.], June 6.

W. S. Wilson, M.E.I.C., Toronto, Ont[.], June 9.

Geo. Spence, Affil. E.I.C., Regina, Sask[.], June 14.

J. M. Bennet, Jr.E.I.C., Halifax, N.S[.], June 15.

L. C. Sentance, M.E.I.C., Hamilton, Ont[.], June 15.

A. W. Johnston, Allways, Englan[d], June 19.

A. Shattuck, M.E.I.C., Regina, Sask[.], June 20.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Major Frederic J. Delaute, O.B.E., M.E.I.C., of Sarasota, Florida, died at his home on February 1, 1951.

He was born in Brussels, Belgium, in 1879. He studied practical and theoretical mechanics at the Academie Royale in Brussels, and he later attended the Ecole Nationale d'Horlogerie, de Petite Mecanique et d'Electricite, in Brussels.

From 1899 to 1900 he was with General Electric Company in Schenectady, N.Y. He worked with Linore-British Refrigeration of Canada, in Montreal, for several years, and with the Montreal Light, Heat and Power as draughtsman and designer. In 1906 he went to the Department of Marine and Fisheries at Ottawa. He remained with the Department for many years. During the first World War he served with the Canadian Forces in Europe, with the rank of major, being mentioned in despatches, and receiving the O.B.E.

He retired from the Department of Marine about 1935, when he went to Florida. In Florida during the recent war, Major Delaute did voluntary wor[k] for the U.S.A. Coast Guard Auxiliar[y] teaching junior members the use [of] navigation instruments.

Major Delaute joined the Institut[e] as an Associate Member in 1908, becom[-] ing a Member in 1940. He attained Lif[e] Membership in the Institute in 1946.

Wallace Dickson, M.E.I.C., retired civ[il] engineer, who was on the engineerin[g] staff of the City of Montreal for 3[?] years, died in Grimsby, Ont., on May 1[?], 1951.

Mr. Dickson was born in Longu[e] Pointe, Montreal, in 1879. He graduate[d] from McGill University's metallurgic[al] and civil engineering faculties with [a] B.Sc. in 1907. For two years afterwar[d] he was engineer in charge of new work[s] for Midland Furnaces, Midland. Ont[.] after which he worked for two years [as] assistant engineer for Canadian Copp[er] Company at Copper Cliff, Ont. He wa[s] the engineer in charge of new work[s] for Coniagas Smelter and Refining Com[pany]

pany in Thorold, Ont., for a time, and later he was assistant superintendent for the Buffalo Ontario Smelting and Refining Company at Kingston, Ont.

Mr. Dickson joined the Montreal Water Works Department in 1915 as an assistant engineer on the enlargement of the aqueduct. He remained on the city's staff for many years, going to the Technical Service department as an assistant engineer, and a locating engineer. He retired from the department in 1946.

He joined the Institute as an Associate Member in 1915, becoming a Member in 1920, attaining Life Membership in 1946.

Wm. L. Stamford, M.E.I.C., of Victoria, B.C., died on May 9, 1951.

Mr. Stamford was born in Dundas, Ont., in 1883. He was educated at the University of Toronto where he received a B.A.Sc. degree in civil engineering in 1909. That year he did hydraulic work with the consulting engineers, Kerry & Chace, in Winnipeg. In 1912 he went to the Marine Department as assistant engineer. In 1915 he was acting district engineer for the Department in Victoria, B.C. Early in 1920 he was transferred to the Prince Rupert agency of the Department as superintendent of lights. After 19 years at the northern post, he returned to Victoria, and in 1942 he was appointed local agent for the Department of Transport. He held this post until his retirement in 1948.

He joined the Institute as an Associate Member in 1916, becoming a Member in 1940. He attained Life Membership in the Institute last January.

C. M. Johnston, M.E.I.C., vice-president and secretary of Welch and Johnston, Limited, died at his home in Ottawa on May 25, 1951.

Mr. Johnston was born at Parry Sound, Ont., in 1896. He graduated from Queen's University, receiving a B.Sc. in electrical engineering with honours in 1920. During World War I he served overseas with Canada's forces, after which he went to Ottawa. There he went into partnership with Henry R. Welch, M.E.I.C., in the automotive electric firm which in due course represented a number of Canadian, British and American firms in the maintenance and repair of equipment. The organization commenced as a specialized technical service for internal combustion engines, with particular attention to electrical equipment, adding radio in 1921. It was incorporated in 1929 to work on maintenance problems of special auxiliary equipment of the automotive and aircraft industry.

Mr. Johnston joined the Institute as a Student in 1920, becoming a Junior in 1923, an Associate Member in 1930, and a Member in 1940. He was a member also of the Association of Professional Engineers of Ontario, and of the Royal Photographic Society, and a past vice-president of the Ottawa Executives Club.

F. J. Ryder, M.E.I.C., of the Canadian Bridge Company Limited, Walkerville, Ont., died on June 22, 1951.

Mr. Ryder was born at Holyoke, Mass., in 1907, and he was educated there and at McGill University where he graduated in civil engineering in 1929.

He joined the Canadian Bridge Company after graduation, in the draughting department in Walkerville. He accepted the position of sales engineer for the company in 1938, in charge of the company's Toronto office. In 1943 he was transferred back to the head office in Walkerville to assist in the planning and production of war materials. In 1945 he was appointed assistant shop superintendent in Walkerville, and he was appointed superintendent in 1950.

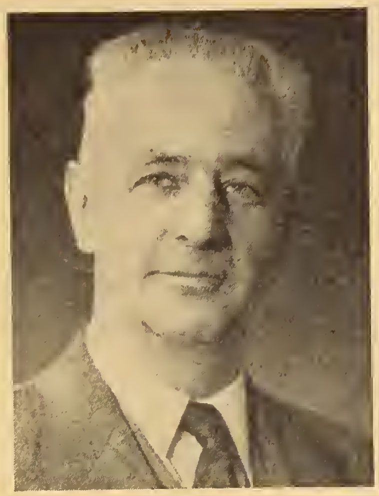
F. J. Ryder, M.E.I.C.

Mr. Ryder served from 1949 to 1951 as councillor of the Institute representing the Border Cities Branch. He had been active in the work of the Branch, being its secretary-treasurer in 1945, and its chairman in 1946. He joined the Institute in 1928 as a Student, transferring to Junior in 1935 and to Member in 1942.

Max G. Saunders, M.E.I.C., works engineer of the Kingston Plant of the Aluminum Company of Canada, Limited, councillor of the Institute representing the Kingston Branch, passed away on June 2nd, 1951, after a short illness.

Mr. Saunders was born in Elgin, N.B., in 1897 and attended Acadia University, receiving a B.A. degree (in absentia) in 1916. He served overseas from 1915 to 1919 with the Canadian Army and later with the Royal Air Force. On return to Canada he entered Nova Scotia Technical College and received a B.Sc. degree in mechanical engineering in 1923, winning the Governor General's prize for proficiency.

He was the assistant professor of engineering at Acadia for 4 years and in



Max. G. Saunders, M.E.I.C.

1927 he received a master of arts degree from that university. That year he joined the staff of the Aluminum Company of Canada, Limited, at Arvida, Que., as a mechanical engineer, becoming mechanical superintendent in 1932. During World War II, Mr. Saunders was officer commanding the Regiment du Saguenay and retired with the rank of major. In 1945, he was appointed works engineer at the Kingston Plant of the Aluminum Company of Canada, Limited, where he was in charge of all engineering, tool and die design, shops, and maintenance of equipment, buildings and grounds.

While at Arvida, Mr. Saunders was active in the Saguenay Branch of the Institute, being chairman in 1939-40, and member of council for that branch in 1941-43.

He has represented the Kingston Branch on the Ontario Provincial Division of the Institute since its formation, and was recently elected a member of the Institute Council to represent the Kingston Branch.

Among his many worthy interests was Mr. Saunders' strong support of the Institute and of his profession. He joined the Institute in 1933 as an Associate Member, transferring to Member in 1940, and has ever maintained an encouraging and helpful influence on the activities of the young engineer.

Gordon Saunders, S.E.I.C., a son, is with the Ontario Department of Highways, Toronto, Ontario.

Jet Aircraft Fuel Shortage

As the world's air forces and civil air lines turn to gas turbine powered aircraft, the supply of suitable fuels is becoming a serious problem.

Because their combustion is continuous and under moderate pressure, gas turbines will operate on a wide range of fuels—a considerable advantage over aircraft piston engines which require fuels of high octane rating. The most common fuel has been kerosene which has a relatively low vapour pressure resulting in several definite advantages for aircraft use. Kerosene fractions, however, comprise only about seven to ten per cent of crude petroleum and it is thus becoming increasingly difficult to meet the world demand.

Fuel technologists and aero engineers are studying the problem in the hope that alternative fuels can be found with the desirable properties of kerosene.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CIVIL

CIVIL ENGINEER required by organization in Montreal with construction experience and construction accounting, to be responsible to chief engineer. Good opportunity for advancement. Apply to File No. 3081-V.

GRADUATE CIVIL ENGINEER required by consulting engineering firm in Toronto area. Five to ten years experience in drainage and water distribution systems, design, draughting and supervision. Must be able to design and detail structural steel and reinforced concrete. Apply to File No. 3034-V.

CIVIL ENGINEER required by engineering firm in Toronto with municipal experience covering the field of water, sewerage systems and sewage disposal. Apply to File No. 3089-V.

ELECTRICAL

SENIOR ELECTRICAL ENGINEER who can actually head up electrical design work on a hydroelectric project, required by consulting engineering firm in B.C. Apply to File No. 3069-V.

ELECTRICAL ENGINEER required in Montreal by manufacturer. Applicant should have some experience with electrical contractor. For estimating and general engineering duties. Apply to File No. 3077-V.

MONTREAL ELECTRONICS MANUFACTURER has vacancy for an electronics engineer for design development and field testing of television receivers. Should have at least two years experience in television engineering. Apply to File No. 3079-V.

ELECTRICAL DRAUGHTSMAN required by western Ontario chemical industry. Applicant should have thorough knowledge of explosion proof Class 1, Group D installations, powerhouse control wiring, synchronous motor installations, substation layouts and underground distribution systems. Senior man with 5-10 years experience sought, capable of preparing detailed drawings, bills of material from sketches prepared by electrical engineer. In addition, drawings of existing installations have to be brought up to date. Permanent position. Apply to File No. 3080-V.

ELECTRICAL ENGINEER required in Montreal for the installation of equipment in new plant. Some previous experience necessary. Age 25 to 35 years. Apply to File No. 3085-V.

ELECTRICAL ENGINEER required in Province of Quebec with a minimum of four or five years experience in supervising an electricians crew in an industrial plant. Applicant must have a proven record of success in industrial electrical maintenance. Salary open. Preference will be given to a man with pulp and paper experience. Apply to File No. 3091-V.

MECHANICAL

MECHANICAL ENGINEER required with several years' experience in a responsible position concerned with the maintenance and operation of large hydro-electric plants having reaction turbines. Applicants should be preferably graduate mechanical engineers and must be acquainted with the theory of strength of materials, fatique phenomena and modern metallurgy with special reference to the alloy steels used in hydro-electric turbines. Location Rio de Janeiro, Brazil. Applicant must be willing to learn Portuguese and adapt himself to foreign living conditions. Age 30 to 40 years. Apply to File No. 3082-V.

MISCELLANEOUS

SENIOR CONSTRUCTION ENGINEER, bilingual with first class organizing and administrative ability for construction job abroad. Apply to File No. 1298-V.

TRANSFORMER DESIGNER required for new plant being built at St. Johns, Que. Applicant should have several years experience in the design of distribution and power transformers to Canadian Standards. A responsible and secure position is offered with wide scope of advancement both personally and in the design field. Salary open. Give full details of education and experience. Apply to File No. 3059-V.

CHEMICAL OR MECHANICAL ENGINEER to act as buyer in chemical organization in Ontario. Duties to assist in supervision of department and to do buying of technical equipment. Some experience in practical buying and expediting. Salary open. Apply to File No. 3073-V.

ENGINEER REQUIRED by large oil company in Montreal. Applicant should have some experience in the design of piping with a certain amount of administration office experience and field inspection work. Apply to File No. 3074-V.

TWO SALES ENGINEERS required. One English speaking to be located in Central Ontario, preferably in the general Toronto area. Applicant should be preferably an airforce veteran or one who has had some experience with aero-engine fittings. Second engineer should be bilingual and be located in the Montreal-Quebec area. Salary, all expenses paid, prepaid hospitalization, group life, weekly indemnity and surgical benefits. Qualifications: mechanical engineer, preferably married, age 30 to 35 years with some selling experience and owning a car. Apply to File No. 3075-V.

RECENT GRADUATE required by manufacturer in Winnipeg. Applicant must be interested in production planning, time and motion study etc. Work will be in connection with the setting up of a modern production program. Training period. Salary open. Apply to File No. 3076-V.

SALES ENGINEER, preferably mechanical with some pulp and paper experience. Location Montreal. Apply to File No. 3078-V.

EXECUTIVE ASSISTANT, Dominion-Provincial board, Fraser River Basin, headquarters Victoria, B.C. Applications will be made in writing accompanied by appropriate references and mailed to Mr. Geo. J. Alexander, Secretary, Deputy Minister of Fisheries, Parliament Bldgs., Victoria. Must be graduate civil engineer eligible for registration in B.C. and one who has had experience along hydraulic lines and capable of supervising hydraulic studies and other investigations throughout the watershed. Technical knowledge and administrative experience essential. Starting salary $4,800.00 per year. Apply to File No. 3083-V.

PLANT ENGINEER required by manufacturer of chemically blown sponge. Applicant must be capable of organizing and supervising general plant maintenance. Also a broad background in the installation and maintenance of all types of rubber processing machinery would be helpful. Location Province of Quebec. Salary open. Apply to File No. 3086-V.

MECHANICAL OR CIVIL ENGINEER required for Northern Ontario Sulphate Mill. Recent graduates would be considered. Excellent opportunities to gain experience and good prospects for promotion. Apply to File No. 3087-V.

PLANT ENGINEER required in steel foundry, Joliette, Quebec. Experience in mechanical draughting necessary. Salary open. Apply to File No. 3083-V.

GRADUATE ENGINEER required in Toronto, to be responsible and to supervise the work from 6 to 10 engineers. Applicant should have a good knowledge of structural work including reinforced concrete, structural steel and timber and preferably experience in materials handling which would involve the layout of belt conveyor systems. Salary to experienced man $450.00 to $500.00 per month. Also 1 to 2 draughtsmen required with experience in the above mentioned work. Apply to File No. 3089-V.

MECHANICAL OR CIVIL ENGINEER required by pulp and paper mill in Province of Quebec. Applicant should be bilingual and have considerable experience in design. Good salary together with social benefits. Apply to File No. 3090-V.

DUST CONTROL ENGINEER for a group of Asbestos mills. Applicant should be a graduate engineer with experience in ventilation and dust control. Work will consist of investigation and development of dust control methods and equipment and cooperating with the staffs of the various mines on the installation and operating of dust control systems. Apply to File No. 3092-V.

ENGINEER required by Montreal manufacturer for sales and service work of industrial instrumentation. Territory Montreal. Salary open. Apply to File No. 3093-V.

ONE ASSISTANT STEAM PLANT SUPERINTENDENT, required for large Newfoundland paper mill. Essential requirements—1st Class British Board of Trade Marine Engineers Certificate, sound Mechanical training, experience with high pressure boilers and turbines. Age 1mit 45 years. Attractive salary detailed information available on application. Apply to File No. 3094-V. and good working conditions. Other

ONE ENGINEER, required for large Newfoundland paper mill, with 2nd Class British Board of Trade Marine Engineers Certificate, to supervise small steam plant and act as assistant master mechanic over mechanical shops. Must have sound mechanical training. Single man preferred. Attractive salary and good working conditions. Other detailed information available on request. Apply to File No. 3094-V.

WANTED CANADIAN AGENT with pump engineering experience, to cover manufacturer's range of accelerators, boiler feed and condensate pumps. Write Ryaland (Manchester) Limited, 71 Welcomb Street, Hulme, Manchester 15, England. Apply to File No. 3095-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMISTS AND CHEMICAL ENGINEERS required to take charge of process development groups. Applicants should have at least five years development and production experience in chemical industry. Positions in Ontario. Salaries open. Apply to File No. 1335-V.

TWO CHEMICAL ENGINEERS required by paper company located in Province of Quebec. Applicants should have at least one year's experience in chemical laboratory work or related fields. Recent graduates of chemical engineering or general science will also be favourably considered. Apply to File No. 2098-V.

CHEMICAL ENGINEER required in central Ontario, with three to five years experience, preferably in a petrochemical industry. Salary open. Apply to File No. 3016-V.

CHEMICAL ENGINEER required for Ontario bleached sulphate pulp and paper mill. Pulp and paper experience desirable but not essential depending on age. Apply giving full particulars as to personal, education, experience, references to File No. 3029-V.

CHEMICAL ENGINEER or chemist preferably with eight to ten years' experience in the paint and lacquer industry. Applicant should be fully experienced in the formulation and development work of the above items. Location Ontario. Salary open. Apply to File No. 3052-V.

CIVIL

PROFESSOR OF CIVIL ENGINEERING required by university located in Ontario. The person appointed will be required to take charge of courses in highway engineering and to assist in associated civil engineering courses. Applicants should have had not less than ten years practical experience, part of which must have been spent in highway engineering. They should have graduated from a recognized university and post-graduate study will be considered an asset. An interest in soil mechanics is desirable. Salary, according to qualifications, up to $5,000.00. Apply to File No. 3014-V.

GRADUATE CIVIL ENGINEER required as transitman for railway company located in Province of Quebec. Starting salary $250.00. Apply to File No. 3025-V.

CIVIL ENGINEER required with about six years experience on construction of all types, by young progressive organization located in Province of Quebec. Applicant must have good personality and be thoroughly bilingual. Excellent opportunities offered. Starting salary about $5,000.00. Apply to File No. 3031-V.

TWO GRADUATE CIVIL ENGINEERS with a few years experience in heavy construction, preferably with contractors and on power house construction, required by large public utility in Province of Quebec. Salaries open. Apply to File No. 3035-V.

CIVIL ENGINEER, experienced, required by city in Eastern Ontario to act as building and plumbing inspector and to assist in the engineering department. Full employee benefits, salary according to qualifications. Apply to File No. 3037-V.

CIVIL ENGINEER for the design and layout of structural steel, reinforced concrete and general building work. Mechanical experience essential. Age 24 to 30 with at least 4 years experience in engineering. Location Ontario. Apply to File No. 3056-V.

CIVIL ENGINEER with experience in wharf and dock work required by contractor in Montreal. Salary open. Apply to File No. 3060-V.

ELECTRICAL

FULLY EXPERIENCED ELECTRICAL ENGINEER required by textile industry located outside Montreal. Applicant must have some real practical experience, about 15 years in a manufacturing plant, preferably textile mill. Excellent opportunity offered. Apply to File No. 1418-V.

ELECTRICAL ENGINEER with at least five years professional experience, a substantial part of which should have been in hydro-electric central station and substation design. Salary $325.00 to $400.00 per month depending on qualifications and experience. Location Victoria B.C. Apply to File No. 2073-V.

ELECTRICAL ENGINEER required in Ontario with experience in the application of electrical wire and cable, or electrical engineer who has had at least a few years experience in some aspect of the electrical cable industry, either with a cable manufacturer or in the distribution department of a public utility. Salary open. Apply to File No. 2097-V.

ELECTRICAL ENGINEER required in Ontario. Age 25 to 35 years. Duties include product design development and engineering of small AC and DC motors. Excellent starting salary and future prospects. Apply to File No. 3041-V.

ELECTRICAL ENGINEERS REQUIRED by large Canadian Manufacturer for application engineering and negotiation work on electrical apparatus to specialize in specific industries such as: Central station, metal working, transportation, paper and pulp, rubber, mining and chemical, marine. Applicants should have high intelligence, commercial sense, sound engineering background, pleasing personality. Exceptionally interesting, well paid work for men with necessary high qualifications. Some travelling. Apply to File No. 3043-V.

YOUNG ELECTRICAL ENGINEER to act as sales engineer for manufacturer in Montreal. Applicant should have some experience with public utility or cable manufacturer. Territory largely Eastern Provinces. Apply to File No. 3047-V.

ELECTRICAL ENGINEER experienced required by manufacturer in Ontario, of small transformers, such as those used in radio, television, automobile ignition coils and battery boosters. Applicant should be able to write specifications and prepare designs, as well as know something of manufacturing problems and have about 5 or 6 years experience. Apply to File No. 3049-V.

ELECTRICAL ENGINEERS REQUIRED by large organization in Montreal with university degree in electrical engineering, engineering physics or radio engineering. Non-graduates acceptable if equivalent training and experience have been obtained by other means. Intermediate and senior engineering positions are also available for men with two or more years experience in design and development of radar or radio communications equipment. Duties involve electrical design and development of radar and radio communications equipment for defence and civilian purposes. Salaries open. Apply to File No. 3064-V.

MECHANICAL

MECHANICAL ENGINEER required for layout and design of plumbing and heating equipment. Location Montreal. Salary open. Apply to File No. 1252-V.

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for ordinary colliery plants screening equipment. Hoists, simple steel structures, etc. Salary open. Apply to File No. 1332-V.

MECHANICAL DESIGN ENGINEERS required by West Coast pulp and paper mill, previous pulp and paper experience desirable but not necessary, and consideration will be given to all applicants with industrial experience. Salaries from $3,600.00 upwards commensurate with experience. These are permanent appointments in well established mill. Apply to File No. 1582-V.

MECHANICAL ENGINEER required by large firm in Montreal to act as railroad car engineer. Applicant should have two or three years (or more) of experience in the design of tank cars, as defined by the Association of American Railroads. Familiarity with the requirements of the A.A.R., the I.C.C., the Bureau of Explosives and the Board of Transport Commissioners is essential. Salary open. Apply to File No. 1600-V.

MECHANICAL ENGINEER required by large firm in Montreal. Applicants should have experience in the pulp and paper industry, particularly in the design and for operation of paper making machinery. One or two years experience desired. Salary open. Apply to File 1600-V.

MECHANICAL ENGINEERS required by large manufacturing firm located one hundred miles from Montreal. Excellent opportunities for experience and promotion in time study standards department eventually leading to shop management. Apply to File No. 1621-V.

MECHANICAL ENGINEER 25-30 years of age required for manufacturer of spun synthetic textile yarns at Granby, Quebec. The plant superintendent is a graduate mechanical engineer and the position is that of assistant superintendent. Duties will include planning production, the maintenance of the machines, planning and installation of new machinery and daily contact with all levels of personnel. Salary will depend on the experience of successful applicant. Minimum $300.00 per month. Apply to File No. 1700-V.

MECHANICAL ENGINEER recent graduate up to three years employment interested in obtaining drawing office experience in plant production of heavy armament work. Forty minutes by tramways from Phillips Square, Montreal. Apply to File No. 2014-V.

MECHANICAL ENGINEER required for engineering office of large oil company. Applicant should have minimum of two years experience in design and layout of mechanical equipment. Working knowledge of pressure vessel design an asset. Location Montreal. Salary open. Apply to File No. 2052-V.

MECHANICAL ENGINEER with 3 to 5 years experience in maintenance engineering. An asset if bilingual but not necessary. Location: Valleyfield, Quebec. Excellent opportunity offered. Salary open. Apply to File No. 2053-V.

MECHANICAL ENGINEER with at least 2 to 3 years experience in the design and job fabrication of A.S.M.C. Pressure vessels and heat exchangers required for design, estimate and inspection work by engineering company located in Montreal. Salary commensurate with ability. Apply to File No. 2070-V.

YOUNG MECHANICAL ENGINEER to act as expeditor in the purchasing department of organization in Montreal. Applicant should be between 30 to 35 years and be free to travel 50% of the time. Material handled would be all types of heavy equipment in connection with smelting plant. Apply to File No. 3019-V.

MECHANICAL ENGINEER required by organization in Montreal. Applicant should have had experience in production planning and the design and application of mechanical equipment to production operations. Duties will include research and the development of mechanical equipment for one of the primary industries. Preferably single and free to travel. Apply to File No. 3020-V.

MECHANICAL ENGINEER 1949 or 1950 graduate with some experience in heating or combustion engineering or ventilating and air conditioning, required by firm in Montreal. Apply to File No. 3021-V.

MECHANICAL ENGINEERS 1950 graduates required by manufacturer in Montreal of heavy industrial equipment. Salary open. Apply to File No. 3030-V.

MECHANICAL ENGINEER with several years experience in maintenance and plant engineering work. The position open is that of plant engineer at the Toronto plant of organization with headquarters in Montreal. Salary range $400.00 to $450.00 per month. Apply to File No. 3048-V.

TWO MECHANICAL ENGINEERS OR MECHANICAL DRAUGHTSMEN required for layout piping and general work in plant engineering and design. Age 24 to 30 with at least 4 years experience in engineering. Location Ontario. Apply to File No. 3056-V.

MECHANICAL ENGINEERS with M.E. degree or equivalent theoretical knowledge. For senior positions which are also available, three or more years experience in design or manufacture of electrical apparatus or similar products will be required. Duties: processing and preparation of manufacturing information required to manufacture and assemble complex radar and radio communication equipment. Salary according to experience and qualifications. Location Montreal. Apply to File No. 3064-V.

MECHANICAL DRAUGHTSMEN required by large machinery manufacturing firm in Eastern Townships. Knowledge of machine design. Salary commensurate with ability. Apply to File No. 3065-V.

MECHANICAL ENGINEERS required by large machinery manufacturing firm in Eastern Townships. Opportunity for recent graduate or experienced engineers. Apply to File No. 3065-V.

MISCELLANEOUS

FOUNDRY METALLURGIST required in British Columbia. Applicant should have broad experience in research work. Apply to File No. 1118-V.

PHYSICIST OR MECHANICAL ENGINEER wanted to act as head of Nuclear Engineering Branch by National Research Council. Applicant will be required to direct a group of physicists and engineers in applied research and engineering development related to design of atomic energy plants and plant equipment. Salary $5,000.00 to $6,300.00, Apply to File No. 1325-V.

SENIOR DESIGN ENGINEER required in Ottawa, with a degree in mechanical or chemical engineering. Applicant should have a minimum of 5 years experience in mechanical design particularly with reference to chemical plant equipment and process. Apply to File No. 1507-V.

TECHNICAL DIRECTOR wanted for paper company producing from 100% rag to 100% sulfite papers. Applicant should be a graduate chemist or chemical engineer and must be bilingual. Surroundings are ideal and living conditions very good: Mills located near Montreal in the Laurentian mountains. Apply to File No. 1586-V.

DESIGN ENGINEER approximately 10 years experience in structural material handling and mechanical design. Boiler design experience an asset but not essential. Location Western Can. Apply to File No. 2000-V.

ASSISTANT PRODUCTION SUPERINTENDENT required by large firm of long standing manufacturing men's shirts, pajamas, etc., for plant near Three Rivers, Quebec. Experience in manufacturing these lines or similar necessary. Applicant would be required to plan for high production, improve methods, lower costs, etc. Good proposition to right party. Apply to File No. 2018-V.

PROJECT ENGINEER graduate with at least ten years experience in design, construction and operation of petroleum chemical plants on petroleum refineries, required to supervise project division of company engaged in engineering and construction of gas processing plants located in Montreal, Canada. Salary commensurate with ability and experience. Apply to File No. 2051-V.

DRAUGHTSMAN, senior layout man, required for the engineering department of new plant in Western Ontario. Must be capable of making complicated layouts from specifications, drawings, sketches or notes furnished by engineers and have considerable knowledge of manufacturing processes and their limitations. Should be capable of doing some designing. Experience in structural work and piping. University degree would be helpful but not necessarily required. Apply to File No. 2062-V.

INDUSTRIAL ENGINEER required by firm of management consultants. Should be experienced in plant layout, production control, time studies, wage incentives, cost and budget controls. Age 35-60. Free to travel. Apply to File No. 2079-V.

RESIDENT ENGINEERS AND INSTRUMENTMEN required for work on the construction of the Quebec North Shore and Labrador Railway. Applicants should have some experience on highway work. Good working conditions. Salaries open. Apply to File No. 2086-V.

POSITIONS AVAILABLE with The Consolidated Mining and Smelting Company of Canada Limited, at Trail, B.C., for experienced mechanical, structural and electrical designers and draughtsmen. for work connected with the design and layout of equipment and buildings in our mining, metallurgical and chemical and fertilizer plants. Application should be made in writing giving full particulars on education, experience and stating approximate salary expected, to the manager, Personnel Division at the above address. Apply to File No. 2090-V.

A MATURE GRADUATE ENGINEER with 10 years experience in the operation of ore dressing and hydrometallurgy plants is required, to take charge of hydrometallurgical ore treatment plant of 750 tons per day with ultimate capacity 1500 to 2000 tons. Position requires sound background in chemistry and chemical plant control equipment. The position offers excellent opportunities for advancement in a growing organization. Reply with full details of experience, educational background, marital status to File No. 3002-V.

WE ARE SEEKING a top quality business minded engineer with good executive drive for a new and modern coal mining operation in Alberta. Both strip and underground operations are involved. This man will work with the mine manager and be responsible to the managing director for all business aspects; planning control, purchasing etc. Underground mining experience is not a prerequisite but some experience in business administration and/or in dirt moving operations with heavy equipment would be desirable. Present accommodation is limited but the opportunity for advancement, both within the mining company and other interests controlled by the same principals, is excellent. The salary is open. Apply to File No. 3004-V.

ENGINEERS REQUIRED by firm of consultants in Montreal. Civil, mechanical, electrical and structural engineers and draughtsmen also petroleum engineer required with some experience. Salaries open. Apply to File No. 3007-V.

EXPERIENCED INSTRUMENT ENGINEER required in Montreal. Permanent appointment for a man between 25 and 35 years of age and A.I. medical category. He should be able to select proper equipment for new jobs also interpret results and calculate correction factors of instruments. He must have experience and ability to organize instrument maintenance and carry out normal repairs. Apply to File No. 3010-V.

WANTED RESEARCH SCIENTIST. Salary $5,850 to $6,850 depending on qualifications and experience. Duties to direct laboratory research and pilot plant development work in the chemistry of explosives and propellants. University graduate preferably at the Ph.D. level; five to ten years' experience in explosives or propellant research or in related fields; administrative experience. Canadian citizen. Apply to File No. 3011-V.

ENGINEERS REQUIRED by firm of consultants in Toronto capable of taking responsibility for phases of electronic and mechanical equipment sales and engineering, mining or industrial plant construction. Apply to File No. 3012-V.

SAFETY ENGINEER assistant, recent graduate in chemical or mechanical engineering with an interest in plant safety work. Location Ontario. Salary open. Apply to File No. 3015-V.

:LECTRICAL AND MECHANICAL ENGINEER required by electrical organization in Ontario, presently engaged in the conversion programme of industrial firms. Applicants should have some industrial experience. Apply to File No. 3017-V.

:ESIDENT ENGINEERS required by firm of consultants in Ontario, for large construction projects. Applicants should be experienced and be thoroughly bilingual. Apply to File No. 3022-V.

:STIMATOR, preferably graduate engineer experienced in quantity survey as relative to building construction. This is a permanent position with a good initial salary and the prospects for advancement would be excellent for the right man. Location Ontario. Apply to File No. 3026-V.

:ALES & SERVICE ENGINEER in the water treatment field for manufacturer supplying chemicals and equipment to all types of industries throughout Canada. Engineering graduates with 2 or 3 years experience or 1951 graduates. Territory Quebec and Ontario with considerable travelling. Car provided, travelling expenses paid. Salary based on qualifications. Apply to File No. 3027-V.

UNIOR ENGINEER with a knowledge of sanitary engineering required by large inter-municipal corporation in Western Canada. Duties include preparation of plans and specifications, to layout and supervise construction and maintenance, to make reports of investigations of special engineering problems. The immediate problems are additions to present facilities and enforcement of the regulations to industrial wastes. Salary open. Apply to File No. 3028-V.

/ACANCIES EXIST with major oil company having operations in several South American countries for: District Electrical Superintendent, Electrical Engineer, Senior Chemist (refinery), Assistant Chief Chemist (refinery), Junior Mechanical Engineer. Interested parties should submit full details of qualifications. All replies will be held in the strictest confidence and should be addressed to File No. 3034-V.

/IECHANICAL OR CHEMICAL ENGINEER with at least 7 years experience in either industrial construction or chemical plant maintenance. The position open is that of resident engineer on construction of new plant in Montreal East and the chief duties will be the inspection of all mechanical work during construction. When the plant has been completed, then this man, if suitable, will have the opportunity to take over the position of plant engineer. The tentative salary range is $400.00 to $500.00 per month. Apply to File No. 3048-V.

:ALES ENGINEER, wanted to manage Vancouver Office of American firm engaged in industrial sales to power plants, pulp and paper mills, municipalities, institutions, etc. Must be graduate mechanical engineer, Canadian citizen, 30 to 40 years of age, with previous experience in similar work. Salary open. Apply to File No. 3050-V.

/IAINTENANCE AND CONSTRUCTION ENGINEER required by an established metallurgical plant in Montreal. Permanent position offering opportunity for advancement. Apply to File No. 3053-V.

ENGINEERING ASSISTANT AND ESTIMATOR required for branch office in Toronto of large U.K. electrical manufacturers. Duties will be of a varied nature and applicants should have some previous experience. Apply to File No. 3055-V.

FINANCIAL ANALYST REQUIRED by large mining and manufacturing organization in Province of Quebec. Technical education such as engineering or science, plus knowledge of accounting, or preferably courses in accounting or business administration. Salary depends upon qualifications and will advance with experience. Apply to File No. 3057-V.

TWO ENGINEERS, electrical, mechanical or chemical, either newly graduated or with several years experience, required by large sugar refinery located in Montreal. Salary open. Apply to File No. 3058-V.

ASSISTANT RESIDENT ENGINEER required in Vancouver, B.C., for Granville Bridge. Qualifications required are preferably university graduate in civil engineering or structural with a minimum of three to four years field experience in construction work, or equivalent. Interviews would be conducted with persons now in vicinity or those willing to go to location. Apply to File No. 3062-V.

PROJECT ENGINEER required by organization in Montreal offering all modern employee benefits. Applicants should be chemical engineer with four to five years experience in design, construction or operation of petroleum and light hydro-carbon plants. Salary commensurate with experience. Submit full details of qualifications with recent photo. Apply to File No. 3063-V.

CHIEF INSPECTOR REQUIRED by large oil refinery located in Montreal area. Applicant must be a graduate engineer and should have minimum of five years applicable experience in inspection and maintenance of refinery operating equipment. Duties would consist of scheduling and supervision of inspection policy, corrosion investigations, welding procedures, etc. Pension, accidents and sickness benefits provided. Excellent opportunity for ambitious man with executive ability in a rapidly expanding company. Salary open. Apply to File No. 3066-V.

APPLICATIONS for the position of town engineer for town located in Manitoba, population 6,100, will be received up to July 7th, 1951. Commencement salary $330.00 per month plus car allowance. Engineer to have charge of construction and maintenance of streets and sidewalks and gravity water system with sewage disposal plants. Applicants will require to state qualifications, furnish references and state the earliest date on which duties can be assumed. Apply to File No. 3067-V.

MECHANICAL AND SENIOR ELECTRICAL engineers required by consulting firm in Montreal with experience in electronics. Salaries open. Apply to File No. 3070-V.

ENGINEERS required by municipality in Ontario. Applicants should have experience in structural design, sewer design or sewer construction. Salaries open. Apply to File No. 3072-V.

Situations Wanted

GRADUATE PRACTICAL MECHANICAL ENGINEER with foremanship record, health, married, 39, bilingual, pilot, also experienced in aeronautics, civil, hydraulical and some electro-electronic engineering wishes serious assignment abroad in southern climate, preferably in British possessions. Apply to File No. 140-W.

ELECTRICAL ENGINEER, aged 36, 1st class honors degree, P.Eng., M.E.I.C., A.A.I.E.E., A.M.I.E.E. Apprenticeship and erection experienced with large electrical manufacturing company and 10 years experience as electrical engineer for large industrial companies—all companies are of world renown. Two years Canadian experience. Desires post as electrical engineer for industrial company or other suitable post preferably in Southern Ontario or British Columbia. Available at short notice. Apply to File No. 391-W.

INDUSTRIAL AND CIVIL ENGINEER, B.A.Sc. 1939. M.E.I.C., Prof. Eng., age 42, married, thoroughly bilingual. Experience: all phases of production, sales, maintenance, construction. Available on short notice. Apply to File No. 2157-W.

ENGINEER, MECHANICAL, M.E.I.C., interested in position offering opportunity as representative, plant or assistant engineer. Experience includes twelve years design, construction and maintenance with pulp and paper industry. Age 40, married. Apply to File No. 2642-W.

MEHANICAL ENGINEER, M.E.I.C., Queens 1936, age 38, married. Currently engaged in research work, 2½ years. Desire to return to industrial or commercial field in Toronto district. Have had the following experience since graduation: About 10 years diversified work in plant engineering embracing dust control, 2½ years; application of control to metallurgical processes (primary metal producers), 3 years; industrial ventilation and air conditioning, 1 year; general plant maintenance, 3½ years; about 2 years steel forging experience in small plant covering purchase, installation, and operation of equipment. Would be available at reasonable notice to present employer. Apply to File No. 2966-W.

ELECTRICAL ENGINEER, S.E.I.C., B.A.Sc., P.Eng., Laval 1950. Age 24, bilingual, single. Experience: 3 summers in workshops of RCEME; electrical estimator; inspection, reports, recommendations on electrical installations of mines. Would accept position in any branch of electrical installations of mines. Would accept position in any branch of electrical engineering, including sales. 2 weeks notice. File No. 3276-W.

MECHANICAL ENGINEER, Toronto, Jr.E.I.C., P.Eng. Age 29, married. Wishes to join a medium sized company to co-operate with management in reducing manufacturing costs by better production methods. Five years experience as chief engineer in charge of production and product design. Accustomed to working closely with shop and inspection department. Capable of acting as group leader and of assuming full responsibility relative to tooling, processing, and plant layout for increased productivity. Interested in working into management position. Apply to File No. 3361-W.

ELECTRICAL ENGINEER, Manitoba 1950. S.E.I.C. Age 30, married with family, airforce veteran. Experience with power utility, dyke construction, pump station construction estimating. Presently employed in signal department of Canadian Railway. Prior to war, construction and mining experience. References and detailed experiences on request. Seeks employment where hard work and initiative will lead to advancement. Apply to File No. 3375-W.

BRITISH DIESEL AND ELECTRICAL ENGINEER, A.M.I.E.E.; six years electrical officer R.N.V.R.; nine years commercial experience in U.K., Malaya and Ceylon in sales, contracts and servicing equipment ranging from generation to household appliances; accustomed to executive responsibility and currently chief engineer for leading British firm in Ceylon; has had brief experience of conditions in Canada and desires progressive position and permanency there. Aged 36. Available July. Wife Canadian. Apply to File No. 3398-W.

BRITISH CIVIL ENGINEER, 27 years of age, single. Graduate of Trinity College, Dublin, with B.A. degree geology; and B.A.I. in civil engineering. Technical officer with Royal Engineers, 5 years practical engineering experience. Presently employed in Canada. Desires position with a future, possibly administrative where academic training, technical knowledge and personal qualities may be combined. Willing to work hard and accept responsibility. Apply to File No. 3400-W.

EXPERIENCED ENGINEER, A.M.I.C.E., M.E.I.C., age 31. 14 years combined civil mechanical background. Design and construction in road works water supply, sewage system and large factory construction in U.K. Hydro-electric construction and investigation in U.K. and Canada. Geophysical investigation and deep well drilling and operation for water supply in N. Africa. Aircraft component design and machine shop practice in U.K. Require progressive position where experience may be utilized combined with aptitude for administration organization and production. Apply to File No. 3435-W.

CHEMICAL ENGINEER, B.A.Sc. Excellent background. 8 years experience. Presently employed on large scale production supervision. Seeks position of responsibility with promising future. Preferably in Ontario. Married, 3 children. Apply to File No. 3487-W.

ELECTRICAL AND MECHANICAL ENGINEER, S.E.I.C. Age 24. Experience 12 months powerhouse electrician, (Des Joachims). Graduating end of May. Undertaking valuation of European power plants this summer. Available October 1st. Interested in power plant equipment and operation—diesel steam or hydraulic. Apply to File No. 3488-W.

GRADUATE ENGINEER with qualifications and experience to handle position as works manager or plant superintendent, extensive experience in connection with mechanical equipment, of mining and metallurgical industries as well as industries as well as in metal-working establishments. Presently employed in responsible position. Interested in either domestic or foreign assignment. Apply to File No. 3493-W.

MECHANICAL ENGINEER, Jr.E.I.C. Graduate University of Saskatchewan 1950. Single, age 23. Have been employed in non technical work in the west. Desire position in maintenance or plant engineering work with an opportunity to gain experience and advancement. Type of position more important than renumeration. Apply to File No. 3495-W.

ELECTRICAL ENGINEER, M.Sc., Jr.E.I.C., completing a two year graduate training course with a large electrical manufacturer, seeks to better his position. Would consider professional employment with any progressive manufacturer or consulting engineer, however, prefer British Columbia or Alberta. Apply to File No. 3499-W.

ELECTRICAL ENGINEER: Sask. 1950. Three summers experience as electricians helper with industrial concerns. Also experienced in the installation of large power equipment. Desires position with consultant firm or in city engineering department. Available upon short notice. Married veteran with one child. Apply to File No. 3500-W.

ENGINEER, M.E.I.C. Age 46, married. Wide experience design, construction, operation and maintenance of plants manufaturing Kraft pulp, coal and synthesis gases and bye products, and sugar; including refractories and brick-work settings, concrete structures, steelwork, tanks and vessels, piping, mechanical conveyors, boiler plant and all ancillary equipment. Resident Engineer for the past 15 years. Available from mid-August. Apply to File No. 3505-W.

MINING AND STRUCTURAL ENGINEER, M.E.I.C. and P.Eng. Married. With long experience in open pit and underground mining, in design and inspection of construction dwellings, mine and mill buildings, railway trestles and conveyor belt trestles. At present employed. Available September 1st, 1951. Apply to File No. 3507-W.

SENIOR MECHANICAL ENGINEER, M.E.I.C. Four years' experience as chief engineer with small company. Nine years on board as designer. Sixteen years' total experience with medium to heavy machinery including hydraulic presses, forging machines, valves, pumps, controls, boilers, tanks, etc. Also in charge plant services and maintenance. Organization and administration. Experienced writer and lecturer. Apply to File No. 3508-W.

ENGINEER, M.E.I.C., P.Eng., Quebec., University Sask. '26, with 25 years varied experience on construction, design and management of public utilities, public works and housing developments in all parts of Canada desires partnership in consulting firm or management position where experience can be of value. Initiative good judgment and tact. Ability to organize effectively. Knowledge of legal and accounting aspects of construction. Available now. Apply to File No. 3511-W.

CHEMICAL ENGINEER, Prof. Eng. (Quebec) Jr.E.I.C. Specialized in Chemical Engineering. Three years experience in industry and presently employed. Bilingual. Worked on chemical control, industrial research. Also supervising experience. Would like position as engineer along following lines. Industrial research. Designing (chemical field). Consulting assistant. Applicant is mechanical inclined and has good creative imagination. Apply to File No. 3514-W.

GRADUATE MECHANICAL ENGINEER, Sask., 1948, Jr.E.I.C. Single, R.C.A.F. veteran. Experience in production control, method analysis, time study, cost control and industrial relations. Desires a change into a field of engineering that will give more opportunity to practice mechanical engineering. Willing to work for moderate salary to gain experience. Apply to File No. 3516-W.

MECHANICAL ENGINEER, Jr.E.I.C., civil designer, and executive. B.Sc., P.Eng., A.S.M.E., A.S.C.E. Age 28, married. Five years experience in design, estimating, administration, and supervision of engineering for pulp and paper mill, dams, hydro-electric plants and related structures, bridges, filtration plants, industrial buildings, and foundations. Previous successful record established in shipbuilding, and automobile industry, and U.S. government road construction. Ambitious, aggressive, and serious businessman seeking permanent employment in construction, industry, plant engineering, or sales; where security and scope for advancement are unlimited. Present salary $5,000.00. Ontario or West Coast preferred. Apply to File No. 3517-W.

METALLURGICAL EXPERT of considerable industrial experience, age 47, married, M.E.I.C., P.Eng., with educational background covering mechanical engineering, mathematics and physics, metallurgy and metallography. A disciple and coworker of one of those European Physico Chemists who laid foundations for the modern science of metallic structure. Thoroughly versed on research level in the modern statistical control of the mass production of quality. Able to develop metallurgical iron and steel business on any scale, especially for armament purposes. Even small firms with good prospects of development are considered. Apply to File No. 3521-W.

CHEMICAL ENGINEER, 30 years old, newly arrived from Sweden. 8 years experience in laboratory research work and production control, former assistant at the Technical Universities of Stockholm and Budapest, specialist in food, fermentation, cereal and agricultural chemistry, is looking for suitable position. Married, no children. No location preference. Apply to File 3526-W.

GRADUATE CHEMICAL ENGINEER, Toronto 1950, single. Experience in methods analysis, time and motion study and cost control. Desires to gain experience in a field more closely related to chemical engineering. Production or technical sales preferred. Willing to work anywhere. Apply to File No. 3527-W.

GRADUATE ENGINEER, Jr.E.I.C. Sask. 1948. Married, one child. Seeks responsible position in an engineering capacity with good chances for advancement, with a construction company or consulting firm in Western Canada. Experience includes survey work, draughting and design of building layout, piping layout, steam plant layout, earthwork and field supervision. Currently employed as field engineer with supervisory staff. Available on one months notice. Apply to File No. 3530-W.

CHEMICAL ENGINEER, Ph.D. from University of Berne, Switzerland. Age 30. Recently arrived in Canada. Extensive experience in paper industry (research and production). Desire position in pulp and paper or allied industry. Available immediately. Apply to File No. 3531-W.

BRITISH SUBJECT, mechanical engineering degree 31 years; apprenticeship (2 years), design experience (1 year), commercial engineering experience (2½ years) on modern steam power plant projects, all with largest British manufacturer of mechanical and electrical power equipment, seeks suitable position with Canadian firm. Apply to File No. 3532-W.

ELECTRICAL ENGINEER, Jr.E.I.C., western Canadian university, 1949. Age 25, will complete two year graduate apprenticeship with an electrical engineering company in England this summer, desires position as sales or outside erection engineer. Apply to File No. 3533-W.

NEWS of the BRANCHES

Activities of the Thirty-three Branches of the Institute and abstracts of papers presented at their meetings

Cornwall

John A. Sargeant, jr.e.i.c.
Secretary-Treasurer

A. A. B. McMath, m.e.i.c.
Branch News Editor

N.R.C. Tour, June 14

This event provided 19 members of Cornwall Branch a fine opportunity to become acquainted with some of the activity there. Arriving in Ottawa at 10 a.m., the group was welcomed in the Council Chamber of the Sussex Street building, by Mr. S. J. Cook of the Public Relations branch. After Mr. Cook had traced the history of the organization, two parties were formed and conducted through the Divisions of Radio and Electrical Engineering, Physics, Applied Biology, and Applied Chemistry. At 1 p.m., the group enjoyed an excellent dinner in the cafeteria. H. W. Nickerson expressed the appreciation of the Cornwall visitors, for the fine reception they had received.

From 2:00 to 4:30 p.m., a tour through some of the buildings at the Montreal Road Laboratories enabled the visitors to see the Divisions of Building Research and Mechanical Engineering. Among the activities observed were test huts, soil mechanics, a heat pump, a hydraulics lab for testing boat hulls, a low temperature chamber for testing vehicles, and wind tunnels for testing small objects.

To conclude a fine day, 22 members of the Ottawa Branch met the Cornwall Group at a supper in the National Research Cafeteria. This was followed by a lengthy sing-song. This friendly gesture by Chairman B. G. Ballard and the other Ottawa members was much appreciated.

Hamilton

Geo. L. Schneider, jr.e.i.c.
Secretary-Treasurer

Bernard A. Warren, s.e.i.c.
Branch News Editor

Dinner Meeting at Brantford, Ont., May 16.

"You and the Atom" was the subject of a sparkling address given by Dr. Martin W. Johns, of McMaster University, before sixty-five members of the Branch.

The meeting was held in Brantford to foster friendship between Hamilton members and those living in Brantford and district who are unable to attend all meetings in the Ambitious City.

After an excellent turkey dinner was served, Branch Chairman E. T. W. Bailey, in welcoming the group, discussed for a few moments the advantages of the E.I.C. to those who do not live in a branch city.

Mr. Wm. Dawson introduced the speaker. Dr. Johns, who received his B.A. and his M.A. at McMaster University and his Ph.D. at Toronto in 1938. After a period at Chalk River, he joined the staff of McMaster University in 1947 to lecture on Nuclear Physics.

Dr. Johns said that only in the last fifty years have we come to know very much about the atom; and, as is usually the case, there has been a definite time lag between discovery and application of the product and process by which atomic energy can be utilized.

In the last fifty years we have come to grips with Newton's Laws of Conservation. The law of Conservation of Momentum has always come through victorious, but the law of Conservation of Mass has of necessity been modified slightly.

Although there is a million times more energy available in a nuclear reaction than in a chemical one, scientists are, as yet, still in the state where, what they know about the atom corresponds to what the blind men knew about the elephant. Each knows a part of its nature from what individual discoveries have shown—each one covering a different aspect of the atom's makeup and conduct under varied conditions.

Should the kernels of atoms be placed together, one cubic millimeter of them would weigh in the order of 100,000 tons. Fortunately, however, the actual scale runs something like this. One kernel, the size of a golf ball situated in Brantford would have the adjacent ball or kernel in Paris, the next in Galt and so on.

Dr. Johns went on to tell of the medicinal value of radio-active elements. Phosphorus is used to treat cancer of the bone marrow and iodine,which has a half life of four days, to treat thyroid. In the medicinal field the uses of these radioactive elements are practically unlimited.

On a straight energy basis alone, one quarter of a cubic inch of uranium is equivalent to sixteen million cubic feet of gas, eight thousand cubic feet of coal, and forty-seven hundred cubic feet of oil.

Dr. Johns had with him a geiger counter which picked up cosmic rays causing a distinct clank on the machine. A wrist watch with a luminous dial held close created a great clatter on the counter which is often used in the laboratory to detect spills of radio-active material. Scientists claim that cosmic rays change the species of animal and man over a period of many years, and atomic rays are suspected of being able to speed up the rate of the evolution of man.

Excellent slides showed the engineers the sixty-five ton cyclotron in use at McGill University and the speaker told of a giant ninety feet diameter "racetrack" cyclotron machine being built at Brookhaven. By means of these machines scientists can study protons and neutrons, the neutrons which, although they do not remain in the cameras view, can be studied on the way out. Neutrons can also be made to do useful work on the way out. One cannot see the atom but one can see where it was.

To start a pile of heavy water costs about six million dollars, and as far as we now know, the pile cannot be reduced in size to operate cars and busses. However, atomic energy could be used to advantage in a situation as exists in Saskatchewan where there is no known coal and very little water power available.

While unfriendly powers may know the secrets of atomic energy, it is the technological know-how and engineering application of these secrets which are so jealously guarded.

In Canada, the establishment of the atomic energy pile at Chalk River has given a tremendous impetus to the fundamental atomic research, sparking the programme to over one hundred times that which existed in Canada previous to the last war, concluded Dr. Johns.

A healthy discussion period followed during which the speaker, who was thanked by Mr. John Mitchell, demonstrated a remarkable mastery of his subject.

E.I.C.-A.I.E.E. Joint Meeting, April 9

The meeting of the Hamilton Branch of the E.I.C. and the Hamilton Subsection of the Toronto Branch of the A.I.E.E., brought together an audience of 140.

The programme for the evening consisted of the presentation of papers on the Electrical and Mechanical Features of the New Stelco Five-Stand Cold Mill.

Joe Thwaites, electronics engineer with the Canadian Westinghouse, and chairman of the Toronto Branch of the A.I.E.E., extended a welcome to the meeting, along with Mr. A. P. Craig, vice-president and general manager of the Canadian Westinghouse. Mr. Craig suggested that meetings of this type create a rare opportunity for different branches of the engineering profession to develop a mutual respect for the others' problems.

Mr. Thwaites handed the meeting over to E. T. W. Bailey, chairman of the Hamilton Branch of the E.I.C. who promptly called on Mr. A. A. Moline, chief engineer of the Canadian Westinghouse; to introduce the first speaker; Mr. Ralph A. Harvie, manager of the Industrial Application Department of Canadian Westinghouse.

Mr. Harvie spoke on the electrical features of the five-stand cold mill.

In producing several hundred thousand tons of cold rolled steel per year—much of which goes into the manufacture of metal furniture, cans, and auto bodies—the new five stand mill, costing six million dollars, has incorporated in it one and a quarter million dollars worth of electrical controls and drive equipment.

The speed range of the five motors, whose aggregate horse-power is 14,300, is an important factor in their design. A wide speed range is necessary to accommodate the rolling process in which the speed of the strip is greatly increased as it becomes thinner. The massive mill is equipped to roll a strip of steel 49 inches wide and 3,300 feet long in one minute.

Although this mill installed at the Steel Company of Canada will help fill Canada's ever increasing requirements for cold-rolled steel, still faster machines with greater capacities must be built, to keep pace with the nation's rapid industrial growth.

"It is, of course, the combined efforts of professional groups of electrical, mechanical, and metallurgical engineers which will be required to produce such machines," concluded Mr. Harvie.

The speaker who pictured the mechanical features of the mill was Mr. Donald Haines, Jr.E.I.C., metallurgical engineer, who maintains quality control in the cold roll plant of the Steel Company of Canada.

The new five-stand cold roll mill produces pressures up to the necessary three million pounds in rolling a thirty-inch strip. Lateral spread must be kept to a minimum, which creates a problem, and roller speeds must be accurately timed to allow for elongation. When work is done on the metal, the heat produced tends to expand the rolls, causing variation in the gauge of the metal. To detect these changes in thickness, a flying micrometer is used.

In the process of rolling, at one point the strip goes slower than the rollers, while closely adjacent, the strip goes faster than the rolls. The spot where the pressure does most of the work is where the rolls are moving just a little faster than the metal passing through.

Lubrication is an important factor in preventing local seizure, and palm oil is used to allow easy reduction, stated Mr. Haines, Jr.E.I.C., who showed excellent slides paralleling the presentation of his subject.

Following the speakers, Mr. Bailey conducted a question period, the interest in which indicated the appreciation of the audience for the fine presentation of the subject by these able engineers.

After Mr. Harold Crane of the Turnbull Elevator Company had thanked both speakers, for their hard work in preparing and presenting their papers, the meeting adjourned to the cafeteria where refreshments were enjoyed, while the discussion of the evening's subject was continued informally.

Prior to the general meeting, some thirty members of the executives of the two groups met for dinner.

Branch Meeting, March 22

Several hundred keenly interested engineers from Hamilton and district heard General A. G. L. McNaughton speak on the type of problem which it is the job of the Joint Commission to solve; regarding international boundary differences. Reviewing the work of the Commission, he illustrated how many rivers, which rise in either Canada or the United States, flow across the border, producing special problems in the way of flood control and contamination.

Due to the fine work of this body of six men, four of whom are professional engineers, many problems have been squarely met and solved with little or no friction between the two nations.

Desirable as the construction of the Saint Lawrence Waterway would be, General McNaughton was inclined to think that a co-operative effort between the United States and Canada would be by far the best method of carrying out this ambitious scheme.

Introduced by Harold Cooch, M.E.I.C., the speaker concluded by stating that the sole purpose of the Joint Commission is to do what should be done in accordance with the principles of justice and equity, and fulfil its mission to promote congenial relations along the 5,655 miles of international border.

Hugh Lumsden, M.E.I.C., thanked the speaker for his interesting account of the work of the Commission.

Previous to the meeting, the General was entertained at dinner at the Hamilton and District Officer's Institute by the Branch executive, as well as several prominent engineers of the district.

Annual Student and Junior Night, March 15

C. P. Layard, Jr.E.I.C., with his well prepared and ably presented paper on "the Electric Smelting of Iron Ore" won first prize in the hotly contested Hamilton Branch Junior and Student Competition.

Mr. Layard is employed by the Steel Company of Canada and his first hand knowledge of the blast-furnace method of smelting of iron ore was evident.

In some parts of this country the proximity of cheap power, as well as ore, could make electric smelting of iron ore less expensive than the blast furnace method. This is true especially in cases where output is not expected to be great enough to warrant the establishing of an expensive blast furnace.

The speaker carried the remarks to a logical conclusion, and on the strength of his previously submitted written paper, he was awarded the cheque for fifty dollars by E. T. W. Bailey, the branch chairman.

Prior to the final night of oral presentations, ten written papers were submitted to the judges, and two semifinal nights were necessary to allow twenty minutes for each contestant to present his paper, before the judges.

From these two evenings, four papers, including that of Mr. Layard were chosen and presented before the Branch meeting on March 15 at McMaster University.

D. J. Urquhart, S.E.I.C., employed at Canadian Westinghouse, was awarded second prize of thirty-five dollars for his fine presentation on "The Gas Turbine as a Locomotive Prime Mover". His talk was very well received by the meeting.

A paper by J. S. R. Beck, Jr.E.I.C., on "Prestressed Concrete Beams" was capably presented and well illustrated. Mr.Beck, a designer with C. C. Parker, consulting engineers, of necessity relied on European examples of prestressing as it has yet to be developed to any great extent in this country. For his paper, he was awarded third prize of twenty dollars.

J. P. Hartt, S.E.I.C., field engineer for the John Mohr Co. of Chicago, designers and erectors of blast furnaces, spoke on his experience of a summer's work with Imperial Oil in Alberta. For his paper on "Soil Corrosion of Pipe Lines" Mr. Hartt received honourable mention.

The chairmanship of the meeting was shared by the three members of the Student's and Junior's Committee, consisting of Messrs. R. D. Rosser, Jr.E.I.C., N. Blakely, Jr.E.I.C., and Committee

Chairman B. A. Warren, S.E.I.C. While the three judges, consisting of Messrs. L. C. Sentance, W. A. T. Gilmour, and Neil Metcalf, all past chairmen of the branch; were deliberating the final judgment, Mr. Warren conducted a question period during which many interested members at the meeting fired pertinent questions at the contestants of the evening.

The other six members who entered the competition were introduced to the meeting. These were D. A. Peterson, S.E.I.C., who spoke on "The Astoria River Power Development"; W. A. Connelly, Jr.E.I.C., whose paper was on "Better Spot Welding" and K. H. Kitching, Jr.E.I.C., who talked about his work in the "Development of Magnetic Cores in High Frequency Transformers". D. M. Stringer, Jr.E.I.C., came down from Brantford to speak on "The Place of Chemical Engineers in Textiles", while the paper of F. D. Priestly, S.E.I.C., covered the "Snare River Power Project." B. G. Cameron, Jr.E.I.C. presented a paper on "Transformer Lightning and Testing".

The evening was topped with coffee and do-nuts. Previous to the evening's papers presentation, all ten contestants, the committee, and the judges had dinner at the Fountain.

The competition kept the panel of most co-operative and capable judges very busy, no detail being overlooked in securing the best judgments, and each contestant received a written appraisal of both written and oral presentation of his paper. The ten entrants represented a good cross-section of local industry by their subjects, and graduates of engineering schools from U.B.C. to Nova Scotia Tech were included among them.

The keenness of the competitors, the interest and assistance of the Branch executive, and the good work of the judges lightened the burden of the papers committee, and were all responsible for the success of the competition. All papers have been forwarded to the Ontario's zone Galbraith Competition.

Kingston

S. H. Rochester, M.E.I.C.
Secretary-Treasurer

Annual Dinner Meeting, May 26

Chairman Mr. G. T. Andrews introduced the distinguished guests and members at the head table.

After dinner, J. T. Provan read the secretary treasurer's report, mentioning that the branch membership now totaled 289, including 260 resident members, 11 non-resident and 2 honorary members, and 5 life members.

Mr. Andrews, in a brief review of the year's activities, pointed out the value of the Engineering Institute in fostering better relations between the younger and older engineers with a view to better understanding and higher proficiency in the field of engineering.

Professor A. Jackson and Lieutenant Colonel King were appointed scrutineers for the election ballot the results of which were as follows: Chairman, Major A. L. MacLean, R.C.E.M.E., R.M.C.; vice chairman, Professor J. S. Campbell; secretary treasurer, S. H. Rochester; Executive Committee, Lt.-Col. J. R. Dunlop, O.C. R.C.E.M.E., Barriefield; V. R. Currie, city engineer, Kingston, Ontario, and J. T. Provan, Aluminum Company of Canada; Ex-Officio Members of Committee, past chairman, G. T. Andrews.

Major A. L. MacLean, introduced the speaker for the evening, Dr. George F. G. Stanley, head of the Royal Military College Department of History, who addressed the meeting on the "History of Kingston". Dr. Stanley followed his intimate and often humourous impressions of Kingston in the years 1673 to 1879 with an appeal that these tangible links with the historical past be maintained. Kingston's story is a long one, linked with the whole story of Canada from Frontenac to La Salle through the Iroquois Wars, the fall of New France, the American Revolution, the War of 1812, the rebellions of 1837, the struggle for responsible government, Confederation, and the career of Sir John A. Macdonald.

In a well informed discourse, Dr. Stanley reviewed the history of Fort Frederick, Fort Henry, the Murney Tower and Alwington House, the seat of three governors. These old buildings in his opinion, are lasting landmarks of the early settlement of the area and are not fully appreciated.

Concluding, the speaker cautioned that the zeal for modernization should not be allowed to blind us to the importance of maintaining our greatest assets — our historical landmarks.

Retiring chairman G. T. Andrews thanked Dr. Stanley and before the meeting was adjourned Major A. L. MacLean accepted the chairmanship.

Lakehead

G. S. Halter, M.E.I.C.
Secretary-Treasurer

General Luncheon Meeting, Fort William, June

Branch Chairman O. J. Koreen presided, and there were 26 members and guests present.

The secretary read the minutes of the general meeting of March 30th. Mr. J. H. Hargrave moved adoption of the minutes, Mr. F. E. Ayers seconded his motion and the minutes were unanimously approved as read.

There was a discussion period regarding *The Engineering Journal*, a suggested grant to Lakehead Branch representative at the Annual Meetings, and the purchasing of engineering films which would be distributed by the local library. The matters were left to the executive for recommendations.

Three interesting films were shown: "A Harbour Goes to France", covering the Mulberry Operation, "Fido", showing fog dispersal in Airports by using burning gasoline; and "Operation Pluto" in which a gas line was built from England to France under the channel.

Another film, "Photo Canada" demonstrated the methods of taking and making aerial photographs.

Annual Dinner Meeting, June 22, at Port Arthur

The secretary-treasurer read the minutes of the last annual meeting on June 20, 1950, and they were duly moved and seconded and approved.

Mr. Korean, presiding, introduced members of the sister professions, Mr. B. G. Weiler of Lakehead Law Society, Dr. B. MacLeod of the Medical Society, and Dr. L. Hastings of the Dental Association, who brought greetings from their respective organizations to the Engineering Institute.

Mr. T. C. Armstrong was called upon to introduce the guest speaker, Mr. N. W. Harrison, district agricultural representative. Mr. Harrison told of the large quantities of dairy and agricultural products being produced in this district and told of the large income to the farmers from the produce. He advised that farming is Canada's largest single industry today and that 25 per cent of freight railway traffic is farm materials. The speaker talked of many interesting sidelights of local farming, and he advised that the latest project of local farmers has been to improve dairy cattle by breeding by means of artificial insemination. Mr. T. C. Anderson moved a very able vote of thanks to the speaker and the vote was seconded by Mr. F. E. Ayers, and was carried unanimously.

The chairman called on the chairmen of various committees who gave their annual reports: programme, F. E. Ayers; membership, E. T. Charnock; audit, A. J. Mickelson; student guidance, W. H. Small.

The chairman moved adoption of their reports and they were seconded and carried.

Mr. H. M. Olsson, nomination committee chairman, then read the proposed slate of officers for the coming year as follows: Chairman, A. J. Mickelson; Vice-Chairman, T. C. Anderson; Sec.-Treasurer, F. E. Ayers; Directors (Fort William), A. D. Norton, G. S. Halter and E. T. Charnock; Directors (Port Arthur), J. H. Hargrave, K. McKaffrey and D. I. Nattress; Ex-officio, S. E. Flook, Councillor, and O. J. Koreen, past chairman; Non-resident, D. Hunter, eastern district representative, and M. S. Fotheringham, western district representative.

Mr. Olsson moved that the slate be accepted and it was seconded by Mr. Small and unanimously approved. A vote of thanks, heartily endorsed by the gathering, was tendered to the outgoing executive.

Mr. Koreen thanked his executive for their co-operation, and for their good work and wished success to the incoming executive and chairman. He then handed the gavel to the new chairman, Mr. A. J. Mickelson, who stated that it would be a pleasure and an honour to serve as Lakehead Branch chairman. He introduced the members of the new executive to the assembly, and the meeting adjourned.

Forty members and guests attended.

Moncton

V. C. Blackett, M.E.I.C.
Secretary-Treasurer

Branch Meeting, April 19

A very interesting lecture on Jet Aircraft was delivered by C. Hastings-Skelton, M.E.I.C., district aeronautical engineer, Department of Transport, Dorval, Que. N. B. Eagles, the branch chairman, presided.

"In jet propulsion," stated Mr. Skelton, "energy is translated into heat and then directly into velocity. In the conventional type of aircraft with its piston engine, the propellor is used to move a large volume of air slowly. The jet uses a small quantity of air at a high velocity."

After describing the four main types of jet engines, the speaker admitted that the jet aircraft has its limitations. It lacks the flexibility of control of the propellor type, and the power is low while taxiing and at take-off. Furthermore, the range is short and there is a sharp loss of power at reduced speeds.

However, there are many important advantages. The power unit is smaller and lighter than the reciprocating engine of comparable power. A low grade of fuel, generally kerosene, is used, thus reducing the fire risk. A unit can easily be lifted out for repairs and replaced by another. The mechanism is simple and there is no ignition system except for initial starting. In operation, there is a saving in time as no warm up period is required. The overall efficiency increases with the speed and altitude, and there is less vibration and none of the gyroscopic action of the propellor type of aircraft. Finally, passengers can be deplaned without danger as the aircraft is close to the ground.

Following the address, a film was screened, showing the operation of jet engines.

The chairman extended the thanks of the meeting to Mr. Skelton for the paper he had presented.

Montreal

R. S. Wotherspoon, M.E.I.C.
Secretary-Treasurer

Eastern Township Meeting, June 1

An Eastern Townships branch of the Institute is a strong probability for next fall. At a meeting of the branch held in Sherbrooke on June 1st, a petition was signed by some 30 members in the district and a committee was appointed to complete the required procedure for the establishment of a branch. George M. Dick, M.E.I.C., manager of engineering and purchasing at Canadian Ingersoll-Rand, was appointed chairman of the provisional committee.

The meeting had been organized by the branch as a special service to its non-resident members in the Eastern Townships. Some 30 members in the district attended and about 10 members from Montreal travelled to Sherbrooke for the occasion. A visit was made in the afternoon to the plant of the Canadian Ingersoll-Rand Company in Sherbrooke. In the evening, members were the guests of Crépeau, Coté & Lemieux, consulting engineers of Sherbrooke, at

The dinner meeting at the Social Club in Sherbrooke, at which engineers in the Eastern Townships district discussed the possibility of forming a Sherbrooke Branch. The meeting was organized by the Montreal Branch and the hosts for the dinner were Messrs. Crepeau, Cote & Lemieux, consulting engineers, Sherbrooke.

a reception in the Social Club. A dinner meeting followed, under the chairmanship of E. R. Smallhorn, chairman of the Montreal branch. Dr. J. B. Stirling, vice-president of the Institute, spoke on engineering organizations and their relationship. Following his address, a discussion was held on the advisability of establishing a branch of the Institute in Sherbrooke to serve the Eastern Townships. The general feeling was that such a branch would survive and that it would be of particular help to younger engineers in the district.

Engineers who attended the Eastern Townships meeting at Sherbrooke, visited the plant of Canadian Ingersoll-Rand, where this photograph was taken.

Ottawa

W. R. Meredith, M.E.I.C.
Secretary-Treasurer

Radar Demonstration

"Radel II," the National Research Council's floating radar laboratory, with 30 passengers aboard, slipped away from her dock behind the N.R.C. Building, Sussex Street, on two cruises recently, to demonstrate a simplified radar guidance system. The same technique may shortly be installed in all Canadian merchant marine vessels.

The two trips, sponsored by the Ottawa Branch of the Engineering Institute of Canada, were preceded by a brief explanation of the workings and uses of radar by Capt. Ross Smyth, master of "Radel II," and R. Guy Ballard, head of the Electrical and Radio Division of N.R.C., and chairman of the Ottawa Branch of E.I.C.

The trim craft left on its first cruise shortly after 5.30 o'clock, eastward on the Ottawa River. A short distance beyond Rockcliffe Airport, it turned on its homeward journey. The second cruise, which started at seven o'clock, followed an identical course.

Radar screens set up on the cruiser's bridge and in the foc'sle below decks, provided the passengers with an intriguing geographical location of the towering banks of the river, and the tiny obstacle "islands" which might impede its course.

The new and simplified type of radar guidance, according to N.R.C. experts, provides the crew of a merchant vessel with the direct locations of islands and objects floating high out of the water. However, because of its 10 degree angle, it will not warn radar men on a merchant ship of an approaching enemy aircraft.

The equipment, the experts pointed out, is so simple it can be managed by anyone with a minimum of instruction.

Saguenay

F. E. Hogg, M.E.I.C.
Secretary-Treasurer

Junior Section

C. C. Louttit
Acting Sec.-Treas.

Smoker Meeting, May 15

A debate on the topic "Resolved that there should be greater standardization of responsibility, authority and remuneration for Professional Engineers in Canadian Industry" was presented. Messrs. D. Archer, P. Shopflocher and S. Solinski took the negative side, while the affirmative was upheld by Messrs. W. Armstrong, W. Tracy and C. Louttit. Mr. H. V. Page acted as chairman. After the debate the members were asked to judge, basing their vote on the manner of presentation rather than the subject matter. The negative side won by an overwhelming majority.

At the conclusion of the business part of the meeting, Mr. H. V. Page was presented with a farewell gift, Mr. D. Archer making the presentation. Mr. Page expressed his appreciation of the kindness and thoughtfulness shown to him.

The social part of the evening then commenced. Adequate refreshments rounded out a very enjoyable evening, attended by 49 members.

Saskatchewan

D. W. Houston, M.E.I.C.
Secretary-Treasurer

W. M. Berry, M.E.I.C.
Branch News Editor

Dinner Meeting at Regina, May 21

Members of the Branch and of the Association of Professional Engineers of Saskatchewan, attended the dinner and programme arranged by H. F. Wickware, programme chairman.

The guest speaker of the evening was Mr. H. P. Swarthout of the General Electric Company, Schenectady, N.Y., who spoke on "Gas Turbines". Mr. Swarthout described his company's efforts to produce a commercial gas turbine for use on railroads and for central station electricity production. Their standard unit is one rated at 3,500 kw., but which in actual practice has been found to average over 4,000 kw. Several units have been sold and are now operating successfully in central power stations. These units have the advantages of fast starting on-load time and relatively high efficiency, especially when the exhaust heat is used for feedwater heating. He explained that his company is now actively considering the development of a 15,000-kw. unit. His talk was well illustrated with slides.

Vancouver

Stuart S. Lefeaux, M.E.I.C.
Secretary-Treasurer

H. T. Libby, M.E.I.C.
Branch News Editor

Plant Visit, June 15

Approximately 30 members of the Vancouver Branch met, in the afternoon, at the Abbotsford plant of the Clayburn Brick Company, about 45 miles east of Vancouver, for a tour through the plant. The party formed into groups, each under the guidance of a qualified member of the plant staff.

The different clays used are mined on the Company's property near Kilgard. They are shipped to the plants where they are stock piled. From the stock piles the clays are clam shelled to their various hoppers from whence they are crushed and blended. The blended clays are conveyed to the pugmills where they are mixed with the correct amount of water.

One machine extrudes the moist clay as a continuous slug which is cut into brick thicknesses with wires. Dry-pressed bricks are made under a hydraulic press. The clay for this process has only a small trace of moisture, which accounts for the name. Special shapes are made by hand in boxes in much the same way as a moulder makes cores.

All bricks are piled on refractory bottomed cars in an open pattern and are conveyed to a drying oven where they remain for approximately two days. From the drying oven they go to the brick kiln. In the first zone of the kiln they are brought slowly up to heat, the temperature increasing along the kiln until the maximum is reached for the particular brick being burnt, approximately 2200° fahrenheit, and then the temperature slowly recedes in each subsequent zone. Temperatures are traced on recording thermocouple pyrometers and are checked with pyrometric cones placed on the loads. In the last zone the bricks are cooled with an air current. The hot air is used partly for secondary air in the firing zone, and partly for heating the drying oven.

The party then proceeded to the Kilgard plant about five miles past Abbotsford where sewer tile and flue linings are manufactured, and witnessed the manufacture of sewer tile. The bell ends are formed by forcing moist clay into a mould. The end of the mould is then removed and the pipe is formed by extrusion. The ends are trimmed and smoothed by hand and the pipes are piled in racks to air dry.

The tiles are piled in beehive ovens and put through their firing cycle, it taking about two days to get up to heat and several more for the fritting and cooling cycle.

The plant is equipped with a machine shop and woodworking plant where dies, moulds, etc. are made, and new machines are designed and tested.

At the conclusion of the tour refreshments were served in the Company's office.

Mr. Dejong, Branch vice chairman, expressed his regret that, owing to pressure of business, Chairman Jack McDonald could not be present, and expressed his thanks to the Manager, Mr. Hengerford, and staff of the Clayburn Brick Company for a very fine and interesting visit.

Tour of Engineering Building, U.B.C.

The May meeting of the Branch took the form of a tour of inspection through the new Engineering Building at the University of British Columbia.

The group was welcomed by Dr. H. MacLeod, dean of the faculty of applied science. Professor F. Muir explained how the building was planned and outlined the facilities that are housed in it. Groups were conducted through the Soil Laboratory, Survey Equipment Room, Materials Testing Laboratory, Hydraulics Laboratory and Drafting Room.

The equipment and methods of each Department were amply explained and demonstrated by the guides, and the members were impressed with the splendid new building and facilities.

After the 2½-hour tour, the members met in one of the lecture rooms for informal discussion, where they were treated to coffee and doughnuts. It was agreed that the evening had been a complete success and every credit was due to Professor S. DeJong, Branch vice-chairman, for arranging it.

H. W. "Dutch" McPherson with the hearty approval of all present, expressed a vote of thanks to the University staff for a very educational and entertaining evening.

Winnipeg

G. W. Moule, M.E.I.C.
Assistant Secretary

G. E. Cole, M.E.I.C.
Branch News Editor

Meeting at Brandon, June 9

Five members of the Management Committee met with a group of fourteen Brandon engineers to assist in the establishment of a section of the Branch in that city.

W. J. Hodge, Jr.E.I.C., explained that two meetings of Brandon engineers had been held this year, and that it had been proposed to establish a Brandon Section of the Winnipeg Branch. Such an organization was thought likely to be of immense service and value to the members in this area, and the Management Committee members were invited to discuss the proposal.

In the absence of Branch Chairman W. D. Hurst, Mr. Fisher expressed the appreciation of the Branch for the hospitality received at Brandon. Mr. Moule led a round-table discussion of Institute, Branch, and Section affairs, and the value of membership in the Institute was discussed. Another topic was engineering salaries, and it was pointed out that while the Institute should not be considered as a bargaining agent, more could be done in the way of recommendations in this respect.

The co-operative agreement in Manitoba was reviewed, and Branch by-laws discussed. It was established that under the Branch by-laws a section could be established in Brandon, and that though corporate membership there is small, an increase is anticipated. The matter of allocation of funds, and of the management of meetings were discussed, and the meeting closed with the suggestion that a formal request for permission to establish a Section would be forwarded to the Management Committee.

The formation of the Brandon Section was approved by the Branch Management Committee at the June 19 meeting.

Electrical Section

K. Hallson, jr.e.i.c.
Secretary

J. G. Dickinson, jr.e.i.c.
Editor

Electrical Section Meeting, May 10

"Some Problems Affecting Long Distance a-c High Voltage Transmission," was the title of the very interesting talk given by Mr. J. Dorsey, of University of Manitoba.

Professor Dorsey has long been studying, lecturing, and experimenting in the realm of long distance high voltage transmission. A good deal of his work has been directed towards d-c transmission. Much, of course, makes impractical, as yet, high voltage d-c transmission, but it can be hoped that something will come of it with the continued interest of engineers, should funds be made available for university laboratory experimentation. Certainly, the cost of long distance a-c transmission is high, and with available hydro-electric developments becoming further and further from the industrial centres, the economics of the situation will offer more and more incentive to improvements in the present systems.

Professor Dorsey's talk was in two sections. The first was a review of fundamental a-c high voltage transmission theory, with particular reference to maximum power output. The second was a discussion of the recent Swedish 600-mile a-c high voltage transmission line from Harspranget to Hallsberg, and the compensation methods there used to increase the power output. Professor Dorsey brought forward some of his ideas as to how the maximum power output of such a line could be increased very substantially.

The talk was extremely interesting from the practical and the academic viewpoints. There was much food for thought, much of which may eventually go to improving long distance high voltage a-c transmission immeasurably.

Vancouver Engineers' Wives Association

Second Annual Dinner and Dance, May 28

Convened by Mrs. A. E. Gordon, Mrs. N. Beaton and Mrs. W. O. Richmond the dance successfully climaxed the season's activities.

In the absence of the president, Mrs. G. W. Allan, Mrs. E. L. Hartley, vice-president, welcomed the guests. Head table guests included: Mr. and Mrs. R. A. McLachlin, Mr. and Mrs. J. E. Macdonald, Dean and Mrs. J. H. McLeod, Dr. and Mrs. J. N. Finlayson, Mr. and Mrs. Sidney Hogg and Major and Mrs. E. L. Hartley.

Mr. R. A. McLachlin, president of the Professional Engineers' Association of B.C. and Mr. J. E. Macdonald, chairman of the Vancouver Branch of the Institute, brought greetings from these organizations. On behalf of the Engineers' Wives Association Mrs. Sidney Hogg presented a cheque for $100 to Mr. Macdonald to be used as a bursary for an engineering student at the University of British Columbia. Vocal solos were given by Mrs. H. Brownell accompanied by Mrs. C. M. Stewart.

Following the dinner, members and their friends enjoyed an evening of dancing with square dance numbers called by Mr. Douglas E. Bell.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

Modern Railroad Structures. C. P. Disney and R. F. Legget. Toronto, McGraw-Hill, 1949. 213pp., illus., $5.00.

Due to a mutual desire on the part of the authors and their friends of making better known the new developments in railroad engineering, this book has been produced and published.

The importance of soil mechanics in railroad work is considered in the first chapter, including subsurface exploration and soil classification, bearing capacities of soils, and drainage considerations.

Steel-pile bridge piers and abutments, with developments in steel piling and steel H piles are then considered, followed by bridges of rigid frame design, precast concrete, and solid deck with tracks.

The authors then consider turntables, three-point turntable design, turntable pits, and conversion procedure.

The concluding 50 pages deal with repaving and restoration of concrete and masonry construction. This includes "intrusion" technique, "Intrusion-Prepakt" process, and "Prepakt - steel - H - column" bridge piers.

Almost every page carries an excellent photographic reproduction of the structure under consideration, in many instances showing fine close up detail.

Each chapter includes bibliographical references, and the book also has a good table of contents and index. E.K.

BOOK NOTES

Prepared by the Library of The Engineering Institute of Canada

Civil Engineering Handbook. 3rd ed. L. C. Urquhart ed. Toronto, McGraw-Hill, 1950. 1002pp., illus., $11.05.

This new edition presents a wealth of essential theory and standards, practice and data, to meet the needs of civil engineers in solving problems — particularly those outside their specialized fields. This handbook gives hundreds of rules, principles, working instructions, and other modern engineering pointers on: surveying, railway, highway and airport engineering, mechanics of materials, hydraulics, stresses in framed structures, steel design, cement and concrete, foundations, sewerage and sewage disposal, water works, etc.

Mécanique Théorique des Sols. K. Terzaghi. Paris, Dunod, 1951. 474pp., illus., 2950 fr.

The contents of this volume have been limited to theories which have stood the test of experience and which are applicable, under certain conditions and restrictions, to the approximate solution of practical problems. The properties of real soils and the performance of soils under field conditions are not discussed in this volume. This is a French translation of the well-known book "Theoretical Soil Mechanics".

Molesworth's handbook of engineering formulae and data. 34th ed. A. P. Thurston, ed. London, Spon, 1951. 1672 pp., illus., 32/6.

This handbook is divided into four sections. The first section is called "general", and contains standard units, mathematical tables, physical data, and similar information of current usefulness. The second section is on civil and general engineering; it deals with such structures as bridges marine works, roads, railroads, irrigation systems, etc. The following subdivision, on mechanical engineering, covers steam engineering, railway engineering, power transmission, refrigeration, marine engineering, etc. The last hundred pages are devoted to information of interest to the electrical engineer.

Natural Gas Economics. J. A. Kornfield. Dallas, Transportation Press, 1949. 261 pp., illus., $5.00.

This book is primarily intended as a reference book covering the major economic problems confronting the natural gas industry of the United States. The author explains the role of natural gas in modern economy, and the modern concepts of its conservation. The intriguing and popular subject of synthetic fuels is discussed at length with a review of the Fisher-Tropsch process, and some of the problems relative to its application in the Southwest.

Ordnance Production Methods. C. O. Herb ed. New York, Industrial Press, c1951. 534 pp., illus., $10.70.

This work is a collection of articles published in the British magazine "Machinery" during World War II. It describes manufacturing operations on rifles and small arms, machine guns, bullets, shells, cartridge cases, guns, bombs, tanks and other weapons of war. In it, Great Britain's production experts explain hundreds of procedures and tooling set-ups that proved successful. It is the editor's claim that the World War II methods explained in this book are still applicable to today's problems.

Plant Layout: Planning and Practice. R. W. Mallick and A. T. Gaudreau. New York, Wiley, c1951. 391 pp., illus., $7.50.

This book is divided in four main parts: Approach to plant layout, planning the processing departments, designing plant service facilities, justifying the layout project. Several sets of elements, factors, principles, and objectives have been presented in itemized lists and tables. The present work has been written primarily with the administrative executive and plant engineer in mind. It was also developed as a quick guide for senior and junior engineers and as a reference work for engineering colleges and schools of business administration.

Radio and Television Receiver Circuitry and Operation. A. A. Ghirardi and J. R. Johnson. New York, Rinehart, c1951. 669 pp., illus., $6.50.

This book is written for the radio service technician, the student and the radio experimenter. The coverage includes the latest developments in circuits, antennas, materials of construction, principles of operation and explanations of the AM, FM and TV forms of transmission. Because of their close relation to the main subject, modern recorders, record changers, and pickup devices are also thoroughly discussed, together with new magnetic recording devices.

Scholarships, Fellowships and Loans. Volume 2. S. N. Feingold. Boston, Bellman, c1951. 312 pp., $5.00.

In this second volume, student aid funds included in volume I have not been reprinted, unless the agency administering the funds has been changed. American scholarships, fellowships and loans are listed alphabetically by administering agency with name and address, qualifications, funds available, special fields of interest, and where to apply for information and application. A section entitled "Planning your career" gives sources of information, sample application blank, suggestions for the scholarship candidate, and filing application. A bibliography of papers on the subject is included.

Thermostats and Temperature-Regulating Instruments. 3rd ed. Roosevelt Griffiths. London, Griffin, 1951. 217 pp., illus., 20/-.

The application of automatic temperature controllers for laboratory and industrial purposes has increased tremendously during the past few years, and is likely to continue to do so. In this revision of this book the author has dealt with every type of instrument, including those of recent development which employ servo-systems or electronic mechanisms. Theoretical aspects of the subject are considered in an appendix. References to the literature of the various types of regulators are given at the end of each chapter.

Traffic Engineering Handbook. 2nd ed. H. K. Evans, ed. New Haven, Institute of Traffic Engineers, 1950. 514 pp., illus., $5.00.

Featuring a great many illustrations, tables and definitions, this handbook covers such varied subjects as traffic

ıccidents, traffic studies, roadway capacity ınd design, traffic signals and signs, speed ·egulations and zoning, and street and ıighway lighting. Also dealt with are raffic markers, parking and loading, ·ehicle motion, one-way streets and oads, traffic islands and pedestrian ›arriers, and bus loading zones. This is ı very comprehensive source book of echniques, principles and standards re- ating to street and highway traffic control.

STANDARDS

\.S.T.M. Publications. American Society for Testing Materials, 1916 Race Street, Philadelphia, Pennsylvania.

›pecial Technical Publication No. 108 —Symposium on Corrosion of Materials at Elevated Temperatures. 121 pp., $2.25.

The behavior of materials in atmos- ›heres from all the common fuels for nobile and stationary power generation ıre discussed, ranging from leaded aviation uels to coal. The paper on corrosion by ›il ash from residual fuels has attracted pecial interest due to the current serious- ıess of the problem in many industries.

›pecial Technical Publication No. 99 —Symposium on Use of Pozzolanic Materials in Mortars and Concrete. 203 pp., $2.50.

This publication contains papers on use ›f pozzolans in ordinary concrete, mass oncrete, effects of calcination on natural ›ozzolans, effect of the use of diatomite reated with air-entraining agents upon he properties of concrete, and other ›apers on similarly interesting aspect of he subject.

ſechnical Publication No. 58B — Report on Standard Samples for Spectrochemical Analysis 1950. 31 pp.

Apart from definitions and nomen- ·lature, this standard deals with available tandard samples: iron and steel, alumi- ıum and its alloys, magnesium and its ılloys, zinc, lead, and tin alloys, copper ılloys. Miscellaneous standard samples ınd pure materials are also dealt with.

›tandards on Benzene, Toluene, Xylene, Solvent Naphta. 43 pp., $1.00.

These specifications cover industrial ›0, nitration grade and industrial grade ›enzene; refined, crude light and crude ıeavy solvent naphta; nitration and ndustrial grade toluene; nitration and ndustrial grade, five-degree and ten- legree xylene.

›tandards on Petroleum products and lubricants (with related information). 764 pp., $5.50.

Prepared by ASTM Committee D-2 ›n petroleum products and lubricants, this ·dition gives in their latest form 125 \STM standards, including 112 test nethods; 8 specifications; 3 lists of defini- ions relating to petroleum, specific ;ravity and rheological properties of natter; 2 tentative recommended prac- ices for the purchase of uninhibited nineral oil for use in transformers and in ›il circuit breakers, and for designating ·ignificant places in specified limiting ·alues.

\Ianual on Measurement and sampling of Petroleum and petroleum products. 120 pp., $2.00.

This includes methods of gaging, tem- ›erature measurement and sampling, a ·ecommended practice for volume calculations and corrections, tests for water and sediment by centrifuge, and gravity by hydrometer.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

Chemical Engineering Costs. O. T. Zimmerman and I. Lavine. Dover Industrial Research Service, New Hampshire, 1950. 419 pp., illus., $8.00.

This book contains many of the cost data of importance to the chemical engineer. The first chapter surveys the economics and general costs of any chemical manufacturing enterprise and contains a bibliography on the subject. The remaining nineteen chapters deal with typical equipment used by related groups, such as evaporators, filter presses, size-reduction equipment, etc. A new publication, "Chemical Engineering Costs Supplement", is to be issued quarterly to keep the information up to date.

Design of Prismatic Structures. A. J. Ashdown. London, Concrete Publications, 1951. 65 pp., illus., $1.85.

This book describes a method of designing sloping reinforced concrete slabs for pitched roofs, the bottoms of bunkers, and other purposes. In addition to theoretical considerations, practical design problems are solved by various methods, among which are the relaxation, column-analogy, moment-balance, and an American method of combining bending and direct thrust.

Dimensional Analysis and Theory of Models. H. L. Langhaar. New York, Wiley; London, Chapman, 1951. 166 pp., illus., $4.00.

This book is devoted to the principles of dimensional analysis which treats the general form of equations that describe natural phenomena. The first four chapters deal with basic principles and develop them mathematically. Chapter 5 covers the theories of similarity and model testing. The remaining five chapters treat specific applications of dimensional analysis. A knowledge of the principles of physics and engineering usually presented in the first three years of an engineering curriculum is assumed.

Fourier Integral and certain of Its Applications. N. Wiener. New York, Dover. 201 pp., $3.95.

This book studies the Fourier integral as a link between harmonic analysis and mathematical theory, physics and engineering. It is based on a series of lectures given at the University of Cambridge in 1932, and considers the relationship of the Fourier transform to the Plancheral theorem, a discussion of an absolutely convergent Fourier Series and of a Tauberian theorem, and the concept of the spectrum. A bibliography is included.

Mathematical Methods in Electrical Engineering: M. B. Reed and G. B. Rec l. New York, Harper, 1951. 338 pp., illus., $5.00.

This book presents the streamlined essentials of mathematics which an electrical engineer i likely to find useful in his professional car er. Attention is centered almost wholly on the manipulative aspects of the material presented. Such topics are covered as imaginary numbers, linear algebraic equations, matrix algebra, vector analysis, Fourier series, Bessel functions, par'ial differential equations, and analytic functions of a complex variable.

Metal Processing, 2nd ed. O. W. Boston. New York, Wiley; London, Chapman, 1951. 763 pp., illus., 7.50.

Providing detailed information on machine processes, accessories and tools, this book illustrates the correlation between design, metals, and manufacturing of a product. This second edition is completely revised with major changes including the substitution of material on surface quality for the chapter on die casting and plastics; an enlargement of the chapters on machinability, machine tool drives, electric motors, and hydraulic pumps; and new information dealing with sintered-carbide tools and their use.

Prefabrication of Houses, a Study by the Albert Farwell Bemis Foundation of the Prefabrication Industry in the United States: B. Kelly; published jointly by the Technology Press of the Massachusetts Institute of Technology and New York Wiley, London, Chapman, 1951. 466 pp., illus., $7.50.

Combining the approach of the economist, architect and engineer, this book

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A library deposit of $5.00 at par in Montreal is required before items may be borrowed. Books, periodicals, etc. may be ordered by members through the library. All carrying charges are payable by the individual concerned. Except in the case of library deposits, please make **no payments in advance.**

Non-members may consult the library, but may not borrow material.

surveys the prefabrication industry. It covers its history and future possibilities, its financial and managerial problems, its design and production processes, and its implications for the rest of the building industry. Numerous plates illustrate the techniques used by several of the large companies. Lists of companies in this field and an annotated bibliography are included in the appendix.

Prestressed Concrete. 2nd ed. G. Magnel. London, Concrete Publications, 1950. 300 pp., illus., 15s.

Presenting a concise account of present knowledge of the subject, this book provides design data for prestressed-concrete structures. In this revised and enlarged edition, the principal changes are: the addition of a chapter on statically-indeterminate multiple-story and multiple-span frames; revision of material on continuous beams, the design of end-blocks; the addition of the results of tests to the chapters on the creep of steel and buckling during prestressing; and the enlargement of the chapter on applications of prestressed concrete.

Pulse Techniques: S. Moskowitz and J. Racker. New York, Prentice-Hall, 1951. 300 pp., illus., $6.65.

The purpose of this book is to enable individuals with electrical engineering background to analyse and design circuits for transmission and utilization of pulses. The special mathematical tools needed, Fourier and Laplacian transforms, are derived and their use explained. The pulse response of both linear and non-linear network is covered and pulse measurement methods and the design of communication and aerial navigation equipment using pulses are reviewed.

Servomechanisms and Regulating System Design. Volume I: H. Chestnut and R. W. Mayer. New York, Wiley, London, Chapman, 1951. 505 pp., $7.75.

Covering the principles of feedback control, this book, the first of a two-volumes set, is adapted to the needs of engineers and engineering students who have not had previous training or experience in the field of closed-loop control systems. It starts with the basic mathematics needed and a description of the nature of the physical problems involved, and proceeds to the solution of advanced designs. Numerous problems illustrate and extend the text material, and a bibliography of pertinent references is included.

Technique du Vide: M. Leblanc. Paris, Armand Colin, 1951. 187 pp., 200 frs.

This small book on vacuum technology begins with a summary of the kinetic theory of gases. The author then deals with the equipment for the production, measurement and maintenance of high vacuum. The book also discusses auxiliary equipment and processes.

Thermodynamics. 2nd ed. G. A. Hawkins. New York, Wiley, London, Chapman, 1951. 563 pp., illus., $6.50.

This book provides a well-balanced treatment of engineering thermodynamics. The major changes in this second edition occur in the following chapters: first law of thermodynamics; the second law and the Carnot Cycle; available energy, unavailable energy, and entropy; mixtures of ideal gases and vapors; the flow of gases through nozzles and orifices; and general thermodynamic equations. Significant minor changes occur in other chapters. A new table on the thermodynamic properties of air is added to the appendix.

Metal Cleaning Bibliographical Abstracts, 1950 Supplement (Special Technical Publication No. 90-A): Philadelphia ASTM, 1950. 27 pp., $1.00; when ordered together the Bibliography and Supplement are $3.00.

Covering a wide range of subject matter, this bibliography should be of value to all those concerned with metals and their surface conditions and cleaning. This supplement to the Metal Cleaning Bibliographical Abstracts (1893-1949) contains 170 annotated references, including 89 additional references for 1932 to 1948, and 81 new references for 1949 and 1950.

Standards on Copper and Copper Alloys: Philadelphia, ASTM, 1951. 530 pp., illus., $4.35.

Containing 108 standards, this volume includes the latest specifications on cast and wrought copper and copper alloys, copper and copper alloy electrical conductors, and non-ferrous metals used in copper alloys. The specifications cover products as well as test methods and two recommended practices.

Standards on Industrial Water: Philadelphia, ASTM, 1951. 160 pp., illus., $2.00.

This volume contains the various A.S.T.M. standard and tentative methods of sampling, analysis, and testing of water employed industrially in the generation of steam or for process or cooling purposes. The examination of deposits formed from such waters is also covered as well as methods of reporting test results. A list of standard definitions of terms and a bibliography of A.S.T.M. publications in the field are given.

Symposium on Rapid Methods for the Identification of Metals. (Special Technical Publication No. 98): Philadelphia, ASTM, 1950. 77 pp., illus., $1.75.

This symposium is a collection of methods and techniques of particular value in the field. The first three papers deal with the general principles of spot testing with chemical reagents, electro spot testing and electrographic analysis, and of modern instrumentation for the rapid identification of metals. The remaining six papers discuss specific applications of these methods or of combinations or modifications of them.

Symposium on Ultrasonic Testing, (Special Technical Publication No. 101): Philadelphia, ASTM, 1951, 133 pp., illus., $2.00.

The ten papers and discussions included in this book represent a summary of the history, theoretical aspects, basic principles of practical testing, and practical applications for the ultrasonic testing of materials. Several of the papers include lists of references, and one bibliography of 342 references on the inspection, processing, and manufacturing control of metals by ultrasonic methods is included.

BOOKS RECEIVED

Blasters' handbook; describing practical methods of using explosives for various purposes. 3rd ed. Canadian Industries Ltd., Explosive division, Montreal, 1950. 283 pp., illus., $1.50.

British chemical plant. British Chemical Plant Mfrs. Ass'n, London, 1951. 299 pp., illus.

Building construction and drawing: a textbook on the principles and details of modern construction for the use of students and practical men; Part I—Elementary course. 20th ed. A. M. Mitchell. London, Batsford, Toronto, Clarke, Irwin, 1950, 648 pp., illus, $2.25.

Construction with moving forms. L. E. Hunter. London, Concrete Pub., 1951. 56 pp., illus., $1.75.

Electroplating for the metallurgist, engineer and chemist. J. B. Mohler and H. J. Sedusky. New York, Chemical Pub. Co., 1951. 257 pp., illus., $5.00, U.S.

Engineering and industrial catalogue. 16th ed., 1950-1951. Canadian Engineering Pub. Ltd., Toronto, c1951. 476 pp., illus.

Fundamentals of electrical engineering. F. H. Pumphrey. New York, Prentice-Hall, 1951. 668 pp., illus., $7.65.

Heating, ventilating, air conditioning guide 1951, Vol. 29. American Society of Heating and Ventilating Engineers, New York, c1951. 1456 pp., illus., $10.75.

How to estimate: being the analysis of builders' prices, giving full details of estimating for every class of building work, with thousands of prices and much useful memoranda. 11th ed. J. T. Rea. London Batsford, Toronto, Clarke, Irwin, 1951. 716 pp., illus., $4.25.

Industrial democracy at work: a factual survey. W. R. Brown and N. A. Howell-Everson. Toronto, Pitman, 1950 104 pp., $3.15.

International bibliography on atomic energy, Vol. 2: Scientific aspects. Atomic energy commission group, department of security council affairs, United Nations. New York, United Nations, Toronto, Ryerson, 1951. $10.00 U.S.

Introduction to the study of aircraft vibration and flutter. R. H. Scanlan and Robert Rosenbaum. Toronto, Macmillan, c1951. 428 pp., illus., $7.50.

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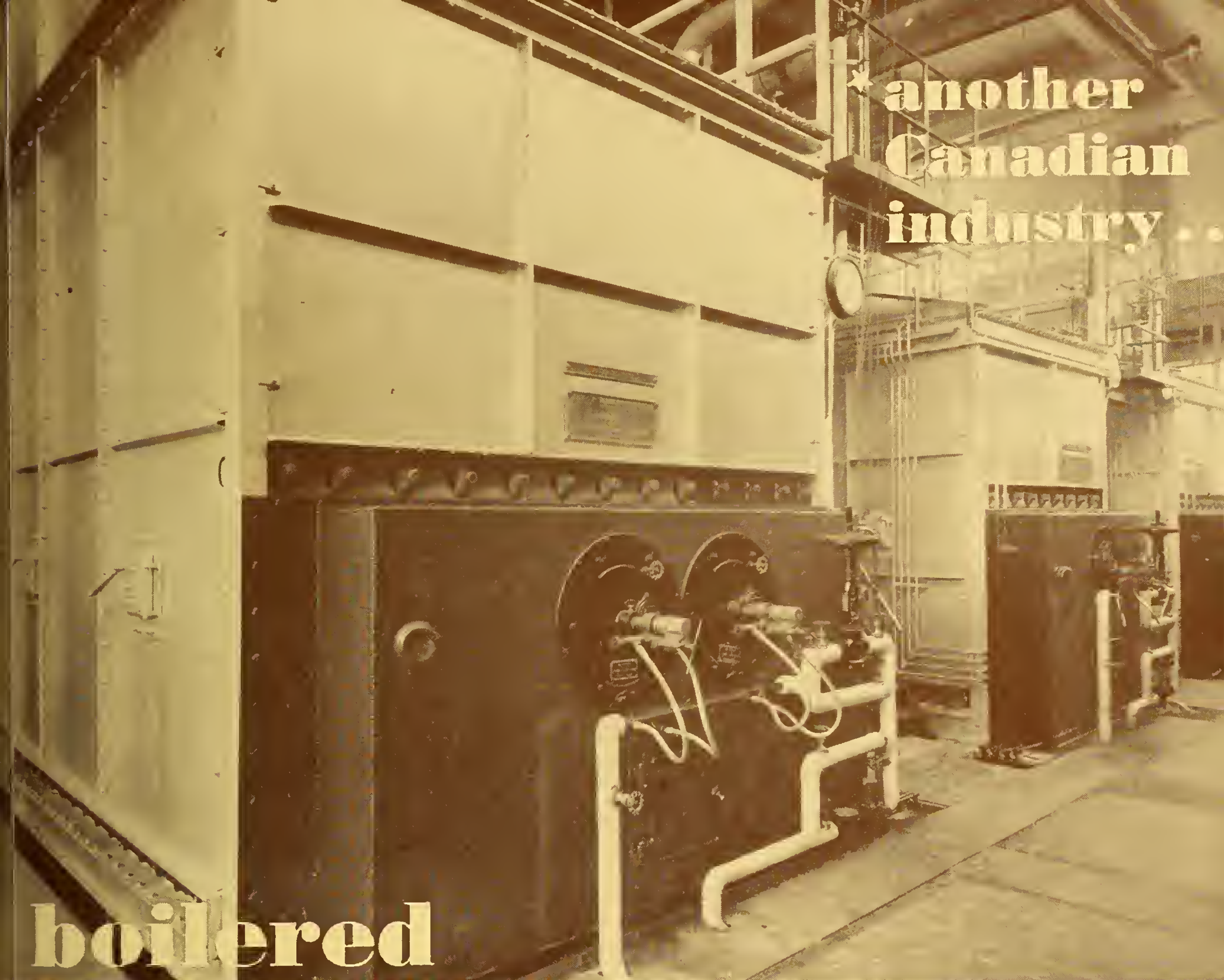

by BABCOCK

★ **Frigidaire Products of Canada Limited,** Leaside, Ont., installed these three oil-fired Type "G", Babcock "INTEGRAL-FURNACE" Boilers. Total capacity 49,000 lbs. per hour; 125 lbs. pressure of saturated steam.

Here are some of the advantages that they can obtain . . .
. . . More Steam per pound of fuel. Flexible to fluctuating demands. Efficient at any rating. A peak output that will meet all probable emergencies. Fitted to existing buildings and equipment without extensive alterations. Maintenance and cleaning hazard avoided by accessibility of all parts. Every modern, reliable device to simplify operation.

Babcock engineers share your desire to obtain the most efficient installation possible for the money you invest. Let them modify your present power supply or suggest new installations to meet your changing requirements.

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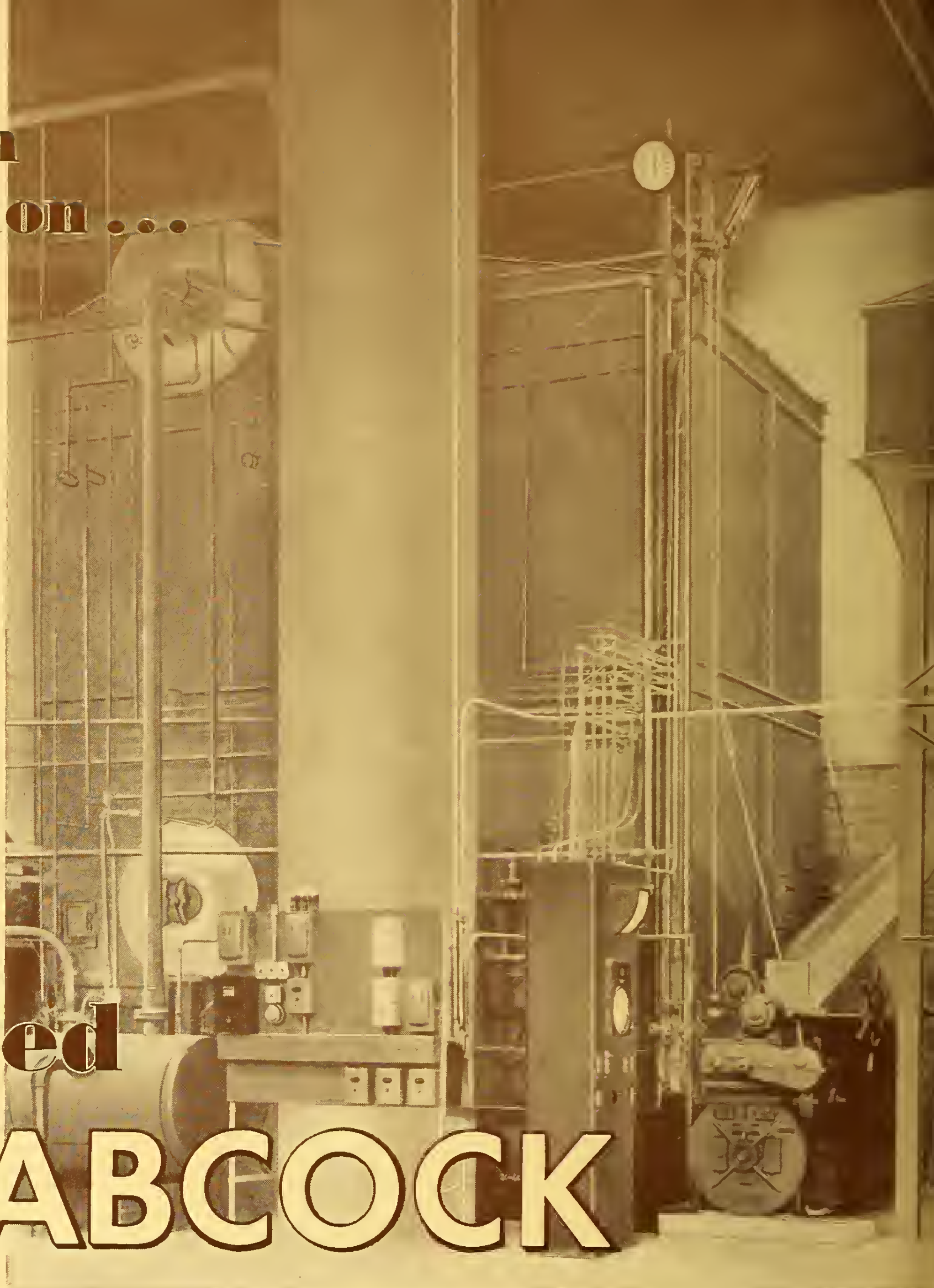
★ another Canadian installation . . .



Photograph courtesy of The Robert Simpson Co. Limited, Toronto.

boilered by BABCOCK

✶ **Simpson's** required 25,000 lbs more steam per hour, to meet the requirements of their new addition to their Mail Order Building on Mutual Street, Toronto. They required that it fit in with all their existing equipment, but still guarantee even greater efficiency.

Their choice was a Babcock Type G Boiler with a Babcock Style 33 chain grate stoker. In case of fuel scarcity, etc., the installation is built for future oil burners.

Find out how you too can increase your power supply or improve efficiency at lowest cost. Consult our engineers.

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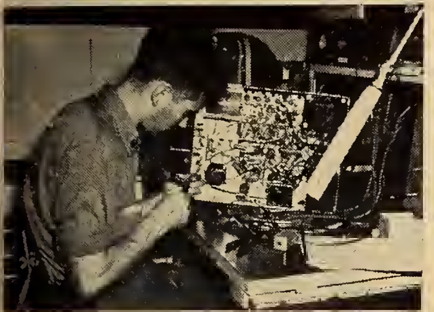
Anaconda CO-OPERATES WITH INDUSTRY



The complex inside workings of a television set in which Anaconda copper is used.

Copper tube is shown assembled into position ready for brazing for refrigerator condenser plates.

Here, two sheets of Anaconda Manganese Brass are being welded to form a refrigerator evaporator.

It's *Copper* for Better Living

Some Westinghouse products—photographs courtesy Canadian Westinghouse Company Limited, Hamilton, Ontario.

Anaconda copper and copper alloys are essential to the manufacture of Electric Appliances. For example, in the Westinghouse plant in Hamilton, largest of its kind in the British Empire, great quantities of copper wire, tubing and brass products are required daily for refrigerator production. In addition, copper is used in thousands of Westinghouse ranges, washers, radios and other home appliances.

There is no industry in Canada, large or small, that is not in some way dependent on copper. For copper, the metal of many uses, possesses a unique combination of characteristics—malleability, tensile strength, corrosion resistance and electrical conductivity — which continues to place it first with Canadian manufacturers. Anaconda American Brass Limited, Main Office and Plant: New Toronto, Ontario. Montreal Office: 939 Dominion Square Building. ANACONDA — since 1922 Headquarters in Canada for Copper and Brass.

ANACONDA
Copper and Brass

For copper and its alloys... consult ANACONDA

BUSINESS & INDUSTRIAL BRIEFS

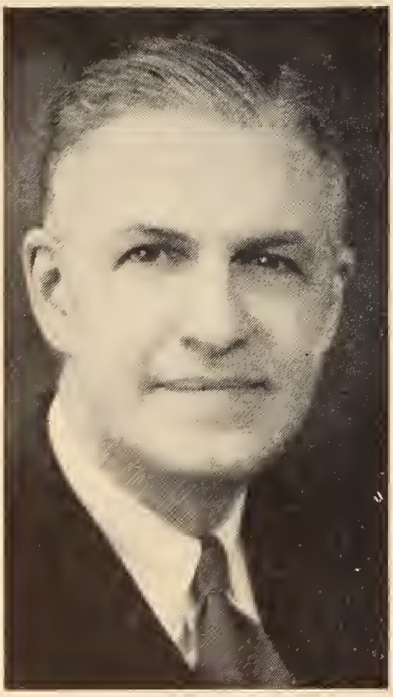
A Digest of Information

received by

The Editor

Appointments and Transfers

K. S. LeBaron.—K. S. LeBaron has been appointed manager of pulp and paper sales for John Inglis Co. Ltd. A graduate of McGill University, in mechanical engineering, Mr. LeBaron has had extensive experience in the paper industry with St. Lawrence Paper Mills, Three Rivers, and as chief engineer of Dryden Paper Co., Nashwaak Pulp & Paper Co., and Canadian International Paper Co. at the plant in Three Rivers. For the past 5 years he has served as district manager of John Inglis Co. Ltd., Montreal.



K. S. LeBaron

J. D. Houlding. — John D. Houlding, electronics marketing department manager at Canadian Westinghouse Co. Ltd., has been appointed to the Defence Production Board at Ottawa as electronics production officer, radar section. As a radar expert on loan to the board, Mr. Houlding brings a great deal of experience to his new position.

He has been an electronics engineer with Canadian Westinghouse since 1945.

•

John G. Young Appointment.—John G. Young Co. Limited, 1359 Notre Dame W., Montreal 3, has been appointed exclusive Canadian distributor for Hi-Speed-It steel hardening compound.

This product is being introduced in Canada and the new appointees will be pleased to supply descriptive literature.

•

H. C. McGee.—H. C. McGee, has been appointed manager of the supply division in Canadian General Electric Company's Montreal district. Formerly he was manager of the construction materials section in C.G.E.'s Toronto district office.

•

Trane Appointments.—Trane Company of Canada Limited announce the following appointments to their sales department. J. Dowell has joined the Toronto sales office and J. K. Walker is now a member of the sales staff of the Vancouver branch. Mr. Dowell joined the Company in 1941 and his service with the organization was interrupted by three years in the R.C.A.F.

J. Dowell

•

C. M. and S. Changes. — W. S. Kirkpatrick has been appointed vice-president at Montreal of The Consolidated Mining and Smelting Company of Canada Limited.

Mr. Kirkpatrick joined the company in 1925 and was appointed assistant general manager in Trail in 1945. He was transferred to the head office of the Company in 1950.

R. D. Perry has been appointed assistant general manager at Trail. Kenneth Clare has been appointed assistant secretary.

•

Ingersoll-Rand Changes. — Canadian Ingersoll-Rand Co. Ltd. have transferred their Toronto office to 1057 Bay St. The Toronto warehouse has also been moved to 115 Merton St. Both office and warehouse are served by the same telephone number: PRincess 4181.

J. K. Walker

G. H. Lloyd.—G. H. (Tom) Lloyd has been appointed sales manager of the mining and process equipment division of Canadian Locomotive Co. Ltd.

Mr. Lloyd has been with the Company for over 22 years. The products handled by his division include Akins classifiers, selectro vibrating screens, and a wide range of industrial equipment made by Canadian Locomotive Co. under license to the process equipment division of General American Transportation Corporation of Chicago.

●

Dow Chemical Appointments. — The following personnel changes have been made by Dow Chemical Co. of Canada Limited: R. H. Wright, formerly manager of the Toronto branch office, has been appointed manager of the Montreal branch office. G. Murray Scott is now manager of the Toronto branch office. He has been with the Dow organization for over five years and has headed the plastics sales division since its establishment. R. M. Munro has succeeded Mr. Scott as manager of the plastics sales division and of the coatings and solvents sales division. Both Mr. Scott and Mr. Munro will continue to operate from the Toronto office of the Company.

●

Packard Electric Officers. — Packard Electric Co. Ltd. have made three appointments to major executive positions.

Thomas Edmondson has been elected president. Two new executive offices have been established, the directors electing Clayton E. Snider, formerly chief engineer, to the office of vice-president and chief engineer, and Clarence W. Spratt, formerly sales manager, has been elected to a vice-presidency. He will continue to act as sales manager.

C. E. Steiss

Sheldons Sales Appointments.—Sheldons Engineering Limited, Galt, Ont have announced the following change in their sales organization. Crawford E Steiss, formerly branch manager of th Hamilton office, is now branch manager of the Montreal office which i located at 5174 Cote des Neiges Road J. Roy Currie, formerly connected wit the Company's Toronto office, has bee appointed branch manager of the Hamilton office which is located at 428 Mai St. W. Victor E. Ellis has succeeded M Currie in the Toronto office.

J. R. Currie

Polymer Changes. — The followi changes have taken place in the Polym Corporation Limited.

E. J. Brunning has resigned from t presidency of the Corporation but r mains as chairman of the board. J. Nicholson, formerly executive vi president and managing director, h left the Corporation to take up dut

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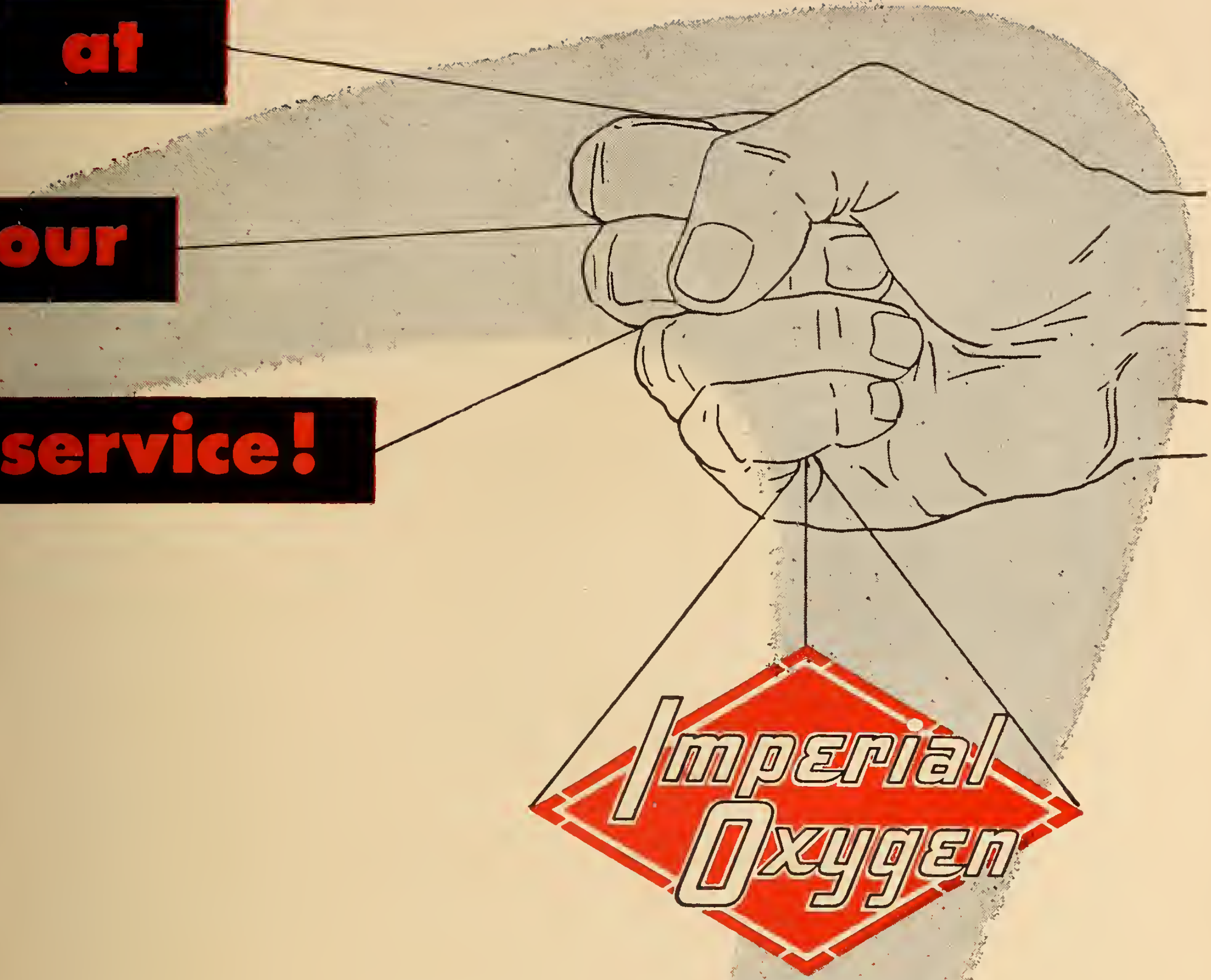

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Branches: 565 TRETHEWEY DRIVE, TORONTO   3445 RIVERSIDE DRIVE, WINDSOR with another concern. J. D. Barrington, formerly vice-president and general manager of Dominion Magnesium Limited, and president of Light Alloys Limited, has been made president and managing director of the Corporation. E. R. Rowzee, who has held the position of manager of Polymer Corporation, is now vice-president and manager of operations.

●

Bristol Aeroplane Acquirement.—The Bristol Aeroplane Company of Canada Ltd., and the Mailman Corporation Ltd., announce that the Bristol Co. has acquired from Canadian Wright Ltd., a subsidiary of the Mailman Corpn., the whole of their aero engine repair and overhaul business which will be operated by Bristol Aeroplane Engines (Eastern) Ltd. The new Company will be a subsidiary of the Bristol Aeroplane Co. of Canada Ltd.

The board of the new Company is as follows: W. R. Verdon Smith, president, R. J. Reynolds, deputy president, H. V. Wright, managing director, Armand Limoges, vice-president and secretary-treasurer.

Mr. Verdon Smith is an executive director of the Bristol Aeroplane Co. Ltd. of England and president of the Bristol Aeroplane Co. of Canada Ltd. Mr. Reynolds is resident executive director of the Bristol Aeroplane Co. of Canada Ltd. Mr. Wright and Mr. Limoges, have been the principal executive officers of Canadian Wright Ltd., for many years.

Defence Production Changes. — The following organization and personnel changes in the production branch of the Department of Defence Production have been announced.

A new office, that of deputy co-ordinator of production, will be filled by A. C. MacDonald, formerly director of the shipbuilding division. Mr. MacDonald is on loan from his duties as executive assistant to the president of Canadian Pacific Railway Company. Replacing Mr. MacDonald in the shipbuilding division is William Cunningham, general manager of the Red Barge Line Ltd., Vancouver. Previously he served the government as special assistant to the co-ordinator of production.

The guns and ammunition division has been set up into two separate divisions. H. R. Malley, previously head of the guns and ammunition division, is now directing the new ammunition division. The gun division is headed by I. F. McRae, manager of the Peterborough works of Canadian General Electric Co. Ltd., whose services are being loaned to the Department. D. B. Mundy, is special assistant to the co-ordinator of production, and R. D. Macdonald is now in charge of the production division of the Washington office of the Department where he will represent the coordinator of production.

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

"The Dominion Engineer".—No. 6 of volume 18 of the Dominion Engineer is devoted to a highly interesting article "The Engineer and His Place in Industry." The article is a re-evaluation problem for management by Alfred Skrobisch. For copies of this and other issues of the Dominion Engineer, write to Dominion Engineering Co. Ltd., P.O. Box 220, Montreal, Quebec.

●

Roofing Maintenance. — "Planned Maintenance for Tar and Gravel Roofs," a new, illustrated bulletin released by The Tremco Manufacturing Company will be of special interest to readers concerned with this type of maintenance problem.

The bulletin, describing economical, labour-saving techniques for the removal of gravel by machine, and the mechanical pumping of roofing materials from the ground to the roof, may be obtained by writing to The Tremco Manufacturing Co. (Canada) Limited, 57 Bloor St. W., Toronto.

●

Voltage Regulators. — The Superior Electric Co., Bristol, Conn., U.S.A., manufacturers of voltage control equipment, have released a new 12-page bulletin featuring the complete line of standard "Stabiline" automatic voltage regulators.

This new bulletin describes in detail the workings of a stabiline automatic voltage regulator in maintaining a con-

stant output voltage regardless of fluctuations in a a-c input line voltages and changes in output load. Apply to the company and ask for bulletin S351.

•

"C.I.L. Oval".—The June issue of the C-I-L Oval carries some interesting articles. The lead article is entitled "Roads—What They Have Meant to Canada." The author is Leonard L. Knott. Other articles in the issue deal with the manufacture of synthetic pearls, the testing of gasoline, and the use of Canadian woods. To obtain a copy of this issue of the Oval, or to be placed on the regular mailing list, apply to The Editor, the C-I-L Oval, P.O. Box 10, Montreal, Que.

•

Industrial Lubrication.—"Lubrication" is the title of a technical bulletin devoted to the selection and use of lubricants. It is distributed in Canada by McColl-Frontenac Oil Co. Ltd., Royal Bank Bldg., St. James St. W., Montreal. This Company has available also a number of technical bulletins describing the uses of industrial oils and lubricants. For copies of "Lubrication", or the technical bulletins, apply to the Company at the address given above.

•

British Pump Brochure.—Drysdale & Co. Ltd., Bon Accord Works, Yoker, Glasgow, Scotland, have recently released an excellent bulletin describing Drysdale rotary air and water extraction pumps. It is known as catalogue R.A.W. 1. The bulletin describes the centrifugal and rotary pumps manufactured by the Company which are capable of handling from a few gallons per minute up to 100,000 gallons per minute. Special features of the bulletin are the "Aquair" patent rotary vacuum pumps, the "Clyvac" patent air and water extraction pumps, and the "Vampire" patent air and condensate extraction pumps. For copies of the brochure apply to the Company.

•

Radiator Catalogue. — Warden King Limited, 2104 Bennett Ave., Montreal have recently released a new catalogue ADM-5009 which features cast iron concealed radiation.

The catalogue contains revised ordering numbers, data on assemblies, and roughing-in-dimensions. Copies may be obtained by applying to the Company.

•

Rod Mills. — Hardinge Co. Inc., 240 Arch St., York, Pa., have just published a new 12-page catalogue on rod mills—bulletin No. 25-C. This catalogue contains a general discussion of the correct field of application of rod mills for both wet and dry grinding. It covers methods of construction and design features of the Hardinge conical, flanged-end, and convex-head rod mills, both trunnion overflow and peripheral discharge types. Specifications include sizes, weights, rod charges, speeds, horsepower ratings, types of liners, feeders and other pertinent information. Apply to the Company for copies.

•

Welding Supplies Price-List. — Canadian Liquid Air Co. Ltd. have issued a revised price list for gas welding rods, fluxes, and accessories. Apply to the Company at 1111 Beaver Hall Hill, Montreal, for copies.

•

Mechanical Seals.—Flexibox Limited, Nash Road, Trafford Park, Manchester 17, England, offer a small folder type two-colour bulletin describing Flexibox mechanical seals.

•

Link-Belt News. — Link-Belt Limited, 731 Eastern Avenue, Toronto, are Canadian distributors of "Link-Belt News". This is a semi-technical publication which describes the various applications of the products manufactured by the Company. To be placed on the mailing list, apply to the address given above.

•

Northern Electric Lighting Publication.—Northern Electric Company Limited, 1600 Notre Dame Street West, Montreal, have recently released a new illumination bulletin entitled "Interior Design Data". This bulletin, one of the most comprehensive of its kind, contains 15 pages of information on the design of lighting installations for commercial and industrial purposes.

In the margins of two pages are 12 colour chips of typical interior flat wall paints. Each chip shows the reflection factor for that particular shade. Elsewhere are illustrations of 68 specific lighting units, together with technical data on their typical distribution curves, height spacing ratios, maintenance factors, efficiencies, and coefficient of utilization tables.

Another feature of the new bulletin is a complete table of recommended values of illumination, from airplane manufacturing areas to the interior of vehicles. Other pages give data on in-

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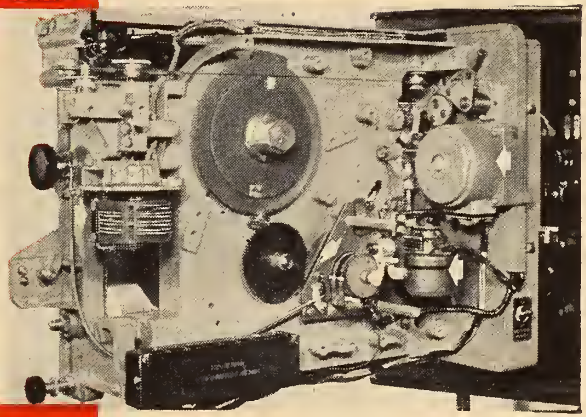
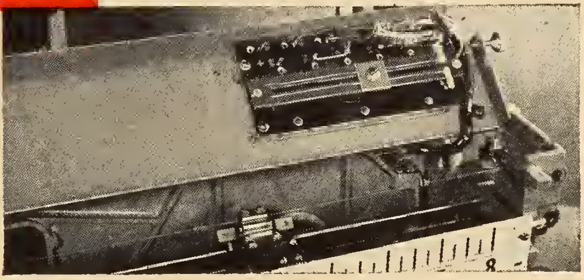
- √ *Entire instrument enclosed in a dust and moisture resistant case.*
- √ *Totally enclosed slide wire.*



Rear view of chassis shows the Slidewire (cover removed) Standardization Unit, Chart Drive and Selector Switch.



Span adjustment slide mounted on rear of circuit resistors panel.

THE *ElectroniK* Potentiometer's inherent accuracy and ruggedness make it an ideal instrument for recording all process and power plant variables. Pressure, temperature, flow, electrical power, frequency, speed can be accurately measured and recorded by this electronic Continuous Balance instrument.

Laboratory accuracy with industrial stamina . . . is insured through the use of the Continuous Balance principle, simplified design and precision made parts. These features, coupled with dependable performance and flexibility of application, make the *ElectroniK* Potentiometer a top performer for every application.

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candescent and fluorescent lamps. Apply to Department 65 of the Company at the address given above.

Drilling Machine. — Catalog DM, of Wales-Strippit of Canada Limited, 344 Sherman Avenue North, Hamilton, Ontario, illustrates and describes the new Wales drilling machine for precision layout, drilling and reaming of holes. Copies are available.

Centrifugal Pumps.—The Chain Belt Company of Milwaukee has just placed on the market a new line of self-priming centrifugal pumps. This new line ranges in size from the small 1½ in. Model 4M pump up to the 6 in. Model 90M pump. Capacities of these sizes range from 4,000 gallons per hour up to 90,000 gallons per hour. For further information on this pump line, write for Bulletin 51-27 to Chain Belt Company, 1600 West Bruce Street, Milwaukee 4, Wisconsin.

Rex Pumpcretes.—George W. Crothers Limited, Leaside, Ontario, offer copies of a 24 page bulletin about Rex Pumpcretes which are manufactured by Chain Belt Company, Milwaukee, Wisconsin.

The publication illustrates job histories of Pumpcretes at work on bridge jobs, tunnels, power projects, over and underpasses, sewage and water treatment plants, buildings, and warehouses.

Various models, dimensions, and specifications are described in the publication.

New Equipment and Developments

R.C.A. Vacuum System. — A new vacuum system, designed for a wide variety of uses, in research, control and production, has been developed by RCA Victor Co. Ltd.

The instrument, designated the RCA type EMV-5 vacuum system, will serve such applications as evaporation of metals and salts, sputtering, applying metallic films, vacuum distillation, drying, preparation of specimens for electron microscopy, study of discharges in gases at low pressures, study of phosphors under electron and ion bombardment, and study of electrical and physical properties of materials at low pressures and in various atmospheres. It can also be used industrially for vacuum coating of many items such as mirrors, lenses, vacuum tubes, and plastic objects. This work can be done on a production basis.

The new instrument consists essentially of a vacuum chamber, and a high-speed pumping unit for evacuation. The pumping system and valves are similar to those used by RCA in the universal model electron microscopes.

Controls and meters are all mounted in the front panel for ease of operation. All electrical circuits which supply power for heating filaments, providing ionization clean-up, and operating the pump, are mounted on the back of a removable panel in the same cabinet with the vacuum system.

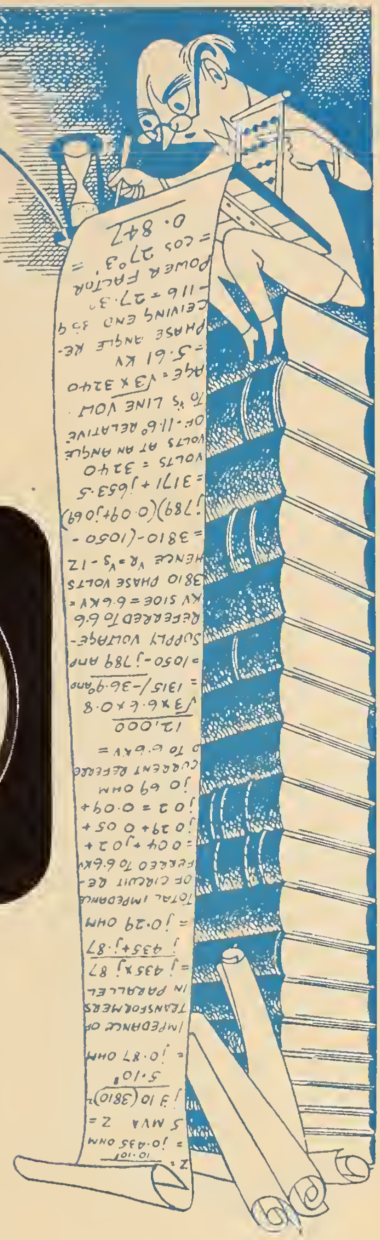
Nickel Fellowships. — Winners of the first three International Nickel graduate research fellowships, each amounting to $6,000.00, have been announced by the national conference of Canadian universities. Inaugurated this year in commemoration of the 200th anniversary of nickel, the three-year fellowships are to be awarded annually to encourage and promote academic research in technical fields serving Canadian metal industries.

This year's winners and the subjects and locales of their intended research are — Calvin R. Cupp of Toronto — "Influence of Dissolved Gases on Mechanical Properties of Metals" — under direction of Professor B. Chalmers of the University of Toronto. G. V. Mueller of Montreal — "Partition of Nickel in Magnesium Silicate Minerals" — under Professor J. S. Stevenson of McGill University. A. T. Casey of Winnipeg — "Metal Reactions with Non-Aqueous Acid Solvents" — under Professor K. Starke of the University of British Columbia.

Rubber Landing Mat.—The Goodyear Tire & Rubber Company of Canada Limited have developed a unique landing mat, made of rubber and airfoam, for the landing of heavy materials.

It has already saved a great deal of money in the paper industry by eliminating damage during the landing of

The right answer



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paper rolls. The jolt of unloading big rolls of newsprint paper is cushioned and damage to the ends of the rolls can be prevented.

The mat is built up with a 2½ inch centre of firm airfoam and a top and bottom cover of high quality lively rubber about ¼ inch thick. The mat is suitable for all types of industry where heavy articles are liable to damage when being handled.

•

Winter Road Thawing.—A novel snow and ice melting system, believed to be the first ever installed in a public roadway, is being located on the northern state parkway near Lake Success, N.Y.

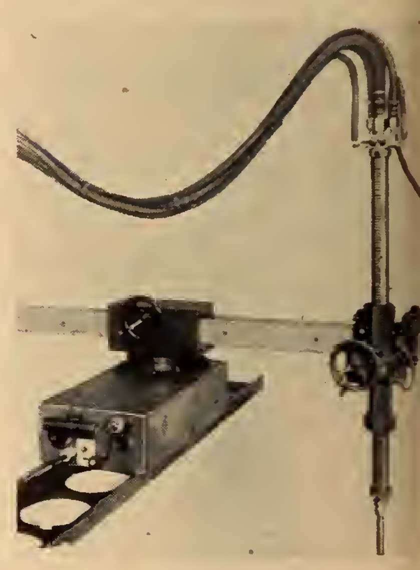
This new weather-proofing set-up utilizes more than three miles of steel pipe embedded in 1,000 feet of hilly section of the west-bound side of the parkway. Special valves are opened when it begins to snow and sleet to send a heat conducting fluid through the pipes to the under-side of the roadway. The fluid transfers its heat to the pavement thereby melting snow or ice and keeping the surface clear. The system is expected to prevent formation of hazardous driving conditions common to this particular section of the parkway.

Use of thermal systems to combat ice formation is growing in popularity. Although this is probably the first application of radiant heat to a main public artery, the system has been used successfully on a smaller scale in store and residential sidewalks, parking areas and garage paths. The system was developed by Minneapolis-Honeywell. Write to Minneapolis-Honeywell Regulator Co. Ltd., Leaside, Ont., for further details.

•

Airco Cutting Machine.—A new Airco heavy duty oxy-acetylene cutting machine for shop and mill work has been announced by Canadian Liquid Air Company Limited, 1111 Beaver Hall Hill, Montreal. Known as the Airco No. 41 Radiagraph, it is motor driven, straight track-guided, and ideally suited for jobs requiring a travelling carriage to carry equipment past the work.

The new machine will greatly simplify gas cutting, flame hardening and welding operations. It is extemely useful in steel mills for billet nicking, slab ripping and skull cutting. Salient features include all-welded construction; accessible, self-contained electric panel; conveniently located controls; insulated bottom plate to protect internal parts from heat; speed ranges from 1 to 72 inches per minute with standard gear reduction unit (other speed ranges with special gear reduction units); and indexed speed control for manual selection of desired speeds.



Airco Cutter

Canada's Capital Expenditures.—Canada's projected capital expenditures in 1951 are now estimated at $4,561 million, an increase of 5 per cent, or $233 million over expenditures anticipated at the beginning of the year. This revised estimate is based on a survey recently completed which was released by the Right Honourable C. D. Howe, Hon. M.E.I.C., Minister of Trade and Commerce. The largest part of the increase takes the form of additional purchases of machinery and equipment by primary and manufacturing industries and utilities.

The new figure of total capital expenditures for 1951 is 20 per cent above that for last year. However, at least half of this increase may be attributed to higher prices. Within the total programme, estimated outlays for new construction now stand at $2,724 million, an increase of 2 per cent over the first estimate for the year, and 16 per cent above 1950. Machinery and equipment expenditures, now estimated at $1,837 million, are 11 per cent above the first 1951 estimate and 28 per cent above 1950.

(Continued on page 734)


DANGER

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 730*)

More than half of the increase over the first 1951 estimate is in manufacturing. The non-ferrous metals products group is up $44 million; petroleum and coal products $15 million; chemicals $15 million; non-metallic mineral products $7 million; paper products $13 million; iron and steel $10 million; and the transportation equipment industry $7 million. About 77 per cent of these increases are for machinery and equipment, and the remainder for construction.

●

Industrial Magnets.—Companies that employ magnets in their industrial processes can now quickly and conveniently determine their strength in gausses, by a newly developed General Electric gauss meter.

Magnets are being employed in a growing variety of separation equipment such as picking up nails on highways; removing tramp iron from processing machinery; preventing metallic sparks in inflammable or dusty atmospheres; and in purifying non-magnetic substances.

The G.E. gauss meter provides a true gauss reading, regardless of its relation to lines of force and/or its distance from the poles of the magnet. For information apply to Canadian General Electric Company, 212 King Street West, Toronto.

●

New Forced Draft Fan.—Prat-Daniel Corporation, which is represented in Canada by T. C. Chown Limited, 1440 St. Catherine Street West, Montreal 25, has announced the development of a forced draft fan embodying many new features that improve aerodynamic characteristics and provide more efficient conversion of velocity to static pressure.

The Company claims the following improved features—1) large, deep inlet cones streamlined to reduce turbulence at the inlet; 2) open space between the wheels of double wheel models, instead of a common center disc, permitting complete four way diffusion of the air leaving the wheels; and 3) an oversize housing to assist diffusion.

Plotted performance shows peaks of efficiency and horsepower curves falling well within the proper fan selection range, making possible selection for maximum efficiency without overloading. Precisely shaped backward curved blades are designed to offer a nearly perfect aerodynamic flow across the leading and trailing surfaces. Complete information may be obtained from the Canadian Company.

●

Printing Press Controls.—A completely redesigned line of a-c preset-speed printing press controls in ratings through 15 horsepower is available from Canadian General Electric's Control Division.

For primary and secondary control of wound-rotor induction motors, the new line is suitable for practically every printing application and is available in both reversing and non-reversing forms. Non-reversing forms are used on flat-bed presses, tin-plate presses, waxing machines, intaglio presses, large cylinder presses, etc. Reversing form are used on offset presses and automatic cylinder presses.

Very fine settings are possible because of a rheostat which provides 50 to 7 points of speed adjustment. Operating adjustments are simple and can be mad from outside the control enclosure. Fo remote operation, a motor-operated mechanism is mounted on the rheosta and speed can be adjusted by any num ber of push-button stations installed a convenient locations about the pres Expensive master stations are unnece sary.

For complete information, commun cate with Canadian General Electr Company Limited, 212 King Stre West, Toronto.

●

C.I.-R. Chipping Hammer.—Canadia Ingersoll-Rand Company Limited, Birl Building, Montreal, have announced new chipping hammer. Known as th I-R chipping hammer, it offers 15 pow sizes based on only five hammer size The basis of this versatility lies in scientifically designed valve with quic ly interchangeable parts that step u chipping hammer power from a norm cut to an extra cut and to a super cu

Controlled air power is obtained b means of the aIRite valve which pr portions the amount of air to the fro and rear of the piston, thereby mai taining good cutting efficiency under a conditions. The new valve meters th air through a combination of ports an surge chambers which eliminates loss power on heavy cuts and provides smooth flow of full power. The valve positive and free-seating—it does n depend on dowels for alignment.

This new chipping hammer featu the new wear-resistant "Iramet."

●

British Sales in Canada.—In a rece address to the Dollar Convention Eastbourne, England. Sir George Nelson, chairman and managing direc

INCO CORROSION ENGINEERING SERVICE

While there is no one standard way to carry out a corrosion test it is often preferable to expose specimens in operating equipment under actual conditions of service.

A device for such tests is the Inco Corrosion-testing Spool. On this spool many different test specimens are installed so that they are protected from mechanical damage during testing and also from coming into contact with each other or plant equipment by which normal behaviour might be disturbed by galvanic effects.

The "spool" test is one of various corrosion-testing methods. Often it is unnecessary to make this test because our files contain data from more than 2000 plant tests on over 40,000 metal and alloy specimens. Also a vast amount of valuable corrosion data has been accumulated over the years at Inco's testing Station at Kure Beach and more recently at our new Harbor Island laboratory.

Inco's Reference Library is at your service. Whenever you need assistance in solving a corrosion problem, our Corrosion Engineering Section will always cooperate with you.

EMBLEM OF INCO SERVICE
TRADE MARK

HE INTERNATIONAL NICKEL COMPANY OF CANADA LIMITED, 25 KING ST. W., TORONTO of the English Electric Company Limited, outlined the steps British manufacturers must take in their efforts to trade capital goods in Canada.

In the first place, Sir George maintained, Britain must realize that now her post-war problems are mainly solved, she will be expected to meet all delivery dates. Absolute assurance must also be given Canadian buyers that orders will not be diverted by the British Government for defence purposes. Price competition must, of course, be met.

Sir George stressed the fact that feeling towards Britain in Canada is favourable, but he pointed out that, through the influence of environment, Canadians are accustomed to American styles and standards. British manufacturers will have to recognize this in their sales approach, he believed.

"You must quote for the equipment they specify they want at competitive prices and deliveries—and not just offer them what you would like to sell them, for there is no royal road to the solution of the problem," Sir George said. He believed that there was no question of successful British tenderers depriving Canadian industry of its means of livelihood, since Canada's production of capital "plant" while greatly increased, is not sufficient to produce Canada's total future needs, at least for the next few years. "On the contrary," he said, "they will be helping in the development of Canada's resources at a greater rate than would be achieved if left to itself."

"The Canadian buyer will also expect to get the same after-sales service from the British trader as he is used to in dealing with United States manufacturers," Sir George continued. "A qualified representative must be at hand in Canada."

•

New C.I.L. Plant.—An expansion of the New Toronto "Fabrikoid" plant of Canadian Industries Limited, at a cost of more than $1,000,000 will be commenced shortly. The announcement was made by J. E. Preller, manager of the Company's "Fabrikoid" division.

The growing demand for vinyl-coated fabrics and films is taxing existing processing facilities to capacity. The new expansion will house the latest equipment for producing these products which are marketed under the Company's name of "Fabrilite". Engineering for the project is being carried out by C.I.L.'s own engineering department with the exception of designing of the new offices which is being done by N. A. Armstrong.

•

Slope-Belt Conveyor. — The world's longest slope belt conveyor system using belts designed by The Goodyear Tire & Rubber Company of Canada, Limited, will soon be operated by the Dominion Steel & Coal Company, to make available millions of tons of iron ore lying under the sea.

More than twice as high as a previous world's record claimed by the United States, the 1,730-foot record-breaking lift belt system will be installed in the Wabana Iron Ore Mine located on Bell Island, Newfoundland.

Previous to the installation of the new equipment, mining operations were slow and expensive because of the necessity of using several methods of transport to move the ore from its submarine location to the surface deckheads for transportation to the smelter. An involved system requiring the use of electric locomotives and hoists transported the ore from its source to the surface at a distance of 12,500 feet. With the older equipment, only 25 tons of muck could be carried. The new system when completed, will transport a thousand tons of ore an hour in a continuous stream.

Two flights of the system will be 1,450 feet long and eight flights 1,230 feet long. The belts will be 36 inches wide and will haul the iron ore at 575 feet per minute. The entire project will be automatically controlled.

This new method of transportation features the use of compass cord conveyor belts of Goodyear design, with Stephens-Admason conveyor equipment. The belts are a yard wide and total more than five miles in length. They are being made at the Goodyear plant in Bowmanville, Ontario. The conveyor equipment is being made in Belleville, Ontario. General manager of the steel operations of the Dominion Steel & Coal Corporation, Limited, is C. M. Anson, M.E.I.C.

(*Continued on page 746*)

NEW FRANKI PILE-DRIVER

cuts down costs and time

This new Franki machine has been in operation at the C.N.R.'s Bonaventure Freight Yards, Montreal.

This amazing new FRANKI Pile-Driver operates on a circular platform, with double-acting hydraulic jack which permits wide, evenly distributed soil pressure. The new machine was developed recently by Franki engineers. Cutting time and labour costs substantially, it enables FRANKI to serve its clients better than ever and at a lower rate.

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BUSINESS AND INDUSTRIAL BRIEFS

(Continued from page 736)

Darling Bros. Appointment. — An agreement has been concluded between Darling Bros. Ltd. of Montreal and United Centrifugal Pumps, a division of the United Iron Works, Oakland, Calif., whereby the Canadian concern will manufacture United's complete line of pumps in Canada.

Darling Bros. have completed manufacture of several large units for the Canadian Oil Company's new plant at Montreal East. They are presently engaged in production of United process pumps for another major oil company located at Sarnia, Ont.

●

New Fairbanks-Morse Building.—The Canadian Fairbanks-Morse Co. Ltd. have opened a new building in Winnipeg located at 114-140 Gary St.

Built on a 290-foot frontage by a 120-foot depth, the location is convenient to railway stations, hotels, post and customs offices, federal government building, and the business part of the city. The manager will be H. L. Matthews.

●

Foster-Wheeler Contract. — Standard-Vacuum Oil Co. have announced that Foster Wheeler Corpn. has been chosen as general contractor for the new crude oil refinery to be constructed at Durban, Union of South Africa, for Standard-Vacuum Refining Co. of South Africa (Pty.) Ltd.

An advance party of construction engineers from Foster Wheeler's New York headquarters is expected to arrive in Durban in a few weeks to begin the field survey work in connection with the project.

●

Portable Fire Extinguisher. — A 4-lb. dry-chemical fire extinguisher with a rubber hose is now on the market. Introduced by Ansul Chemical Co., the Ansul 4-B offers these advantages: (1) ease of operation; (2) flexibility in fighting overhead and ground-level fires; (3) maximum extinguishing effectiveness for inexperienced operators.

Operating range of th Ansul 4-B Extinguisher is 12 to 15 feet. Dry chemical is ejected through a self-closing nozzle which produces the fan-shaped stream pattern characteristic of Ansul hand extinguishers. (The extinguisher is pressurized by a 1½ oz. carbon dioxide cylinder in the dry chemical chamber.) The new extinguisher has a capacity of 4 lb. of dry chemical. When fully charged, it weighs 10½ lb.

●

Lower Air Operating Costs.—A saving of from 10 to 20 per cent in the overall operating costs of his Company's transpacific services will be effected by the use of jet-powered Comet aircraft, W. G. Townley, executive assistant to the president of Canadian Pacific Airlines, told members at the semi-annual meeting of the American Society Mechanical Engineers.

●

G.E. Turbojet Engine.—Canadian Ge eral Electric Co. Ltd. have announc a new turbojet engine for advanc military aircraft. It is manufactured b General Electric Co. in the Unit States.

Known as the "Advanced J-47" t engine incorporates new designs with t best features of the well-known J- engine but "with a thrust output much greater that it isn't even in t same class". It has a low rate of fu consumption and was designed for t performance compatible with simplici reliability, and producibility.

General Electric's current producti J-47, which is rated in excess of 5,2 pounds, is the power-plant for such a vanced military aircraft as the Nor American F-86 "Sabre" (being built f the R.C.A.F. by Canadair Ltd. in Mor real), the six-jet Boeing B-47 "Strat jet" bomber; Convair B-36; North Am erican B-45; Republic XF-91 a Martin XB-51.

●

Zinc Oxide Reclaiming Process. — Wolverhampton, England, firm of me refiners has developed a process for r claiming 50 tons of zinc oxide whi normally "goes up the chimney smoke". The zinc released in the me ing process of copper and other met is oxidized, passed through cooling tu and caught in special sleeves. For fu ther information communicate w the United Kingdom Information Offi 275 Albert St., Ottawa, Ont.

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CONTENTS

14,900 copies of this issue printed

Columbia Cellulose Plant Uses Bark Waste for Fuel

S. B. Roberts

Chief Engineer,
Celanese Corporation of America,
New York City.

A paper presented at the 65th Annual General and Professional Meeting of The Engineering Institute of Canada. at Montreal, May 11, 1951.

Relating the history and evolution of the cane mill from its earliest applications down to the development of modern fibre mill design, the author enumerates the mechanical mill components and tells how each is designed and operated. Details of methods used in handling bark in the boiler house are given and experience to date at the Prince Rupert Mill with the burning of bark is discussed. A brief discussion following delivery of the paper is recorded.

An important new component was added to Canada's pulp and paper industry recently when the new sulphite pulp mill of Columbia Cellulose, Ltd., near Prince Rupert, British Columbia, commenced operations. The new Canadian company is an affiliate of Celanese Corporation of America. One of the most interesting features of the new plant is the mechanical equipment installed for the preparation and burning of bark.

At the time of writing, the mill had been in operation for only about one month, and the operating data included in this paper is therefore not complete. It is hoped however that the meager data presented will help others confronted with the same problem of turning a bark nuisance into a profitable source of fuel.

Specifically, the discussion covers the sugar cane mill, which dehydrates the wood room refuse, the pneumatic conveyor which delivers refuse to the boiler plant and, finally, the boilers and the fuel burning equipment.

Although the cane mill is an old and highly developed machine, it is not too well known outside of the sugar industry. Its evolution and principal design features may be of interest to mechanical and wood pulp engineers.

Since 1932 our organization has installed 17 specially designed small 3-roll cane mills for expressing the free water from industrial fibres. The first was installed in Canadian Celanese's factory in Drummondville, Quebec. These mills range in size from 16 in. x 24 in. to 18 in. x 30 in.—the size referring to roll size. It was therefore natural to try dewatering West Coast bark in one of them in 1947, when we started to investigate fuels for the then projected West Coast pulp mill. Nor was it unnatural to seek the advice of the cane mill manufacturer who had built our special mills. From experience we knew such mills are extremely rugged and have low maintenance costs. With such a cane mill we expected moisture would be reduced to about 50 per cent.

Cane Mills

Modern cane mills are highly developed machines which, by an arrangement of rolls, squeeze the blanket of fibres twice during one pass through the mill, and at the same time, by the molar action of mating juice grooves turned in the faces of the rolls, produce finely divided material with ruptured vascular bundles. Their slow development started when sugar cane was first brought from the South Pacific, via Australia and Indo China to India and Egypt, about 325 B.C. Evolution progressed from the mortar and pestle stage through crude mill stones and vertical wooden rolls, to beam presses and oxen-driven rolls which forced juice through split-reed plaited baskets.

Then in 1449, Pietro Speciale, prefect of Sicily, was credited with the first 3 roll mill, forerunner of the modern mill. It employed vertical wooden rollers meshed together with wooden cogs, and was fed by hand through both nips. The first steel-studded, and later smooth steel rolls, were built in England in the 17th century. Headstocks were fitted with adjusting pressure screws, and were changed from wood to cast iron. Grooving was developing. In England the 3 rolls were arranged on the apexes of an isosceles triangle as at present.

The second major development came in Puerto Rico in 1805 when the first crude turnplate was fitted between the 2 lower rolls, to deliver once-squeezed material to the second nip without using hands. Early reports called this a "dumb turner", because it replaced the Puerto Rican negresses who had previously done this hazardous work at the expense of many hands and arms. It is described as a fixed, shim-adjusted beam with a curved upper surface.

The development of lever-controlled, and later hydraulic loading of the top roll automatically adjusted the mill to suit the throughput. With heavy loads the top roll rose and passed a thicker blanket of cane, with little or no loss in extraction efficiency. The tightly compacted wall of cane at the nip blocked the juice from passing through the nip, compelling it to flow back down the ascending surface of the roll and into the juice pan under the rolls. These developments led to heavy hydraulic pressures up to 800 tons between nips. They were followed early in the 20th century by a realization of the importance of grooving the rolls, to drain off the juice efficiently. Since 1870, developments involve details rather than principles of design. Materials have improved greatly. Rolls now have rough granular cast iron surfaces to prevent them from wearing smooth and losing their power of nip. Like the best natural grindstones, the combination hard and fast-wearing soft particles insure a fresh sharp surface throughout the life of the roll. That is, it "wears rough".

Modern Mill Design

A standard cane mill cannot be successful unless the fibre is strong enough in shear and tension to withstand the pressure necessary to crowd out the liquid. The expressed liquid must also be fluid enough to flow down the roll face ahead of the nip. If the fibre isn't strong enough, it will be milled to a slurry and run off with the liquid. If the liquid is too viscous, slippage at the nip will be excessive and the output of the mill reduced or even stopped by a choke.

Slippage is the first consideration with an untried fibre. It is affected by the strength and length of the fibre, for the nip creates a tremendous pull. The greater the diameter of the rolls, the more nearly vertical will be the entering pressure, with a smaller horizontal force acting in opposition to the flow of fibre. The feed angle and area of mill opening are less important factors. Much ingenuity has controlled slippage. Helical grooves are milled across the circumferential juice grooves. They produce a hook toothed surface to bite into the slippery material, without reducing the extraction efficiency. On special mills one manufacturer employs an auxiliary 10-inch diameter grooved and toothed feeding roll, which is hydraulically loaded. It is mounted so as to force-feed the first nip. It carries its own scraper. A quick-acting hydraulic jack under the bearings of the top roll permits a choke to be relieved, and to be passed through by operating a two-way cock to lift the bearings of the top roll.

Headstocks and Rolls

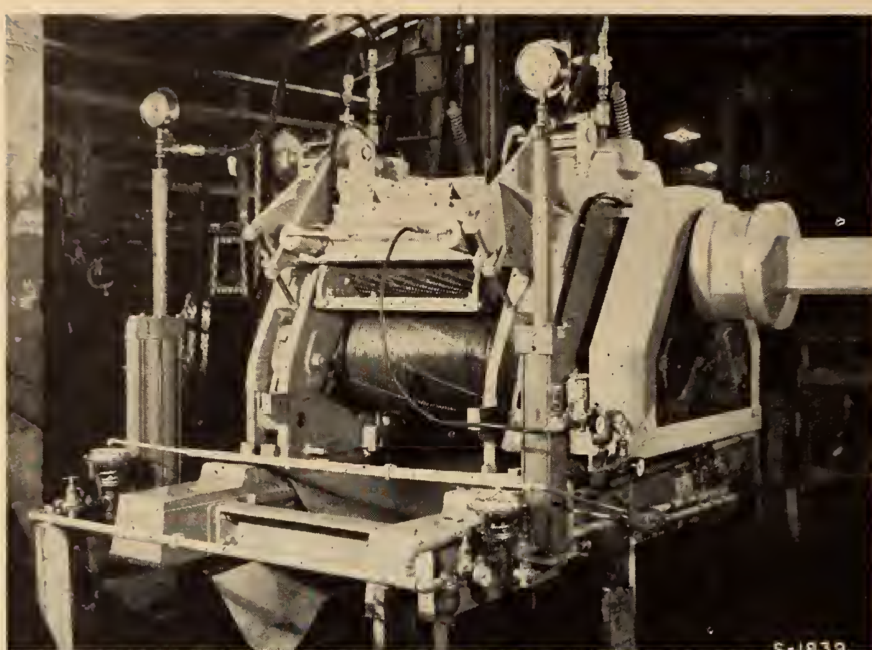
Headstocks are one-piece heavy steel castings, bolted to rigid cast beds to reduce the vibration incident to such heavy pressures between rolls. Beds are grouted to the foundations. Headstocks, or side frames, are of open design so that any roll, or the hydraulic pressure devices, can be removed without disturbing adjoining rolls. Bearings are generally open, very accessible, water cooled, and automatically lubricated.

Rolls are cast iron shells shrunk on to alloy shaft. The top roll is driven through a coupling and drives the other two rolls through long-toothed involute crown gears. Peripheral speeds up to 70 feet per minute have been reported. A general rule-of-thumb is to compute this in f.p.m. by multiplying the roll diameter expressed in inches by 1½. The Watson Island mill has an 18-in. diameter x 30-in. face, and runs at 35 f.p.m. Juice grooving in sugar cane mills varies from about 2½ in. pitch at the first crusher rolls, to ¼ in. pitch on the last 3-roller mill in a crusher and 4-mill tandem arrangement. I am not aware of any exhaustive tests on grooving for bark. For Watson Island we selected ½ in. pitch for the mating circumferential juice grooves, based on our experience with bagasse and other fibres. It is fine enough to give good dewatering and coarse enough to take a 2-in. plank if it has to. Helical grooving and the auxiliary force-feeding roll are also used.

We have used rolls of bronze and stainless steel, where corrosion requires special materials, but the less malleable "wear rough" surface of the regular cast iron developed by the cane mill manufacturers is much the best material for bark. The profile of juice grooves shows a 55 deg. included angle at the sharp root of the groove, with a 1/16-in. flat at the outside diameter This flat is to prevent a ragged edge incident to the use of coarse-grained cast iron. The 55 deg. angle has been taken from cane practice. It is sufficiently acute to cause fibre to arch the "V", with space below for liquid to escape. That angle also forms grooves deep enough to get the essential rubbing and cell-splitting action produced by closely pressed mating rolls running against each other.

In some sugar cane factories much hot water is added to the bagasse between the tandem mills, to dissolve the last traces of sucrose. To deal with this extra water, so called "Messchaert" grooves are cut at 2 to 4 inches

Fig. 1. Early horse driven roller mill.
(From Labal's Histoire des Antilles Françaises, 1722.)



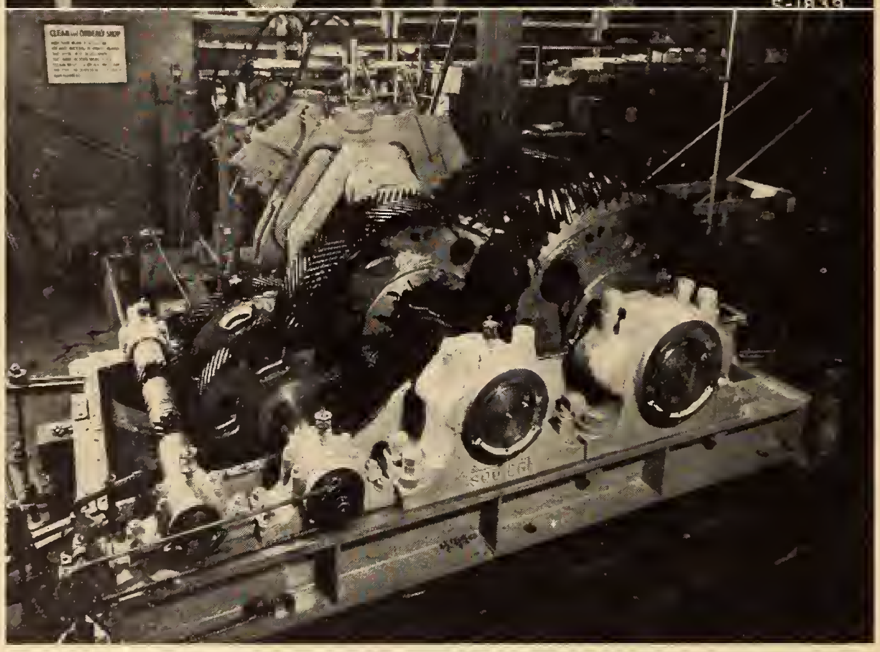


Fig. 2 (Top). Close-up of cane mill showing rolls and crown gears.
Fig. 3 (Bottom). Gear train drive for cane mill.

apart, usually not over ¼ in. wide and 1¼ in. deep. For bark we do not feel their extra cost can be justified. Without them, a 3-roll cane mill is a rugged piece of equipment requiring little care. With them, a heavy bar fitted with a row of narrow chisel-shaped scrapers is needed to clear out the deep grooves. The side wear on these scrapers and the added problem of separating the trash which they throw down into the juice pan complicates the job.

Large sugar mills carry up to 800 tons on the top roll; general practice ranges about 550 tons. The 18 x 30 mill at Prince Rupert carries a maximum of 125 tons on the top roll.

Scrapers and Turnplate

Scrapers, or doctor blades, are needed to keep the rough surface of the rolls clean so the juice can escape. They are toothed to fit the juice grooves and inclined at the proper angle to shave off the fibres with minimum friction and wear. Their tips are renewable, although their life is frequently a year. Adjustable springs apply the required pressure to the scrapers on the top and rear roll. The scraper tip for the lower front roll is bolted to the very important turnplate which is a deep modified "I" beam casting, mounted between the lower rolls and set on heavy shelves which are integral with the frame. One of the functions of the turnplate is to scrape the front roll, the other is to turn the blanket upward through the nip of the back roll. It can be tilted or slid fore and aft by external levers and adjusting bolts. Its upper surface is curved to gradually reduce the pressure in the blanket as the bark passes under the top roll from the first nip to the second. There is from ½ in. to ¾ in. clearance between the trailing edge of the turnplate and the back roll, to provide space for moving the rear roll and to allow a slot for second-nip liquid to pass down to the juice pan.

We set the rear nip iron to iron and opened up the first nip to about ¾ in. The curve of the top of the turnplate is generally a logarithmic spiral, although some manufacturers have developed their own curve which they feel has some advantages. Considerable water is removed during the milling, incident to crowding a blanket of fibres across this stationary surface. The blanket is being pushed by the first nip and frictioned against the turnplate and the moving top roll. Meanwhile the blanket is being upset by the expanding passage just ahead of the second nip.

If this turnplate is set too high excessive power is required. The pressure in the confined space pushes up against the top roll in opposition to the hydraulic pressure which creates the powerful nips. If it is set too low, the blanket is not continuous and back roll operation becomes irregular. It is thus customary to set the top of the turnplate below the periphery of the top roll a distance equal to about twice the mill opening, and to drop the heel as much as ½ in. on large cane mills. When once set, it seldom needs adjusting.

Drives are usually electric motors through gear trains but, in raw sugar factories, steam turbines and engines are also used to improve their steam-electric balance. With engines, some speed variation is obtainable. Although the rise and fall of the top roll automatically adjusts the mill to the load, large changes in the throughput may require a variable speed motor. At Prince Rupert a 1[illegible] horsepower 1800 r.p.m. woundrotor motor is installed with speed control. Provision is also made for doubling the mill speed in the future, by changing the V belt sheaves when and if an extension is built to the factory.

Results and Observations

For best extraction and maximum capacity the blanket of waste should be fed to the mill as evenly as possible. The weight of bark per ft. b.m. of log as given by various authors varied so much that we ran a carefully conducted trial on April 16th on 27 random run-of-the-mill hemlock logs. Western hemlock is the principal species run at Prince Rupert, although there is some spruce and fir. All waste was weighed and bare logs measured. The results were as listed in Table I.

Due apparently to less gums and resins in the West Coast hemlock, it mills much better and at higher mill throughput rates than does the Eastern bark, which was observed in the pilot plant runs. Dirt and sand has largely been lost during salt water storage and in the hydraulic barker.

Pneumatic Conveyor—Blowers and Star Feeder

Dripping-wet bark from the hydraulic barker, together with sawdust, knots and wood room trash is delivered to a hog and then to the cane mill by conveyors. These run continuously while the wood room is in operation. The digesters draw from the chip storage bins during the second and third shifts when the wood room only operates during the daylight shift. The shredded and dewatered product from the cane mill is conveyed to a feed hopper over a rotary feeder, which delivers it to the low pressure pneumatic conveyor. This sends it from the wood room to the cyclone in the boiler house through 500 feet of 17-inch-diameter steel duct. The two blowers are in series and handle only the conveying air. The velocity of the blast from the second blower is increased to about 23,600 f.p.m. in a special venturi, which produces a slight negative pressure at the throat where the bark enters the conveyor.

The blowers are vane type, rated at 9350 c.f.m. and are designed to use 1.5 lbs. of air per lb. of wood waste. A 60 horsepower 1750 r.p.m. motor is belted to each (1530 r.p.m.) blower. The rotary feeder is an 18-in. diameter by 12-in. wide star-type air lock. Static pressure after the second blower, under rated load of 14 tons per hour of refuse containing 50 per cent moisture, is designed to be 42 inches of water. We have, however, been able to carry heavy loads with only one blower operating. Under that condition the suction at the bark inlet was 23 in. and the discharge at the fan was 25 in. That is a total head of 48 in. The motor drew 60 amps. (rating 56 amps.)

In the event of a choke, a flutter vane at the inlet to No. 1 blower-inlet drops, to switch off the motor which drives the supply conveyor. The ducting is arranged with no vertical risers. Maximum slope is 7 in 12. It has been designed for a velocity of 6,000 feet per minute. Cleanouts are provided. There are four bends ranging from 23 deg. to 30 deg. The cyclone is set above the horizontal flight conveyor, which serves the chutes to the furnaces. The inlet to the cyclone is 69 feet above the inlet to the No. 1 blower.

Either of the 250,000 pounds-per-hour boilers is designed to take all of the bark, so we have not provided any holding bins. There is a by-pass duct to outdoor storage for use if the main duct should choke. This storage can be reached by a bulldozer and thence delivered to the coal elevator. Through fairly extensive trials at the plant the Riley Stoker Corporation in Worcester, Mass., we have determined that the spreader stokers can handle crushed bark, although at the Prince Rupert mill they will normally handle only coal.

For this particular arrangement of buildings and equipment the investment was less for the pneumatic than for the belt conveyor with which we compared it. Much of the run from the wood room to the boiler house is out-of-doors, and the annual rainfall is about 100 inches. Power requirements are higher however. The use of preheated air or the re-use of flue gas are future possibilities for still further reducing moisture of bark in the conveyor and cyclone, if and when justified. Corrosion would be a factor with flue gas.

Bark Handling in the Boiler House

The cyclone collector is 10 ga. steel, 8 ft. 9 in. diameter x 25 ft. 5 in. high. It has a conveyor pipe inlet and a vent through the roof. It is designed for a 2.5 in. (water) drop across it under full flow, bottom discharge leads to a vibrating pan feeder which serves four purposes: (a) It prevents accumulation of bark and possible choking in the lower cone of the cyclone. (b) It provides a partial air seal at the discharge. (c) It moves the material horizontally from the cyclone to the lower flight of the horizontal drag conveyor. (d) It loads this conveyor evenly across its width.

The vibrating-pan feeder is magnetic, and the amplitude and feed-rate can be changed by controlling the motor-generator set which energizes it. A bin-level indicating device warns the operator if the cyclone begins to accumulate bark. The whole bark system is electrically interlocked, so that failure of one unit will shut down all equipment back of it to the first conveyor under the barker pit.

The cyclone's vibrating pan discharges bark and wood waste into a 24-in. horizontal flight conveyor, which runs in front of the boilers. Eight chain-operated slide gates in the bottom of this conveyor serve the four inclined gravity bark chutes to each of the 2 boilers.

TABLE I

Fir, All waste weighed

Tally of 27 logs (B.C. timber scale)	(feet)	8,227
Calculated Volume of 27 bare logs	(cu. ft.)	1,105
Total surface of 27 logs	(sq. ft.)	2,702
Weight of bark and trash	(lb.)	4,440
Weight of chip fines	(lb.)	1,814
% Waste based on weighed waste and assumed 44 lb. weight of solid wood		13.2
Density of bark after mill	(per cu. ft.)	23.3
Density of chip fines	(lb. per cu. ft.)	19.3
Waste to Boiler House per foot (B.C. timber scale)	(lb.)	.76
Cane mill throughput rate	(lb. per hour)	15,000
Motor horsepower 100, with peaks up to 140 h.p.		
Hydraulic pressure on top roll	(Tons)	80
Logs 20 feet long — average diameter bare log	(in.)	19
Expressed water pinkish brown, trash negligible.		
Heating value of wood waste (bone dry basis)	(B.t.u. per lb.)	9,400
Net Heating value of wood waste as fired	(B.t.u. per lb.)	4,870

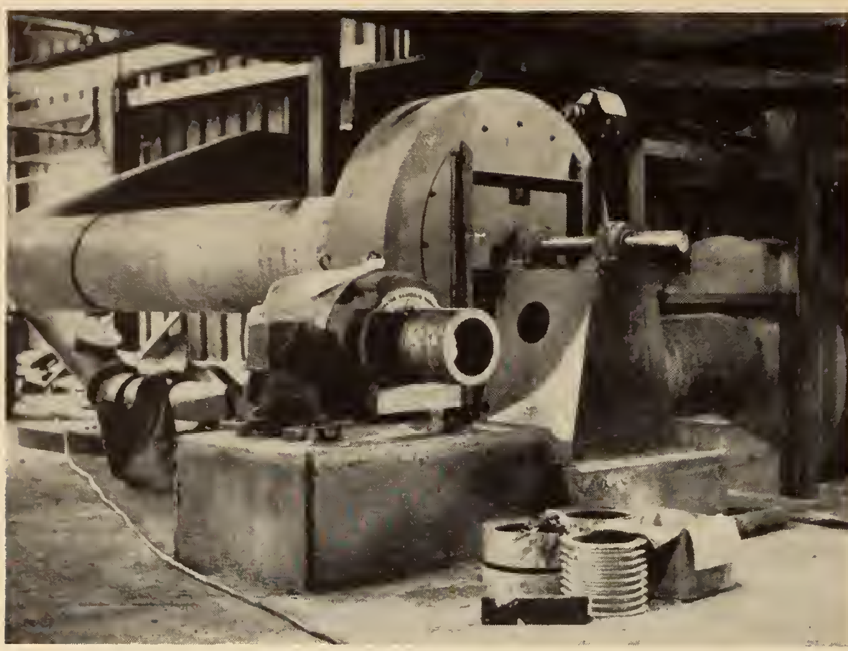


Fig. 4. Tandem blowers for pneumatic bark conveyor.

The size of the gates at the top of these chutes, and not the volume of bark, determined the width of this conveyor. The gates are adjusted by hand in such a way that bark is distributed equally among the active furnace chutes.

The front water wall tubes of each boiler are bent to admit four bark chutes which enter at 45 deg., 12 feet above the grate. These chutes have a top-hung swing damper to reduce air infiltration. The weight of the bark (about 23 lb. per cu. ft.) pushes these dampers open. The lower ends of the chutes, close to the fire, are stainless steel. A jet of low pressure air at the bend in the bark chute and another under the lower end of the chute have been provided for emergency use but have not so far been required. The chutes are arranged with an observation port, which can also be used as a roust hole to clear a block, or scrape coke from the fire side of the chute if it should form.

Burning Bark

The size of the boilers was easily determined from the calculated plant steam demand. The pressure and total temperature were chosen to yield a turbine water rate to match the factory's steam-electric balance. Double automatic extraction turbo-generators are installed with a condenser under one of them. Telkwa coal was indicated as the probable basic fuel, although provision was made for burning oil with minor changes to the front water wall, when and if oil becomes the cheaper fuel.

When we approached two boiler manufacturers with our proposal to burn wood room waste in the same furnace with coal, under 250,000 lb. per hour boilers, they discouraged us. They had been given small samples of bark which we had milled in our Maryland plant. They preferred separate furnaces for the different fuels. They referred to their experience with hogged fuel and oil and anticipated trouble from slagging. For bark, they preferred the more or less conventional Dutch oven, inclined grate, or spreader stoker in separate furnaces. We concluded that cost and maintenance would be too high for a Dutch oven or separate furnace on this particular job.

I believe their reluctance to pioneer was perhaps due to a failure to appreciate that cane-milled bark is entirely different physically from hogged fuel. One observer has recently likened it to peat moss. From experience many years ago, we were convinced that, like bagasse in one cane factory, milled bark could be simply chuted high up in a furnace, and it would burn in suspension over another fuel. We believed also that with properly adjusted chute flaps, excess air would not be a serious problem.

In the end we discarded pulverizers which had been recommended for coal, because the coal as received at Prince Rupert is normally extremely wet with poor grindability and high ash. We chose spreader stokers because they cost less. Chain grates were specified, so as to have better control of the fuel bed than with stationary grates. A single roll crusher is installed to control the maximum size of coal. The grates are somewhat unusual, in that they travel towards the rear of the furnace. This was done in case some of the wood waste, which we decided to chute in near the front wall, might not flash but fall to the grate and be discharged to the ash pit without burning completely.

As a second line to fall back on if the chip chutes didn't operate as expected, trials were run on bark in a standard spreader in a pilot plant at Worcester, Mass. These tests proved that a good distribution pattern of bark over the grate could be had.

When the wood room is in operation, bark will have to be supplemented with coal. Coal costs $9.62 a ton, delivered, that is 41 cents per million B.t.u. We felt this cost justified good combustion control for burning coal. As over-fire air nozzles are needed with a spreader, we would be able to pipe some of this air to the bark chutes if subsequent operation required air to cool the chutes or move material, without adding excess air. Experience and observations to date show that air is not required in the chutes.

The vertical gas velocity through the furnaces was purposely held down to provide time for consuming the bark before it reaches the cross tubes. At peak boiler capacity when burning coal, it is 17.5 feet per second. The bark is chuted in 12 feet above the grate. The furnaces are 30 feet wide, 16 feet from front to rear, and about 35 feet high. There are 2 independent 15-foot-wide chain grates running side by side in each furnace. It is 19 ft. between sprocket shafts. The total effective grate surface is 540 square feet. Due to the 4 air zones under the grates, it is possible to have a short fire near the front of the furnace across the full width of the boiler.

Early operation indicates good performance when burning bark with coal. The bark is light, shredded, and runs less than 50 per cent moisture. It seems to ignite as soon as it enters the furnace, even on light loads when the coal flame is relatively short and below it. Apparently, very little falls to the grate. Due to the rather high furnace, it is necessary to balance the draft near the grates when burning coal only, to reduce the excess air leakage. When bark is burning it is better to set the furnace draft as required at the bark chute level. There has been some evidence of puffing when burning bark. This is caused by the 4 bark chutes receiving 4 slugs of bark from the conveyor simultaneously. If this becomes a problem, the flights of the horizontal conveyor will be respaced so that the flights don't register with all four bark chutes of one furnace at the same moment. More flights might also be added to reduce the volume of the slugs.

Stokers and Grates

There are eight 20-in. over-running reel-type coal feeders in each boiler, set about 4 feet above the grates. The front water wall tubes are bent to admit the 4-bark chutes and arranged with headers at the 8 spreaders in each boiler. Coal is chuted directly to each stoker hopper from an overhead bunker above the firing aisle. The feed rates of the stokers are adjustable from the board by hand, or by automatic combustion control. During the past 4 months they were required for a while, to handle very fine and sloppy-wet coal from Cadomin, Alberta. During that period, less difficulty was experienced than with other methods of firing such a fuel. Feeders had to be cleaned occasionally and the distribution pattern required attention.

Grates are under manual speed control. There are four zones of underfire air. Forced draft air from the tubular air preheater is kept below 300 deg. F. to prevent overheating the grates. Stack losses are also recovered in an extended-surface economizer. It has cast iron fins on tubes. Forced draft and induced draft fans are under automatic combustion control. To eliminate corrosion at the cold end of the preheater tubes during light loads, hot air is recirculated to the inlet of the forced draft fan.

Boilers

Each of the 2 boilers has a 4-hour rating of 250,000 lb. per hour, at 600 p.s.i.g. and 750 deg. total temperature with 340 deg. F. feedwater. Furnaces are waterwalled on four sides. Rear wall tubes are bent back and refractory-covered at their lower ends to radiate heat onto the fuel bed at the discharge end of the grate.

Although we consider spreader stokers the best of the solid fuel burners in respect to carry-over and bird-nesting, conventional soot blowers have been provided in the Columbia Cellulose boilers with retractable units at the furnace exit, that is, at the entrance to the superheater. Special attention was given to the arrangement and wide spacing of the first cross-tubes. This was because of experience elsewhere with slagging when burning certain oils, also because of reported slagging when burning hogged fuel which has soaked in salt water. The ash fusing point of Telkwa coal is only 2,000 deg. F., so we didn't want to gamble on the unknown fluxing action of coal-ash in the presence of wood ash containing sea salt in combination.

The working volume of the furnace is 15,160 cu. ft. and the heating surface of the boilers is allocated as follows:

Boiler Tubes	19,522 sq. ft.
Water Walls	6,866 " "
Superheaters	4,420 " "
Economizer	6,750 " "
Air Heater	16,050 " "

Total heat liberation in B.t.u. per cubic foot per hour is:

180,000 lb. steam per hour—coal only	14,940
180,000 lb. steam per hour—wood and coal	15,800
250,000 lb. steam per hour—coal only	21,200
250,000 lb. steam per hour—wood and coal	21,800

Overfire air is admitted through the front and rear water walls. Nozzles are adjustable and set 7 ft. 9 in. above the grate at the rear. In the front wall they are on either side of, and below the stokers, 2 ft. 9 in. above the grate. There is also a row at 14 feet above the grate in the front wall. This overfire cold air is delivered at 30 in. pressure by a 75-hp. motor-driven fan at each boiler. The air nozzles under the coal feeders can also be used to control, to a limited extent, the distribution pattern on the grate. A separate branch duct from the same blower serves the bark chutes if needed.

Cinders

Cinders from the hoppers under the third pass of the boiler, and from the air preheater, are return-

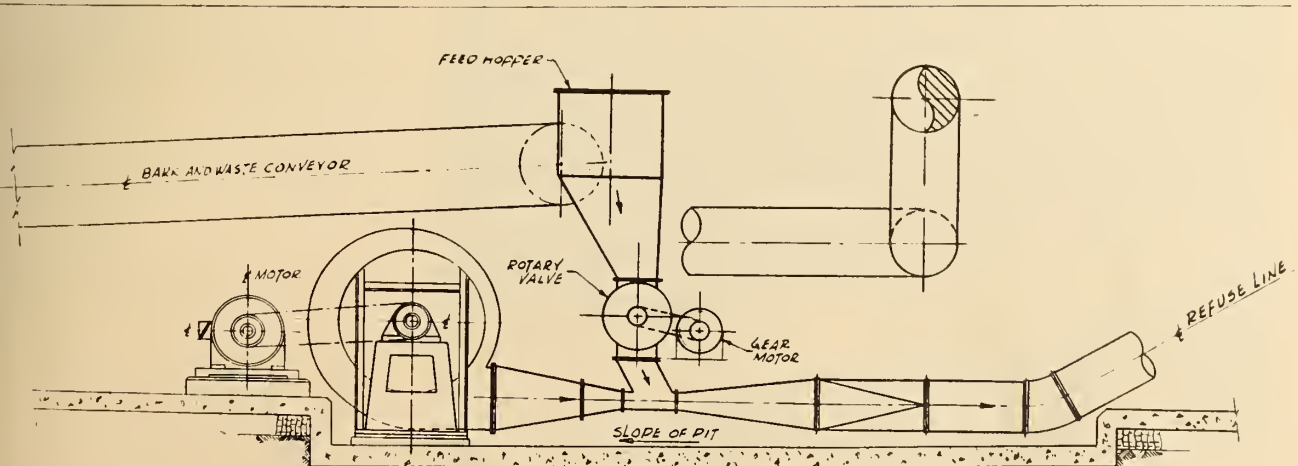


Fig. 5. Arrangement of bark feeder at discharge of second blower.

Fig. 6. Front of boilers showing coal and bark chutes.

ed continuously to the furnace by pick-up nozzles discharging through two rows of openings in the rear wall. These openings are 7 feet and 5½ feet above the grate. Air from a 20 hp. fan blowing cold air provides the vehicle. This fan is sufficiently large to pick up fly ash from the dust collector in the future, if carbon in the fly ash is high enough to justify reburning, and if the added dust loading can be tolerated. At present the fly ash is handled, together with ash from the main ash pit, by a pneumatic system into a 100-ton storage silo. It is removed through a rotating dustless unloader to trucks. Although the mill is outside the town limits, a centrifugal dust collector has been provided ahead of the induced draft fans to insure clean pulp, regardless of wind direction. The collector protects the fan from some erosion. The draft loss through it is 2 in. Its tubes are 10½ in. diameter. Its expected recovery is 90 per cent with both coal and wood ash of a stipulated sizing.

Observations and Notes

These are a miscellany of more or less unrelated facts.

1. There is no difficulty in adjusting the slide gates in the bark conveyor to share the bark among the bark chutes.
2. The milled bark is open, light, and fast burning. When the boiler is steaming at 40 per cent and above, the bark burns in suspension, and none appears to fall to the grates. At lighter loads, some does reach the grate. No difficulty of any kind has been observed due to burning bark and coal on the same grate. No slagging has been observed.
3. A new fire can be quickly started by covering a layer of coal on the grate with bark and lighting with a piece of wood.
4. It does not appear that any overfire air is needed at the rear, but some is needed at the bark burning zone, that is, through the high nozzles in the front wall.
5. Smoke from the stack is light. An early determination of combustibles in the ash according to A.S.T.M. methods in a muffle furnace and corrected for moisture shows the high figure of 9 per cent combustible.
6. CO_2 runs about 14.3 per cent.
7. We have carried a 75,000 lb. per hour steam load on bark alone.
8. The draft at the level of the grates is nearly .1 in. higher than at the level of the bark chutes.
9. The boilers have been steamed at 280,000 lb. per hour each.
10. Some laboratory analyses of bark before and after the pneumatic conveyor show a 2 per cent loss of moisture to the conveying air.

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Acknowledgments

First, I appreciate that Celanese Corporation of America has given permission for me to describe these installations.

I am indebted to Mr. Edward S. Moore, Mr. Vincent Lyons, Mr. Daniel Sargent and Mr. Martin Grossman, of the Celanese Corporation, for advice on the manuscript and slides, search of the literature, and observations during the start-up. I am, also, indebted to the staff

at the plant for analyses and samples.

The Geo. E. Squiers Company's engineers, particularly Mr. E. A. Schwarz, have given me photographs of the special cane mill built for the Watson Island plant. Mr. Schwarz and his engineers have been especially helpful during discussions in their pilot plant during tests with Eastern bark.

Advice and suggestions from the Riley Stoker Corporation and Foster Wheeler Limited during the early design stages of the bark burning furnace were of great help.

Discussion

Charles Neal[1], Do the high pressure air jets underneath the bark delivery spouts contribute to the distribution of the bark on the grate?

Mr. Roberts, The conditions of operation at Columbia Cellulose do not require these jets. However, it is hoped that some improvement may be obtained by further experiments. It is believed that these jets would be of much more value on installations where the heat input to the furnace from the bark is from 50 per cent to 100 per cent of the total heat input to the furnace. At Columbia Cellulose it is less than 25 per cent.

A. J. Bonney, M.E.I.C.[2], What velocity of air was used at the intake nozzle of the bark conveyor line where the bark is dumped from the feeder into the pipe line through which it is blown to the boiler house cyclone.

Mr. Roberts, 23,600 feet per minute.

Mr. Bonney, What is the thickness and material specification used in the conveyor line?

Mr. Roberts, Ordinary black steel, 10-gauge thickness was used for the conveyor line. We have had only about one month's experience with the system, but observations of the blades and scroll of the fan, as well as the pipe at the first bend, which is only 10 feet beyond the high velocity zone, show negligible wear. Due to temporary difficulty with the feeder, the bark was fed directly into the fan suction for a while, instead of into the venturi at the discharge. This should have caused accelerated wear on the fan blades. The bark, etc., is quite fine and well washed of dirt or sand so we predict a satisfactory life for the pipe, with perhaps annual patching at the elbows.

J. M. Jopp, M.E.I.C.[3], What is the width of the Squiers press, and are there any features of the press as supplied to Columbia Cellulose not normally included in a Squiers bark press design?

Mr. Roberts, Width of rolls is 30 inches. New features at Columbia Cellulose include: (a) an auxiliary 10-in. force, feed roll, and (b) hydraulic jacks to lift top roll to relieve jam and to enable inspection at turnplate.

J. E. Neilson, M.E.I.C.[4], volunteered the information on the reason for the use of cold air, viz. —In the original design it was thought that a high pressure of as dense air as possible would be needed to penetrate the length of the furnace. In the field it was found that much less than the rated 30 in. would give ample penetration. The use of hot air could bring up the efficiency slightly.

Ollison Craig[5], Did the Columbia Cellulose engineers feel that any superheat control could be obtained by adjusting the overfire air nozzles to produce a longer or shorter flame in the furnace?

Mr. Roberts, Sufficient experimenting has not been carried out on these boilers to determine the effect of superheat control by adjustment of overfire air nozzles. Further work is contemplated in this direction. It should be kept in mind that, while one of these boilers has been in operation for some four months or so up to the time of presentation of this paper, bark has only been available for a month to six weeks.

There was also considerable concern as to whether or not the bark would burn with a short flame, or continue to burn through the superheater zone. A boiler meter chart was presented, showing that a maximum steam temperature of 720 deg. F. was obtained during a short maximum load test of 280,000 lb. per hour (boiler rating 750 deg.; load 250,000 lb. per hour). Due to a favourable heat balance and the use of heat rejected to the condenser in process water, we are not penalized if superheat is somewhat below its maximum. √

[1] Steam plant superintendent, Consolidated Paper Corporation, Wayagamack Division, Three Rivers, Quebec.
[2] Chief engineer, Quaker Oats Company, Peterborough, Ontario.
[3] Chief engineer, of Brown Corporation, La Tuque, Que.
[4] Chief engineer, Foster Wheeler Ltd., St. Catharines, Ont.
[5] Vice-President, Riley Stoker Corporation, Worcester, Massachusetts.

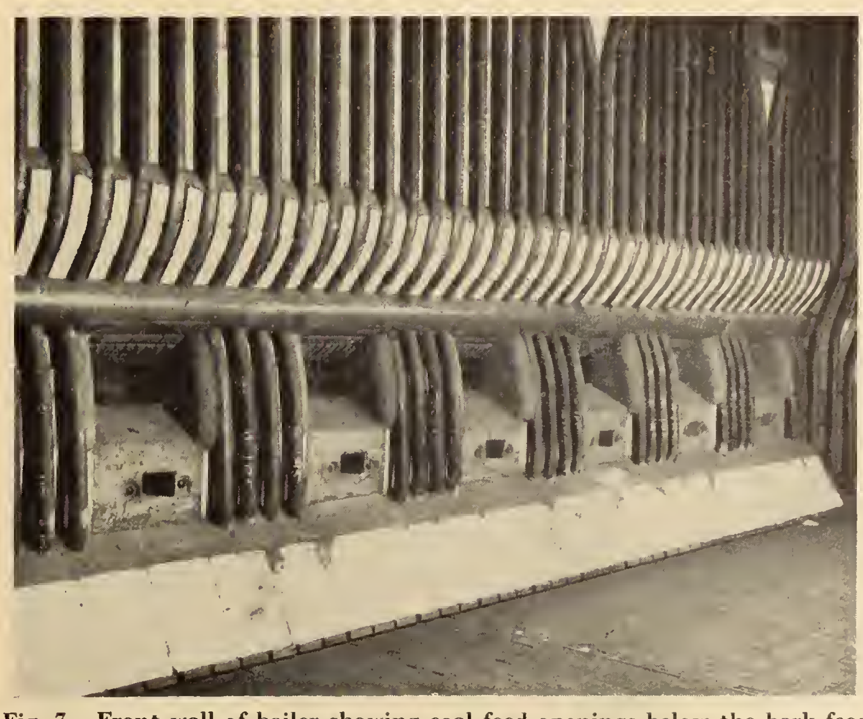


Fig. 7. Front wall of boiler showing coal feed openings below the bark feed opening at top right.

The Watson Island Plant
of
Columbia Cellulose Limited

A general description of the project, compiled from details supplied by H. B. Roberts, chief engineer, Celanese Corporation of America.

The new plant of the Columbia Cellulose Co. Ltd.- is situated on Watson Island in the northwest corner of Canada, on the west coast of British Columbia. It is 40 miles south of the Alaskan border, 9 highway miles south of the centre of Prince Rupert, the principal seaport of northern British Columbia and the western terminus of the northern line of the C.N.R.

Contrary to what might be expected, the climate of western British Columbia is not arctic. The average temperature for the winter months October to May is 40.5 deg. F. Humidity is very high and rainfall averages 102 inches per year. This combination of warmth and moisture is favourable for timber growth. The Pacific Northwest contains one of the world's finest remaining stands of high grade pulp woods.

The Province of British Columbia made available to the Company a sufficient forest area to maintain the anticipated pulp mill capacity in perpetuity. This tract, north of the mill, was granted under Forest Management License No. 1, and is the first of its type in the Province. The area of the forest is 600,000 acres, ranged along the Skeena and Naas water sheds. 50 per cent of the forest growth is hemlock. Most of the timber is non-resinous and therefore well suited to the sulphite process of pulping.

During the United States Army "occupation" a large camp was erected on the site of Port Edward, a small townsite just east of the mill. Watson Island became a storage point for high explosives, and the United States Army built a large semi-circular dock in front of the island, 3,700 feet long, with loading deck 62 feet wide. After V-J day, the Army moved out, leaving behind all buildings and the dock. Columbia Cellulose first purchased the dock and eventually the island.

This paper describes the general features of the new Watson Island Mill of the Columbia Cellulose Corporation, recently opened at Prince Rupert. Descriptions are given of the site, the woodroom, digesters, product, services, heat and power, fuel, and accommodation.

The water surrounding the mill called Porpoise Harbour, is entirely landlocked and sheltered from storms. The dock accommodates ships of any size and a good highway leads to Prince Rupert and also to Terrace and beyond. One can drive from the mill to Vancouver. This is in contrast with most other British Columbia pulp and paper mills, where no road to the outside world is possible. Designing activities began in 1947 with the central engineering department of Celanese Corporation of America undertaking the design and construction. However, other engineering firms and consultants were freely used.

It was decided to build the mill on two levels. On the 64-foot level is located the power plant, wood room, chip storage and coal storage. On the 18-foot level are all the operating departments and the acid plant, digester room, screen room, bleachery, chemical mixing, pulp drying, finishing, shipping, warehouses and office. The limestone sulphur and chemical storages are also on the lower level. The main line of the C.N.R. runs along the west side of the plant, between the mill building and the wharf. The

Fig. 1. The log haul-up.

From the dedication address of Harold Blancke, president, Columbia Cellulose Company Limited

"To my mind, those who wisely try to find economic well-being for the people by conserving for efficient use the rich natural resources of a new country are those who deserve the highest admiration from future citizens.

"The policies of conservation laid down by the present generation of British Columbia public officials arouse enthusiasm everywhere among men of good will. Here in the vast spaces of the Northwestern section of our Continent are greater natural resources than any yet developed. They could be wasted by predatory individuals in search of a fast profit. Or they could be systematically developed into a base for an industrial economy that can endure until the end of time. It is fortunate for British Columbia and for Canada that the government has enacted into law this latter far-sighted programme. The Province's natural heritage will now become the permanent foundation for industrialization in the best interests of the people. . . .

"At the close of the First World War, Canada was a nation of 8,500,000 people, an exporter of raw materials with a foreign trade amounting to $2,350,000,000. Today, with a population of still less than 15,000,000 people, ranking 28th among the nations of the world in population, Canada ranks 4th in total foreign trade among all nations, following only the United States, the United Kingdom and France. While its population doubled, its foreign trade has tripled and now approximates $7,000,000,000. About a third of Canada's net national income is derived from the export of goods and services. This great foreign commerce has made possible such a high standard of living that Canada's per capita national income is the second highest in the world. . . .

"One-third of Canada is covered by forests, a great woodland area of 1,220,000 square miles. It is estimated that some 700,000 square miles are capable of producing a continuous timber crop and about 473,000 square miles of this area are considered to be economically and geographically accessible. The extent of this wealth staggers the imagination. The Canadian newsprint industry, which alone produces over 18,000 tons of newsprint every working day, leases less than 15% of Canada's Crown lands. Pulpwood accounts for only 18½% of the annual forest depletion. Fuel wood is estimated at 22%. Fire and insects account for about 22½%. Of the useful crops, only lumber requires more trees than are destroyed annually by fire and insects. Large as is the present yield, the annual consumption of wood from our forests is less than the annual regrowth and under good forest management we should in time be able to increase our wood production two or three times its output today.

"The Forest Management Licences written by the Provincial Government of British Columbia represent the culmination of years of study and planning to use the vast forest resources of the Province to inaugurate sound industrialization. One of the functions of a licence is to make available a sufficient forest area to furnish a sustained yield of timber in order that the licencee's mill may operate continuously on a large scale. Columbia Cellulose Company is aware of its responsibilities as the first company to be licenced under this policy. It is, in effect, a partnership with the people through their organized government. . . ."

lagoon will be used as log storage. Facilities are available for the movement of pulp and supplies by either rail or water. The present wharf has facilities for rail loading.

Water Supply

It was found that for the initial period of operation, the watershed flowing immediately out of the Prudhomme-Kloiyah Lake system was adequate for the mill supply, although it was necessary to impound this water to take care of the long dry periods in the summer and late winter months. The dam site selected required the grading of a pipeline site from the mill to Kloiyah, 35,000 feet away. The pipeline is a 48-inch wood stave pipe running alongside the Prince Rupert-Terrace highway. The dam is a solid concrete structure, incorporating a fish ladder. Its crest is at 90 ft. elevation, the main ground floor level of the plant is 18 ft. 9 in., but 50 feet of this head differential will be lost in pipe friction at maximum plant production. At two points along the pipeline it was necessary to tunnel through a total of approximately 5,700 feet of solid rock. The cross sectional area of the tunnels has been made adequate for twice the capacity of the 48-inch pipe, so that doubling of the plant is possible without further rock tunneling.

Wood Room

The wood room of the plant is arranged so that the logs are fed up singly by conveyor, on the longest and highest log haul-up in any pulp mill on the West Coast. The horsepower on this haul-up is 400 in two 200-h.p. drive units. At the head of the log haul-up the log is stopped by a hydraulic stopping mechanism and cut off to 20-foot lengths and fed into a Bellingham type hydraulic barker. The barked wood is transferred along chain conveying sections to live rolls, where the transfer man has the choice of three routes. One: where the log is clean and the right diameter it is immediately fed to the chipper mechanism; two: where the log is the correct diameter but dirty with bark or any other objectionable material, it is fed to the cleanup conveyor where bark seams, adhering bark, etc., are cut out with mechanical hand tools; and three: where the log is clean but the diameter too wide, it is transferred to

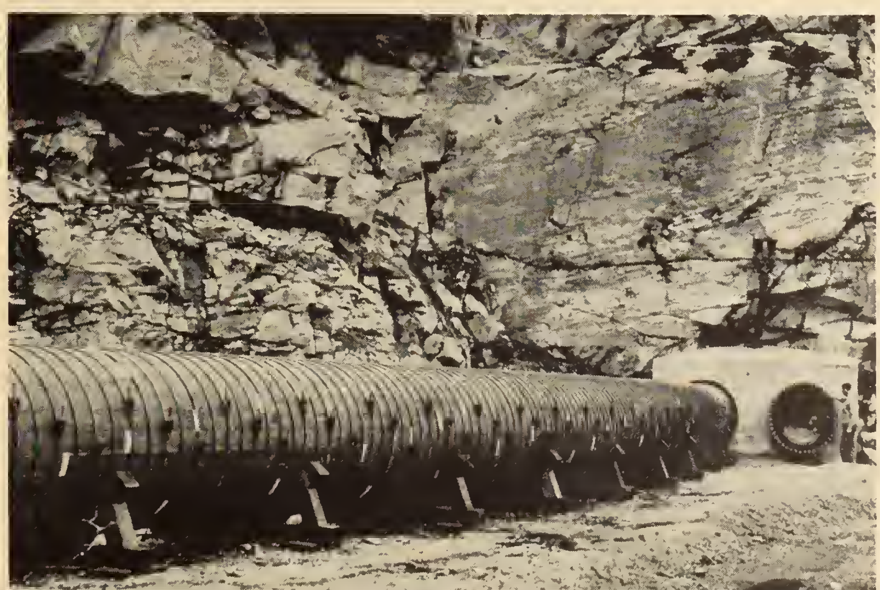


Fig. 2. 48-inch wood stave pipe line for plant water supply.

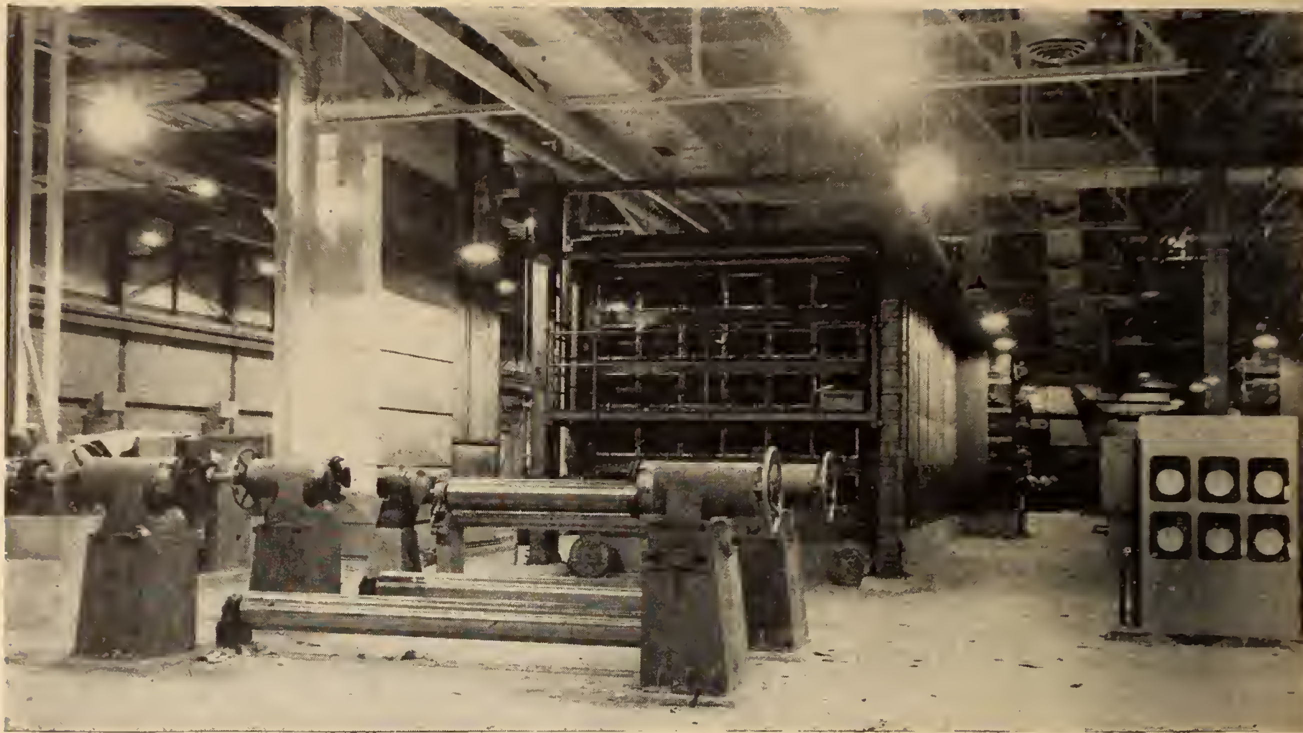


Fig. 3. Machine room with dryers in the background.

a quartering saw with a no-man carriage where it is quartered and again fed forward through a washer to the 153-inch 1500-h.p. chipper.

Conveyors take the chips away to a surge bin located over chip feeders which, in turn, feed vibrating screens. The accepted chips are conveyed away to the top of a chip storage building, where the species are segregated into any one of the 12 bins. The chips are extracted from bottom aprons onto one of two conveyors, and taken over weightometers to the uptaking conveyor to the digester building.

Digesters

A series of interesting electrical interlocks come into play when a digester is filled with chips. The cook sets up on the electrical switch mechanism a prescription of chips of any particular species and, pressing one button, the whole system from the chip bins on goes into operation, extracting only that species and that quantity of chips prescribed by the cook. If the weightometer electrical relay system does not indicate that chips are being extracted at a certain rate from any bin the electrical control assumes that that bin is empty and automatically transfers the extracting mechanism to another bin of the same species.

Five 10,000-cubic-foot digesters are installed—19 feet in diameter and 56 feet high. These digesters are unique in that they are the first vessels of this type and of this size which have been erected, welded, x-rayed and stress relieved in the field. The welding was done in large measure by men who are trained and skilled in welding; the x-raying was done by radioactive cobalt isotopes lowered inside the digester; and stress relieving was done by portable oil furnaces which circulated hot gases through the digester for a prescribed period.

(See "Field Welded Digesters for the Columbia Cellulose Company", P. E. Savage, M.E.I.C., The Engineering Journal, April, 1951. Page 286.)

Since the hot acid system of cooking is used, the digester is filled with chips dry, the cover bolted on and acid pumped in to sweep the digester free of incondensable gases. The supply of raw acid is from the combustion of Texas sulphur, which is stored in silos adjacent to the acid making plant.

Tubular sulphur melters are used. Conventional rotary sulphur vaporizers and combustion chambers, and spray coolers bring the cool SO_2 gases to the limerock and pressure absorption towers. The resulting raw acid is settled, filtered and then pumped to the storage and accumulator system consisting of two closed raw acid storage vessels, a stainless steel backed constant level pressure absorption tower, one low pressure accumulator and two high pressure accumulators. These vessels have such a large acid capacity in relation to digester volume that acid strength should remain constant, once satisfactory operating conditions are established. In cooking, indirect heating is used in the acid system. The digesters are fully instrumented, not only for the usual temperature, pressure controls but also for the recording of p.h. throughout the cook.

The Pulp

At the end of the cook the resulting pulp is blown into one of three blow pits, which are each arranged with three agitators and two pumps. Provision is made for the addition of a predetermined quantity of diluted waste liquor, so that these blow tanks are rapidly brought to a uniform consistency, and the blow pumped immediately to the head box feeding knotters, and red liquor washers. The liquor drained away from the red liquor washer is impounded in a special tank and forms the basis of investigations already planned.

Pulp is pumped through a series of chests to allow a very high measure of blending. It is then diluted and flat-screened in the normal manner, this installation being one of the largest of its kind in the industry. The flat screen rejects are rescreened and meet the knotter rejects, and flow away to refining and wet lap for sale. The screened pulp is deckered and pumped through the bleaching and treating plant and emerges as white high alpha cellulose ready for deckering and drying. The drying machines consist of wet ends and standard dryers of 136-inch working width.

Because of the necessity of absolute control of the quality of the final product for the acetate yarn process, it is necessary to test each jumbo roll and to store these jumbo rolls during the testing time interval. The full width sheet is reeled into jumbo rolls weighing 7 to 8 tons, and handled by crane into the jumbo roll storage, where they are identified, tested, classified and reclaimed in the pulp finishing machines.

The Output

The product leaves the mill in either the form of wood pulp bales, or in rolls when intended for the acetate mills of Celanese Corporation of America. If it is to go out in rolls, the jumbo rolls are split into the smaller size rolls required, wound up on standard cores, wrapped, headed, weighed, marked and taken away by an automatic conveyor to a stacker lowerator. Such wood pulp which is produced for paper process or any dissolving pulp that is sold in the form of bales is cut on an automatic cutter layboy arrangement, and the bales automatically conveyed away over a scale to an 830-ton capacity hydraulic press.

Extraction of the bale from the press is automatic by means of the air flow conveyor mechanism. Immediately afterwards the bale is tied on a tying table, wire tying machines and wire being used. After tying, it is again identified and transported away by the same automatic conveyor as the rolls of the other product and again transferred by a stacker lowerator to the handling floor of the main warehouse. In the main warehouse l ft trucks transport the finished material, whether it be rolls or bales, to the waiting cars or to the commodious warehouse which, it is estimated, can handle approximately 10,000 tons of product. Although the design of this mill is based upon 200 tons per day capacity of dissolving pulp, provision is made in all design for the exceeding of this figure.

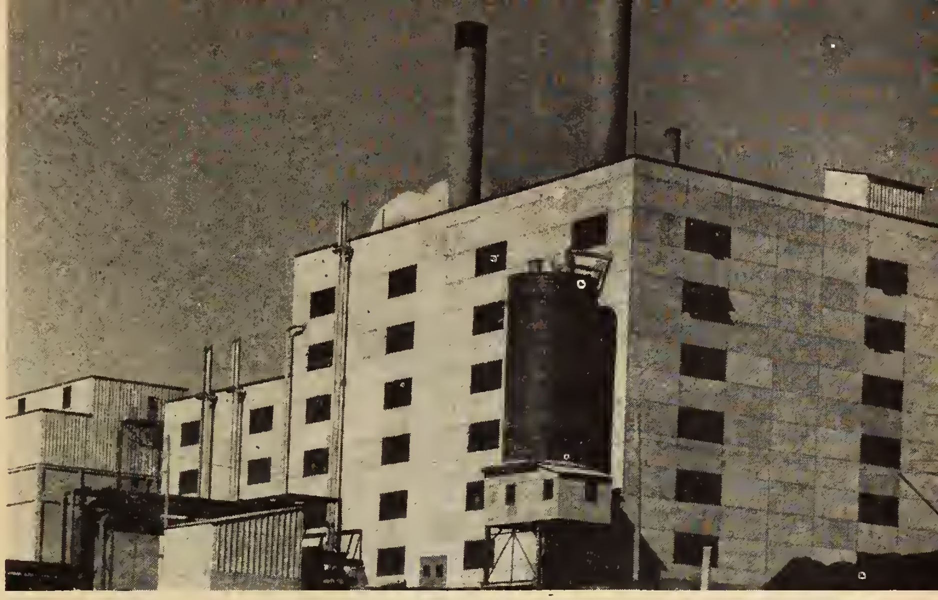


Fig. 4. The steam plant.

Services

When the water pipeline reaches the mill the water is given a preliminary screening through wire mesh filters. The filtered water is pumped to the precipitator floculator equipment, to the boiler feed

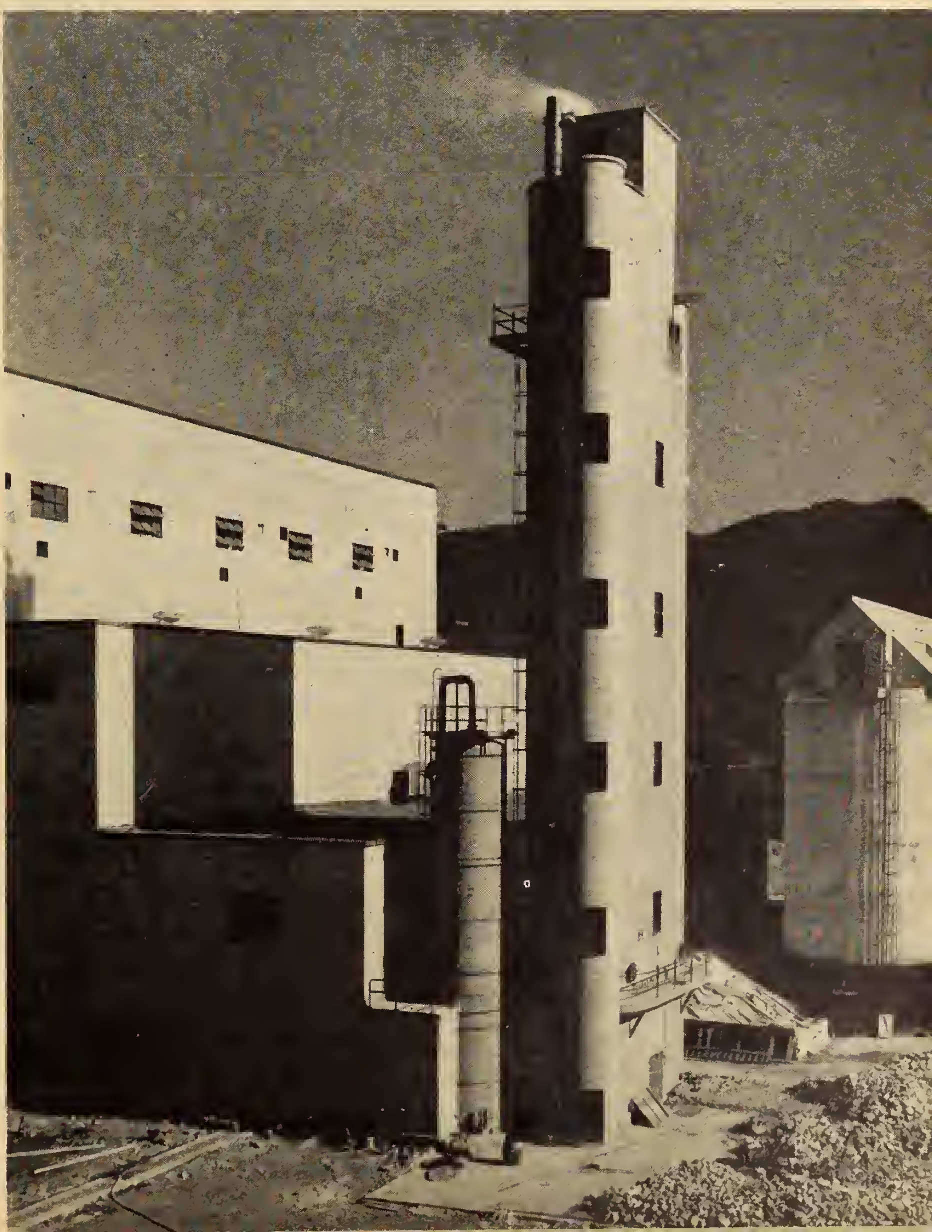


Fig. 5. Acid plant with limestone towers. Sulphur storage silos are in the background.

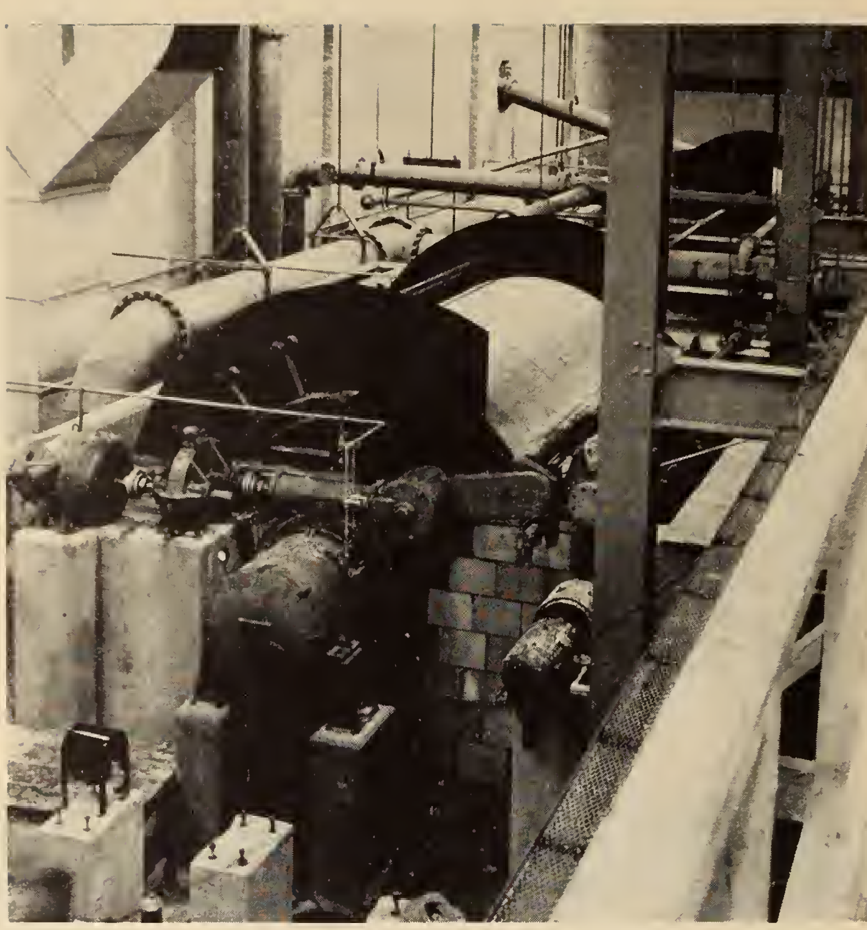


Fig. 6. Vacuum deckers at Sherbrooke.

make-up and to the wood room hydraulic barker supply.

Chemicals for the treatment of water are received in bulk, conveyed to three silos and fed automatically into the mixing flumes ahead of the precipitator. These floculator precipitators work on the principle of slow agitation for floc agglomerization and the formation of a sludge blanket in the upgoing passages of the precipitator. This blanket is set at a predetermined height by the extraction of a sample of water at that height and passing it over photo-electric cells which, by the opacity of the withdrawn sample, automatically controls the increase or decrease of the sludge extraction. The same controls automatically allow the back flushing of the sludge extraction mechanism on a preset scale.

From the top of the diverging channels the clarified water overflows to a concrete launder which supplies the eight 32 ft. x 22 ft. rapid sand filters. The sand filters are rated conservatively at two gallons per square foot per minute. The filtrate is collected below the gravel bed by porcelain collectors, and is conducted away to the clear well from which water is pumped by three 6,000-gallons-per-minute pumps. Water is also extracted from this clear well and pumped to the condenser in the power plant. The water from the condenser returns again to this same clear well. All valves surrounding the filters are controlled from the operating floor. Simple reading of flow meters and loss of head meters give the operator full control of the filtering beds.

The mill is equipped with an up-to-date machine shop, carpenter shop and electrical repair shop. Also available are the large facilities of the Prince Rupert Drydock.

Heat and Power

The steam plant consists of two boilers, which have a continuous rating of 180,000 pounds of steam per hour, with a four-hour rating of a quarter of a million pounds of steam per hour each. The steam is generated at 600 pounds pressure. 750° F. and is taken by the steam main to either of two turbines or to the pressure reducing stations. The two turbines are of 7,500 Kilowatt capacity each. One is totally extracting at 175 pounds pressure and at 75 pounds pressure. The other extracts at both these pressures and also condenses to the exhaust. Pressure reducing stations supply steam when needed by process when this is not provided by the turbine extractions. These stations reduce from 600 down to 175 and from 175 down to 75. The resultant superheat is eliminated by controlled injection in the low pressure steam lines. The generators are equipped with integral exciters. One turbine driven emergency exciter is provided.

Fuel

In the boilerhouse a part of the fuel to be used will be coal mined at Telkwa, B.C. The coal will be received in run-of-mine size, crushed, screened and conveyed away to either the hoppers or to outside pile storage. Reclaiming of coal from the pile storage to the uptaking conveyor elevator boot will be by bulldozer. The burning of coal will be through spreader stokers with travelling grates. Over the main fuel bed the sawdust and bark which has been dewatered in the wood room by a bark press and disintegrated by hogs, is burned in suspension. To extract this undesirable material all flue gases flow through dust collectors to steel stacks extending through the plant roof. Equipment is installed for the pneumatic extraction of ash and dust. This is accumulated in an outside pile storage from which it will be loaded onto trucks and transported away to the various site filling jobs which are planned for it.

Accommodation

During the course of construction it was necessary to house as many as 600 men on Watson Island. Although all of the employees engaged in this operation were on the payroll of Columbia Cellulose Company Limited, the management of the bunkhouses and dining room was under the supervision of a catering contractor.

With the help afforded by the bunkhouses on the Island itself, the City of Prince Rupert has been able to house and provide for the influx of construction and operating personnel. At the same time, the Provincial Government has resurveyed the excellent building site at Port Edward, approximately one-half mile from the mill. When the government puts up this land for sale it is anticipated that many employees will take advantage of this and build themselves.

Hydraulic Model Investigations by the Ontario Hydro

A paper presented before the 64th Annual General and Professional Meeting of The Engineering Institute of Canada, at Toronto, July, 1950.

by

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

Hydraulic Engineer, Generation Department, The Hydro-Electric Power Commission of Ontario.

Investigation of problems in ıydraulic design by models has ɔecn carried on by the Engineer-ng staff of The Hydro-Electric Power Commission of Ontario for nany years. Over thirty separate nodels have been used in these in-·estigations, many of them design-·d to solve a single problem, but ɔthers more complex providing for he investigation of many problems ısually, in each instance, connect-·d with one particular power de-·elopment.

The Commission has in opera-ion or under construction, 65 ıydro-electric plants, a number of liesel and steam electric stations ıf moderate size and, also under onstruction, two large steam elec-ric stations. Their combined peak apacity totals 2,800,000 kilowatts, ınd the transmission system covers ɔractically all of the Province. The ize of the system and the number f its generating plants suggests he reason for the considerable ıumber of hydraulic model tests onducted.

Queenston Development Intake

While the major part of the Commission's hydraulic model test-ng has been carried on during the ıst twelve years, it had its incep-ion thirty-two years ago. In 1917, onstruction of the Queenston De-elopment on the Niagara River ommenced. The site of the intake s about two miles above the upper rapids in the Chippawa-Grass Island pool, where velocities were moderate and where the lateral draft of the water entering the intake might readily carry large amounts of ice into the power canal. Enormous quantities of ice at times enter the river from Lake Erie, causing concern to the designers of the plant for a suitable design for the intake.

Various radically different designs for the structure were considered, and to test their efficacy a model on a scale of 20 to 1 was built in the Dufferin Islands channels adjacent to the forebay of the Ontario power plant, from which an ample supply of water was secured by gravity. The model was built in the early summer of 1918 and work continued through the summer of 1919.

The river portion of the model was 105 feet in width, representing about half the width of the Niagara River outward from the Canadian shore. The maximum depth was about one foot. With such dimensions water velocities were readily measured by a small Price current meter.

The open air model had certain disadvantages. Wind effects usually are troublesome, but in this particular instance were not serious as the area was almost surrounded by tree-clad hills. Inclement weather sometimes caused interruptions, and work had to be discontinued in the fall, although results were urgently needed. It was recommenced in the following summer. One decided advantage was the ample supply of clear water drawn from the forebay of the power plant, and returned to the river after passing through the model. There was no deterioration in quality, as so often happens in the laboratory where the water is recirculated.

Several other models were built in the laboratory at the same time, all of them in connection with the Queenston Development. In these, the problems investigated included the design of certain parts of the

This paper discusses typical hydraulic model tests conducted by the Ontario Hydro since 1917, and particularly over the past 12 years. Included are descriptions of tests for the design of the Queenston intake, for rating flow meters and for loose rock weirs at the DeCew plant, for log chutes, gate closure at Des Joachims and sectional models for Nipigon River developments. The author draws conclusions as to suitable scales and emphasizes the value of trained personnel for testing.

Fig. 1. Log slide, George W. Rayner Development.

Fig. 2. Model of Des Joachims Development showing debris cleared below sill of sluice by water action.

intake, canal bends, and the forebay at the terminal end of the canal. The last named, by contrast with the intake, was on a very small scale. Measurements of water levels were necessarily made with great precision and with instruments designed with this in view. The consistency both of results from tests repeated time after time, and of progressive changes in the design was gratifying.

The model consisted of a straight reach of the canal (a rectangular rock cut with concrete lining, width 48 feet) followed by the forebay and the headworks of the power house. In the prototype there is, 1,000 feet upstream from the forebay, a bend with a deflection of 46° 45'. The curve introduced a disturbance in the flow in the prototype, which altered the flow in the forebay appreciably from that indicated by the model. It was an excellent indication of the necessity of having the conditions in the model conform in all particulars with those to be experienced in the prototype.

DeCew Falls Development

The construction of the DeCew Falls plant near St. Catharines occasioned the construction of five models. The plant, operating under a head of 285 feet, draws its water from Lake Erie via the Welland Ship Canal, the water used being part of the Niagara River waters diverted under international agreement. It was essential therefore that the water diverted be measured accurately, and that a continuous indication of the diversion should be available, to conform with the agreement with the Department of Transport regarding draft of water through the canal.

The intake structure was therefore designed to measure, as well as to control the flow. The water flowing through the intake passes through six tubes seven feet diameter controlled by pivot valves. It was planned to use the differential pressure between certain points on the tubes to actuate flow meters. A model of one of the tubes on a scale of one to 24 was used for the rating and tested under all possibl[e] conditions of water level, flow, an[d] valve setting.

The rating of the flow meter[s] was based on the results secure[d] from the model. After the intak[e] was in service, a series of test[s] extending over several weeks wa[s] conducted by engineers of th[e] Commission and the two Feder[al] governments, and verified th[e] meter ratings. The difficulties en[-] countered in the tests on the pro[-] totype were considerable. Man[y] runs were made useless by surge[s] as ships passed through the shi[p] canal. Conditions in the prototyp[e] are such that a complete ratin[g] under all conditions is impossibl[e]. Extremes of water level are s[o] transitory that tests under the[se] conditions could scarcely ever b[e] completed. The model, howeve[r], provided the answer under all con[-] ditions and its accuracy was con[-] firmed by the verification tes[ts] made in the field.

One model designed to confirm [a] computed result provided some un[-] sought information of value. A irregular weir was designed to control water levels above Wellandvale in the Old Welland Canal, through which water passes from the tailrace toward Lake Ontario. As it was necessary to maintain the water levels rigidly within certain limits, it was important to predetermine correctly the discharge curve for the weir. The model confirmed exactly the computed discharge curve. It also indicated that the wing walls downstream were of a greater height than necessary. The resulting saving in concrete probably paid the cost of all models used on this particular development.

Models of Loose Rock Weirs

There are two separate power houses at DeCew Falls, the older one having a capacity of about 51,500 horsepower at 66 2/3 cycles, and the newer one containing two 25-cycle units of 75,000 horsepower each. The tailrace of the plant is the Twelve Mile Creek, which was improved for a distance of about 3½ miles to its junction with the old Welland Canal.

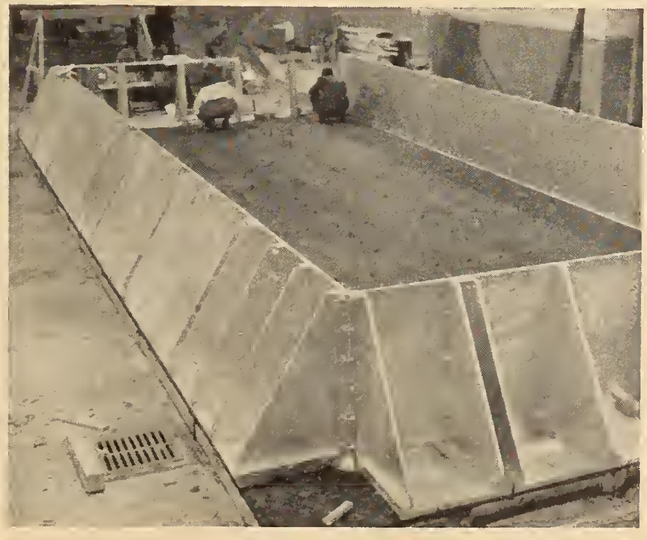
The channel improvements when the second unit was installed were designed to regain the considerable fall in the river channel. In the interval between the time of installation of the first and second units, however, it was necessary to absorb this fall so that, with the increased flow, scouring of the channel would not occur. To this end, five loose rock-fill weirs were used, and models of these were built in the 18-inch glass-sided channel in the laboratory. The conditions varied from site to site so that several separate models were necessary. These weirs had to be built in flowing water, and their stability at all stages of construction was important. Much flatter downstream slopes were necessary in these cases than in a rock fill bulkhead dam with concrete corewall or other types of watertight membranes which do not act as spillways. The models provided information to enable satisfactory designs to be developed for the different sites with regard to rock size, downstream slope, discharge capacity, seepage, and behaviour during construction. The prototypes conformed satisfactorily with the indication of the models.

Log Chutes

On rivers where lumbering operations are proceeding, the construction of a power plant or storage dam necessitates provision for the satisfactory passage of timber drives. Many models were built and tested in the laboratory, and studies were made of the behaviour of numerous log slides and the log-driving facilities in various parts of the country. Conservation of water is nearly always of importance. Investigations in the models were therefore aimed at conformation with this requirement, while effecting a satisfactory draft of logs toward the slide and their discharge from the chute into the river without damage.

Fig. 3. Des Joachims Development. Measurement of forces acting on model closure gate.

Fig. 4. Virgin Falls model. Plywood walls in place.



The design favoured in most instances for the chute itself is in general a V-shaped section, in which the vertex of the V is replaced by a circular arc. The design of the transition from the wide rectangular opening to the chute section is carefully developed, first on the drafting board, and then tested and if necessary revised in the model.

As a means of conserving water over the full range of headwater level and, at the same time, passing the logs smoothly and without damage into the narrow section of the chute, it was proposed to use taintor gates in certain instances. A finely-made model of one of these was built to enable the forces acting on the gate to be measured, a knowledge of these forces being essential for the design of the hoisting arrangement.

Among the slides built recently and now functioning most successfully is that at the George W. Rayner Generating Station on the Mississagi River. (Figure 1.) This chute, six feet deep and seven feet wide at the top, the base being a circular arc with a radius of $1\frac{1}{2}$ feet, conveys sawlogs and pulpwood through a vertical distance of 210 feet from headwater to tailwater, and discharges the timber into a narrow gorge with rock walls. The logs attain a velocity (from measurements in the model) of about 100 feet per second and very few are damaged. A careful examination of one or two hundred logs moving slowly in slack water downstream showed only one with any evidence of damage. It is doubtful if so successful a result could have been secured without the model experiments to give guidance in suitable revisions in the preliminary design.

Des Joachims Development

Models involving a most varied series of studies were those connected with the closure of the Main and McConnell dams at the Des Joachims development on the Ottawa River. The description of the scheme of closure is perhaps necessary in order that the model studies might be understood. The operation was similar in each case, so that the description of operations at the McConnell Dam will suffice.

Nine sluices were left in the dam through which the river flowed after the closure of the main dam. Closure was effected in 39 separate operations, a steel gate frame being lowered in front of the sluice, sealing against the face of the dam below the sill and the intermediate pier sections. Five gates or shutters were then lowered in guides in the frame, shutting off the flow from the sluice.

Behind the gate, forms were then built and concrete placed up to a certain level. The gate was removed and placed in front of another sluice, where the operation was repeated. Three gates were used so that concrete placing was practically continuous, and the water level raised gradually. This method permitted a constant flow through the open sluices to supply power plants downstream.

Several problems, for their solution, called for model investigations. Among these were:

1. Means of preventing an accumulation of debris on the face of the structure below the sill of the sluice;
2. The discharge capacity of the sluices;
3. The forces acting on the closure gate during the lowering operation.

The successful solution of the first of these is illustrated in Figure 2. The action could be viewed in the glass channel, and it is assumed that the behaviour was similar in the prototype. In any event, closures were effected without difficulty in every sluice.

Determination of the discharge coefficients of the sluices requires no comment, but the third item is worthy of special mention. The model of the gate was carefully made to conform as nearly as possible with the design of the prototype. (Figure 3) It became apparent that the uplift of the flowing water was such that difficulty would be experienced in lowering the frame as originally designed.

Various modifications were made to reduce the uplift. In addition four counterweights were provided, each weighing four tons. With these changes, it was deduced from the model that the gate could be lowered in the 38-foot sluice with a head of 24 feet on the sill. In the 39th pour at McConnell Dam, the head on the sill was 23.5 feet, and the gate failed to close completely with all counterweights in place, until about 2,800 pounds of additional weight was added. The close agreement between behaviour of model and prototype was not only gratifying but amazing.

Sectional Construction of Models

Two models worthy of mention because of their size and construction are those of the Virgin Falls dam and parts of the Pine Portage development, both on the Nipigon River. The former had outside dimensions, 18 feet by 40 feet. Both were built of prefabricated parts useable over and over, and adaptable to models of any size in multiples of three feet in width and five feet in length. (Figure 4)

The floor of the model was made up of precast haydite panels five feet long by three feet wide, laid on the laboratory floor and shimmed up to form a level surface. Metal tie strips joined the panels to form a continuous surface. Mastic cement was used at joints and for waterproofing. The walls were made up of plywood sections, with counterforts fastened to the floor slabs. Rubber strips ½-inch square were used to seal all panel-to-base and panel-to-panel joints.

General Comments

The writer offers it as his opinion that a model such as that used for the Queenston intake on a scale of 1 to 20 is unnecessarily large. While it approximates the prototype more closely than one on a scale of say 1 to 50, it introduces certain physical difficulties in securing all the measurements desired. The scale should be as large as possible while keeping the size of the model within reasonable limits.

The laboratory equipment and layout are of great importance, but a more important point is that trained personnel must be available to carry on the work. There has been an immense advantage in the proximity of the laboratory to the engineering offices in conducting the work described in this paper.

Acknowledgment is made of the cordial co-operation of Professor E. A. Allcut and the members of the staff in Mechanical Engineering of The University of Toronto. Credit for the success of model tests in recent years should go to the writer's assistant, Mr. J. B. Bryce, and appreciation is expressed for the energetic assistance and ingenuity of the assistant engineers engaged in the work.

Defence Research in Canada

Dr: O. M. Solandt, Affil.E.I.C.
Chairman, Defence Research Board, Ottawa.

A paper presented at the 65th Annual General and Professional Meeting of The Engineering Institute of Canada, at Montreal, May 11, 1951.

This paper describes the role and the growth over four years of Defence Research in Canada. Within the limits of security regulations, the curtain is lifted on some of the principal activities of the Defence Research Board, in the realm of weapon development in aeronautical and electronic research, as well as in the related fields of mechanics and metallurgy. The growing need for trained scientists and engineers is emphasized.

The Defence Research Board was legally established on April 1, 1947. It is a part of the Department of National Defence, and has the status of a fourth service. The Board is responsible for meeting the research and development needs of all three armed forces. The Board does not attempt to do research on all problems of concern to the Canadian armed forces. It has instead selected a relatively small number of fields of special importance to Canada, or for which Canada has particular resources or facilities, and has concentrated its efforts in these fields. The Board maintains close liaison with the United States and the United Kingdom in order to ensure that the Canadian armed services have the very latest research and development information on fields which concern them, whether or not actual research is being done in Canada.

The Defence Research Board itself consists of twelve members, six ex officio, and six appointed to represent science and industry throughout Canada. The ex officio members include the Chiefs of Staff of the three armed services, the President of the National Research Council, the Deputy Minister of National Defence, and myself as Chairman. The Engineering Institute is well represented on the Board by Dr. Mackenzie, a former President of the Institute, by Alan Cameron of Nova Scotia Tech., and by the Chairman, who has the misfortune to be only an affiliate of the Engineering Institute because of unfortunate deficiencies in his earlier education. Dr. Paul Gagnon of Laval University and Colonel R. D. Harkness, both members of the Institute, are former members of the Board. Many members of the Institute also give invaluable assistance as members of Advisory Committees and Panels.

Four Years of Growth

The Board now has a staff of more than 1,600, and operates nearly a dozen research establishments scattered from Halifax to Victoria and from Toronto in the south to Churchill in the north. The total budget of the Board for the fiscal year 1951-52 is about $35,000,000. This will be divided almost equally between research and development. The greater part of the development expenditure is, of course, being made in industry. The greater part of the research budget goes for the support of the Board's own establishments, but the research expenditure also includes a substantial amount of research being done in the universities and in industry. This budget does not by any means represent the total of research that is being done in Canada for the armed forces since other government departments, especially the National Research Council and the Bureau of Mines, devote a considerable part of their budget to research for the armed services.

When the Board began work there was no immediate prospect of orders for new equipment from the armed forces. It was therefore obviously wise to devote our time and energy during that period to more basic research which would build up a background of knowledge and experience on military problems in Canada. Consequently during the early years of the organization emphasis was on basic research, and the need was for chemists and physicists rather than for engineers. However, now that we are entering a stage of partial mobilization, with the armed forces actively re-equipping with new weapons, there is much greater emphasis on applied research and development, with consequently increasing emphasis on the work of the engineer.

Armament Research at Valcartier

The Defence Research Board took over the Canadian Armament Research and Development Establishment, better known as CARDE from the Canadian Army in 1946. The establishment had been formed on paper by the union of several pre-existing organizations, but had never really existed in fact. Its new buildings had not been completed when the war ended and the majority of its key scientific and technical staff had left before the Board took over. In the ensuing five years the Board has, with the full co-operation of the Army and Laval University and more recently of the Air Force, built CARDE into a research and development establishment for armaments and explosives of which Canada can be justly proud. It is interesting that the majority of those who have been directly responsible for this success are members of the Engineering Institute of Canada. They include particularly Dr. D. C.

Rose, who was the first Chief Superintendent, Mr. Carleton Craig of McGill University, the present Chief Superintendent, and Dr. Paul Gagnon of Laval University.

The establishment is now adequately staffed and equipped to do research and development, design, and even limited production on a wide range of armaments and explosives. It has a very completely equipped explosives pilot plant, and limited outdoor range facilities. It is just completing the construction of an indoor range for ballistic research and measurement. In addition to the good facilities of the establishment, we are particularly pleased with its organization. We feel that we have achieved here a very close collaboration between the services and the civilian scientists.

Service personnel work together harmoniously with scientists in combined teams, the leaders being sometimes scientists and sometimes service officers. This has proved to be very valuable. It gives service technical officers a sound understanding of the problems of weapon development and the scientist a better comprehension of the difficulties of the user. But most important of all, the combination of the user and the scientific approaches in the design team will produce better weapons more economically and more quickly.

An important trend in evidence at CARDE is the increasing application of electronics and photography to the instrumenting and recording of transient phenomena encountered in many of their engineering tests. Strain gauges and piezzo electric crystals trace their reports on cathode ray tubes, which are photographed to give a permanent record. Microflash photography, applying modern developments in radar pulse techniques, permits projectiles to be studied in flight and on impact with targets. These new methods enable the scientist to observe quantities which were previously inaccessible, and to provide the engineer with more accurate design data from fewer tests than has previously been possible.

New Weapons

The development of a new guided missile is just beginning at CARDE. Like all of its kind, it will be a complex device in which all aspects such as structure, aerodynamics and electronics are extremely closely interrelated. This presents some interesting problems in the organization of a development team to ensure that the specialists in each field work smoothly and effectively within the larger plan. I realize that much study has been given by engineers in recent years to improve organization. In this project however, we have not only to make sure that the engineering organization is first-class, but also that scientists such as chemists, physicists, aerodynamicists and mathematicians are all brought together to produce a smooth and orderly flow both of information to the engineer, and of problems from the engineer to the scientist.

We are developing a new infantry anti-tank weapon not unlike the American Bazooka which we expect to be considerably more accurate. On account of some of its novel features this device has presented some difficult problems to the engineers in devising economical production methods.

An improved anti-tank shot for the 17 pdr. and 76 mm. guns has been successfully developed. This shot has improved the accuracy and penetration obtainable with these guns, and has been accepted by both the U.S. and U.K. In our efforts to meet the wide temperature range from far below zero to over 100° above, many problems of tolerances and differential expansion had to be solved. Work is also proceeding on the design of a howitzer for mountain warfare. This is the first attempt at gun design which has ever been made in Canada, even though thousands of guns were produced in this country during World War II.

In this, as in our other armament projects, we have run up against the comparative scarcity of trained mechanical design engineers in this country. This, we realize, stems from the fact that much of our engineering production is based on the designs of others. Until this situation is changed many of our engineers with real mechanical design talent will seek employment outside Canada or be forced, through economic necessity, to concentrate mainly on production engineering. Until these two aspects of mechanical engineering come into a better balance, we will have to rely in peace and in war on the goodwill and co-operation of others. This is a national weakness, particularly in a period of crisis when the resources of others are fully committed. Your Institute, through its many members, can do much to provide the opportunity for young designers to use their talents in this country.

I shall now say a few words about each one of a rather heterogeneous list of other defence research activities of special interest to engineers. I know that you will realize that many of our most interesting engineering accomplishments are secret and cannot be discussed at a public gathering. I hope that these examples of our unclassified projects will give you a clear idea of the sort of work that we do.

For the Armed Services

The Suffield Experimental Station in southern Alberta, again in close co-operation with the Canadian Army, has recently completed the development of a greatly improved and simplified flame-thrower for infantry use. The development of the flame-thrower itself has been paralleled by a series of research projects designed to improve the properties and methods of manufacture of flame-thrower fuel. This work has been done both at Suffield and at the Defence Research Chemical Laboratories in Ottawa.

In the field of naval research, the Board's two laboratories at Halifax and Esquimalt have been concentrating mainly on anti-submarine problems. Unfortunately most of their progress in these fields cannot be reported. They have, however, made some progress in other fields that is of considerable engineering importance. The work of the Naval Research Establishment at Halifax on the cathodic protection of ships' hulls and ships' equipment by the use of magnesium anodes has attracted much favourable attention, and is already being fairly widely applied in industry. This laboratory has also done extensive work in oceanography and particularly in the development of new equipment for oceanographic research.

In the field of electronics, the Board has been working in co-operation with Canadian industry and with the National Research Council, to increase the total volume of research and development effort available to the Canadian armed forces. The Board now operates in Ottawa the Defence Research Telecommunications Establishment. This consists of two sections: the Radio Physics Laboratory, which is concerned primarily with ionospheric and radio propagation research, and the Electronics Laboratory which is concerned with communications and radar problems. The work of this section is closely co-ordinated with that of the Radio Division of the N.R.C., which devotes a part of its resources to military research.

In the course of its work on ionospheric research, the Radio Physics Laboratory has designed and had built by Canadian industry a new automatic ionospheric recorder, which they consider to be the best of its kind in the world today. The Board has also given active support to various projects for the development of techniques and equipment for electric computation in Canada. We feel that before long electronic computers will be an essential part of a wide variety of military equipment, including especially data transmission and fire control systems. We therefore felt that it was important to build up a foundation of knowledge and experience in this field in Canada. This has been accomplished not only by contracts with industry but especially by support of the Computation Centre at the University of Toronto, where a small group of scientists have already made substantial contributions to computer design.

Aeronautical Research

In the field of aeronautics, the Board has supported a comprehensive programme to strengthen aeronautical research, design and development along the chain from fundamental research through basic research, design and development to production and use. The Board gave the University of Toronto a grant to set up the Institute of Aerophysics, and to equip it with a supersonic wind tunnel for postgraduate training. It has also supported gas dynamics research at McGill. To cover the field of applied research and development it has supported the setting up of the new National Aeronautical Establishment. This Establishment was recently formed as a separate entity. Its policy is laid down by the National Aeronautical Research Committee, and it is operated for this Committee by the National Research Council.

The new establishment has been formed out of the aeronautical research and development staff and facilities of the National Research Council, both at the Flight Research Section at Arnprior and at the main laboratories on the Montreal Road. A large expansion of the staff and facilities, especially for flight research, will take place in the very near future. The new extension of the airfield at Uplands was specially designed to meet the needs of this Flight Research Section. A new hangar and ancillary buildings have been planned for Uplands, and will be built this year. When the buildings are complete, the Flight Research Section of the N.A.E. will move from Arnprior to Uplands. It is hoped that this will mark the beginning of a new era in aeronautical research and development in Canada and that before long the Canadian National Aeronautical Establishment will become as famous as the Royal Aeronautical Establishment in Farnborough, the N.A.C.A. Laboratories at Langley Field, or the U.S. Air Force Establishment at Wright Field.

In Mechanics and Metallurgy

In the field of mechanical engineering, the Board has supported very interesting work being done by engineers and physicists at the University of Toronto and at the University of Western Ontario, aimed toward the production of a heat pump for use in the Arctic. This pump is intended for use where unfrozen water can be obtained beneath the ice in lakes. The pump freezes this water and makes use of latent heat of freezing as a source of additional energy to increase the efficiency of the pump. Trials have shown that the idea is practicable. There remains only the minor problem of getting rid of the ice. The experts have so far been unable to find any ready market for ice in the Arctic.

You will also be interested to know that the Defence Research Board is co-operating with the Board of Mines, the University of Toronto, and industry in a comprehensive programme of research and development on the processing and use of titanium and titanium alloys. We feel that this is a field of great potential importance to Canada, and one to which we can well afford to devote a considerable part of our effort. Another item of interest is work on the development of a new type synthetic rubber, items from which will retain their flexibility at temperatures as low as —65° F., and of an oil resistant synthetic rubber with improved low temperature flexibility.

From the point of view of the Defence Research Board, the most important event of 1951 has been the formation of the Department of Defence Production. We in the Board have always actively supported the idea that the chain from research through design and development to production and use is a continuous one. It must be arbitrarily divided for purposes of administrative convenience, but these arbitrary divisions must not be allowed to prevent the free flow of both ideas and people up and down the chain. As long as there was no Department of Defence Production we felt that there was a link missing in the chain. We are now busily co-operating with the Department of Defence Production to try to complete this link.

Need More Engineers

It is a link which connects research and development to production. It will be partly in the Defence Research Board, partly in the Department of Defence Production, and partly in the technical branches of the armed services. Wherever the parts of the link are located they must be composed of highly skilled research minded engineers, who can talk as equals to the research scientist on one hand, and to the production engineer on the other. We are quite sure that the right kind of people for this job are available in Canada, but we are equally sure that the number that is available will not be adequate to our growing needs. We feel that because of this the Defence Research Board must do everything possible to support the universities in their task of supplying engineers. The Board must also try to divert a proportion of the best engineering graduates away from the more practical aspects of engineering toward applied research, design, and development. √

Montreal's Master Plan for Improved Traffic

by

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Commencing with a discussion of city traffic problems generally, this paper lists the many contributing causes of present street congestion and trends that have added to its severity. Measures for relief are of two main types; regulatory measures, which can be applied as a short-term remedy; and street improvements as a longer-term permanent cure.

Plans for city boulevards for Montreal, and later for a subway, are enumerated. Other proposed remedies are related, such as projected expressways, street widening and tunnel projects. In conclusion the author tells what has been accomplished to date, of the measures proposed in the "Master Plan" published in 1944.

The advent of the motor vehicle brought about a social and economic transformation that is nothing less than a revolution in human affairs—the automotive revolution. It has not only altered transportation, together with the methods and processes of production and distribution, but even the very pattern of our community life.

From wagon trails came the sweeping curves and broad straight ribbons of the modern highways. But all the vehicles of our mechanized age move into the jaws of a huge trap when they enter our cities with their network of streets. As automobiles have rolled off the assembly line and traffic controls have multiplied, pressure on existing street facilities has produced in succession: delays, congestion, stagnation, mounting economic losses to motor users, with the attendant loss in assessed valuation in cities and the creation of blighted areas.

It has come as almost a surprise that our once highly developed city street systems have become totally inadequate. In the past, emphasis had been placed upon the development of a network of rural highways connecting the more important centres of population. City dwellers were strong supporters of such policies since from early days, city streets had been improved to a high standard. Now the situation is in reverse. City streets laid out and improved many years ago are totally inadequate, and have become the most serious bottleneck in vehicular movement.

In pioneer days the surveyor had laid out the land in huge sections, and road building followed these criss-cross section lines. The road system was thrust into a strait jacket. Today, the street system occupies about 30 per cent of the urban area. However, there is not sufficient room for automobiles, nor even enough open space in the entire business centre to park all the cars entering daily.

Complexity of The Traffic Problem

With all the talk of traffic congestion, most commentators have lost sight of one of the most basic causes. Our roads were overcrowded, and traffic had risen steadily over a period of years, but most of us had ignored another steady and inevitable force that had built up concentrated activity on the highways, especially in the urban areas. Some people call it a rise in the standard of living.

Moreover, during the great depression a decade ago, the shorter week was started to spread employment. This has not only increased our leisure, but during the reduced working period, it has concentrated all types of activity, including traffic on the highways. Fuel deliveries for heating alone on a five, instead of a six day per week basis, increased 20 per cent. Taking a square mile in any of the larger cities, with a 200-day heating period per year, we would require about 10,000 truck loads of fuel to heat buildings in the area. The increase in truck activity would be from 50 to 60 truck loads per day. When all other deliveries are similarly increased, one can readily visualize the concentration in traffic from this source alone.

There are also the freight-handling agencies; the local bus or street car company, with their problems of mass transportation; taxi-cab companies, the purveyors of vehicle and parking services, the public utilities, the railroad depots and terminals, the intercity busses, the municipal airports and the ground links to air transportation.

Many agencies are interested in the street system planning, acquisition, design and operation

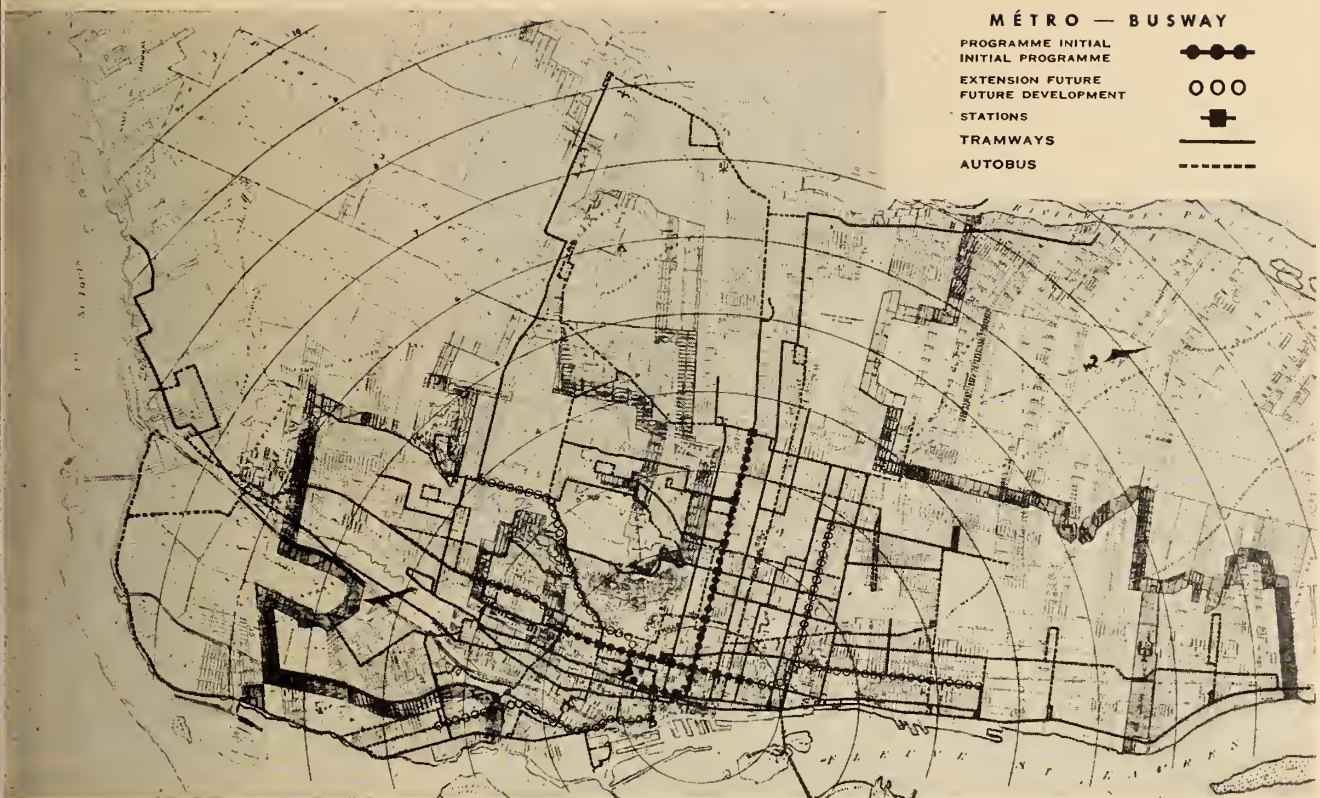


Fig. 1. Map showing proposed routes for Montreal subways.

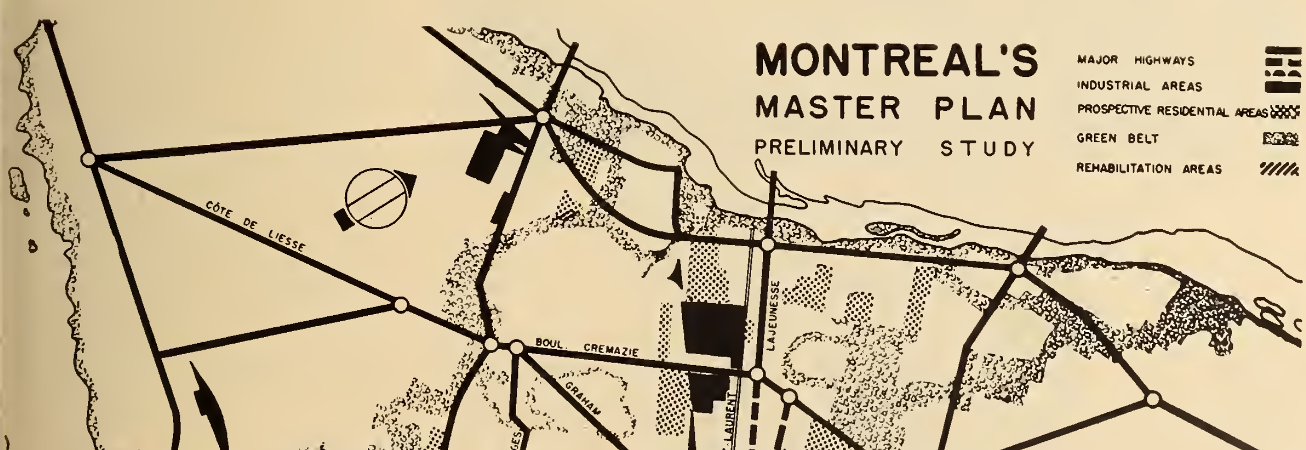


Fig. 2. Map showing preliminary studies for Montreal's Master Plan.

Fig. 3. Intersection of Interboro and Grand Central Parkways in the Borough of Queen's, New York City.

namely the police department, the engineering department, the city planning, public utilities, street lighting, legal departments, and in some instances the traffic engineering department. Under a democratic government, expenditure of public funds requires the approval of elected representatives.

In Montreal, to solve its traffic problems, the City has depended chiefly on the co-operation of three departments: The City Planning Department, concerned with transportation problems, the creation of a system of main arteries, street widenings, and extensions; the Police Department, whose duty is to assure the orderly flow of traffic by traffic signals, one-way streets, sign-posts, enforcement of the traffic by-laws; and the Public Works Department which carries out the construction and maintenance of streets.

Traffic Safety

In recent years, the major preoccupation of city dwellers and their governments has been the reduction of hazards and delays arising out of vehicular traffic. This concern showed itself in increased emphasis in the reorganization and tightening of traffic safety regulations.

The street system is killing and maiming people, while engineering and enforcement could rid street use of its major hazards. In six years of war more than 94,000 Canadian servicemen were killed, wounded or missing. Concurrently, at home, 10,000 Canadians were killed and 160,000 injured in traffic accident. In 1949, 44 Canadians were killed and 843 injured each week by automobiles, while property losses from automobile accidents amounted to $19 millions. In 1949 Montreal had the highest record of 132 deaths.

At least half of the traffic facilities occur in cities and cause tremendous property loss. These losses are not only from collision, but from depreciated land value that results from inaccessibility of urban marketing areas for much of the population involved.

In passing it is interesting to note how traffic safety compares with other public safety activities. All buildings are subject to rigid construction codes, and to careful inspection. The enforcement is always left to technicians or experts. Fire prevention is vigorously pursued in most instances. Public health measures are carried on relentlessly to rid our community of diseases. Public water supply, sewerage, garbage disposal, food inspection and many other health measures now are provided as a matter of course.

In almost every type of public safety *except traffic*, action follows immediately when neglect of duty is evidenced by the loss of life or the dissipation of resources. A fire resulting in injuries is always carefully investigated and punishment meted out. A single accident, like the crash of a plane, grade crossing accident or a collapsing bridge may bring about investigations resulting in major changes in laws, codes and policies. However, the chances of such accidents are remote in comparison with the accident frequency on our streets.

Remedial Measures

Traffic has given cities their form, and traffic will change cities' form or take it away altogether. While many of us are worrying about our cities being atom-bombed, the automobile has already accomplished a less spectacular but quite effective job of devastation. Its explosive effects have pushed sections of our cities far beyond the corporate limits, never to return to the property tax rolls. However, it is not the motor vehicle which has created city congestion but rather obsolete street and transportation systems and excessive population density. The city is strangling itself with the congestion of vehicles that are themselves choked in the tangle of the city streets.

The remedies at our disposal are of two distinct types: first, those which deal with the regulation and supervision of traffic, and second, those which deal with physical construction and the planning of improvements. The former may be considered as fitting the traffic to the streets, and the second as fitting the streets to traffic. The first is merely a palliative, it is only the use of tools to the best advantage. But to plan is to provide new tools. Stops at intersections, one-way streets, parking bans, partial street widenings, narrowing of sidewalks near intersections, and other similar regulations and improvements are necessary remedies, but only partial solutions. Cities must be planned, and their activities correlated in term of transportation. Whereas the railways provided suitable tracks before high speeds were developed, no such provision was made for motor traffic. The whole system of major roads is like a railway without sidings.

Every type of vehicle has a specific use, and roadways must be designed to fit them. Each mode of transportation has its own respective advantages and limitations. The city of tomorrow must adapt its street system and land uses to these characteristics. They become the elements of urban design with which the city is to be formed. Interference to fast through traffic must be reduced by controlled-access expressways and provision of off-street loading and parking facilities. For example, a well designed 4-lane expressway will carry, at twice the average speed, the same number of cars as five 40-foot wide ordinary city street pavements, on which parking is prohibited and with favourable control of cross traffic from intersecting streets.

In seeking permanent solutions, the planner ought to take into consideration land uses, which constitute a basic element of all traffic problems. Sources of traffic must be classified and their location determined in relation to street capacities, and vice versa, if built-in congestion is to be eliminated. Centralization requires balanced transportation facilities especially in relation to mass transportation, off-street loading, vehicle storage and elevator capacity. Rockefeller Center in New York, and the Merchandise Mart in Chicago, are illustrations which demonstrate that centralization produces interesting benefits that can be reaped, if large groups of businesses concentrated on small land areas are adequately served by integrated facilities for horizontal and vertical transportation.

All traffic experts agree on the essential requirements for the future, namely that:

1. Sidings must be provided for automobiles.
2. A sharp line must be drawn between traffic thoroughfares, and local roads, where people live, shop and have their business and amusements.
3. Building development must be divorced from traffic arteries.
4. The wanton exposure of pedestrians to vehicular traffic must be stopped.

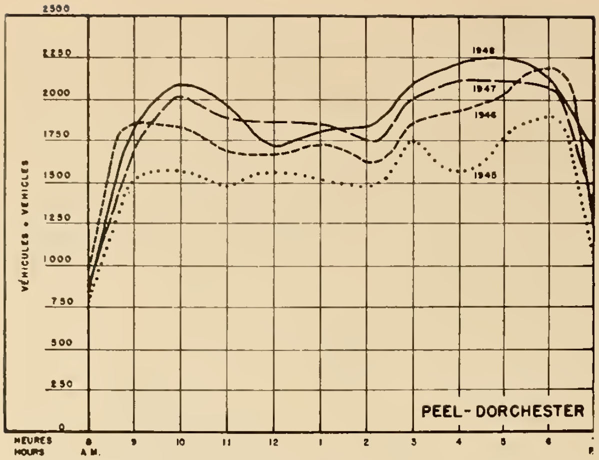
For adequate traffic solutions, a lot more urban space will be required than the old standard of one-third, established during the horse-and-buggy era. This means the destruction of the present land-uses, the elimination of numerous vested property rights and the compensation of huge investments already made upon these land-uses.

Gradually city planning ought to bring the necessary transformation in the city fabric, so that its skylines will take a distinctive form, reflecting the functional designs of a motor age. But time measured in generations will be needed. In the meantime, immediate measures have to be adopted in order to cure such traffic pains, as confusion, congestion, lack of parking places, accidents and costly delays. That is why such emphasis has been lately placed on traffic engineering, through the establishment, or staff expansion of traffic engineering departments.

The traffic engineer finds himself responsible for forcing the movement of the irresistible force of traffic through the impenetrable obstacle of congestion. He is in fact a repair man, a first-aid traffic corpsman, using negative control to avoid paralysis. He has to devise expedient measures to cope with immediate traffic problems in the form of first-aid treatments. But, even the most optimistic construction programme, can never be expected to solve all traffic problems. New traffic ways will serve only a part of the average city. Many areas will continue to depend for transportation services on existing roadways.

The effective operation of the existing street system involves utilizing to the best advantage exist-

Fig. 4. Gowanus Elevated Highway, in the Borough of Brooklyn, New York.



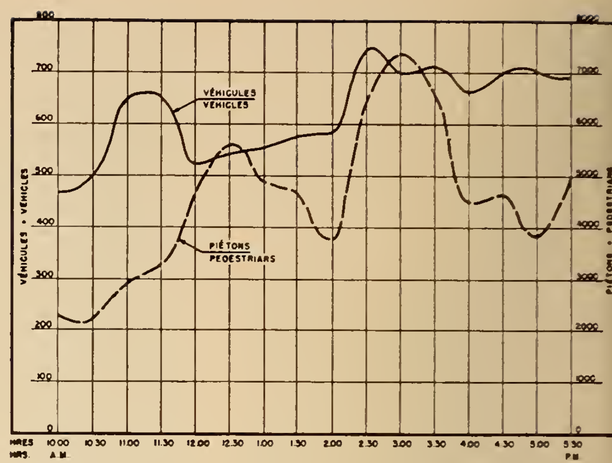


Fig. 5 (left). Hourly variation in traffic volume at the corner of Peel and Dorchester Streets, in Montreal.

Fig. 6. (right). Hourly variation in vehicle and pedestrian traffic at St. Catherine and University Streets, Montreal

ing streets through, among other means:

1. Control measures;
2. Installation and operation of traffic control devices;
3. Localized structural changes to the streets;
4. Effective utilization of public transit, etc.

What is most urgently needed for Montreal during, let us say, the next two years, might be the implementation of such a programme of traffic easement, in order to make the best and maximum use of our today's streets. However important and urgent may be such traffic easement measures, we cannot expect them to perform miracles, and, in the long term, extensive physical improvements will hold out the only real hope for relief.

In making use of immediate measures, one of the most common errors is uncovered when the citizen honours regulations more in the breach than in the observance. Traffic signs are frequently posted which are of no significance whatever to the street user. Theories of licensing will not work in practice, because the public do not wish the resultant restrictions imposed. Impressive designs of traffic facilities may be constructed which result in utter confusion. A few well conceived traffic policies applied uniformly, and of such simplicity that they are generally acceptable, are far better than elaborate schemes, which prove to be unforceable and inapplicable. On the basis of these planning concepts, let us examine briefly the activities pursued by Montreal in relation to the preparation and implementation of a master plan for improved traffic.

Master Plan of Main Thoroughfares

In a report entitled "Planning for Montreal", published in November 1944, the City Planning Department presented a preliminary plan of main thoroughfares, aimed at "removing congestion from the centre of business, linking city streets with the provincial highways, relieving over-burdened thoroughfares, ensuring easy connections between the city and harbour and the satellite towns. This Master Plan has gradually taken shape, since the City's powers of homologation permitted it to reserve the land required for proposed streets.

The Department has conducted yearly traffic surveys since 1945, to obtain facts pertaining to the characteristics of traffic patterns. Parking surveys were also conducted throughout the central area in 1946 and 1947. These included tabulations of all parked cars within a designated area, to determine present and future needs for parking facilities. Having ascertained the reasons for these traffic conditions the Department has determined that remedies should be applied to:

1. Increase the capacity of the down-town section to absorb more traffic.
2. Facilitate access to the central section.
3. Route the traffic created by large industries and provide for the future development of the outlying districts.

The Central Area

The central area of a city must be kept in good running order, to increase its capacity to absorb traffic. Difficulties in the way of widening streets in the central area, to adapt them to present traffic needs, make it obligatory in some instances to increase their capacity by establishing one-way streets, and keeping unnecessary parking or heavy traffic away from congested streets.

What the central area lacked most was a distributing artery. This was the primary object of the wide boulevard recommended to the civic authorities, along Dorchester Street, from Guy to Beaver Hall Square, 104 feet wide, and from Beaver Hall Square to De Lorimier, 120 feet wide. This artery will relieve the important east-west arteries, as well as those running north-south.

Some cross-streets will have to be widened to accommodate more traffic or to divide it close to its destination. It is with this end in view that the need was demonstrated, for improving Saint Urbain Street, especially at Sherbrooke Street; widening Cathedral Street; widening University Street from Dorchester to Saint Paul; for linking Windsor Street to Colborne through Bonaventure Station, and for widening Saint George and Sanguinet Streets south of St. Catherine. The removal of tramway lines in the central district would certainly relieve congestion along main arteries. But such measure should be compensated for by allowing other less cumbersome means of mass transportation to be more fully developed.

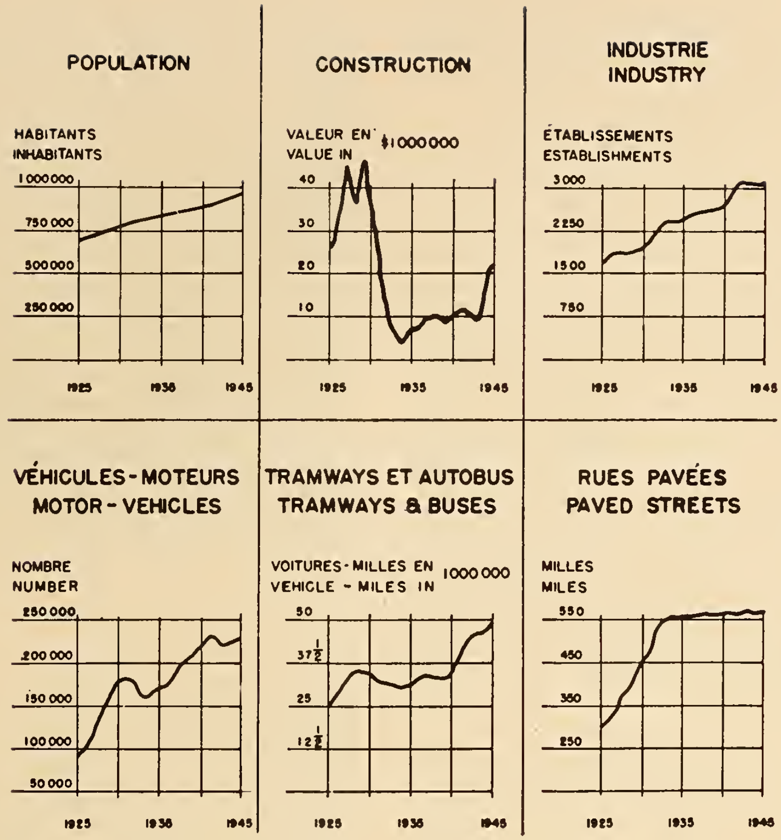


Fig. 7. Growth factors in Montreal over a recent twenty-year period.

Parking

The parking problem, in the central area particularly, has taken on a tremendous importance. The principles in regard to parking are briefly summed up as follows: The city is responsible for dealing with the problem of parking by whatever means may be necessary. Theatres, hotels, office buildings, etc., should provide their own off-street storage space for the parking they attract. All-day and overtime parkers should be prohibited. In certain streets with high curb turn-over, where commercial loading and unloading at the curb will permit, parking may be employed with restrictions and control. In the long-term programme, most heavily travelled streets in congested areas must be cleared of parking to permit the free flow of traffic.

The Planning Department has recommended the following measures:

1. A by-law requiring off-street parking spaces within certain types of buildings for use of the occupants;
2. Acquisition of suitable vacant lots in the central area for parking;
3. Two large underground parking garages at Champ de Mars and Dominion Square.

Access Roads

Main streets leading to the centre no longer provide for smooth traffic. They are congested by heavy local traffic, and the nearer the centre, the narrower they become. Census figures — showing the extension of housing and industry in the suburbs are mute evidence that critical conditions prevail on our city streets. Each day, suburbanites must travel over streets which patently have not been built for such a decentralized way of life. For example, in the Cote de Liesse traffic circle area only, employment has increased by 30,000 over the past decade; small wonder that a flood of motor vehicles congests the major traffic arteries from suburbs to downtown areas. Prevention of such "floods" is neither possible nor desirable. However, "flood" control, despite its expense in city areas, is possible and must be undertaken if the economic life of the City is not to be throttled.

Expressways would provide a radical solution, and would facilitate access to the centre. The City Planning Department has studied the necessity and possibility of a number of expressways, and the best available location for them. An east-west expressway, about 14 miles long, has been designed to link the highway leading to Toronto with the Jacques Cartier Bridge, by traversing the industrial section in the west part of the city, then running along the Harbour, with possible extension eastward to Viau Street and Bout de l'Ile. This expressway would particularly serve the industrial zones along the Lachine Canal and the river, and would eliminate heavy traffic from the main thoroughfares through the down-town area. An east-west expressway appears more urgently needed than one from north to south, because the building of the proposed subway may relieve the north-south arteries to such extent that for many years to come, widened boulevards will meet the needs in that direction.

Outlying Districts

The decentralization of industries throughout the city and metropolitan area has resulted in heavy truck traffic, as well as daily mass movement of the population. Over the last ten years, more than 2400 new industrial buildings were erected all over the centre of the Island. In order to carry the traffic created by these industrial zones, appropriate concentric arteries are needed. It would be unsound to try to correct previous mistakes downtown, if the same mistakes were repeated in outlying sectors now being developed.

Several projects have been put forward, such as the extension of Saint Joseph Boulevard, between d'Iberville and Pie IX Boulevard; the widening of Jean Talon Street between Saint Andre and d'Iberville and its extension westward to Décarie Boulevard, via Graham, Dresden and Namur; the extension of Mount Royal and Marie Anne Streets to link with Rachel Street; the widening of Lajeunesse, from Jean Talon to Villeray; the redesign of Snowdon Junction, removing the tramway loop and providing a direct crossing to the Décarie Boulevard traffic through Queen Mary Road; two new vehicular tunnels under Lachine Canal at Saint Remi Street and Atwater Avenue; extension of Christophe Colomb Street under the C.P.R. to Saint Gregoire, the opening of

Cavendish Boulevard, between Upper Lachine Road and Cote de Liesse, and the completion of the Metropolitan Boulevard.

What Has Been Done So Far

Studies such as these have paved the way for a realistic long term policy. As for short-term projects, for the utilization of streets, the civic authorities a few years ago set up an Advisory Committee on which have been sitting representatives of the Police, Public Works and Planning Departments, the Tramways Company, The Automotive Transport Association and the Royal Automobile Club. This Committee has recommended the prohibition of parking along some of the most crowded streets, the establishment of logical zones of one-way streets, and local improvements such as the reducing of the central mall on Saint Joseph Boulevard west of Park Avenue, and other similar measures.

In 1947, the City Council approved a by-law authorizing the borrowing of $10 millions for expropriation, as well as the necessary legal procedures to make possible most of the projects recommended, appropriating more than $10 millions on the basis of the assessed values only of the properties affected. In 1949, the City Council authorized the borrowing of another $16 millions for expropriation and other improvements such as the tunnels at Cavendish Boulevard and Christophe Colomb Street. To date, improvements have been carried out at Snowdon Junction, at the intersection of Sherbrooke and St. Urbain, and in the widening of Cathedral Street. Removal of existing buildings is completed or under way on the University, St. Maurice, Isabella Street projects and the intersection of Craig and Bonsecours Streets. Property has been acquired for the Lajeunesse, Jean Talon, Mount Royal, Marie Anne and Frontenac Street projects, for the widening of St. Lawrence-Cremazie intersection and for the Christophe Colomb tunnel under the C.P.R. Legal preceedings are already under way for another six projects.

Agreements have been reached with the federal government for the building of two tunnels under the Lachine Canal, at Saint Remi Street and at Atwater Avenue. The former is almost completed and work on the latter will start this month. These two tunnels will cost over $10 millions, of which the City's share is a third. An exchange of property worth more than $750,000 was completed with the C.N.R., making possible the demolition of the old St. James Hotel and the widening of Cathedral Street between St. James and Notre Dame. Next summer, Windsor Street may be joined directly with Colborne Street and a parking lot for 200 cars provided by enlarging Chaboillez Square. Money has also been appropriated and plans are almost completed for the tunnels at Christophe Colomb and Cavendish Avenue, under the C.P.R. tracks.

A special by-law was adopted in 1949, compelling the owners of new buildings of 10 storeys or more to provide parking for the occupants. To apply this to buildings of less than 10 storeys the City Charter would have to be amended. Another by-law being considered will authorize temporary permits for establishing parking lots in any part of the City under certain conditions. A by-law is also under preparation to require off-street loading and unloading space in certain types of buildings.

In order to devise means of carrying out its improvement programme, authority was sought by the City from the province to create a Board of Research on Traffic and Transportation Problems. Following enactment of legislation, the City Authorities in July, 1949, appointed the members of that Board of Research, the objective of which was to set out a programme and recommend ways and means of implementing it. In November, 1949, the Board of Research recommended that the following be built:

1. The east-west expressway;
2. A subway system comprising a north-south line under Saint Denis Street, an east-west line under St. Catherine Street, and a downtown loop by Craig Street;
3. Three underground parking garages at Dominion Square, Champ de Mars, and Berri Street;
4. Various street widenings, extensions and intersection improvements, already recommended by the planning department.

Transportation Commission

In January, 1950, the Board of Research forwarded to the City Council a draft Act to be submitted to the provincial legislature, which would authorize the City to acquire immediately the Montreal Tramways Company, and create a Montreal Transportation Commission which would operate the transportation system and would be entrusted with building the subway and expressway. With regard to street widenings and other local improvements, the Board concluded that these, as well as the expressway, could be financed out of current City revenues. The Board of Research believed that private initiative would help with parking garages, as was the case with the four-storey underground garage for 1,700 cars, under Union Square in San Francisco. This garage is a money-maker and, more important

Fig. 8. Lakeshore drive, Chicago.

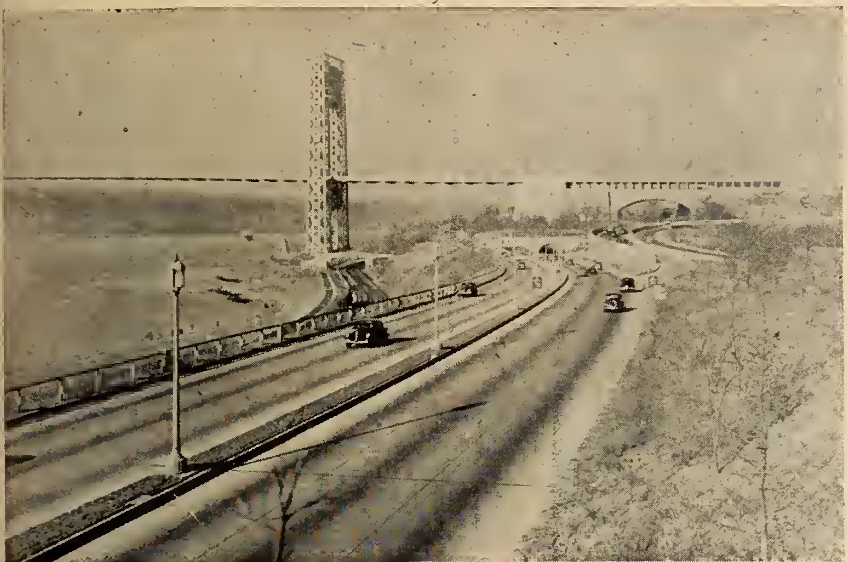


Fig. 9. Henry Hudson Parkway, near George Washington Bridge, Manhattan, N.Y.

still, it helps rid the vicinity of an intolerable parking jam.

Following the adoption by the Provincial Legislature of Act 14 George VI, Chapter 79, a Montreal Transportation Commission was created in August, 1950, charged with bringing an adequate solution to mass transportation problems. The members of this Commission were appointed last November. As for the expressway, to avoid unnecessary delays, the City has appropriated funds for a survey of the right-of-way. This survey is now completed for the central section, between Atwater Avenue and Jacques Cartier Bridge.

Planning Done, Action Needed

The foregoing is but a brief summary of the municipal activities so far carried out, to assure Montreal of an adequate traffic system. The studies undertaken by the municipal departments concerned have provided the city authorities with a comprehensive programme, the implementation of which should result in general benefits, both toward a functional solution of our traffic problems and the provision of a stimulus to private enterprise.

The way for improvement has been pioneered. To reap the full benefit requires increased facilities which cannot be done without any longer; it requires organization, as well as co-operation from the many and varied groups concerned with various phases of the problem. Finally, it demands of each citizen sufficient self-restraint and a sense of responsibility commensurate with the measure of traffic improvement needed to keep our City progressing. √

The First Canadian Aircraft

An important milestone in Canadian aviation history was passed recently at Malton airport near Toronto, when the Avro Orenda-powered CF-100 twin-jet fighter made its first flight. Since its engines are the first production aircraft engines to be designed and built in Canada, the CF-100 is the first all-Canadian aircraft of any type.

The flight may be said to have marked the coming of age of Canada's aircraft industry. During the war Canada produced more aircraft per capita than any democratic nation but had to import the engines to power them. Now the CF-100 is being considered for use by other countries in the North Atlantic Treaty Organization. Its exceptional long range, unusual in a jet fighter of such speed, fire power, manoeuvrability, and rate of climb, will carry it across the Atlantic non-stop with ease. Full performance details are secret but it has been authoritatively described as being at least two years ahead of anything similar in the United Kingdom or United States.

It has been satisfactorily flight tested by the R.C.A.F. and by the U.S.A.F. at Wright Field in Ohio. It has been demonstrated to the heads of the French and Norwegian Air Forces, to the U.S.A.F. in Washington and to the U.S.A.F. Association in Boston. On this last occasion "Air Force" magazine, the official organ of the association, in speaking of "Canada's remarkable CF-100 fighter" said that its performance was the "highlight of the aerial display." At Washington the press said, "The demonstration showed off to good advantage, the CF-100's ability to turn inside anything". Its short landings and take-offs were acclaimed.

The Avro Orenda CF.100 fighter.

FROM MONTH TO MONTH

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

1951 Student Conference

The annual conference of student delegates which has become a permanent part of the Institute's Annual Meeting was held this year at the Mount Royal Hotel on May 8th, the day preceding the official opening of the meeting. (See the June issue Page 559.)

The minutes of the meeting were reproduced and have been passed to all those who participated. From these minutes have arisen certain resolutions and recommendations which will be of interest to members. Action is in hand and comments or suggestions are solicited. Here are the resolutions and recommendations:

It is resolved:

(1) That the E.I.C. conference delegates undertake projects to aid and further counselling of High School students with regard to engineering education.

Recommended that the student delegates conduct, in their own areas, during the 1951-52 session, experiments in counselling high school students in order to determine a basis for the formulation of counselling techniques. The results of these individual experiments would be presented at the 1952 E.I.C. conference at Vancouver. It is intended by the student delegates of the 1951 conference that the counselling plan be continuous with an aim of attaining a satisfactory counselling system in Canadian high schools. It is suggested that the Institute attempt to provide the engineering undergraduate societies with material pertaining to the professional guidance tests which are available. It is also suggested that the delegates procure speakers, where necessary, through their local branches.

(2) That in future student conferences, items of student section business relating to membership, interest, and activities be included in agenda only as points of exchange information rather than topics suggestive of general action.

It is recommended that prior to discussion, each delegate shall present a brief outlining his own society's organization and activities.

(3) That the student societies endeavour to increase student interest and membership by the most effective means at their disposal.

It is suggested that each student delegate inform his student body of the ideas, proposals, and decisions presented during the conference.

(4) That the inter-society contacts established at the annual conference be maintained throughout the year.

Recommendations—

(a) That the engineering societies communicate voluntarily with each other on matters of current and general interest including exchange of information regarding society business.

(b) That undergraduate societies contribute substantially to the news section of the E.I.C. Journal.

(c) That the publications committee be approached with regard to the possibility of printing, under a sub heading of branch news, all student society news submitted.

(5) That the Institute executive be requested to furnish university engineering undergraduate societies with copies of all main and sub committee reports.

(6) That the idea of a case history booklet be dropped completely as being of little value to engineering students.

Resolutions Committee:
*R. Foxall (U.B.C.).
D. Young (Manitoba).
D. Sherk (Toronto).

*In the Annual Meeting report in the June issue of the *Journal*, the name of R. G. Foxall, of the University of British Columbia was omitted from the list of delegates to the Annual Students' Conference (page 560).

Mr. Foxall took a most effective part in the deliberations and was, in fact, named chairman of the Resolutions Committee. The *Journal* sincerely regrets this omission.

Cover Picture

On the cover this month is an aerial view of the new plant of Columbia Cellulose Limited at Watson Island, about nine miles south of Prince Rupert on the British Columbia coast. Details of this important new addition to Canada's pulp and paper industry are included in the two leading articles of this issue.

A Tribute to the Profession

The mural depicted in the accompanying photograph will be of interest to Canadian Engineers. It was painted recently by Adam Sherriff Scott, R.C.A., well known Canadian artist, for the Engineers Club of Montreal.

This Club, well known throughout Canada and the United States, was founded in 1902, received its charter in April 1903, and opened its clubhouse on Dorchester Street, Montreal, in the same year. The present clubhouse on Beaver Hall Square was occupied in 1908.

The first president of the Club was Percival Walter St. George, M.E.I.C., M.I.C.E. (1849-1923), City Surveyor of Montreal 1883-1900 and Charter Member of the Canadian Society of Civil Engineers, now the Engineering Institute of Canada. The charter membership consisted of 150 engineers, other members being known as privileged members. At a later date the membership was made open to members irrespective of their occupations or professions. The secretary-manager of the Club is Major E. de L. Greenwood (R.M.C.) who served with the Royal Engineers in France 1914-1918.

Mr. Sherriff Scott writes:

"The idea behind the mural is simply that engineers are the servants of industry and I have attempted to build up from the dam and pylon in the middle foreground a background of industry in general. That the Bell Telephone building, the Jacques Cartier Bridge and Mount Royal are part of the scheme is purely incidental and to give a touch of local colour".

The St. Lawrence Waterway

At the Annual Meeting of the Institute in 1946, and again at this year's meeting, J. G. G. Kerry, M.E.I.C., retired former partner in the Toronto consulting engineering firm of Smith, Kerry and Chace presented papers to suggest that it might be feasible to construct the proposed St. Lawrence waterway in such a way that it would remain ice-free throughout the year.

The designs which would achieve this objective would also result in a considerable increase in depth and the waterway could therefore accommodate a much greater proportion of the world's shipping. Mr. Kerry has claimed also that it could be constructed as an all-Canadian route.

Mr. Kerry's papers (see *The Engineering Journal*, January, 1946 and June, 1951) have inspired considerable interest among engineers, and suggestions have been made that the Institute should take some cognizance of the proposals. It would hardly be in order for the Institute to endorse officially such proposals since it has not the facilities to verify or refute the suggestions. In their essentials, however, the papers have pointed out that the verification or refutation of the ideas probably can be achieved if full data, not presently available, on depths, temperatures, currents, etc., in the Great Lakes, the St. Lawrence River, and the Gulf of St. Lawrence, are obtained and studied.

Council has discussed the subject at considerable length and has felt that it would be helpful if the government would obtain the data necessary to a proper study of the whole situation. Accordingly at the meeting held in Toronto on June 16th, Council approved of the following resolution with instructions that it be transmitted to the Minister of Transport at Ottawa.

"The Engineering Institute of Canada recommends to the Government of the Dominion of Canada that provision be made as quickly as possible to investigate the depths, temperatures, currents and other details of the waters of Lake Ontario, the St. Lawrence River, and the Gulf of St. Lawrence to the end that a more accurate study can be made of the proposal for a year round open channel and an all-Canadian route for power and navigation."

Aeronautical Research in Canada

During the Second World War considerable expansion took place in the aircraft industry in Canada, with the effort devoted almost exclusively to the construction of military aircraft which had been designed and developed initially either in the United Kingdom or in the United States. Since the end of the War, however, the Government's policy has been to foster actively the development of aircraft and engines in Canada. The great importance of aircraft in warfare, coupled with the fact that the growth of bomber performance renders Canada liable to direct air attacks in any future hostilities, means that grave risks would be inherent in any policy that would leave Canada fully dependent on the U.K. or the U.S.A. for her defensive aircraft. Considerable effort has therefore been expended during the last few years in building up in Canada an aircraft industry of high calibre.

The present world situation, and the post-war growth of the aviation industry to its present high level of activity, have produced an urgent need for increased effort in aeronautical research in Canada. The Aeronautical Laboratories of the National Research Council came into being in 1929 but, mainly because of the depression of the 1930's, they remained undeveloped until the Second World War necessitated their growth and expansion. These laboratories are still modest in both equipment and staff in relation to the overall importance and magnitude of aviation. It has been difficult, particularly in recent years, for equipment to keep pace with the developments and requirements of the industry and in serving a field which is changing so rapidly, considerable ingenuity must be exercised if equipment for research and development is not to become obsolete.

To achieve a more orderly development of facilities the National Research Council and the Defence Research Board explored the possibilities of creating a National Aeronautical Establishment and it was announced early this year that such an establishment had been set up as a separate agency of the National Research Council along lines similar to the Atomic Energy Project.

In the United Kingdom, the United States and in some other countries, notably Germany, aeronautical laboratories of major importance have always been established at sites where flight research facilities can be developed. The well-known Royal Aircraft Establishment at Farnborough and the National Advisory Committee for Aeronautical Laboratories at Langley Field are typical examples. When the laboratories of the Division of Mechanical Engineering, National Research Council, were established on the Montreal Road, it was hoped that proximity to the R.C.A.F. Station at Rockcliffe would be beneficial. However, when the Flight Research Section was established in 1946, operational difficulties rendered it undesirable to locate these at Rockcliffe and the Unit was eventually established at Arnprior, Ontario, which offered the best available among the possible sites not too distant from the parent laboratory. The physical limitations of the Arnprior aerodrome have now become a serious handicap to the work of this Unit, and, after a full study it has been decided that the flight research facilities of the new N.A.E. can be accommodated, and will best serve their intended purposes, at Uplands Airport, Ottawa. The existing Aeronautical Laboratories of the Division of Mechanical Engineering, together with the new flight research facilities to be provided at Uplands, will thus form the nucleus of the N.A.E. which will be operated by the National Research Council on behalf of the National Aeronautical Research Committee. Mr. J. H. Parkin, C.B.E., M.E.I.C., the present Director of the Division of Mechanical Engineering, National Research Council, is the Director of the new establishment.

The National Aeronautical Research Committee, which provides direction for the National Aeronautical Establishment, is a four-man Committee consisting of the president of the National Research Council, the chairman of the Defence Research Board, the Chief of the Air Staff, and the chairman of the Air Transport Board. The Committee has already held its first meeting, with Dr. C. J. Mackenzie, M.E.I.C., appointed as the Chairman. A technical advisory panel of deputies under the National Aeronautical Research Committee will be responsible for technical matters involving policy and will serve as an advisory panel to the director of the Establishment. This panel will be composed of the director of the Establishment; the chief of Division (B) of the Defence Research Board, who is also the scientific adviser to the Chief of the Air Staff; the Air Member for Technical Services, R.C.A.F., and the Chief Aeronautical Engineer of the Department of Transport.

The development of the Ottawa aerodrome at Uplands has already commenced. Sufficient land was acquired by the Government to meet any reasonable future requirement and construction of the new aerodrome is in hand. It is planned this year to provide two runways

200 ft. wide, one of which will be 8,800 ft. long and the other will be 6,000 ft. The design of the flight research facilities is nearing completion and it is hoped that construction will be commenced early this summer. A concrete arch hangar is planned, with administrative, laboratory and workshop facilities integral with the hangar and extending around three of its sides. A heating plant, a storage and motor transport building and a cafeteria will complete the first stage of the Flight Research Unit, with occupancy planned for the summer of 1952. As the need for new research equipment or new laboratories develops, these will be located, whenever practicable, on the new site at Uplands, where sufficient land is available for development over the years of an aeronautical research centre which can meet the major requirements of Canadian aviation.

Unification of Standards

It seems certain that in the not too distant future a much greater degree of interchangeability between military equipment made in British, Canadian and American factories will be achieved.

Discussions which started during the last war resulted in the signing of a "Declaration of Accord" in 1948 when Britain, Canada, and the United States accepted the principle of a unified screw thread. Real standardization among them was held up, however, because there was no similar agreement on the dimensions of bolts and nuts.

A recent conference in Ottawa has cleared this obstacle. Details of the decisions reached have not yet been announced because the delegates must refer back the agreed recommendations to the standardizing bodies in the three countries. The urgency of defence requirements makes it practically certain that the recommendations will be confirmed and that engineering producers in all three countries will soon start working to unified standards. The principle will also be adopted by the other nations of the British Commonwealth.

Apart from the military significance of this development, it will lead to interchangeability in all products of wide range of engineering industries. In particular unofficial announcements from the motor industry on both sides of the Atlantic indicate that they intend to adopt the unified standard for their civilian as well as their armament production.

Aerial Survey Training

As a result of discussions between the United Nations and various agencies of the Netherlands Government, the Netherlands authorities have decided to establish an International Training Centre for Aerial Survey. Organization is proceeding by the Netherlands Technical University at Delft and the Agricultural University at Wageningen.

The subjects to be studied and taught are: Aerial photography, Photogrammetry, Geology of the crust of the earth, Forestry, and Soil science. The principal requirement for admission will be a degree from a technical college in the field in which the applicant will specialize. This means, for instance, that only geologists can be admitted to study photogeology. As far as the subject of photogrammetry is concerned, there will be room for surveyers, civil engineers, army, navy, and air force officers, and similar persons with sufficient mathematical schooling.

The organization will be put into operation in the course of 1951. It will be possible to receive a limited number of Fellows immediately, which will be gradually increased to 70. In September 1951 it will be possible to start the complete training in the new Institute, which will accommodate up to 200 trainees. Enquiries about enrollment should be addressed to "International Training Centre for Aerial Survey, c/o Professor W. Schermerhorn, Delft, The Netherlands."

News of Other Societies

The triennial reunion of the **Engineers' Alumni Association** of the University of Toronto is planned for Friday and Saturday, October 26 and 27, 1951, at the Royal York Hotel.

The fall general meeting of the **American Institute of Electrical Engineers** (33 West 39th St., New York) will be at Cleveland, Ohio, October 22 to 26. The winter general meeting is scheduled for January 21 to 25, 1952, at the Hotel Statler, New York.

A national meeting of the **American Institute of Chemical Engineers** (120 East 41st St., New York 17) will take place at Rochester, N.Y., September 17, 18 and 19. Headquarters will be at the Sheraton Hotel.

Also announced is the Annual meeting of A.I. Ch. E., December 2 to 5, 1951, at the Chalfonte-Haddon Hall Hotel, at Atlantic City, N.J.

The **American Society of Mechanical Engineers** (29 West 39th Street, New York) announces the following meetings to take place during the coming months: the 6th annual petroleum mechanical engineering conference, September 24 to 26, at Tulsa, Oklahoma; the fall meeting, at Hotel Radisson, Minneapolis, Minn., September 25 to 28; the exhibit and joint conference of the industrial instruments and regulators division of A.S.M.E., and the Instrument Society of America, at Houston, Texas, September 10 to 14; the fuels and coal conference, a joint meeting with the American Institute of Mining Engineers, at Roanoke, Va., October 11-12; the annual meeting of A.S.M.E., at Atlantic City, N.J., Chalfonte-Haddon Hall Hotel, November 25 to 30.

The third international symposium on the chemistry of cement will be held in London, England, from September 15 to 20, and will be organized jointly by the Building Research Station of the Department of Scientific and Industrial Research and the Cement and Concrete Association (52 Grosvenor Gardens, London, S.W.1).

Personals

News of the Personal Activities of Members of the Institute

J. J. Miller, M.E.I.C., electrical and mechanical superintendent for The Niagara St. Catharines and Toronto Railway Company at St. Catharines, Ont., has been elected chairman of the Niagara Peninsula Branch of the Institute.

Mr. Miller is from Winnipeg, Man., and a graduate of the University of Manitoba, class of 1937, with a B.Sc. degree in electrical engineering. He had served a special apprenticeship with Canadian National Railways before and during his university course, and in 1937 he became inspector of air conditioning, at Montreal, to supervise installation and operation over the entire system. In 1944 he worked on developing new methods of maintenance for motive power and car equipment. Later in that year he was made chief electrical supervisor of the electric traction system of C.N.R. In 1945 he went to his present position in St. Catharines.

W. D. Hurst, M.E.I.C.

W. D. Hurst, M.E.I.C., city engineer and commissioner of buildings in Winnipeg, Man., was recently elected chairman of the Winnipeg Branch of the Institute. He has also recently been elected vice-president of the Canadian Section of the American Waterworks Association.

Mr. Hurst is a native of Manitoba and a graduate from University of Manitoba, class of 1930. On a teaching fellowship, he did graduate studies at the Virginia Polytechnic Institute, receiving a C.E. degree in 1931.

Since that time he has been associated with the engineering department of the city of Winnipeg. He was a resident engineer on reservoir construction in 1931, and served thereafter as an investigating engineer, and as assistant engineer in the water works operating branch, and assistant city engineer. He received the appointment as city engineer in 1944.

He is a past-chairman of the Minnesota Section of the American Waterworks Association. A member of the Association of Professional Engineers of Manitoba since 1931 he has served for several years on the Council of the Association, the last two years of which he has been president.

E. M. Nason, M.E.I.C., district engineer in the public health engineering division of the Department of National Health & Welfare at Moncton, N.B., has been elected chairman of the Moncton Branch of the Institute.

Mr. Nason was born at Welsford, N.B. and studied at the University of New Brunswick, where he received a B.Sc. degree in civil engineering in 1936. He worked as an instrument man and assistant engineer in charge of highway construction from the Department of Public Works of New Brunswick for three years. In 1940 he worked with the R.C.A.F. Eastern Air Command on construction at Moncton, and at Boundary Bay, B.C. He worked later with the Department of Transport, Air Services in the Moncton Branch; and with the Canadian Pacific Railway at Fredericton. He was appointed assistant city engineer of St. Catharines, Ont., in 1945, and two years later went on the staff of the city of Saint John, and was appointed director of works for Saint John. He was later the town engineer for Bridgewater, N.S. In 1949 he joined the Public Health Engineering Division of the Department of National Health and Welfare in 1949.

H. A. Marshall, M.E.I.C., industrial sales representative for Imperial Oil Limited at Sydney, N.S., has been elected chairman of the Cape Breton Branch of the Institute.

Mr. Marshall was born at Dartmouth, N.S. He received a B.Sc. degree from Dalhousie University in 1941, and went to Nova Scotia Technical College where he received a B.Eng. degree in 1943 in mechanical engineering. From 1943 to 1945 he was an engineer officer with the Royal Canadian Navy. He was sent to U.S. Naval Academy at Annapolis for a course, and in 1944 was placed in charge of fuelling operations at St. Johns Nfld., and was a technical advisor on lubrication problems. In 1945 he joined the Imperial Oil Limited, Maritime division, working as industrial lubrication engineer. He was appointed an industrial sales representative of the company in 1948.

R. F. Shaw, M.E.I.C., vice-president of the Foundation Company of Canada Limited, Montreal, was appointed some time ago to be chief engineer of Defence Construction, Limited, Ottawa.

Mr. Shaw is chairman of the Young Engineer Committee of the Engineering Institute, and a member of the Library and House Committee.

He is a civil engineering graduate of McGill University, class of 1933. He joined Foundation Maritime Limited in

R. F. Shaw, M.E.I.C.

1937 as assistant to the vice-president building construction; was named assistant to the president in charge of shipbuilding; and later shipyard manager at Pictou, N.S. He returned to Montreal in 1945, to Foundation Company of Canada Limited. He was assistant to the president from 1946 to 1949, then manager of engineering. He was appointed vice-president in 1950.

R. H. Moore, M.E.I.C., mechanical and electrical superintendent of Falconbridge Nickel Mines Ltd., has been elected chairman of the Sudbury Branch of the Institute.

Mr. Moore was born in Winnipeg, Man., and studied at the University of Manitoba receiving a B.Sc. degree in civil engineering in 1933 and in electrical engineering in 1934. He joined the Hudson Bay Mining and Smelting Co. Ltd. at Flin Flon, Man., in 1934, and worked on design of machine parts, and installation and erection of machinery. He worked with Babcock Wilcox & Goldie McCulloch Ltd., at Galt, Ont., from 1944 to 1946, when he went to the Falconbridge Nickel Mines Ltd., at Falconbridge.

Major A. L. Maclean, M.E.I.C., associate professor in the department of mechanical engineering at the Royal Military College of Canada, has been elected chairman of the Kingston Branch of the Institute.

Mr. Maclean was born and educated at Toronto, Ontario. He graduated from the University of Toronto with a B.A.Sc degree in metallurgical engineering in 1941. He joined the army as a lieutenant, going overseas with the R.C.E.M.E. in 1942, and serving with the first Canadian base workshop in the United Kingdom. He was placed in command of the first Canadian mobile tire repair unit in North West Europe, and in 1945 to 1946, with the rank of major, he commanded the first Canadian sub workshop of R.C.E.M.E. in the United Kingdom. That year he returned to Canada and was in command of the R.C.E.M.E. workshops in London, Ont. He proceeded to a ten-months advanced Ordnance Officers Course at the United States Army's Ordnance School in Maryland, and in July 1948 he was appointed to the Royal Military College. He will leave R.M.C. in January 1952 to attend the Canadian Army Staff College at Fort Frontenac, Kingston, Ont.

A. J. Mickelson, M.E.I.C., has been elected chairman of the Lakehead Branch of the Institute.

Mr. Mickelson was born at Port Arthur, and studied at Tri-State College of Engineering where he received a B.Sc. degree in civil engineering in 1926. Upon graduation he joined the Provincial Paper Mills at Port Arthur as an instrumentman and draughtsman on construction. Later he was with Barnett McQueen Construction Co. at Fort William, Ontario. In 1934-35 he was an instrumentman and assistant to the resident engineer on highway location and construction in the Department of Northern Development, Thunder Bay District. He joined C. D. Howe Company Limited at Port Arthur, Ont. in 1936. He was assistant engineer in the Great Lakes Paper Co. Ltd., for several years. In 1947 he became a partner in the firm McIntosh & Mickelson associated architects and engineers at Fort William, Ont. The firm is now known as Mickelson & Fraser, engineer and architect.

A. Geo. Jacques, M.E.I.C., of Montreal, formerly general manager of St. Lawrence Paper Mills Co. Ltd., and Lake St. John Pulp & Paper Co. Ltd., has retired from active participation in the affairs of these companies. **S. E. Williams,** M.E.I.C., has assumed the duties performed by Mr. Jacques.

Mr. Jacques joined the Lake St. John company at Dolbeau, Que., as general superintendent in 1934. He graduated from McGill University in 1917, and was associated with the pulp and paper industry from the time of his graduation.

Mr. Williams has been resident manager of the St. Lawrence Paper Mills at Three Rivers.

Harold Randle, M.E.I.C., has been elected president of the Association of Professional Engineers of Alberta. Mr. Randle is equipment and water works engineer for Calgary Power Ltd., at Calgary, Alta. Vice-president of the Association is **H. H. Moor,** M.E.I.C., superintendent of the Edmonton Refinery for the Imperial Oil Ltd., manufacturing department at Edmonton, Alta. Councillors of the Association are **J. Graham Dale,** M.E.I.C., Edmonton; **W. J. Dick,** M.E.I.C., Edmonton; **J. J. Hanna,** M.E.I.C., Calgary; **T. D. Stanley,** M.E.I.C., Calgary; **A. G. Donaldson,** M.E.I.C., Lethbridge; **A. Frame,** M.E.I.C., Edmonton; **G. W. Govier,** Edmonton; **R. S. Woodford,** M.E.I.C., Calgary. Dominion councillor on the board of the Association is **R. M. Hardy,** M.E.I.C., of Edmonton; and the E.I.C., councillor is **P. M. Sauder,** M.E.I.C., Lethbridge, Alta.; university faculty representative is **J. Graham Dale,** Edmonton; and the registrar and deputy registrar of the Association are **J. F. McDougall,** M.E.I.C., and **J. Graham Dale.**

Shawinigan Water and Power Appointments

John Morse, M.E.I.C., vice-president of The Shawinigan Water and Power Company, Montreal, in charge of generation and transmission, has retired after 44 years with the company.

William R. Way, M.E.I.C., general superintendent of The Shawinigan Water and Power Company's generation and transmission department has been appointed a vice-president of the company in charge of that department.

Born at Rattvik, Sweden, Mr. Morse graduated in electrical engineering at

William R. Way, M.E.I.C.

Gothenburg in 1906 and immediately sailed for this continent. He spent a few months in New York State with the Otis Elevator Company, the old Maxwell Briscoe Motor Company and the General Electric Company, before coming to Montreal in 1907 to join the then youthful Shawinigan company as a draughtsman. Four years later he was made Shawinigan's superintendent of operations; in 1916, general superintendent; in 1938, assistant general manager and in 1940, vice-president.

Mr. Way, who succeeds John Morse joined the company upon his graduation from McGill 33 years ago. After six years in the Montreal office as assistant engineer and in the protection, metering and hydraulic test divisions, he was transferred to Shawinigan Falls in 192- as chief system operator. He returned to Montreal in 1930 as assistant superintendent of operation, then becoming successively superintendent, assistant general superintendent and, in 1944, general superintendent.

Canadian vice-president of the American Institute of Electrical Engineers and a member of the executive committee of the Canadian Electrical Association, Mr. Way is also an active member of the Corporation of Professional Engineers of the Province of Quebec and of the Engineering Institute of Canada.

J. M. Sharpe, M.E.I.C., superintendent of the system operating division since 194-

eplaces Mr. Way as general superin-endent. A graduate of McGill Univer-ity in 1925 as a bachelor of science in lectrical engineering, Mr. Sharpe spent he next two years in Shawinigan's ap-renticeship course, then going to the hawinigan Falls power-houses. He was ransferred to the system operating office n 1928 and became successively chief ystem operator and system operating ngineer before being appointed super-ntendent of that division.

:. **A. Gaherty,** M.E.I.C., president of Cal-ary Power Ltd., has been appointed hairman of the Canadian national com-nittee of the Conference Internationale es Grands Reseaux Electriques (Inter-ational Conference on Large Electric ystems).

Mr. Gaherty succeeds **John Morse,** I.E.I.C., retiring from The Shawinigan Vater and Power Company, who has erved as chairman of the Canadian ommittee since its formation in 1938

John Morse, M.E.I.C.

ind, in recognition of his services, has low been appointed its honorary hairman.

:. **V. Leipoldt,** M.E.I.C., vice-president of The Shawinigan Engineering Com-any Limited, has been reappointed ecretary-treasurer of the Canadian ommittee of C.I.G.R.E.

The C.I.G.R.E., founded in 1921 with eadquarters in Paris, is the most active nternational organization in the electro-echnical field, with a permanent mem-ership of over 1,200 and 2,000 corre-ponding members in various parts of he world. It has enrolled top-level men n the industry in many nations, devoted o promoting the international exchange f practical experience in the operation nd design of large power systems.

At plenary sessions held biennially, eports are submitted by special in-estigating groups, as well as by the eneral membership, on new technical levelopments. The Canadian committee as been requested to present two such echnical papers at the session to be eld in Paris May 29 to June 7 next ear.

Mr. Gaherty is well known in the Canadian electrical utility industry. In ddition to being president of Calgary Power Ltd., he is president of Montreal Engineering Company Limited, Mari-ime Electric Company Limited, and Ottawa Valley Power Company, and a lirector of the Demerara Electric Com-any Limited. He is past-president of the Canadian Electrical Association and was the recipient of the Julian C. Smith medal of The Engineering Institute of Canada in 1950.

J. W. Sanger, vice-president of the Institute, has recently been appointed a member of the newly created Manitoba Hydro-Electric Board which will have control of the waterpower developments in Manitoba. He will serve as a part time member. Mr. Sanger has been general manager of the Winnipeg Hydro-Electric System since 1945. From 1922-1945 he was chief engineer of the System.

Active in community efforts Mr. Sanger has been vice-chairman of the Manitoba Division of the Navy League of Canada, vice-chairman of the Industrial Development Board of Manitoba and has served on the executive of the Winnipeg Board of Trade. He has also been vice-chairman of the Manitoba Power Commission.

H. F. Bourne, M.E.I.C., who was district engineer for the Provincial Department of Public Works, Victoria, B.C., has been promoted to divisional engineer in charge of engineering district No. 1, which comprises the whole of Vancouver Island, with headquarters at Victoria, B.C.

Mr. Bourne is the immediate past-chairman of the Victoria Branch of the Institute.

John Horsburgh, M.E.I.C., engineer with the Water Resources Branch, Department of Mines and Natural Resources has been appointed representative of Manitoba on the Greater Winnipeg Diking Board.

Mr. Horsburgh is a graduate in civil

engineering from the University of Manitoba.

During World War II he served overseas with the Royal Canadian Engineers.

H. W. Short, M.E.I.C., contracting engineer with the Ontario Division of the Dominion Bridge Company Limited was elected president of The Canadian Institute of Steel Construction at their annual meeting held at the Seigniory Club, Quebec.

Mr. Short has been in the structural steel industry for the past 45 years, with the Dominion Bridge Company for 36 years. He started out as a draughtsman and checker with the Canada Foundry Co. in 1906. In 1912 he became draughtsman checker for the Hunter Structural Steel Company. He spent three years with this company, joining the Dominion Bridge in 1915.

Until 1935 he was assistant chief draughtsman. At that time he was appointed sales engineer for northern Ontario and northwestern Quebec mining territory. Since 1942 he has been contracting engineer for the Company's Ontario Division. He is also a director of the Sault Structural Steel Company.

Mr. Short is a member of the Association of Professional Engineers of the Province of Ontario.

Air Vice Marshal C. R. Dunlap, M.E.I.C., has been appointed air officer commanding the Air Defence Command of R.C.A.F. at St. Hubert, Quebec.

Air Vice Marshal Dunlap was stationed at Edmonton, Alberta, in command of the North West Air Command, since 1949.

G. E. Carss, M.E.I.C., is working for Poole Construction Company Limited, Regina Saskatchewan.

Mr. Carss graduated from University of Saskatchewan with a B.Sc. degree in civil engineering in 1946. The following year he was resident engineer for the Department of Highways & Transportation at Regina, Sask. In 1950 he did engineering and construction for the Department of Resources & Development, at Jasper, Alberta.

J. W. Fagan, M.E.I.C., formerly assistant general manager of Northern Electric Company Ltd., Montreal, has been appointed vice-president in charge of operations of the Company.

J. W. Fagan, M.E.I.C.

He has been with the Company since 1923. Starting as a production clerk, Mr Fagan progressed through the general manufacturing department, serving successively as production superintendent and assistant general superintendent.

In 1938, Mr. Fagan became shop superintendent of the telephone division, and later, assistant works manager, and works manager, before succeeding to the managership of the division in 1945. With the amalgamation of the electronics and telephone divisions into the communications equipment division last year, he was promoted to assistant general manager.

Born and educated in Ottawa, Mr Fagan attended the University of Ottawa before enlisting in the artillery in World War I. After serving as a gunner in Belgium and France, he entered McGill on demobilization and graduated in 1923 with a B.A.Sc. in mechanical engineering. He is a member of the Corporation of Professional Engineers of Quebec.

John M. Dyke, M.E.I.C., has joined the staff of F. S. B. Heward & Co. in Montreal.

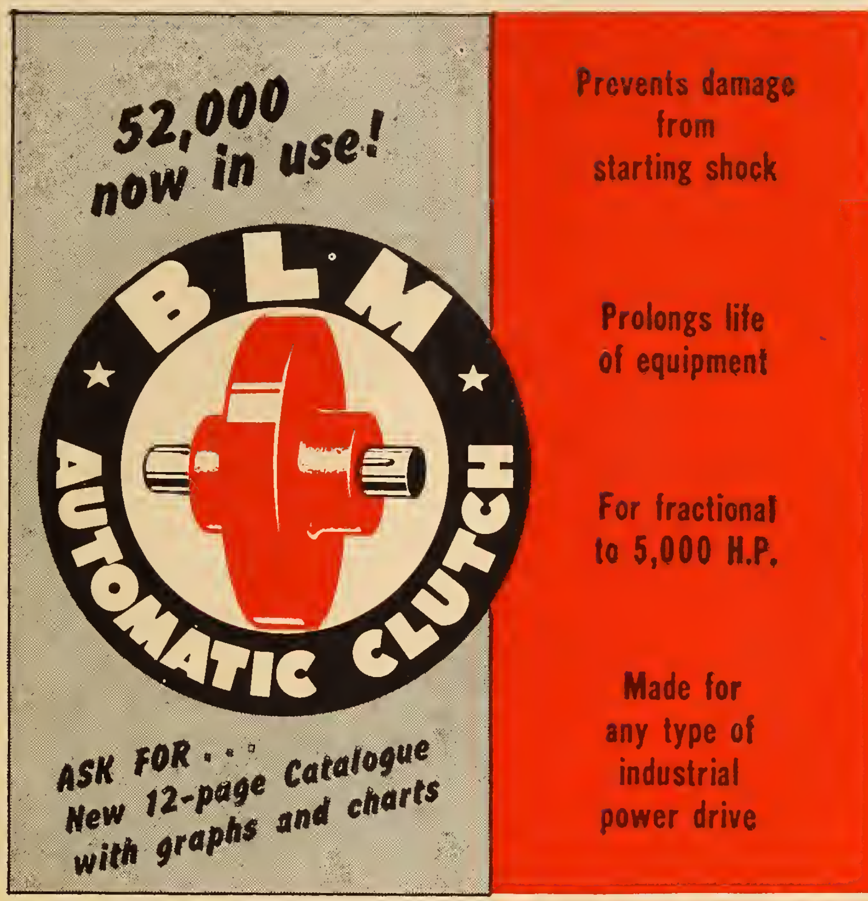
Mr. Dyke graduated from the University of Toronto in 1943 with a B.Sc degree in mechanical engineering. After which he served in the R.C.N.V.R. In 1945 he was employed as a boiler design engineer with John Inglis Company Limited in Toronto. For the past four years he has been with the Canadian Pacific Railway in Montreal, as a mechanical engineer.

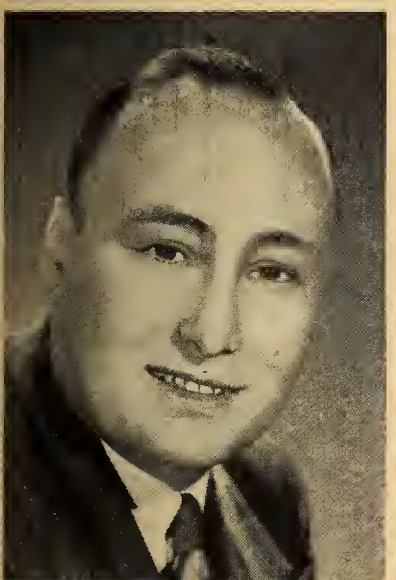
C. A. Miller, M.E.I.C., who is with Canadian Industries Limited, has been transferred from McMasterville, Que., to De Salaberry Works, Defence Industries (1951) Limited, Valleyfield, Que. His new position is that of assistant manager (services.)

E. W. Montgomery, M.E.I.C., is an engineer with Quebec Iron & Titanium Corporation at Sorel, Que. Previously he was with the Water Resources Branch, Department of Mines and Resources of Manitoba.

Alexander D. Murray, M.E.I.C., formerly field engineer with Angus Robertson Limited is a resident engineer on the Quebec North Shore and Labrador Railway.

Mr. Murray has past experience on the Algoma Central; National Transcontinental; Northern Alberta Railways and with the Royal Engineers in England.





M. A. Montgomery, M.E.I.C.

Mortimer A. Montgomery, M.E.I.C., has been appointed sales manager for Canadian Blower and Forge Company Limited.

Mr. Montgomery graduated from the University of Saskatchewan in mechanical engineering, and joined the company's sales staff in 1937 in the Montreal district. From 1942 to 1945 he served as an engineer officer in the Royal Canadian Navy, Construction Directorate. Returning to Canadian Blower and Forge Company Limited, he moved to Kitchener where he has held the position as assistant sales manager for engineering products.

He has been actively associated with the Engineering Institute being the first chairman of the Kitchener Branch. He is also a member of the Kitchener Chamber of Commerce, the Association of Professional Engineers of Ontario, and the Gyro Club.

Alexander Frame, M.E.I.C., has been appointed Deputy Minister of Highways for the province of Alberta.

Mr. Frame, a native of Lochmaben, Scotland, graduated from Heriot-Watt College of Applied Science, Edinburgh, and Edinburgh University. He served in Gallipoli, Palestine and France during the First World War and after the war came to Canada joining the Alberta Department of Public Works in 1923. From 1928 to 1933 he was successively junior engineer, resident engineer, and assistant district engineer at Calgary.

From 1933 to 1937 he was district engineer at Red Deer and from 1937 to 1946 held the post of chief engineer and superintendent of construction. He was chief maintenance engineer from 1946 to 1948 and highway commissioner from 1948 until taking over his present position.

He is a member of the executive council of the Association of Professional Engineers of Alberta. He is a past-chairman of the Western Canada Association of Highway Officials.

A. Frame, M.E.I.C.

C. F. Ripley, M.E.I.C., announced in June the formation of the firm Ripley

C. F. Ripley, M.E.I.C.

and Associates, civil engineers in consulting and inspection service, at Vancouver, B.C.

Mr. Ripley graduated from the University of Alberta in civil engineering with a degree of B.Sc. in 1944. He was employed by the soil mechanics department of the Prairie Farm Rehabilitation Administration, Saskatoon, on field exploration and laboratory testing for earth dams. In 1945 he went to Harvard University where he earned his master of science degree in civil engineering, majoring in soil mechanics. From 1946 to 1949 he was with P.F.R.A. as a soil mechanics engineer on the St. Mary and Milk River Irrigation development, in charge of field inspection of Pothole and St. Mary Dams. He transferred to the South Saskatchewan River Project as soil mechanics engineer in charge of field exploration and soil mechanics design studies on the proposed $100,000,000 development. He resigned from P.F.R.A. in May and entered the consulting field, to offer a complete engineering service in the soil mechanics field.

T. W. H. Stoddart, M.E.I.C., who was formerly with the Northern Electric Company Limited in Montreal is now in Toronto working for The Exide Battery Company.

D. Temple, M.E.I.C., is assistant resident engineer for Defence Industries Limited in Montreal. Previously he was superintendent on inspection and general services for the National Research Council Atomic Energy Project at Chalk River, Ont.

Duncan McIntyre, M.E.I.C., who has been with the design office of P.F.R.A at Regina, Sask., is now with the Department of Transport, Special Projects Branch at Ottawa, Ontario.

Mr. McIntyre graduated from the University of Saskatchewan in 1946 with a B.Sc. in civil, in 1948 he received an M.Sc. from University of Wisconsin. After which he went to the Prairie Farm Rehabilitation Act engineering office.

Joseph T. Thwaites, M.E.I.C., has been appointed manager of electronic research at Canadian Westinghouse Company Limited, Hamilton.

Mr. Thwaites was the first person in Canada to take a formal course in electronics and has the distinction of receiving three Certificates of Appreciation from the United States government for wartime service and achievement.

J. T. Thwaites, M.E.I.C.

Mr. Thwaites was on loan to the U.S. War Department from Canadian Westinghouse and serving in the United Kingdom at the time.

Pioneering in electronic research at Westinghouse since 1931, Mr. Thwaites contributed very greatly to the development of the science.

Mr. Thwaites attended Queen's University, where he graduated in 1925 with a B.Sc. degree in physics. After graduation he went on to a two-year post-graduate course in electronics.

He returned to Westinghouse during 1929 and entered the radio engineering department as radio test engineer. The following year he joined the switchgear division and served as a special products engineer until his appointment as division engineer in charge of electronics in 1939.

Between 1940 and 1943 Mr. Thwaites was instrumental in increasing the Canadian production of aluminum beyond all expectations by means of large scale applications of ignitrons. He also carried out pioneer work on X-ray penetration of steel, part of the general programme which led to X-ray inspection of welds and castings.

He was loaned to the U.S. government in 1943 and sent to Great Britain the following year.

F. M. Weston, M.E.I.C., is an engineer in Marine Service, Department of Transport, in Saint John, N.B. His work previously was assistant to the director of works and water and sewage at Saint John.

J. D. P. McPherson, M.E.I.C., who very recently joined the Construction Equipment Company Limited in Montreal, has been transferred to the Toronto office of the Company.

R. C. Gillstrom, Jr.E.I.C., of Shawinigan Falls, has been elected chairman of the Shawinigan Falls Junior Section of the St. Maurice Valley Branch of The Institute.

Mr. Gillstrom graduated from the University of Saskatchewan in 1949, receiving a B.Sc. degree in mechanical engineering. At present he is a development engineer for Canadian Industries Limited, at Shawinigan Falls.

W. Douglas Baines, Jr.E.I.C., who was in the civil engineering department at Michigan State College, in East Lansing, Mich., is now with the National Research Council, division of mechanical engineering in Ottawa, Ont.

Mr. Baines graduated with honours in engineering physics from the University of Alberta in 1947 with the degree of B.Sc., and in 1948 he received an M.Sc. degree from State University of Iowa.

A. J. Barker, Jr.E.I.C., who was with H. G. Acres & Company, at Niagara Falls, Ontario, is with the British Columbia International Engineering Company Limited, at Vancouver, B.C.

Mr. Barker is a graduate of Edinburgh University, where he received a B.Sc. in civil engineering in 1948.

Capt. Gerald P. Dawson, Jr.E.I.C., is with the Canadian Army at the Officer Candidate School at Camp Borden, Ontario. Previously he was stationed at Barriefield, Ontario, at the Royal School of Signals. He graduated from McGill University with a B.Eng. in electrical engineering in 1949.

D. J. Glenn, Jr.E.I.C., a sales representative for Northern Electric Company Limited, has been transferred from Toronto to Sarnia, Ontario.

Mr. Glenn graduated from the University of Toronto with a B.A.Sc. in electrical engineering in 1947.

Pierre Gerin-Lajoie, Jr.E.I.C., who is with Canadian General Electric Company, has been transferred from Winnipeg, Manitoba to Port Arthur, Ontario.

He graduated from Ecole Polytechnique, Montreal, in 1949, in civil engineering.

F. E. Hertha, Jr.E.I.C., is with Hollingsworth & Whitney Paper Company in Waterville, Maine, working in the engineering department.

A. B. Jarvis, Jr.E.I.C., of McColl Frontenac Oil Company Limited, who was on a temporary transfer from Montreal to Edmonton, Alberta, has returned to Montreal.

F. J. LeBlanc, Jr.E.I.C., is an engineer in the telephone division of Northern Electric Company Limited in Montreal, Quebec. He graduated from the University of New Brunswick with a B.Sc., in electrical engineering in 1949, after which

he was sales engineer with Sangamo Company Limited in Toronto, Ontario, until his recent appointment.

G. L. Schneider, Jr.E.I.C., is with C. C. Parker, consulting engineers in Hamilton, Ontario.

Mr. Schneider is the secretary-treasurer of the Hamilton Branch of the Institute.

A. H. Urwin, Jr.E.I.C., is now in Charles City, Iowa, U.S.A., working for Oliver Corporation as maintenance foreman in the foundry.

Mr. Urwin joined the Saskatchewan Power Commission after graduating in 1947 from University of Saskatchewan. He has worked until his recent appointment for the Defence Research Board at Ottawa and at the Experimental Station at Suffield, Alberta.

R. D. V. Merritt, Jr.E.I.C., is sales engineer for Amalgamated Electric Corporation Limited, in Montreal, Quebec. Previously he was in Vancouver, B.C., working as a lighting engineer with the Company. A graduate of the University of British Columbia, he received a B.A.Sc. in 1949.

Donald B. Bogue, S.E.I.C., (University of British Columbia, B.A.Sc., electrical, 1951) is with Canadian General Electric at Toronto, Ontario.

Robert Buru, S.E.I.C., (University of Manitoba, B.Sc., electrical, 1951) is a mechanical inspector for Canadian National Railways in Toronto, Ont.

L. R. Boutillier, S.E.I.C., (Nova Scotia Technical College, B.Eng., mechanical, 1951) is working as junior engineer for

Dominion Iron & Steel Limited at Sydney, Nova Scotia.

Marcel Bourque, S.E.I.C., (McGill University, B.Eng., civil, 1951) is with Crepeau, Cote & Lemieux, consulting engineers at Sherbrooke, Quebec.

Peter R. Angell, S.E.I.C., won honours in mechanical engineering, and the British Association medal for great distinction on his graduation from McGill University this year with a B.Eng. degree. He is working with Chrysler Corporation at Highland Park, Michigan.

V. E. Campbell, S.E.I.C., (University of Saskatchewan, B.Sc., mechanical, 1951) is a graduate engineer in training with Canadian Westinghouse in Hamilton, Ontario.

John Corey, S.E.I.C., (McGill University, B.Eng., civil, 1951) is a draughtsman with Fraser Brace Engineering in Montreal, Quebec.

F. G. Denson, S.E.I.C., is a distribution engineer in the Water Works Branch of the City of Winnipeg engineering department.

He graduated with a B.Sc. degree in civil engineering from the University of Manitoba in 1950.

D. F. Messervey, JR.E.I.C., a sales engineer with Canadian Allis-Chalmers Limited has been transferred from Toronto to Montreal. He joined the Company in 1948. He had been for a year a plant engineer for the Minas Basin Pulp & Power Company in Nova Scotia, after graduating in 1946 from Nova Scotia Technical College in mechanical engineering.

F. I. Morton, JR.E.I.C., is a junior engineer for Radio Engineering Products Limited at Montreal. Previously he was junior design engineer with the engineering department for the City of Ottawa. He graduated from the University of Saskatchewan with a B.Sc. in engineering physics in 1949.

G. Leonard MacLean, JR.E.I.C., is an engineer for Lukis, Stewart and Company Limited in Montreal.

He graduated from McGill University in 1949 as a mechanical engineer, and he joined the Coca Cola Company Limited. Montreal. He has worked also as an engineer for Canadian Underwriters Association.

T. H. McSorley, JR.E.I.C., who was formerly with new Brunswick Department of Public Works as resident engineer on highway construction. at Fredericton, N.B., is now with Fraser Companies Limited at Edmunston, N.B.

Mr. McSorley is a graduate of University of New Brunswick, where he received a B.Sc., in civil engineering in 1944 and B.Sc. in electrical engineering in 1947.

S. Nixon, JR.E.I.C., is a service engineer for Canadian General Electric Company in Winnipeg, Manitoba.

He graduated from the University of Alberta with a B.Sc. in electrical engineering in 1949.

D. J. Parry, JR.E.I.C., is resident highway engineer on construction of main highways for the Department of Highways of the Alberta Government.

He graduated from the University of Alberta with a B.Sc. in mining engineering in 1949.

A. J. Paxton, JR.E.I.C., (University of Saskatchewan. M.Sc. mechanical engineering, 1951) is junior engineer for Canadian Industries Limited in Montreal, Quebec.

Guy Perrault. JR.E.I.C., is with Iron Ore Company of Canada. at Mont-Joli, Quebec.

Mr. Perrault is a graduate of Ecole Polytechnique where he received a B.A.Sc. in civil engineering in 1949.

R. D. Rosser, JR.E.I.C., is sales engineer on electrical apparatus for Canadian Westinghouse Company Limited at Edmonton, Alberta. He graduated from the University of Alberta in 1949. and was employed on the engineering apprenticeship course of the Company at Hamilton.

John C. Reinhardt, JR.E.I.C., is an electrical engineer for Canadian General Electric in Toronto, Ontario. He graduated from the University of Toronto with a B.A.Sc. in electrical engineering in 1949. After graduation he took a test course with the Company in Peterborough, Ontario.

W. H. Renwick, JR.E.I.C., is engineer for Murray Air Conditioning Limited in Ville St. Laurent. Quebec. Previously he was with Linde Canadian Refrigeration Company Limited. in Montreal, Quebec. He is a graduate of McGill University where he received a B.Eng. in mechanical engineering in 1949.

W. A. Runge, JR.E.I.C., is with Dominion Electrohome Industries Limited in Kitchener, Ont. Previously he was a junior partner with A. A. Gleason Limited. in London, Ontario, commercial photographers.

Mr. Runge graduated from Queen's

University in electrical engineering in 1944. That year he went to work for Canadian Hanson and Van Winkle Company Limited in Toronto, Ontario, as an electrical engineer and design draughtsman. Then in 1945, he was employed by Turbo Research Limited, at Leaside, Ontario. From 1946 to 1948 he was associated with McColl-Frontenac Oil Company in Toronto as a sales and service engineer.

A. W. Poushinsky, Jr.E.I.C., is a project engineer at the experimental and proving establishment of the R.C.A.F., at Rockcliffe, Ontario, working for the Department of National Defence. He had been at the R.C.A.F. Station at Edmonton working on design and installation of radio and radar equipment. He graduated from University of Alberta with a B.Sc. degree in 1947.

G. J. Flanagan, Jr.E.I.C., is with Byers Construction Company at Hebertville, Quebec. He graduated from McGill University with a B.Eng. in civil engineering in 1949.

Louis J. Dugas, Jr.E.I.C., who was formerly with the Provincial Colonization Department is now with Defence Construction Limited, as assistant resident engineer on a project in Bagotville, Quebec. He graduated from Ecole Polytechnique with a B.A.Sc. in civil engineering in 1947.

C. G. Simms, Jr.E.I.C., is with Stadler-Hurter & Company in Montreal, Quebec. Previously he was draughtsman for Dominion Bridge Company in Montreal, Quebec.

L. W. Stock, Jr.E.I.C., is assistant secretary on township planning for North York, at Willowdale, Ontario. Previously he was with F. A. Bell, consulting engineer and county engineer at St. Thomas, Ontario. He received a B.A.Sc. from the University of Toronto in 1949.

D. E. Smith, Jr.E.I.C., who was formerly with H. G. Acres & Company, is now with Ellis-Don Limited, engineers and contractors, at London, Ontario.

J. E. Neville, Jr.E.I.C., is with Montreal Engineering Company Limited in Montreal, Quebec. Previously he was an apprentice engineer with Canadian Westinghouse Company Limited at Hamilton, Ontario.

Walter W. Armstrong, S.E.I.C., (McGill University, B.Eng., chemical, 1951) is a development assistant for Canadian Industries Limited at Shawinigan Falls, Quebec.

Edward F. Bell, S.E.I.C., is in the planning department of Canadian Acme Screw & Gear Company, at Toronto, Ontario. He graduated from University of Manitoba in mechanical engineering in 1950.

Harold G. Bird, S.E.I.C., (University of Saskatchewan, B.Sc., civil, 1951) is a civil engineer on the staff of the Saskatchewan Department of Highways at Regina, Sask.

Glen A. Blair, S.E.I.C., (McGill University, B.Eng., chemical, 1951) is with Building Products Limited at Ville La Salle, Quebec.

G. R. Biddle, S.E.I.C., (University of British Columbia, B.A.Sc., chemical, 1951) is a technical assistant with Canadian Industries Limited at Shawinigan Falls, Quebec.

C. B. Newbury, S.E.I.C., (McGill University, B.Eng., chemical, 1951) is a chemical engineer for Imperial Oil Limited, in the engineering division in Sarnia, Ontario.

S. Nichols, S.E.I.C., (Nova Scotia Technical College, B.Eng., civil, 1951) is an engineer assistant in the Bell Telephone Company of Canada in Ottawa, Ontario.

J. L. Nicks, S.E.I.C., is a junior engineer for the Hydro-Electric Power Commission of Ontario working at the regional office at Port Arthur, Ontario.

Mr. Nicks graduated from the University of Manitoba in electrical engineering in 1950.

R. G. Northrup, S.E.I.C., is a civil engineer and designer for Hamilton Bridge Company in Hamilton, Ontario.

He graduated from the University of New Brunswick with a B.Sc. in civil engineering in 1950.

W. N. O'Brien, S.E.I.C., (McGill University, B.Eng., 1951) is a junior engineer for International Nickel Company Limited at Copper Cliff, Ontario.

M. Paquet, S.E.I.C., who graduated from Laval University in electrical engineering last year, is with Tassé Sarault & Associés at Quebec, Que. Previously he was with Canadian Fairbanks-Morse Company Limited, at Quebec.

P. I. Powis, S.E.I.C., (University of Saskatchewan, B.Sc., mechanical engineering, 1951) is working for Dominion Engineering Works at Lachine, Quebec.

D. P. Roberton, S.E.I.C., is with Darling Brothers Limited, Montreal, Quebec. He graduated from McGill University in mechanical engineering in 1950.

R. W. Rankie, S.E.I.C., (Nova Scotia Technical College, B.Eng., mechanical, 1951) is engineer for Bathurst Power & Paper Company, Bathurst, N.B.

G. C. Simpson, S.E.I.C., (McGill University, B.Eng., honours, electrical, 1951) is an engineering assistant for Canadian Industries Limited at Kingston, Ontario.

D. A. Snow, S.E.I.C., is junior engineer for Dow Chemical of Canada Limited, at Sarnia, Ontario. He graduated from Nova Scotia Technical College with a B.Eng., in mechanical engineering in 1950. Previously he was assistant superintendent with Dennisteel Corporation Limited in London, Ontario.

Harry Soloninka, S.E.I.C., (Queen's University, B.Sc., civil, 1951) is engineer for Ontario Construction Company Limited at St. Catharines, Ontario.

Russell A. Silk, S.E.I.C., is working for Unifin Tube Company in London, Ontario, as mechanical engineer on heat exchange equipment.

He graduated from the University of Toronto in 1950 with a B.A.Sc. degree.

G. F. Smalley, S.E.I.C., (University of Toronto, B.A.Sc., mechanical, 1951) is with Procter & Gamble Company of Canada Limited, Hamilton, Ont.

D. A. Dolan, S.E.I.C., is on the test course of Canadian General Electric, at Peterborough, Ontario. He graduated from the University of Saskatchewan with a B.Sc. in electrical engineering in 1950.

L. G. Guglielmin, S.E.I.C., (University of British Columbia, B.A.Sc., metallurgical, 1951) is with International Nickel Company at Copper Cliff, Ontario.

D. R. Gaitens, S.E.I.C., is a mechanical engineer for Price Brothers, in Kenogami, Quebec. He is a graduate of McGill University class of 1950.

He has been a defence research scientist at the Canadian Army Research Development Establishment at Quebec, Que.

R. R. Guenett, S.E.I.C., (McGill University, B.Eng., electrical, 1951) is a student engineer with Canadian Westinghouse in Hamilton, Ontario.

W. L. Hatton, S.E.I.C., (University of British Columbia, M.A.Sc., 1951) is a research scientist with the radio physics laboratory of the Defence Research Board, in Ottawa.

Yvan Hardy, S.E.I.C., (Ecole Polytechnique, B.A.Sc., civil, 1951) is a civil engineer for Quebec Hydro-Electric Commission, working in the engineering design division in Montreal.

James J. Harris, S.E.I.C., (University of Manitoba, B.Sc., mechanical, 1951) is junior engineer for research and development department with Canadian National Railways in Montreal, Quebec.

J. C. Heath, S.E.I.C., is a diesel supervisor for Algoma Central & Hudson Bay Railway in Sault Ste. Marie, Ontario.

Mr. Heath is a graduate of the University of Manitoba where he received a B.Sc. in mechanical engineering in 1950.

A. B. Hunter, S.E.I.C., has been appointed service engineer for Alchem Limited in the Montreal office.

Mr Hunter graduated from the University of Toronto with a B.Sc. degree in mechanical engineering in 1950.

During World War II he was a pilot in the R.C.A.F. Prior to joining Alchem Mr. Hunter was with the Aluminum Company of Canada at Kingston, Ontario.

G. C. Ireland, S.E.I.C., is in the engineering section of directorate of electrical engineering Department of National Defence, at Ottawa, Ontario. He graduated from the University of Saskatchewan in electrical engineering in 1950, and was for a time with the Navy Technical service of the Department.

R. C. Johnston, S.E.I.C., (McGill University, B.Eng., electrical, 1951) won top honours in his last year, was a University Scholar, and was awarded the British Association medal in engineering. He was a wireless operator in the Royal Canadian Navy during World War II, with the rank of sub-lieutenant. He received his early education in Toronto.

M. O. Jones, S.E.I.C., (University of British Columbia, B.A.Sc., mechanical, 1951) is a development engineer in the gas turbine division of A. V. Roe Canada Limited, at Malton, Ontario.

K. H. Johnson, S.E.I.C., (University of British Columbia, B.A.Sc., civil, 1951) is an estimator and assistant engineer for Lickley Construction Company Limited, in Vancouver, B.C.

R. E. Kazan, S.E.I.C., is a sales engineer for Howards & Sons in Montreal, Quebec. He graduated from McGill University in 1950 with a B.Eng., in chemical engineering.

Daniel Klein, S.E.I.C., (University of Manitoba, B.Sc., mechanical, 1951) is with Northern Electric Company in Montreal, Quebec.

W. G. Lancaster, S.E.I.C., is with Poole Construction Company in Exshaw, Alberta. He was formerly in Calgary, Alberta, working with Crowther, McKay, McClary & Associates, consulting engineers.

G. W. Ledingham, S.E.I.C., is a time study and industrial engineer for the Steel Company of Canada Limited in Hamilton, Ontario. He graduated from the University of Saskatchewan with a B.Sc. degree in mechanical engineering in 1950.

A. C. Meckling, S.E.I.C., is a sales engineer for R. L. Brews & Son, Calgary. Previously he was in Edmonton, Alberta. working for R. L. Burns & Sons. He graduated from the University of Alberta with a B.Sc. degree in electrical engineering in 1950.

J. L. Messier, S.E.I.C., (Ecole Polytechnique, B.A.Sc., civil, 1951) is a testman on electrical apparatus for Canadian General Electric Company at Peterborough, Ontario.

G. P. Miller, S.E.I.C., (Nova Scotia Technical College, B.Eng., civil, 1951) is a structural designer for Montreal Engineering Company in Montreal, Quebec.

J. G. Morrison, S.E.I.C., (Nova Scotia Technical College, B.Eng., mechanical, 1951) is a junior engineer for the Bell Telephone Company of Canada working at Sherbrooke, Quebec.

Gordon McDougall, S.E.I.C., (McGill University, B.Eng., mechanical, 1951) is a mechanical engineer for Dominion Rubber Company Limited in Montreal, Quebec.

S. Eric McFall, S.E.I.C., is an engineer in training with Aluminum Company of Canada in Montreal, Quebec.

Geo. N. Neary, S.E.I.C., (Nova Scotia Technical College, B.Eng., civil, 1951) is in the engineering department of Buchans Mining Company at Buchans, Newfoundland.

D. L. Stewart, S.E.I.C., (University of Saskatchewan, B.Sc., mechanical, 1951) is a student graduate on a training course with Canadian Westinghouse in Hamilton, Ontario.

F/O G. D. Steele, S.E.I.C., is construction engineering officer for R.C.A.F. at Trenton, Ontario. He graduated from University of New Brunswick in 1950 with a degree of B.Sc. in 1950.

J. J. Tremblay, S.E.I.C., (McGill University, B.Eng., civil, 1951) is with Defence Construction Limited at Bagotville, Que.

A. W. Thompson, S.E.I.C., (McGill University, B.Sc., civil, 1951) is with the engineering department of Imperial Oil Limited at Calgary, Alberta.

J. R. Tanner, S.E.I.C., (University of Toronto, B.A.Sc., mechanical, 1951) is student engineer on electrical apparatus and appliances for Canadian Westinghouse Company Limited at Hamilton, Ontario.

Visitors To Headquarters

J. F. Wickenden, M.E.I.C., Three Rivers, Que.

V. C. MacDonald, S.E.I.C., Winnipeg, Man., June 27, 1951.

G. S. Warner, Jr.E.I.C., Regnia, Sask., July 4.

G. R. Turner, M.E.I.C., Ottawa, Ont., July 11.

W. R. Meredith, M.E.I.C., Ottawa, Ont., July 12.

W. C. Brennan, Charlottetown, P.E.I., July 13.

R. H. Payton, M.E.I.C., St. Laurent, P.Q., July 17.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Lt.-Col. A. R. Sprenger, M.E.I.C., veteran of campaigns on India's northwest frontier and the First World War, died on June 18, 1951, in hospital after a lengthy illness.

Born in India, in 1877, Colonel Sprenger graduated as an officer at the Royal Military College, Sandhurst, England, in 1897. He was commissioned to the India Staff Corps of the Imperial Army and saw service on the Afghan frontier in Bengal and Punjab.

In 1900 he took part in the suppression of the Boxer Rebellion in China, and later returned to England to study engineering. In 1905 he came to Canada and for the next 10 years carried on engineering work in the bridge building field. He worked with the National Trans-continental Railway in charge of bridge construction at Saint John and at Newcastle, N.B.

Colonel Sprenger, joined the 115th Battalion at Saint John, N.B., in 1915 and went overseas with the unit as adjutant. He was transferred to the Canadian Engineers in England and later was on loan to the British Air Ministry.

Going to France in 1918 he saw action on the Amiens and Arras fronts. He was wounded some months before the war ended and was invalided to England. Following his return to Canada in 1919 he continued to practice his profession as a consulting engineer in Montreal. He was president of the Filmite Company Regd., for a time, and he was later associated with Wartime Merchant Shipping Company.

In 1929 he was named commanding officer of the 4th Divisional Engineers here and held that post until 1933.

Colonel Sprenger was a member of the Corporation of Professional Engineers of Quebec, and of the Royal Empire Society. He joined the Institute in 1906 as a Student becoming an Associate Member in 1908 and transferring to Member in 1919. He attained his Life Membership in the Institute in 1945.

G. R. G. Conway, M.E.I.C., died on May 20, 1951, in Mexico, where he has lived for many years.

Mr. Conway was born at Southampton, England, in 1873. He was educated at Hartley University College in Southampton and served a pupilage in civil engineering.

He worked in England and Scotland in municipal engineering projects, and he went to Mexico in 1907 as chief engineer of the Monterey Railway Light & Power Co. Ltd. He came to Canada in 1909 as chief engineer of the British Columbia Electric Railway Company, Vancouver.

Mr. Conway returned to Mexico in 1917 to the Mexican Light & Power Company. He was appointed managing director and later president. After many years as president, he retired from the company in 1947.

He joined the Institute as a Member in 1909 and attained Life Membership in 1946. He was a member also of the Institution of Civil Engineers, a recipient of the Institution's Telford Medal, and a contributor to the literature of the Institution. He was well known for his research in the history of Mexico. A year ago he was appointed a Commander of the British Empire.

W. E. Patterson, M.E.I.C., who was manager of engineering and development for Merck & Company, Limited, Montreal, died on June 25, 1951.

Mr. Patterson was born at Vancouver, B.C., on January 16, 1900. He studied at Queen's University where he received a B.Sc. degree in chemical and metallurgical engineering in 1924. Upon graduation he joined G. F. Sterne & Sons Limited as chief chemist, and Sternson Laboratories Limited, as managing director, for which companies he assumed responsibility for plant development and manufacturing control. For them he did soil stabilization work and inspection on airports at Malton, Hamilton, London, Moncton, Dartmouth and Yarmouth, and soil and general inspection at the Shand Dam. In 1940 he was sent to England to do work on special compositions for the Department of Munitions & Supply. He joined Merck & Company Limited in Montreal in 1942 as a technical director, becoming manager of engineering and development in 1947.

He joined the Institute as a Member in 1947. He was also a member of the Chemical Institute of Canada and in 1950 was appointed director of publications of the Chemical Institute.

F/C F. W. Smith, JR.E.I.C., of Shelburne, N.S., who had been stationed at the R.C.A.F. Station, Summerside, P.E.I., was killed in a plane crash in Labrador, in May, 1951.

F/C Smith was born at Halifax, N.S., in 1927. He received a B.Eng. degree in chemical engineering from Nova Scotia Technical College in 1949. Prior to joining the R.C.A.F. he was a plant service chemist for Canadian Industries Limited, at Toronto, Ontario.

He joined the Institute as a Student in 1949, transferring to Junior in 1951.

News of the Branches

Sarnia

G. R. McMillin, M.E.I.C.
Secretary-Treasurer

Field Trip, June 19th

Approximately forty-five members of the Sarnia Branch motored to London for a trip through the General Motors Diesel Limited plant. Entire arrangements for the trip, which included a steak dinner at the Glen Allen restaurant west of London, were made by the Junior Executive under the chairmanship of Mr. Murray Stewart. Following the dinner, Mr. G. E. Humphreys, chairman of the London Branch of the Institute, welcomed members of the Sarnia Branch and expressed the desire that a joint meeting of the London and Sarnia Branches could be arranged at some future date.

General Motors Diesel Limited plant occupies 226,000 square feet, contains three miles of railway track and employs approximately one thousand workers. By June 1950, only nine months after breaking ground for the plant, production began on the first general purpose diesel electric locomotive. This is the type currently in production for Canadian Pacific Railway and may be used in multiple units each of 15,000 horsepower for heavy freight service. Smaller powered switcher locomotives are also in production in units of 6,000, 8,000 and 12,000 horsepower. Engine parts such as pistons, heads, connecting rods and fuel injectors are often interchangeable between models of different horsepower ratings, higher power being obtained by additional cylinders.

Sixteen diesel electric units were produced during May, 1951, bringing the total to over 100 units built at the plant. General Motors Diesel Limited are justly proud of this record, accomplished almost entirely by Canadian workmen relatively inexperienced in this type of heavy steel welded construction. All engineering except for minor changes and innovations made at the plant, originate in the General Motors Chicago offices. Several major components are manufactured at the Electro-Motive Division of General Motors, located at La Grange, Illinois. These include all the diesel engines, generators and traction motors for assembly and installation at the London plant. Other parts and materials are supplied by over 250 Canadian vendors as well as some items such as locomotive wheels which are imported from England.

Assembly lines are so laid out that all incoming material is received on one side of the plant in numerous assembly bays which feed into one main assembly line. Bays where heavy sub-assemblies and frame sub-assemblies are welded and assembled together on jigs, employ travelling cranes. In one section axles and wheels receive finish machining prior to assembly in the large cast truck frame, along with gear-coupled traction motors; two four-wheeled trucks are required for each locomotive. The chassis is built up from heavy steel plate and channels, of all-welded construction. A shot peening chamber handling a complete locomotive, and an annealling furnace operating up to 1200 deg. F. in a 12-hour process are additional points of interest. In one of the final assembly operations, a crane lowers the entire chassis, power plant, and control cab weighing 125 tons on the two trucks.

Following the tour which required about one hour and a half, lunch was served in the cafeteria. On behalf of the visiting engineers, Mr. Bob Connell moved a vote of thanks to the General Motors Diesel Limited and guides who had conducted them on such an excellent plant visit.

- ★ Completely flexible and adaptable to rapidly changing traffic conditions.
- ★ Sectionally-built . . . all parts interchangeable without special fittings.
- ★ Keeps replacement parts inventory to a minimum.
- ★ Retains exceptional brilliance of former types.
- ★ Easy to maintain.
- ★ Light weight with strength and durability.
- ★ Low cost.
- ★ A product of Northern Electric's advanced Traffic Engineering.

Long-range, high-intensity lens provides clear and unmistakable attention-demand signals in all kinds of weather . . . Special super-brilliant parabolic reflector of silver-coated clear pat glass . . . Exceeds standards of Institute of Traffic Engineers.

Northern Electric

COMPANY LIMITED

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another Canadian industry . . .

★ **Courtaulds (Canada) Ltd. Cornwall, Ont.**

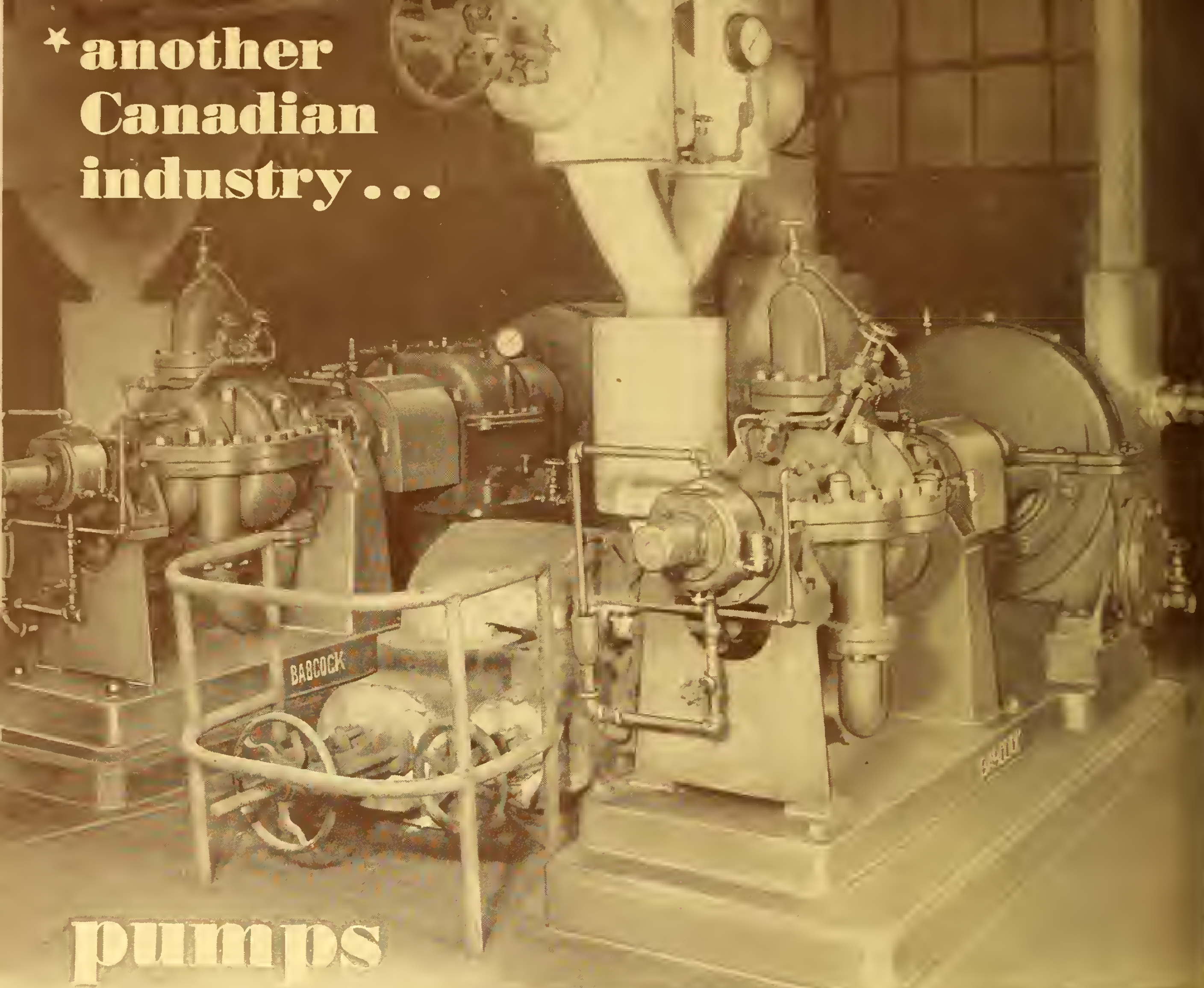
boilered by BABCOCK

18 years ago Courtaulds (Canada) Ltd., Cornwall, Ontario, first installed a Babcock boiler. As the demand grew for process steam Babcock made further installations. Today another 105,000 lbs. of process steam per hour is provided for this busy plant by this new Babcock boiler. It is fired by a 16 ft. Babcock Style "40" chain grate stoker and gains additional B.T.U. from every pound of fuel with a Babcock loop type economizer. Find out how Babcock boiler installations are engineered to fit your particular needs. Write for further information today.

BABCOCK - WILCOX & GOLDIE - McCULLOCH
GALT LIMITED ONTARIO
MONTREAL TORONTO CALGARY VANCOUVER

BABCOCK
"INTEGRAL-FURNACE"
BOILERS

* another Canadian industry . . . pumps



by BABCOCK

These two Babcock Four-stage Centrifugal Boiler Feed Pumps are installed in the tire plant of the

Dominion Rubber Company, Limited,

at Kitchener. One pump is driven by a Babcock H-1 Steam Turbine, and the other by a 125 h.p motor with speed increaser. Each has a capacity of 261 Imperial gallons per minute, discharging against a total head of 795 feet when running at 3500 r.p.m.

Each pump is individually designed to meet the exact specifications for its job. It is not merely an adaptation. Thus every Babcock pumping installation guarantees efficiency and reliable economy.

BABCOCK - WILCOX & GOLDIE - McCULLOCH

GALT LIMITED ONTARIO

MONTREAL TORONTO CALGARY VANCOUVER

Photograph courtesy of Dominion Rubber Company Limited.

BABCOCK Centrifugal PUMPS

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CHEMICAL

HEMICAL ENGINEER required for research department of organization in Quebec. Recent graduate or experienced engineer for work on existing processes and original development. Apply to File No. 4006-V.

ELECTRICAL

LECTRONICS ENGINEER with about 5 years experience in circuit design and graduate electrical engineer for position of electronic circuits design draughtsman, preferably with experience. Position with manufacturer in Ottawa. Apply to File No. 3098-V.

ADIO ENGINEER, senior design engineer with 8 to 10 years experience in low, medium and high frequency communication, transmitter design. Must be capable of heading a section and have the qualities necessary for advancement. Starting salary $6,000.00 per year. Location Montreal. Also Junior Radio Engineer with 3 to 5 years experience in electronics design. Apply to File No. 4010-V.

ELL QUALIFIED ELECTRICAL engineer to act as supervisor of underground distribution by a Canadian utility in Brazil for planning underground distribution systems and allied substations; standardizing present practices, special studies. Prefer 7 to 10 years experience. Quote File 13771. Apply to File No. 4014-V.

ECTRICAL ENGINEERS with test-course experience are required for specification writing, comparison of tenders, supervision of acceptance tests, liaison with manufacturers and checking drawings. Possibility of going to Brazil in six months to two years. Quote File No. 14110. Apply to File No. 4014-V.

IEF OF SYSTEM PLANNING well qualified electrical engineer is required by a Canadian utility in Brazil for long range planning of generating, transmission and receiver facilities; supervision of distribution, relay protection, carrier current, research and standards department, forecasting capital expenditures. Prefer 7 to 15 years experience. Quote File No. 13737. Apply to File No 4014-V.

REE ELECTRICAL ENGINEERS required by large organization in Montreal for specialized sales work in power apparatus. Applicants should have about 5 years experience partly or completely in test room or power house work. Salary commensurate with experience. Apply to File No. 4015-V.

MECHANICAL

GRADUATE MECHANICAL ENGINEER for position of structural and components design draughtsman, preferably with experience, also draughtsman for mechanical electromechanical and circuits layout with at least 2 years experience. Apply to File No. 3098-V.

YOUNG ENGINEER preferably mechanical required for Montreal sales office of Toronto manufacturer. Apply to File No. 4018-V.

MECHANICAL ENGINEER required for Toronto sales office of large manufacturing firm in Montreal. Training period in Montreal. Good opportunity offered. Apply to File No. 4020-V.

MINING

MINING ENGINEER, recent graduate required by organization in Province of Quebec. Apply to File No. 3097-V.

MISCELLANEOUS

CHIEF OF FOREIGN WIRE RELATIONS required by Canadian Telephone Company in Brazil. Prefer about 10 years experience with a manufacturer or utility; experience in design, operation and maintenance of telephone plants including carrier systems as well as a knowledge of the fundamentals of power generation and distribution would be valuable. Practical and theoretical experience in inductive co-ordination, electrical protection and electrolysis problems as applied to telephone plants with emphasis on the methods of protecting them from lightning and low frequency induction would be desirable. Apply to File No. 3099-V.

GENERAL MANAGER required to supervise the entire operations of water, light and power Commission in Ontario. State qualifications, age, experience, references and when available. Apply to File No. 4000-V.

YOUNG ELECTRICAL OR MECHANICAL engineers required by electrical manufacturer located in Montreal for plant in Ontario. Apply to File No. 4002-V.

THREE MINING OR MECHANICAL engineers required by large mining company in Quebec, also draughtsman for layout and design work. Apply to File No. 4003-V.

APPLICATIONS FOR THE POSITION of engineer for the Town of Fort Francis will be received until August 31st, 1951. In reply please state age, qualifications, experience and salary expected to J. W. Walker. Apply to File No. 4004-V.

WORKS MANAGER required by machine company located in Maritimes, presently engaged in marine engine repairs, marine repair work afloat, machine shop work, boiler and tank building. Applicants should be between 40 and 50 years of age. Apply to File No. 4005-V.

1950 OR 1951 MECHANICAL OR ELECTRICAL engineers, required by construction company located in Montreal. Apply to File No. 4007-V.

HEAT TREAT SPECIALIST required in Montreal. Applicant should have knowledge of electric heat treating of precision machined parts. Should be capable of assisting in department layout and selection of equipment. Apply to File No. 4011-V.

ELECTRO PLATING SPECIALIST with knowledge of electro plating high grade machined parts with cadmium, zinc, copper, tin and silver. Should be capable of assisting in department layout and selection of equipment. Location Montreal. Apply to File No. 4011-V.

CANADIAN COMPANY located in Ontario urgently requires engineers to fill key positions (1) works manager, (2) graduate engineer for engineering division, (3) chief inspector, (4) methods engineer (tool design department). Nature of work is aircraft, on jet engine work. Apply to File No. 4012-V.

A CANADIAN UTILITY in Brazil requires a well qualified business man with utility experience to direct sales promotion, billing, tariffs, consumer research, statistics, advertising and to correlate economics data. Duties would include correlating the business activities of nine public utilities. The successful applicant will report directly to Vice-president operations. Quote File No. 13740. Apply to File No. 4014-V.

A CANADIAN UTILITY IN BRAZIL requires a rate setting engineer or a retired rate specialist to set up a retail rate department in Rio de Janeiro and Sao Paulo. The position would be permanent for an experienced engineer but would last two or three years for a retired consultant. Quote File 13513. Apply to File No. 4014-V.

FOUR SALES ENGINEERS required by Montreal manufacturer of automatic controls and industrial instruments. Two vacancies for bilingual mechanical or electrical recent engineering graduates. Apply to File No. 4016-V.

TWO SENIOR ENGINEERS with experience in general and detailed layout of mill buildings, equipment and equipment layout, including processing equipment, material handling, conveying, packaging, etc. Location Quebec. Apply to File No. 4017-V.

ENGINEER with experience in development or research preferred but not essential. Age 24 to 28. Personality and appearance suitable for outside trade contact is necessary. Location is Montreal. Salary commensurate with experience. Apply to File No. 4021-V.

ENGINEER, age 24 to 28 required with experience in sales or purchasing preferred but not essential. Location is Montreal. Salary commensurate with qualifications. Apply to File No. 4021-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMISTS AND CHEMICAL ENGINEERS required to take charge of process development groups. Applicants should have at least five years development and production experience in chemical industry. Positions in Ontario. Salaries open. Apply to File No. 1335-V.

CHEMICAL ENGINEER or chemist preferably with eight to ten years' experience in the paint and lacquer industry. Applicant should be fully experienced in the formulation and development work of the above items. Location Ontario. Salary open. Apply to File No. 3052-V.

CIVIL

CIVIL ENGINEER for the design and layout of structural steel, reinforced concrete and general building work. Mechanical experience essential. Age 24 to 30 with at least 4 years experience in engineering. Location Ontario. Apply to File No. 3056-V.

CIVIL ENGINEER with experience in wharf and dock work required by contractor in Montreal. Salary open. Apply to File No. 3060-V.

CIVIL ENGINEER required by organization in Montreal with construction experience and construction accounting, to be responsible to chief engineer. Good opportunity for advancement. Apply to File No. 3081-V.

GRADUATE CIVIL ENGINEER required by consulting engineering firm in Toronto area. Five to 10 years experience in drainage and water distribution systems, design, draughting and supervision. Must be able to design and detail structural steel and reinforced concrete. Apply to File No. 3084-V.

CIVIL ENGINEER required by engineering firm in Toronto with municipal experience covering the field of water, sewage systems and sewage disposal. Apply to File No. 3089-V.

ELECTRICAL

FULLY EXPERIENCED ELECTRICAL ENGINEER required by textile industry located outside Montreal. Applicant must have some real practical experience, about 15 years in a manufacturing plant, preferably textile mill. Excellent opportunity offered. Apply to File No. 1418-V.

ELECTRICAL ENGINEER with at least five years professional experience, a substantial part of which should have been in hydro-electric central station and substation design. Salary $325.00 to $400.00 per month depending on qualifications and experience. Location Victoria, B.C. Apply to File No. 2073-V.

ELECTRICAL ENGINEERS REQUIRED by large Canadian Manufacturer for application engineering and negotiation work on electrical apparatus to specialize in specific industries such as: Central Station, metal working, transportation, paper and pulp, rubber, mining and chemical, marine. Applicants should have high intelligence, commercial sense, sound engineering background, pleasing personality. Exceptionally interesting, well paid work for men with necessary high qualifications. Some travelling. Apply to File No. 3043-V.

YOUNG ELECTRICAL ENGINEER to act as sales engineer for manufacturer in Montreal. Applicant should have some experience with public utility or cable manufacturer. Territory largely Eastern Provinces. Apply to File No. 3047-V

ELECTRICAL ENGINEER, experienced required by manufacturer in Ontario of small transformers, such as those used in radio, television, automobile ignition coils and battery boosters. Applicant should be able to write specifications and prepare designs, as well as know something of manufacturing problems and have about 5 or 6 years experience. Apply to File No. 3049-V

ELECTRICAL ENGINEERS REQUIRED by large organization in Montreal with university degree in electrical engineering, engineering physics or radio engineering. Non-graduates acceptable if equivalent training and experience have been obtained by other means Intermediate and senior engineering positions are also available for men with two or more years experience in design and development of radar or radio communications equipment Duties involve electrical design and development of radar and radio communications equipment for defence and civilian purposes. Salaries open. Apply to File No. 3064-V.

SENIOR ELECTRICAL ENGINEER who can actually head up electrical design work on a hydroelectric project, required by consulting engineering firm in B.C. Apply to File No. 3069-V.

ELECTRICAL ENGINEER required i Montreal by manufacturer. Applican should have some experience with elec trical contractor. For estimating an general engineering duties. Apply t File No. 3077-V.

MONTREAL ELECTRONICS MANUFAC TURER has vacancy for an electronic engineer for design development an field testing of television receiver Should have at least two years exper ence in television engineering. Apply t File No. 3079-V.

ELECTRICAL DRAUGHTSMAN require by western Ontario chemical industr Applicant should have thorough know ledge of explosion proof Class 1, Grou D installations, powerhouse control wi ing, synchronous motor installatior substation layouts and underground di tribution systems. Senior man with 5 10 years experience sought, capable preparing detailed drawings, bills material prepared by electrical enginee In addition, drawings of existing i stallations have to be brought up date. Permanent position. Apply to Fi No. 3080-V.

ELECTRICAL ENGINEER required Montreal for the installation of equi ment in new plant. Some previous e perience necessary. Age 25 to 35 yea Apply to File No. 3085-V.

ELECTRICAL ENGINEER rquired in Pr vince of Quebec with a minimum four or five years experience in supe vising an electricians crew in an i dustrial plant. Applicant must have proven record of success in industri electrical maintenance. Salary open. Pr ference will be given to a man wi pulp and paper experience. Apply File No. 3091-V.

MECHANICAL

MECHANICAL ENGINEER required f layout and design of plumbing and hea ing equipment. Location Montreal. S ary open. Apply to File No. 1252-V.

MECHANICAL DRAUGHTSMAN requir by large coal mining firm in the Ma times for simple designing, layout a detail drawings for ordinary collie plants screening equipment. Hois simple steel structures, etc. Salary op Apply to File No. 1332-V.

MECHANICAL DESIGN ENGINEERS r quired by West Coast pulp and pa mill, previous pulp and paper exp ience desirable but not necessary, a consideration will be given to all ap cants with industrial experience. S aries from $3,600.00 upwards comme surate with experience. These are p manent appointments in well establi ed mill. Apply to File No. 1582-V

MECHANICAL ENGINEER required large firm in Montreal to act as railrc car engineer. Applicant should have t or three years (or more) of experie in the design of tank cars, as defined the Association of American Railroa Familiarity with the requirements of

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THE DEFENCE RESEARCH BOARD

requires

FOR EMPLOYMENT IN THE FOOD SECTION
DEFENCE RESEARCH MEDICAL LABORATORIES
TORONTO, ONTARIO

Research Scientist to conduct research and development in food packaging and packing. This will involve work independently and in co-operation with manufacturers and other agencies on suitable container materials and methods of container fabrication, and will require a knowledge of such materials as paper and paper products, plastic films, metal foils, metal cans, enamels, adhesives, inks, etc. Applicants should have a Ph.D. or M.Sc. degree in chemical engineering, organic chemistry, or physical chemistry, and should have had some industrial experience with the container materials mentioned above.

Initial salaries will be dependent on qualifications and experience. Generous leave and other employee benefits including Group Hospital-Medical Insurance Plan are available, Superannuation Plan in effect.

Apply to:

Director of Research Personnel,
Defence Research Board,
Department of National Defence,
"A" Building, Ottawa, Ontario.

Please quote position number G-11 when applying.

A.A.R., the I.C.C., the Bureau of explosives and the Board of Transport Commissioners is essential. Salary open. Apply to File No. 1600-V.

MECHANICAL ENGINEER required by large firm in Montreal. Applicant should have experience in the pulp and paper industry, particularly in the design and for operation of paper making machinery. One or two years experience desired. Salary open. Apply to File 1600-V.

MECHANICAL ENGINEERS required by large manufacturing firm located one hundred miles from Montreal. Excellent opportunities for experience and promotion in time study standards department eventually leading to shop management. Apply to File No. 1621-V.

MECHANICAL ENGINEER, recent graduate, up to three years employment, interested in obtaining drawing office experience in plant production of heavy armament work. Forty minutes by tramways from Phillips Square, Montreal. Apply to File No. 2014-V.

MECHANICAL ENGINEER required as assistant to chief inspection of large oil company in Montreal. Applicant should have at least three years experience in plant maintenance, involving shop fabricating methods and inspection. Knowledge of metallurgy and familiarity with corrosion problems an asset. Salary open. Apply to File No. 2052-V.

MECHANICAL ENGINEER required for engineering office of large oil company. Applicant should have minimum of two years experience in design and layout of mechanical equipment. Working knowledge of pressure vessel design an asset. Location Montreal. Salary open. Apply to File No. 2052-V.

MECHANICAL ENGINEER with 3 to 5 years experience in maintenance engineering. An asset if bilingual but not necessary. Location: Valleyfield, Quebec. Excellent opportunity offered. Salary open. Apply to File No. 2053-V.

MECHANICAL ENGINEER with at least 2 to 3 years experience in the design and job fabrication of A.S.M.C. Pressure vessels and heat exchangers required for design, estimate and inspection work by engineering company located in Montreal. Salary commensurate with ability. Apply to File No. 2070-V.

MECHANICAL AND CHEMICAL ENGINEERS required in the control department of paper mill located in Newfoundland. Applicants must be interested in control and process work. Salaries open. Apply to File No. 2085-V.

McGill University

McGill University requires graduate mechanical engineers in the department of mechanical engineering; qualified in the design field for full time appointment, instructors and demonstrators for seven months, from 1st of October 1951. Apply to File No. 4022-V.

MECHANICAL ENGINEER with several years experience in maintenance and plant engineering work. The position open is that of plant engineer at the Toronto plant of organization with headquarters in Montreal. Salary range $400.00 to $450.00 per month. Apply to File No. 3048-V.

TWO MECHANICAL ENGINEERS OR MECHANICAL DRAUGHTSMEN required for layout piping and general work in plant engineering and design. Age 24 to 30 with at least 4 years experience in engineering. Location Ontario. Apply to File No. 3056-V.

MECHANICAL ENGINEERS with M.E. degree or equivalent theoretical knowledge. For senior positions which are also available, three or more years experience in design or manufacture of electrical apparatus or similar products will be required. Duties: processing and preparation of manufacturing information required to manufacture and assemble complex radar and radio communication equipment. Salary according to experience and qualifications. Location Montreal. Apply to File No. 3064-V.

MECHANICAL DRAUGHTSMEN required by large machinery manufacturing firm in Eastern Townships. Knowledge of machine design. Salary commensurate with ability. Apply to File No. 3065-V.

PROFESSIONAL ENGINEER

WANTED FOR THE TOWN OF FORT FRANCES

Applications for the position of Engineer for the Town of Fort Frances will be received by the undersigned until August 31st, 1951. In reply please state age, qualifications, experience and salary expected.

**J. W. Walker, Town Clerk,
Fort Frances, Ontario.**

MECHANICAL ENGINEERS required by large machinery manufacturing firm in Eastern Townships. Opportunity for recent graduates or experienced engineers. Apply to File No. 3065-V.

ESTIMATOR, preferably graduate engineer, responsible for preparation in checking all estimates for construction or alterations, equipment, installation of equipment, piping, heating, etc. Three years experience necessary. Location Montreal. Apply to File No. 3081-V.

MECHANICAL ENGINEER required with several years' experience in a responsible position concerned with the maintenance and operation of large hydro-electric plants having reaction turbines. Applicants should be preferably graduate mechanical engineers and must be acquainted with the theory of strength of materials, fatigue phenomena and modern metallurgy with special reference to the alloy steels used in hydro-electric turbines. Location Rio de Janeiro, Brazil. Applicant must be willing to learn Portuguese and adapt himself to foreign living conditions. Age 30 to 40 years. Apply to File No. 3082-V.

WANTED CANADIAN AGENT with pump engineering experience, to cover manufacturer's range of accelerators, boiler feed and condensate pumps. Write Ryland (Manchester) Ltd., 71 Welcomb Street, Hulme, Manchester 15, England. Apply to File No. 3095-V.

POSITIONS VACANT

Twenty mechanical engineers, senior and junior, are required to work in Montreal Office on

(a) Design of special machines.

(b) Design of heating and air-conditioning systems.

Must have college degree or equivalent background. Some practical experience in either field is desirable.

Apply in person or by mail to:

**Manager,
C. D. Howe Company Limited,
Consulting Engineers,
1421 Atwater Avenue,
Montreal, Quebec.**

MISCELLANEOUS

FOUNDRY METALLURGIST required in British Columbia. Applicant should have broad experience in research work. Apply to File No. 1118-V.

SENIOR CONSTRUCTION ENGINEER, bilingual with first class organizing and administrative ability for construction job abroad. Apply to File No. 1293-V.

PHYSICIST OR MECHANICAL ENGINEER wanted to act as head of Nuclear Engineering Branch by National Research Council. Applicant will be required to direct a group of physicists and engineers in applied research and engineering development related to design of atomic energy plants and plant equipment. Salary $5,000.00 to $6,300.00. Apply to File No. 1325-V.

SENIOR DESIGN ENGINEER required in Ottawa, with a degree in mechanical or chemical engineering. Applicant should have a minimum of 5 years experience in mechanical design particularly with reference to chemical plant equipment and process. Apply to File No. 1507-V.

TECHNICAL DIRECTOR wanted for paper company producing from 100% rag to 100% sulfite papers. Applicant should be a graduate chemist or chemical engineer and must be bilingual. Surroundings are ideal and living conditions very good. Mills located near Montreal in the Laurentian mountains. Apply to File No. 1586-V.

DESIGN ENGINEER, approximately 10 years experience in structural material handling and mechanical design. Boiler design experience an asset but not essential. Location Western Can. Apply to File No. 2000-V.

ASSISTANT PRODUCTION SUPERINTENDENT required by large firm of long standing manufacturing men's shirts, pajamas, etc., for plant near Three Rivers, Quebec. Experience in manufacturing these lines or similar necessary. Applicant would be required to plan for high production, improve methods, lower costs, etc. Good proposition to right party. Apply to File No. 2018-V.

PROJECT ENGINEER, graduate with at least ten years experience in design, construction and operation of petroleum chemical plants on petroleum refineries, required to supervise project division of company engaged in engineering and construction of gas processing plants located in Montreal, Canada. Salary commensurate with ability and experience. Apply to File No. 2051-V.

DRAUGHTSMAN, senior layout man, required for the engineering department of new plant in Western Ontario. Must be capable of making complicated layouts from specifications, drawings, sketches or notes furnished by engineers and have considerable knowledge of manufacturing processes and their limitations. Should be capable of doing some designing. Experience in structural work and piping. University degree would be helpful but not necessarily required. Apply to File No. 2062-V.

INDUSTRIAL ENGINEER required by firm of management consultants. Should be experienced in plant layout, production control, time studies, wage incentives, cost and budget controls. Age 35-60. Free to travel. Apply to File No. 2079-V.

RESIDENT ENGINEERS AND INSTRUMENTMEN required for work on the construction of the Quebec North Shore and Labrador Railway. Applicant should have some experience on highway work. Good working conditions. Salaries open. Apply to File No. 2086-V.

ENGINEERS REQUIRED by Canadian Armament Research and Development Establishment. Mechanical engineers or those from other branches, such as electrical or engineering physics whose interests or experience lead them to the mechanical design side. Aeronautical engineers, familiar with airframe structural design and stressing. Metallurgical engineers with either physical laboratory or design interests. Mechanical draughtsmen, with experience, capable of handling small sections in the drawing office and/or acting as checkers. Apply to File No. 3044-V.

A LARGE MANUFACTURER requires salesman for heavy equipment and hydraulic equipment. Good background, engineering experience successful record of sales in this field required. Reply in full first letter. Apply to File No. 3045-V.

THE CIVIL SERVICE COMMISSION invites applications for appointment to the hydrographic services of the department of mines and technical surveys. Successful candidates will be assigned to ships during the summer to assist with survey work involved in charting coastal and large inland waters for navigational purposes. Hydrographers spend the winter months at quarters compiling charts. The minimum qualifications for the various types of positions are as follows: (a) graduation from a university or college of recognized standing or, (b) navigational experience or (c) surveying experience or (d) graduation from high school or technical school with an academic standing which would permit entrance to school of applied science. Assignments will be made either at headquarters at Ottawa or at the Victoria Office of the Hydrographic service in B.C. All travelling expenses paid. Those at Ottawa will serve on the Eastern Seaboard and on inland waters, while those at the Victoria Office will be employed on west-ern coastal waters. Allowance for sea duty will be paid for the time spent on board ship while it is away from home port. Apply to File No. 3046-V.

SALES ENGINEER, wants to manage Vancouver Office of American firm engaged in industrial sales to power plants, pulp and paper mills, municipalities, institutions, etc. Must be granduate mechanical engineer, Canadian citizen 30 to 40 years of age, with previous experience in similar work. Salary open. Apply to File No. 3050-V.

MAINTENANCE AND CONSTRUCTION ENGINEER required by an established metallurgical plant in Montreal. Permanent position offering opportunity for advancement. Apply to File No. 3053-V.

TWO ENGINEERS, electrical, mechanical or chemical, either newly graduated or with several years experience, required by large sugar refinery located in Montreal. Salary open. Apply to File No. 3058-V.

TRANSFORMER DESIGNER required for new plant being built at St. Johns, Que. Applicant should have several years experience in the design of distribution and power transformers to Canadian Standards. A responsible and secure position is offered with wide scope of advancement both personally and in the design field. Salary open. Give full details of education and experience. Apply to File No. 3059-V.

ASSISTANT RESIDENT ENGINEER required in Vancouver, B.C., for Granville Bridge. Qualifications required are preferably university graduate in civil engineering or structural with a minimum of three to four years field experience in construction work, or equivalent. Interviews would be conducted with persons now in vicinity or those willing to go to location. Apply to File No. 3062-V.

PROJECT ENGINEER required by organization in Montreal offering all modern employee benefits. Applicant should be chemical engineer with four to five years experience in design, construction or operation of petroleum and light hydro-carbon plants. Salary commensurate with experience. Submit full details of qualifications with recent photo. Apply to File No. 3063-V.

CHIEF INSPECTOR REQUIRED by large oil refinery located in Montreal area. Applicant must be graduate engineer and should have minimum of five years applicable experience in inspection and maintenance of refinery operating equipment. Duties would consist of scheduling and supervision of inspection policy, corrosion investigations, welding procedures, etc. Pension, accidents and sickness benefits provided. Excellent opportunity for ambitious man with executive ability in a rapidly expanding company. Salary open. Apply to File No. 3066-V.

MECHANICAL AND SENIOR ELECTRICAL engineers required by consulting firm in Montreal with experience in electronics. Salaries open. Apply to File No. 3070-V.

ENGINEERS required by municipality in Ontario. Applicants should have experience in structural design, sewer design or sewer construction. Salaries open. Apply to File No. 3072-V.

CHEMICAL OR MECHANICAL ENGINEER to act as buyer in chemical organization in Ontario. Duties to assist in supervision of department and to do buying of technical equipment. Some experience in practical buying and expediting. Salary open. Apply to File No. 3073-V.

ENGINEER REQUIRED by large oil company in Montreal. Applicant should have some experience in the design of piping with a certain amount of administration office experience and field inspection work. Apply to File No. 3074-V.

TWO SALES ENGINEERS required. One English speaking to be located in Central Ontario, preferably in the general Toronto area. Applicant should be preferably an airforce veteran or one who has had some experience with aero-engine fittings. Second engineer should be bilingual and be located in the Montreal-Quebec area. Salary, all expenses paid, prepaid hospitalization, group life, weekly indemnity and surgical benefits. Qualifications: mechanical engineer, preferably married, age 30 to 35 years with some selling experience and owning a car. Apply to File No. 3075-V.

RECENT GRADUATE required by manufacturer in Winnipeg. Applicant must be interested in production planning, time and motion study, etc. Work will be in connection with the setting up of a modern production program. Training period. Salary open. Apply to File No. 3076-V.

SALES ENGINEER, preferably mechanical with some pulp and paper experience. Location Montreal. Apply to File No. 3078-V.

EXECUTIVE ASSISTANT, Dominion-Provincial board, Fraser River Basin, headquarters Victoria, B.C. Applicants will be made in writing accompanied by appropriate references and mailed to Mr. Geo. J. Alexander, Secretary, Deputy Minister of Fisheries, Parliament Bldgs., Victoria. Must be graduate civil engineer eligible for registration in B.C. and one who has had experience along hydraulic lines and capable of supervising hydraulic studies and other investigations throughout the watershed. Technical knowledge and administrative experience essential. Starting salary \$4,800.00 per year. Apply to File No. 3083-V.

PLANT ENGINEER required by manufacturer of chemically blown sponge. Applicant must be capable of organizing and supervising general plant maintenance. Also a broad background in the installation and maintenance of all types of rubber processing machinery would be helpful. Location Province of Quebec. Salary open. Apply to File No. 3086-V.

MECHANICAL OR CIVIL ENGINEER required for Northern Ontario Sulphate Mill. Recent graduates would be considered. Excellent opportunities to gain experience and good prospects for promotion. Apply to File No. 3087-V.

GRADUATE ENGINEER required in Toronto, to be responsible and to supervise the work from 6 to 10 engineers.

Applicant should have a good knowledge of structural work including reinforced concrete, structural steel and timber and preferably experience in materials handling which would involve the layout of belt conveyor systems. Salary to experienced man $450.00 to $500.00 per month. Also 1 or 2 draughtsmen required with experience in the above mentioned work. Apply to File No. 3089-V.

MECHANICAL OR CIVIL ENGINEER required by pulp and paper mill in Province of Quebec. Applicant should be bilingual and have considerable experience in design. Good salary together with social benefits. Apply to File No. 3090-V.

DUST CONTROL ENGINEER for a group of Asbestos mills. Applicant should be a graduate engineer with experience in ventilation and dust control. Work will consist of investigation and development of dust control methods and equipment and cooperating with the staffs of the various mines on the installation and operating of dust control systems. Apply to File No. 3092-V.

ENGINEER required by Montreal manufacturer for sales and service work of industrial instrumentation. Territory Montreal. Salary open. Apply to File No. 3093-V.

ONE ASSISTANT STEAM PLANT SUPERINTENDENT, required for large Newfoundland paper mill. Essential requirements—1st Class British Board of Trade Marine Engineers Certificate, sound Mechanical training, experience with high pressure boilers and turbines. Age limit 45 years. Attractive salary and good working conditions. Other detailed information available on application. Apply to File No. 3094-V.

ONE ENGINEER, required for large Newfoundland paper mill, with 2nd Class British Board of Trade Marine Engineers certificate, to supervise small steam plant and act as assistant master mechanic over mechanical shops. Must have sound mechanical training. Single man preferred. Attractive salary and good working conditions. Other detailed information available on request. Apply to File No. 3094-V.

Situations Wanted

GRADUATE PRACTICAL MECHANICAL ENGINEER with foremanship record, health, married, 39, bilingual, pilot, also experienced in aeronautics, civil, hydraulical and some electro-electronic engineering wishes serious assignment abroad in southern climate, preferably in British possessions. Apply to File No. 140-W.

CIVIL ENGINEER, B.Sc., Queen's 1948, M.A.Sc. Toronto 1949. Prof. Engineer (Ont.) Jr.E.I.C. Age 26, single. Presently employed as assistant town engineer. Have 2 years practical experience in every phase of municipal engineering. Prior to present position have been on highway surveying and construction; precise surveying and mapping, hydrographic surveying. Also experienced in reinforced concrete design, sewerage work and waterworks design. Desires position where opportunity exists for acquiring of further experience in sanitary engineering designs preferably with a consulting engineer specializing in municipal and sanitary engineering. Apply to File No. 250-W.

MECHANICAL ENGINEER, 1950 graduate in industrial option, with 14 months varied experience in large manufacturing industry desires position in production organization. Apply to File No. 1216-V.

GRADUATE ENGINEER, 8 years draughting and design, including 3 years tool design; is available on short notice for group leader: chief draughtsman of small or medium size staff; tool designer; or tool engineer. Location is not a deciding factor. Salary desired $425.00 per month. Personal interview by appointment. Experience also includes structural steel reinforced concrete, steam plant, piping, oil refiner and chemical plant. Apply to File No. 1935-W.

POSITION AS SALES PROMOTION MANAGER sought. Age 34. Competent to handle all phases of advertising; produce sales literature; write and edit; promote general publicity. Experience with firm of consultants; journalism; assistant sales development manager;

Attention, Members

Please telephone in advance and make an appointment if you propose using the Institute's Employment Department.

This will result in a better service to everyone concerned.

TELEPHONE PLATEAU 5078

Except in special cases all interviews will be arranged between the hours of 9 and 12.

manager sales office handling heavy and light equipment. Will consider position as assistant if scope not too limited and permits initiative. Also consider allied work. Apply to File No. 2670-W.

B.A.Sc., Jr.E.I.C. Honours, Toronto, 1947, desires permanent position preferably with small but expanding firm. Experienced in production and technique of rubber and thermoplastic molding and extrusion. Apply to File No. 2888-W.

ELECTRICAL ENGINEER, Manitoba, 1950. S.E.I.C. Age 30, married with family, air force veteran. Experience with power utility, dyke construction, pump station, construction estimating. Presently employed in signal department of Canadian Railway. Prior to war, construction and mining experience. References and detailed experiences on request. Seeks employment where hard work and initiative will lead to advancement. Apply to File No. 375-W.

EXPERIENCED ENGINEER, A.M.I.C.E., M.E.I.C. Age 31. 14 years combined Civil Mechanical background. Design and construction in road works, water supply, sewage system and large factory construction in U.K. Hydro-electric construction and investigation in U.K. and Canada. Geophysical investigation and deep well drilling and operation for water supply in N. Africa. Aircraft component design and machine shop practice in U.K. Require progressive position where experience may be utilized combined with aptitude for administration organization and production. Apply to File No. 3435-W.

ENGINEER, M.E.I.C. Age 46, married. Wide experience design, construction, operation and maintenance of plants manufacturing Kraft pulp, coal and synthesis gases and bye products, and sugar; including refractories and brickwork settings, concrete structures, steelwork, tanks and vessels, piping, mechanical conveyors, boiler plant and all ancillary equipment. Resident Engineer for the past 15 years. Available from mid-August. Apply to File No. 3505-W.

CHEMICAL ENGINEER, Prof. Eng. (Quebec), Jr.E.I.C. Specialized in Chemical Engineering. Three years experience in industry and presently employed. Bilingual. Worked on chemical control, industrial research. Also supervising experience. Would like position as engineer along following lines. Industrial research. Designing (chemical field). Consulting assistant. Applicant is mechanically inclined and has good creative imagination. Apply to File No. 3514-W.

ENGINEER, M.E.I.C., P.Eng., Quebec, University Sask. '26, with 25 years varied experience on construction, design and management of public utilities, public works and housing developments in all parts of Canada desires partnership in consulting firm or management position where experience can be of value. Initiative, good judgment and tact. Ability to organize effectively. Knowledge of legal and accounting aspects of construction. Available now. Apply to File No. 3511-W.

GRADUATE MECHANICAL ENGINEER, Sask., 1948, Jr.E.I.C. Single, R.C.A.F. veteran. Experience in production control, method analysis, time study, cost control and industrial relations. Desires a change into a field of engineering that will give more opportunity to practice mechanical engineering. Willing to work for moderate salary to gain experience. Apply to File No. 3516-W.

MECHANICAL ENGINEER, Jr.E.I.C., civil designer, and executive. B.Sc., P.Eng., A.S.M.E., A.S.C.E. Age 28, married. Five years experience in design, estimating, administration and supervision of engineering for pulp and paper mill, dams, hydro-electric plants and related structures, bridges, filtration plants, industrial buildings, and foundations. Previous successful record established in shipbuilding, and automobile industry, and U.S. government road construction. Ambitious, aggressive, and serious businessman seeking permanent employment in construction, industry, plant engineering, or sales; where security and scope for advancement are unlimited. Present salary $5,000.00 Ontario or West Coast preferred. Apply to File No. 3517-W.

METALLURGICAL EXPERT of considerable industrial experience, age 47, married. M.E.I.C., P.Eng., with educational background covering mechanical engineering, mathematics and physics, metallurgy and metallography. A disciple and co-worker of one of those European Physico Chemists who laid foundations for the modern science of metallic structure. Thoroughly versed on research level in the modern statistical control of the mass production of quality. Able to develop metallurgical iron and steel business on any scale, especially for armament purposes. Even small firms with good prospects of development are considered. Apply to File No. 3521-W.

CHEMICAL ENGINEER, 30 years old, newly arrived from Sweden. 8 years experience in laboratory research work and production control, former assistant at the Technical Universities of Stockholm and Budapest, specialist in food, fermentation, cereal and agricultural chemistry, is looking for suitable position. Married, no children. No location preference. Apply to File 3626-W.

GRADUATE CHEMICAL ENGINEER, Toronto, 1950, single. Experience in methods analysis, time and motion study and cost control. Desires to gain experience in a field more closely related to chemical engineering. Production or technical sales preferred. Willing to work anywhere. Apply to File No. 3527-W.

GRADUATE ENGINEER, Jr.E.I.C. Sask. 1948. Married, one child. Seeks responsible position in an engineering capacity with good chances for advancement, with a construction company or consulting firm in Western Canada. Experience includes survey work, draughting and design of building layout, piping layout, steam plant layout, earthwork and field supervision. Currently employed as field engineer with supervisory staff. Available on one months notice. Apply to File No. 3530-W.

CHEMICAL ENGINEER, Ph.D. from University of Berne, Switerland. Age 30. Recently arrived in Canada. Extensive experience in paper industry (research and production). Desire position in pulp and paper or allied industry. Available immediately. Apply to File No. 3531-W

BRITISH SUBJECT, mechanical engineering degree 31 years apprenticeship (2 years), design experience (1 year), commercial engineering experience (2½ years) on modern steam power plant projects, all with largest British manufacturer of mechanical and electrical power equipment, seeks suitable position with Canadian firm. Apply to File No. 3532-W.

ELECTRICAL ENGINEER, Jr.E.I.C. western Canadian university, 1949. Age 25. will complete two year graduate apprenticeship with an electrical engineering company in England this summer, desires position as sales or outside erection engineer. Apply to File No. 3533-W.

EX R.E.M.E. OFFICER, A.M.I. Mech. E. Age 35. Arriving in Canada in November. Experience of design of mechanisms, maintenance of vehicles, contractors plant, etc., and wide knowledge of management of engineering workshops dealing with machining, assembly, forging and heat treatment. Prepared to accept offers of employment now. Apply to File No. 3534-W.

MECHANICAL ENGINEER, S.E.I.C., University of Saskatchewan, 1950. Age 25. Naval Veteran. Experience includes, automotive mechanics, pipefitting, heating system design and installation, design and draughting office since graduation. Interested in all mechanical fields, especially automotive and implement manufacture, pulp and paper industry, diesel and gas turbine design and steam generating plants. Willing to undertake training program. Available on short notice. Apply to File No. 3536-W.

MECHANICAL ENGINEER, Queen's, 1950, S.E.I.C., Member C.P.P.A. Desires employment in British Columbia preferably in pulp and paper industry Veteran, age 33, married, 1½ years experience in general engineering office of pulp and paper company, 3 years on highway surveys. Presently employed, available September 30th. Apply to File No. 3537-W.

CIVIL ENGINEER, Jr.E.I.C., Toronto. 1949. Presently employed in Ontario at good salary in responsible position. Desire association with responsible engineering firm operating in British Columbia or British Isles. Experience one summer U.K., one year Canada on heavy construction (steam power plants); one year present position in charge of initiating, designing, and manufacturing new reinforced concrete structural units, 3 years under ground mining prior to war; ex-pilot R.C.A.F. Married, one child. Age 31. Apply to File 3538-W.

PRODUCTION MANAGER (A.M.I.P.E.) of a medium sized engineering company in England is contemplating immigrating to Canada and wishes to offer his services to a progressive company who require a works or production manager in light, medium or heavy engineering. Industrial career:—apprenticeship, tool room foreman aero & motor works, machine shop superintendent aero and motor works, production manager of light engineering works (1,250 employees). Age 38 years. Married. Scot. Apply to File No. 3539-W.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

ABSTRACT

Institution of Mechanical Engineers. Fundamental Dynamics of Reaction-Powered Space Vehicles. L. N. Thompson. (IME advance copy).

This paper is an attempt to place in correct perspective the current considerable speculation regarding the problem of interplanetary travel.

The concept and importance of "escape velocity" is dealt with first, and then the elementary mass-ratio equations for the motion of a space vehicle under various conditions are derived.

Available energy sources are considered next, the operational parameter being jet velocity. It is indicated that the maximum jet velocity conceivably attainable with chemical fuels is of the order of 20,000 ft. per sec. Nuclear fuels are dealt with and it is shown that, while energy potentials are very high, the problem of practical utilization is formidable. A thermodynamic type of atomic rocket motor employing an inert reaction mass to absorb the fission energy is postulated, and it is demonstrated that the heat transfer and materials requirements present a problem of the first magnitude.

The influence of propellant density on the performance characteristics of both chemical and atomic rockets is discussed, and it is shown that propellants giving high jet velocities may not necessarily be the best to use.

Orders of magnitude for the mass ratios required for various interplanetary flights are established, and it is indicated that only atomic drive will render them small enough to be attainable in practice.

It is concluded that, unless nuclear energy can be suitably harnessed, economical space-travel will not be feasible.

BOOK NOTES

Prepared by the Library
The Engineering Institute of Canada

American Society for Engineering Education. Engineering College Research Council. Review of Current Research and Directory of Member Institutions, 1951. 244 pp., $2.75.

This is a directory of American university faculties where engineering research is being done. Whenever possible, the following information is given: mail address, research officers, research policies, research personnel, research expenditures, short courses and conferences, research projects now active. The publication also includes lists of associate members, officers of the E.C.R.C., committees of E.C.R.C., official representatives of member institutions; it also includes a subject index to projects.

Behavior of Engineering Metals. H. W. Gillet. New York, Wiley, c1951. 395 pp., illus., $6.50.

This book undertakes to present the viewpoint of the metallurgist for those who have not specialized in this field. Since it is intended to help in choosing suitable engineering materials, the behaviour of these materials is discussed rather than the sometimes abstruse theories that seek to explain this behavior. Following the same reasoning, technical terms have been used as little as possible, and references have been selected, where a choice existed, for easy reading as well as for technical content.

Bibliography of Statistical Quality Control; Supplement. G. I. Butterbaugh. Seattle, University of Washington Press, 1951. 141 pp., $2.00.

The original annotated "Bibliography of Statistical Quality Control" (Seattle, University of Washington Press), of which this is a supplement, was issued in 1946 and listed some 712 articles, manuals, and books appearing in English within the period from 1924 to the beginning of 1946. This supplement, which covers the period from 1946 through June, 1949, lists approximately 725 items. An index covers both the original volume and the supplements.

Fers et Aciers Frittés. R. Kieffer and W. Hotop. Paris, Dunod, 1951. 573 pp., illus., 3200 fr.

The present work is a complete treatise on the metallurgy of iron powders. It contains chapters on the historical development and utilization of powder metallurgy for iron; general properties of powders; compression of powders and properties of compressed powders; sintering and properties of sintered materials; compression and sintering; industrial installations; comparison of properties of metals obtained through fusion and through sintering; products made of porous sintered iron; machinery made of sintered iron and steel; preparation of special iron and steel alloys, through sintering; sintered alloys of iron and other metals.

Hydraulics of Sediment-bearing Canals and Rivers. T. Blench. Vancouver, Evans Industries Ltd., c1951. illus., $4.75.

This work deals with the forming or modifications of natural or artificial channels through sediments. It is the author's claim that it is suitable for students, in that it develops the subject logically on a dynamical basis. The object of the book is to present a satisfying theory that will permit the reader to understand the behaviour of these special channels, and to make quantitate predictions with accuracy. This phenomenom of shifting boundaries in water bodies is normally ignored in conventional books on Hydraulics.

Jacobian Elliptic Function Tables; a Guide to Practical Computation with Elliptic Functions and Integrals Together with Tables of sn u, cn u, dn u, Z(u). L. M. Milne-Thomson. New York, Dover, 1950. 132 pp., $2.45.

The tables and formulae in this extensive collection have been choosen for their applicability to the widest possible range of problems. They cover complete integrals, series, double and half arguments, change of parameter, approximations, differentiation, elliptic integrals of the first, second, and third kind, complex arguments, etc. There is a special section devoted to the use of elliptic functions in conformal mapping.

Measure Theory. P. R. Halmos. Toronto, Van Nostrand, 1950. 304 pp., $7.70.

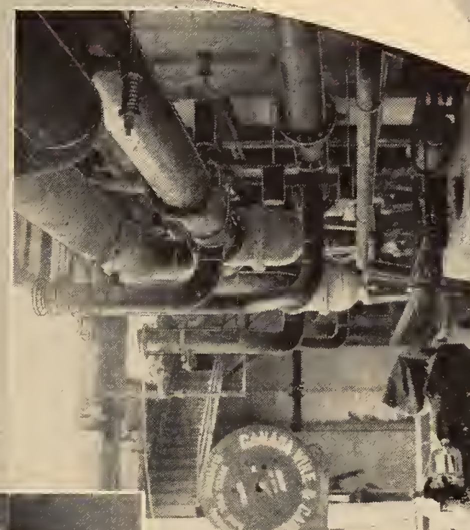
In this book, the main purpose of the author is to present a unified treatment of that part of measure theory which in recent years has become useful for its applications in modern analysis. The amount of new and unusual terminology has been kept to a minimum. The only necessary prerequisite for a profitable reading of the first seven chapters of this book is undergraduate algebra and analysis. At the end of almost every section there is a set of exercises which appear sometimes as questions but more usually as assertions that the reader is invited to prove. At the end of the book is a short list of references, a detailed index, and a long (four-page) bibliography. This work will be useful both as a text for students and as a source of reference for the more advance users of mathematics.

FOR HIGH PRESSURE HIGH TEMPERATURE *PIPING*

In the Power Plant of the new Columbia Cellulose Mill at Prince Rupert, B. C.

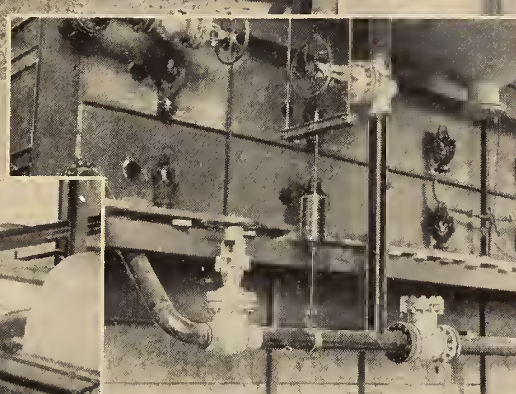
AT THE SITE — On this page are shown some of the Crane assemblies at the site. The photographs are unretouched and were purposely taken before or during erection, when the actual equipment could best be seen before being obscured by insulation, etc.

A piping aggregation in close quarters in the turbine room. ▶

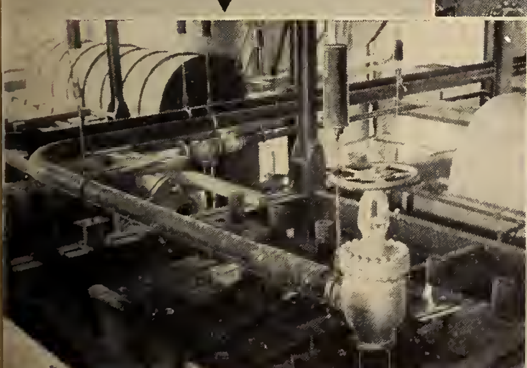


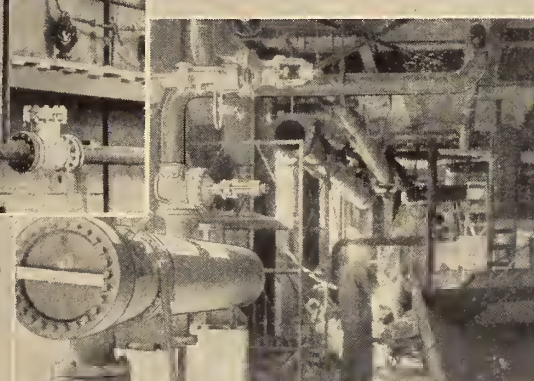
▶ Assemblies laid out ready for erection.

◀ Close up of assembled units including cast steel gate and check valves.



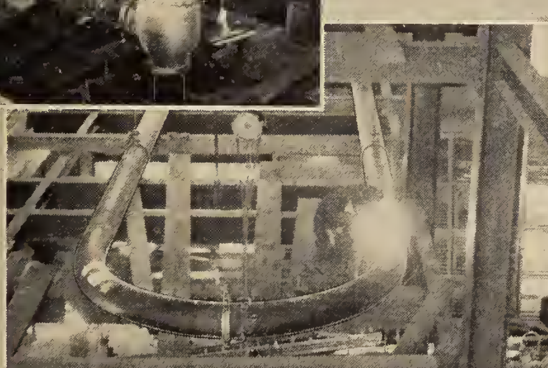
Cast steel angle valve assembly installed in position. ▼





▲ Feed water heat exchanger and piping units under erection.

600 lb., 12" dia. main steam header expansion loop being welded. ▶



In addition to the wide variety of fabricated piping assemblies and valves of all kinds provided for the boiler plant, Crane Limited has also supplied the Prince Rupert mill with plumbing fixtures, drinking water coolers and many other items for which Crane has long been recognized as the dependable — "ONE SOURCE OF SUPPLY".

CRANE

CRANE LIMITED: *General Office: 1170 Beaver Hall Square, Montreal*

Organic Reagents for Organic Analysis. Staff of Hopkins and Williams Research Laboratory. Brooklyn Chemical Pub. Co., 1950. 263 pp., illus., $5.00.

The authors state the purpose of this book to be "The use of organic reagents in preparing derivatives of organic substances for purposes of identification by melting points".

The choice of reagents considered has been based upon accessibility, stability, simplicity of preparation of derivatives, convenience of melting temperature range, sufficient difference of melting points, and extensiveness of series of melting points.

With the preparation of this book, a number of melting points were re-checked and some new ones established.

The first half of the book is a general survey of reagents, arranged alphabetically, including bibliographies; the second half is melting point tables.

The volume is indexed alphabetically for finer reference.

Pocket-Book for Miners and Metallurgists. 5th ed. Comp. by F. D. Power. London, Pitman, c1950. 545 pp., illus., $6.25.

Intended as a vade mecum for those engaged in mining and metallurgical industries, this work is a compendium of information, rules, formulae, tables, and concise notes on the various sciences with which metal mining is concerned.

Being a compilation, a bibliography is included of all source material used, and authors of previously published tables or formulae are duly acknowledged.

Originally published 58 years ago, this Pocket-book has already fully justified its existence. But we would like to draw this 5th edition to the attention of our readers who may already have an earlier one, and to introduce it to those of you who are not yet familiar with this valuable little reference manual.

Prestressed Concrete. 2nd ed. Gustave Magnel. London, Concrete Pub. Ltd., 1951. 300 pp., illus., $3.50.

In this work, the author deals first with statically determinate structures, paying particular attention to the difficult and important problem of providing sufficient bearing area at the ends of the stretched wires. A simple method of designing continuous beams is then explained. This method should make it easier to design a continuous beam in prestressed concrete than in ordinary reinforced concrete. The numerous tests made in the writer's laboratory in Ghent are next mentioned. These deal with creep of steel and concrete, the behaviour of beams when tested to the breaking point, and the problem of buckling during prestressing.

Society for the Advancement of Management; Proceedings of the Annual Fall Conference on Principles, Methods and Techniques for Increasing Productivity, Reducing Costs and Improving Human Relations. New York, the society, c1951. 212 pp., $5.00.

These proceedings are made up of 29 papers on management, such as "Motivation of human resources", by D. J. Morgan; "Industrial mobilization", by Leo Cherne; "Effective manpower utilization under emergency conditions", by H. F. Gracey; "Executive training and development", by E. G. Planty; "Nine incentive plans in a 200-man plant", by F. R. Larrabee; "The logic of efficiency and its acceptability in practice", by R. P. Brecht. The book also contains a list of the society's publications.

Soil Mechanics for Civil Engineers. B. H. Knight. Toronto, Longmans Green, 1951. 255 pp., illus., $4.20.

This book is not intended for the specialist, and, with a technical public in view, its chapters have been arranged so as to be more or less self-contained. Complicated mathematical proofs have been omitted, and every effort has been made to keep the mathematical portions as simple and self-explanatory as possible, although for the benefit of those readers who wish to delve more deeply, a full set of references has been included. Considerable stress has been laid on applications of soil mechanics to highway engineering problems.

Sound Reproduction. 2nd ed. rev. and enl. G. A. Briggs. Bradford, Wharfdale wireless works; C. W. Pointon, Montreal. 246 pp., illus., 10/6. Lib. ed. 18/3.

Written in non-technical language, this volume deals principally with sound reproductions under domestic conditions, and is divided into 2 parts.

The chapter on Loudspeakers treats of size, shape and lining of cabinets, ribbon speakers, reproducing for schools, etc.

Records, the second part, deals with all types of records, pickups, needles and grooves.

Acknowledgments to Technical Article and Books makes a short useful bibliography, and the book is indexed and excellently illustrated.

Structure and Mechanical Properties of Metals. Bruce Chalmers. London, Chapman, 1951. 132 pp., illus., 18s. (Being volume 2 of a series of monographs on metallic materials published under the authority of the Royal Aeronautical Society).

LIBRARY REGULATIONS

Hours

Mon., through Fri. . . 9 a.m. to 5 p.m.

Saturdays . . . . . . 9 a.m. to 12 noon

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Bibliographies and Literary Searches

Short subject bibliographies are compiled on request.

Extensive searches will be made at a charge of $3.00 per hour to members, and $5.00 per hour to non-members.

Please give as much detail as possible when requesting information of either type.

Borrowing and Purchasing

Books, periodicals, photostats, translation, etc. may be borrowed for two weeks at a time. **A fine of 25c. per day will be charged for each day borrowed items are retained beyond this period.**

A library deposit of $5.00 at par in Montreal is required for which two items may be borrowed at one time. Books, periodicals, etc. may be ordered by members through the library. All carrying charges are payable by the individual concerned. Except in the case of library deposits, please make **no payments in advance.**

Non-members may consult the library, but may not borrow material.

This volume is intended to give a simple picture of the structure of metals and alloys in relation to their mechanical properties. The author has avoided mathematical treatment, but it is assumed that the reader has an elementary knowledge of physics and chemistry. After describing the structural build-up of the metal, the process of mechanical deformation is described, together with its effects and the effects of heat treatment. A brief account of the means of examining a structure and determining its qualities, is also given.

Transit Modernization of Street Traffic Control: a Programme of Municipal Responsibility and Administration. John Bauer and Peter Costello. Chicago, Public Administration Service, 1950. 271 pp., $5.00.

The main concern of the authors of this volume is the solving of the problem of mass transportation and general street traffic. This is a question very much in the limelight in most large cities to-day, both how streets should best be planned for layout and traffic, and the means of transportation, whether street-car, trolley coaches or busses, or a combination of all three.

The two writers are both unequivocally in favour of complete modern bus rolling stock for all city mass transportation. The problem is thoroughly discussed from all angles, including the financial and makes both interesting, and instructive reading. The book is indexed and also carries an appendix of "Mass transportation systems in U.S. cities of 100,000 population and over, as of 1949", listing the number and type of each vehicle used, i.e., street-cars, buses, trolley coaches, and rapid transit cars.

World Airline Record 1950-1951. Chicago, R. R. Roadcap & Associates, c1950. 263 pp., illus., $9.75.

This volume presents a traffic, operating and financial coverage of all U.S. certificated airlines, as well as similar information of all the leading airlines of other countries. It is estimated that more than 75% of the world's scheduled airline services is covered in this edition. For convenience and uniformity of presentation, data for individual airlines are arranged under the following headings: Routes, history, description and management; revenue traffic statistics; income accounts; payload and income account analysis; balance sheets; capitalization and financial ratios; historical financial summary.

STANDARDS

British Standards. British Standards Institution, 24/28 Victoria Street, Westminster, London, S.W.1.

B.S. 329:1951 — Round Strand Steel Wire Suspension Ropes for Lifts and Hoists. 3/-.

The rope constructions included in this standard are 6 x 19, 6 x 19 with 6 filler wires, 6 x 19 Seale, 8 x 19, 8 x 19 with 6 filler wires and 8 x 19 Seale. It includes testing requirements, breaking loads and weight of the ropes.

B.S. 641:1951 — Dimensions of Small Rivets for General Purposes. 2/6.

This standard specifies the dimensions of small rivets, such as snap, pan, mushroom, flat and countersunk headed rivets of nominal diameters below ½ inch for general purposes, and the dimensions of countersunk head rivets — 140° (hose rivets) and reaper rivets.

B.S. 673:1950 — Pneumatic Tools and Accessories. 3/-.

This standard deals with the dimensions of shanks for use with the following types of pneumatic tools: rock drills; chipping and caulking hammers and stone tools; picks; demolition picks and spades; concrete breakers; and riveting hammers.

B.S. 743:1951 — Materials for Damp-proof Courses. 2/6.

The specification gives details of lead, copper, bitumen, mastic asphalt, slates and bricks for use as damp-proof courses and information concerning mortar for the bedding of the various materials. An appendix gives guidance in the selection and laying of damp-proof courses.

B.S. 1113:1951 — Water Tube Boilers and their Integral Superheaters. 12/6.

This standard applies solely to water tube boiler units including superheaters and economisers and the other parts connected thereto, without the interposition of a shut-off valve, exclusive of brickwork setting and insulation. The boilers are required to be complete with mountings constructed in accordance with B.S. 759, unless they are specifically excluded in the enquiry and order.

B.S. 1249:1951 — Cast Iron Columns for Street Lighting. 2/–.

This revised British Standard supersedes the previous issue which was published in 1946, and now takes into account recent improvements in the design of the columns. The strength of the columns is ensured by a deflection test and detailed dimensions of a suggested design are given.

B.S. 1347, Pt. 2:1951 — Boxwood for Quantity Surveyors. 2/–.

This publication covers boxwood scales intended especially for the use of quantity surveyors, and was prepared at the request of the Royal Institution of Chartered Surveyors. Dimensions, standard designations, dividing and figuring are specified. The scales are of flat section, with only one scale marked on each edge.

B.S. 1680:1950 — Formulae for the Construction of Paste Polish Tins (Seamless and Built-up). 2/–.

Before the war, it was not uncommon to find tins used for paste polishes constructed with deeply recessed bottoms and exaggeratedly domed lids, which were clearly intended to suggest that more polish was being sold than was in fact the case. These formulae, if widely used, will safeguard the public against such practices.

B.S. 1707:1950 — Binder Distributors for Road Surface Dressing. 2/6.

The standard specifies the essential requirements for the distributors and lays down a requirement for uniformity of transverse distribution of binder. It deals with capacities of tanks and requirements for distribution of binder and deals with lagging, roadwheels and brakes, speed control, measurement of volume and temperature of binder and equipment for hand spraying.

B.S. 1709:1951 — Nomenclature of Drawing Instruments. 2/–.

Herein given are names and descriptions of over eighty drawing instruments. Compasses are dealt with first, these being divided into six classes, i.e., half sets, compasses, dividers, bows, bow half sets and spring bows. The remaining instruments are sub-divided into five classes, i.e. ruling pins, prickers, steel tracers, beam compasses and proportional dividers.

B.S. 1710:1951 — Colour Identification of Pipe Lines. 2/6.

This standard provides primary identification colours which indicate the class of content in pipe lines, these colours being applied along the length of the pipe or in broad rings, as desired. Detailed identification of the contents by narrow rings or letters and for certain special conditions, are covered in the appendices.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

Construction with Moving Forms. L. E. Hunter, London, Concrete Publications, 1951. 56 pp., illus., $1.75.

This book considers the design and use of vertical slip forms for the construction of tall concrete bins, silos and other simple structures. The construction of forms, procedure for their use, description of the concrete plant used, reinforcement methods, and special applications are discussed. A special chapter is included on horizontally travelling forms for sewers, culverts, sea-walls, etc. Numerous illustrations accom any the text.

Fundamentals of Electrical Engineering. F. H. Pumphrey. New York, Prentice-Hall, 1951. 668 pp., illus., $7.65.

Intended as a text for a year's course for non-electrical engineering students, this book provides the background needed for the application, selection, operation and maintenance of various types of electrical equipment. Only a minimum of design computation is included. Electronic techniques are treated in detail. In addition to an explanation of physical phenomena, sufficient quantitative material is provided so that simple amplifiers and electronic switches can be designed.

Heating Ventilating Air Conditioning Guide, Vol. 29, 1951. New York, American Society of Heating and Ventilating Engineers, 1951. 1456 pp., illus., $7.50.

A standard reference book, its fifty chapters are devoted to such varied topics as the fundamentals of thermodynamics, the physiological bases of heating and air conditioning, the calculation of heating and cooling loads of enclosed spaces and to descriptions of systems and apparatus such as steam-heating systems, panel heating, electric heating, refrigeration, and drying systems. The many changes made in this new edition are listed in the preface. There is a large indexed section of condensed manufacturers' catalogs.

Introduction to the Study of Aircraft Vibration and Flutter. R. H. Scanlan and R. Rosenbaum, Toronto. Macmillan. 1951. 428 pp., illus., $7.50.

This book is intended for use by practising engineers in the field who are not familiar with modern techniques of aircraft dynamics, and also by senior or graduate engineering students in courses in aircraft vibrations. The emphasis is on "classical" questions, e.g., the mechanics of linear structural vibration and the various cases of wing flutter the air forces for which can be described by potential theory in incompressible air. Compressible flow results, as well as other advanced material, are included in the appendix. An extensive classified bibliography is also included.

Plant Layout. J. A. Shubin and H. Madcheim. New York Prentice-Hall, 1951. 433 pp., illus., $7.35.

Written for students of engineering and management, this book considers the principles, techniques and procedures connected with the selection and layout of plant facilities. It discusses economic change and growth, the characteristics of industrial processes, plant location, product design, technological advance, and equipment replacement problems. Materials handling and building considerations are discussed in separate chapters. Review questions are included at the end of most of the chapters.

Quantum Theory. D. Bohm. New York, Prentice-Hall, 1951. 646 pp., illus., $10.00.

This book provides a basically qualitative and physical presentation of fundamental principles, supplemented with a broad range of specific applications that are worked out in considerable mathematical detail. Parts I and II present physical and mathematical formulations of the quantum theory. Part III is devoted to applications to simple systems, Part IV to methods of approximate solutions of Schrödinger's equation, Part V to the theory of scattering, and the last Part to the quantum theory of the process of measurement.

Route Surveys. H. Rubey. rev. ed. Toronto, Macmillan, 1951. 282 pp., illus., $5.25.

As stated on the title-page, this is a pocket book for the survey, design and construction of railways, highways, tramways, beltways, canals, flumes, levees, pipe lines, transmission lines, and other route constructions. Beginning with the reconnaissance, the text proceeds through a detailed discussion of location, curve layout, excavation and embankment, etc., with emphasis on practical procedures. Nearly 300 pages are devoted to data tables for quick reference in the field.

Vacuum-Tube Voltmeters. J. F. Rider. 2nd ed. revised by J. F. Rider and A. W. Barber. New York, Rider, 1951. 422 pp., illus., $4.50.

This book deals with the principles of the various types of vacuum-tube voltmeters, their design, application and repair. Every type of instrument is discussed, and most every commercial version is noted in detail, including a presentation of the schematic wiring diagram. The second edition reflects the extensive changes made in vacuum-tube voltmeters during the last ten years.

Gas turbine manual. R. J. Welsh and Geoffrey Waller. London, Temple Press, 1951. 243 pp., illus., 25/-.

Handbook of oil burning. F. H. Faust and G. T. Kaufman. New York, Oil-Heat Institute of America, c1951. 978 pp., illus., $10.00.

National fire codes. 5 volumes. V. 1 — Flammable liquids, gases, chemicals and explosives. V. 2 — Dust explosions. V. 3 — Building construction and equipment. V. 4 — Extinguishing and alarm equipment. V. 5 — National electrical code. National Fire Protection Association. Boston, the association, 1948-1951. illus. Prices: V. 1, $4.00; V. 2, $3.00; V. 3, $4.00; V. 4, $3.00; V. 5, $4.00.

BOOKS RECEIVED

Aircraft jet powerplants. F. P. Durham. New York, Prentice-Hall, 1951. 326 pp., illus., $6.65.

Analysis of the four-bar linkage, its application to the synthesis of mechanisms. J. A. Hrones and G. L. Nelson. New York, Wiley, Cambridge, Mass., Technology press of the Massachusetts institute of technology, 1951. 730 pp., illus., $15.00.

Applied electricity. Edward Hughes. London, Longmans, c1950. 412 pp., illus., $2.10.

Canada 1951: The official handbook of present conditions and recent progress. Canada. Dominion Bureau of Statistics. Ottawa, King's printer, 1951. 311 pp., illus., 25 cents.

Communication networks and lines. W. J. Creamer. New York, Harper, c1951. 353 pp., illus., $6.00.

Destins industriels du monde. Albert Ducrocq. Paris, Berger-Levrault, 1951. 326 pp., illus., 560 fr.

Elements of television systems. G. E. Anner. New York, Prentice-Hall, 1951. 804 pp., illus.

Engineering thermodynamics. H. J. Stover. New York, Wiley, c1951. 458 pp., illus., $5.75.

Eyes in industry: a comprehensive book on eyesight written for industrial workers. D. A. Campbell and others. 234 pp., illus., $6.00.

Introduction to the design of underground openings for defense. Colorado school of mines. Golden, Colorado, the school, 1951. (Being Quarterly of the Colorado School of Mines, V. 46, n. 1, January 1951.)

Operation of sickness benefit plans in collective bargaining. Fred Slavick. Princeton university, industrial relations section, 1951. 109 pp., $2.50.

Origin of the earth. W. M. Smart. Cambridge university press; Toronto, Macmillan, 1951. 239 pp., illus., $2.75.

Petroleum geology. E. N. Tiratsoo. London, Methuen, 1951. 449 pp., illus., 42/-.

Public works congress, 56th annual, New York, October 1950, Proceedings. Chicago, American public works association, c1950. 164 pp., illus., $5.00.

Radio amateur's handbook, 28th ed. American radio relay league. West Hartford, Conn., The league, 1951. 551 pp., illus., $2.50.

Relaxation of constraints and moment distribution. J. Jennings. Manchester, Emmott, c1951. 40 pp., illus., 3/–. (Mechanical World monograph No. 62).

Reviews of petroleum technology, V. 10, 1948. Institute of Petroleum. London, the institute, 1951. 350 pp., 27/6.

Safety in the chemical laboratory. H. A. Peiters and J. W. Creyghton. London, Butterworths, also Lange, Maxwell & Springer, 1951. 258 pp., illus., 15/9.

Selected writings of Bolivar. 2 volumes Banco de Venezuela. New York, the Colonial press, 1951. V. 1, 355 pp., V. 2, 467 pp., illus.

Thermodynamics of fluid flow. N. A. Hall. New York, Prentice-Hall, 1951. 278 pp., illus., $7.35.

Water treatment for industrial and other uses. Eskel Nordell. New York, Reinhold, 1951. 526 pp., illus., $10.00.

TECHNICAL BULLETINS RECEIVED

British Electrical and Allied Industries Research Association. Technical Reports:

No. G/T235, 1951 — Rates of rise of restriking voltage at circuit-breaker positions on 66-kV systems, (System B), by L. Gosland and H. Goldenberg. No. G/T236, 1951 — Rates of rise of restriking voltage at circuit-breaker positions on 66-kV systems, (System C), by L. Gosland and J. S. Vosper. No. L/T232, 1950 — "Heat developed" and "Powder" Lichtenberg figures and the ionization of dielectric surfaces produced by electrical discharges, by A. Morris Thomas. No. L/T249, 1950 — Dielectric properties of ketones, by Vera Daniel and K. H. Stark. No. W/T19, 1951 — Application of electric steam generators to the sterilization of farm dairy equipment, by C. A. C. Brown and others.

Canada. National Research Council. Radio and Electrical Engineering Division. Progress Reports:

No. ERA — 204 — Progress report for January-March 1951.

Canadian Mining and Metallurgical Bulletin. Preprints:

Coal in 1950; Particularly the Domestic Market, by C. L. O'Brian.

Quarterly of Applied Mathematics. Reprints:

Structural analysis by distribution of deformation, by C. V. Kloucek. Reprinted from Volume 9, No. 1, April 1951.

U. S. Bureau of Statistics. Labor Department: Serials:

No. R. 2019 — Work time required to buy food, 1937-1950. Reprinted from Monthly Labor Review, Feb. 1951.

U. S. Highway Research Board. Bibliographies:

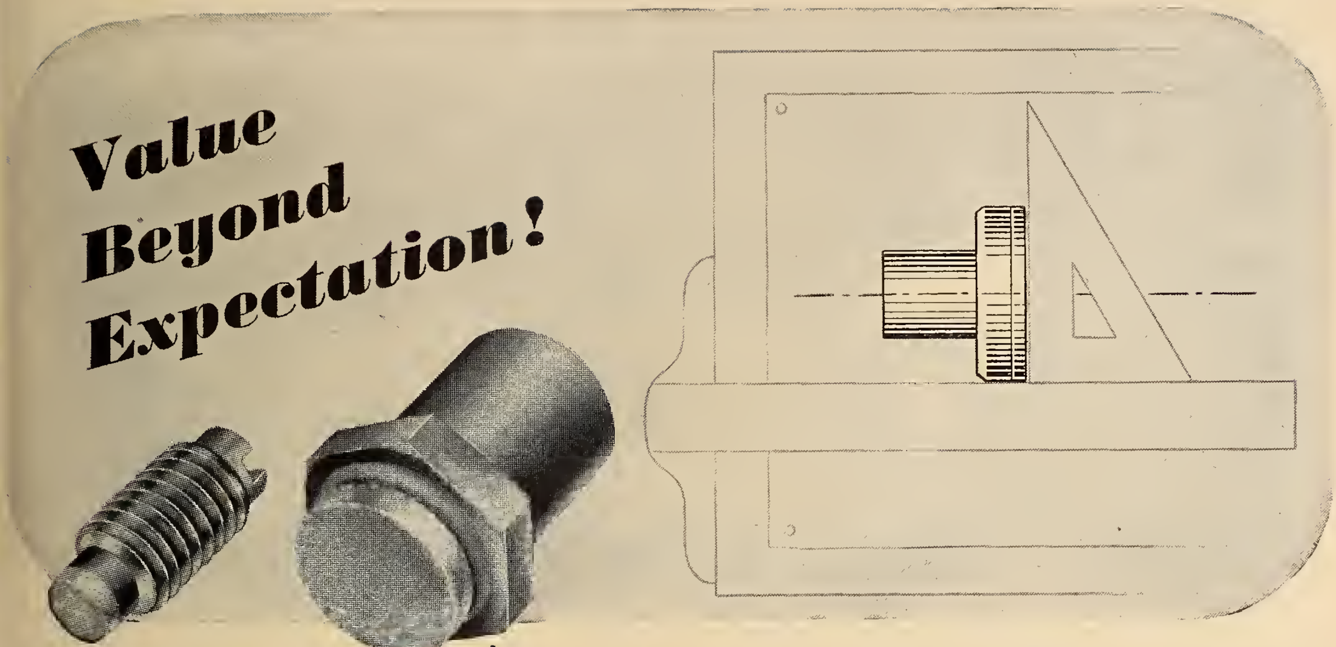
No. 9, 1951 — Bibliography on resistance of bituminous materials to deterioration caused by physical and chemical changes.

. . . Bulletins:

No. 35, 1951 — Highways with a narrow median.

. . . Research Reports:

No. 13-B, 1951 — Scour around bridges.


Value
Beyond
Expectation!

Business & Industrial Briefs

A Digest of Information

received by

The Editor

Appointments and Transfers

Ira G. Needles.—Ira G. Needles has been elected president of the B. F. Goodrich Rubber Company of Canada, Limited. Mr. Needles has been the vice-president of the Company since 1945. He succeeds George W. Sawin, who has resigned for reasons of health.

Mr. Needles has been with the Goodrich organization since 1916 and in 1925 became a member of the staff of B. F. Goodrich of Canada.

Ira G. Needles

C.M. and S. Appointments.—The appointment of J. Bryden, J. H. Salter and B. P. Sutherland to the positions of administrative assistants, was announced recently by R. W. Diamond, M.E.I.C., vice-president and general manager of the Consolidated Mining and Smelting Company of Canada Limited.

New Gutta Percha Offices.—Gutta Percha & Rubber, Limited, have announced the opening of new offices and warehouses in Montreal, and St. James, Manitoba.

The new Montreal premises are located at 6785 Upper Lachine Road (telephone WAlnut 0161). The St. James office is located at 1780 Ellice Avenue (telephone 62-384)

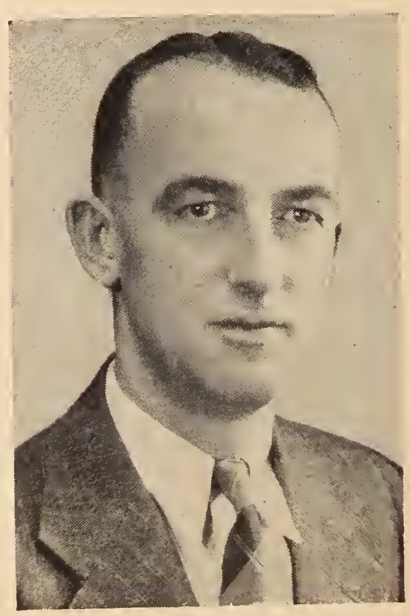
J. B. Knox.—J. B. Knox has been named manager of the Engineering Products Department of R.C.A. Victor Company Ltd.

Mr. Knox joined the Company as an engineer in 1940. He has had extensive experience in the electronics field in Canada, China, and England.

Fairbanks-Morse Appointments.—The Canadian Fairbanks-Morse Company Limited has made the following appointments.

W. B. Coutts is now manager of the Fort William branch which is located at 300 Simpson Street. He has been with the Company since 1927.

M. L. Genest has been named manager of Maritime operations. He will make his headquarters at 75 Prince William Street, Saint John, N.B. He was formerly manager of the Fort William, Ontario, branch. Mr. Genest has been with Fairbanks-Morse since 1913.



W. B. Coutts

G. L. MacDonald.—G. L. MacDonald has taken up residence in Fort William where he will be in charge of the sales activities of the English Electric Company Limited. His territory will be the Lakehead and surrounding area.

J. R. Keller.—J. R. Keller has been appointed to the staff of the fractional horsepower motor section of Canadian General Electric's supply department. He will operate out of the head office of the Company in Toronto and will be responsible for the general application and sale of small motors.

Imperial Oil Fellowship.—Fred Harold Knelman, who is now doing post-graduate work at the Imperial College of Science and Technology, London, England, has been awarded an Imperial Oil fellowship for research in chemical engineering. The fellowship is one of four offered annually by Imperial Oil Limited to encourage post-graduate scientific research. It is valued at $1,250 a year and may be held for a period up to three years. Mr. Knelman lives in Winnipeg.

M. L. Genest

John D. Houlding.—John D. Houlding has been appointed to the Defence Production Board at Ottawa as electronics production officer, radar section. He is on loan to the government from Cana-

John D. Houlding

dian Westinghouse Company Limited where he was electronics marketing department manager.

Mr. Houlding has been an electronics engineer with Canadian Westinghouse since 1945. He served in the R.C.N. as a radar officer on loan to the Royal Navy during the war.

●

Canadian Blower and Forge Changes.—John H. Gregory has been appointed

John H. Gregory

vice-president and managing director and John McMillan is now vice-president and plant manager of Canadian Blower and Forge Co. Ltd. Mortimer A. Montgomery, M.E.I.C., is sales manager (see "Personals").

Mr. Gregory has been with the Company for many years. He was appointed Toronto manager in 1938, manager of engineering sales in 1943 and made a director in 1947.

John McMillan

Mr. McMillan joined the Company in 1920. He entered the sales department in 1923 and was transferred to Toronto in 1928. He was placed in charge of machine tool sales in 1941 and elected to the directorate in 1947.

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 814*)

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

New Dearborn Folder. — Dearborn Chemical Company, 2454 Dundas St. W., Toronto, has available a new, 2-colour, attractive folder covering the control of return line corrosion.

The folder, designated as Bulletin No. 5013, covers the causes of return line corrosion and Dearborn's corrective treatments. Copies may be obtained by writing to the Company.

●

Combustion Engineering Products.— Combustion Engineering Corporation Limited, 540 Dominion Square Building Montreal, Quebec, has recently prepared an attractive folder dealing with the equipment it manufactures and distributes. The wide range of products covered includes superheaters, desuperheaters, economizers, exhaust steam injectors, locomotive feedwater heater and pipe coils, ljungstrom air preheaters locomotive multiple throttle headers rough and machine grey iron and semi steel castings, steam generating units type E underfeed stokers, chain grate stokers, skelly stokers, low ram stokers travelling grate stokers, C-E spreader stokers, chemical recovery systems, Todd oil burning equipment, bowl mills, roller mills, separators, pulverizers, flash drying systems and coal and ash handling systems. The folder also deals with products of the De Laval Steam Turbine Company which include turbines, rotary blowers, gear reduction units, centrifugal pumps, etc. At its Sherbrooke Quebec, plant the Company manufactures, under license, process, liquor, and stock pumps and centrifugal water pumps. Copies may be obtained from the Company.

●

Unifin Tube Catalogue.—Unifin Tube Company, London, Ontario, have issued a most attractive 40-page folder in which are described "Unifin" extended surface heat transfer units for industrial and commercial applications.

This Unifin tubing is manufactured in Canada by an all-Canadian company The catalogue gives a brief description of the patented Unifin tube, a description of construction and application of Unifin blast coils, details of the correct selection of coils for specific requirements description and selection data on Unifin frost-proof blast coils, notes on installation of coils, description and selection data on Unifin booster coils, description and physical data on Unifin unit heater coils. It concludes with some general data material which is of interest to engineers.

The catalogue is most attractive in appearance and highly informative in content. Copies may be obtained by writing to the Company.

●

Iolcroft Releases.—Holcroft & Company, contracting engineers, 6545 Epworth Blvd., Detroit 10, Michigan, offer *Journal* readers the following pamphlets. 'Bearing Balls Hardened Within Close Limits in Automatic Shaker-Hearth Furnaces". "Bright Annealing of Copper in Continuous Controlled-Atmosphere Furnace". "Ford Transmission Shafts, Gas Carburized, in Automatic Furnaces".

●

/ertical Transportation. — Eastern Steel Products Limited, 394 Symington Avenue, Toronto 9, Ontario, offer bulletin No. 125. This is a 4-page brochure which describes the elevators, accessories, and moving stairways manufactured by them in conjunction with J. & E. Hall Limited.

●

Electrical Fittings.—Buchanan Electrical Products Corporation, Hillside, New Jersey, have available copies of a 4-page, two-colour, brochure in which are described the electrical fittings they manufacture. These fittings include connectors, knockout plugs, conduit bushings, conduit locknuts, box connectors, moulded terminal blocks. Copies may be obtained by writing to the Company. Ask for Bulletin No. 1050.

●

'an Folder.—T. C. Chown & Co., 1440 St. Catherine St., West, Montreal, are offering an eight-page illustrated bulletin describing the design features of the forced draft fans manufactured by the Prat-Daniel Corporation. The booklet illustrates very effectively fan wheels, designed with precisely shaped backward curved blades that permit an almost perfect flow of air from leading and trailing edges. Various types of housing are also shown. Ask for Bulletin No. 300.

●

'iesel Engines.—A new comprehensive bulletin describing its type FV Diesel engines has just been announced by The Cooper-Bessemer Corporation, Mount Vernon, Ohio. Built in six, eight, twelve and sixteen cylinder types, the engines are currently used for locomotive service, draglines, and electric power generation in industrial plants. The bulletin gives complete engineering data, specifications and power ratings. Ask for Bulletin FV-63 and apply to the Company.

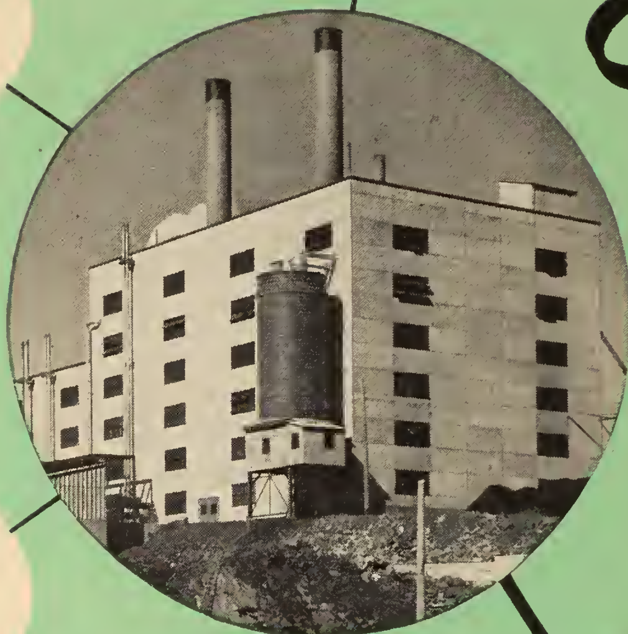
●

ragline Buckets.—Five Esco dragline buckets are described in a new catalogue recently issued by Esco Limited, 16 East 1st Avenue, Vancouver, B.C. Entitled "ESCO Dragline Buckets for Every Digging Condition" the catalogue illustrates and gives specifications for all five types of draglines manufactured by the Company. The catalogue carries a great deal of informative data and specifications are given in easy to read detail and are illustrated with a model view of the representative bucket. Copies may be obtained by applying to the Company.

●

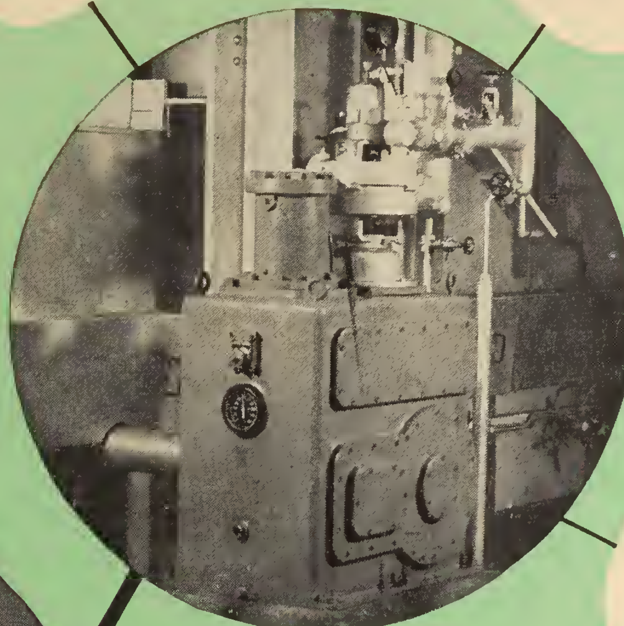
hain-Belt Bulletin.—A new bulletin. "Installation, Operation and Maintenance of Chain Drives and Conveyors" has just been published by the Chain Belt Company of Milwaukee.

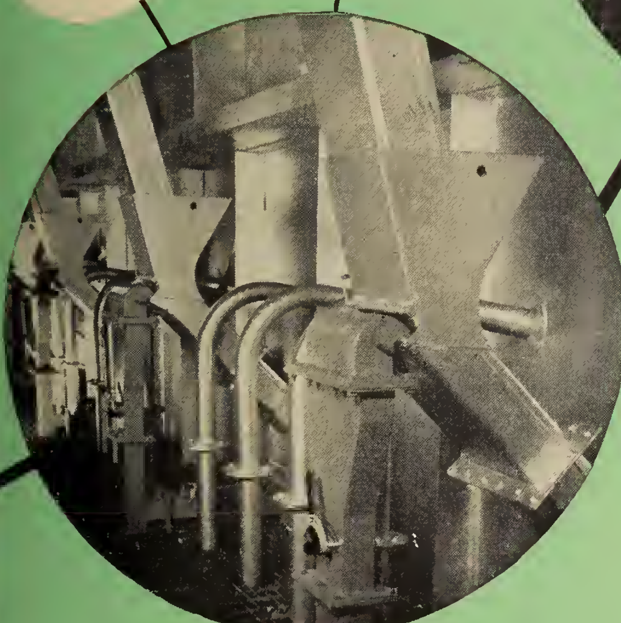
(Continued on page 828)



Exterior of Boiler House

One of Two-250,000 lbs./hr. Steam Generating Units each equipped with eight F. W. Riley Spreader Machines


One of four F. W. Riley
Hydraulic Travelling
Grate Stoker Drives.


Pneumatic Bark
Feeders and Overfire
Air Jets in front wall

Port of 2900 ft. of 48 in. wood stove pipe and end of a mile of rock tunnel for water supply at Prince Rupert plont of Columbia Cellulose Co. Ltd.

Wood Stave Pipe

Used for 5½ Mile Water Supply Line

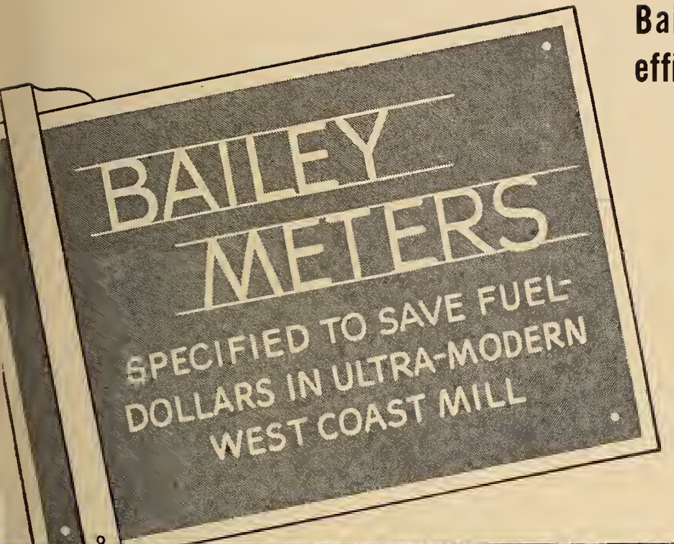
Because of its unique characteristics, Canadian Wood Stave Pipe was both the logical and practical choice for the Columbia Cellulose Company, Limited's plant at Prince Rupert, B. C. for their water supply line.

Low pressure and close adherence to ground contour were the main considerations. In this respect Canadian Wood Stave Pipe with its low friction loss and exceptional flexibility was ideal. This 48″ pipe runs for 5½ miles in one continuous series of curves, dips and tunnels.

This is but one of many instances since 1904, of how Canadian Wood Pipe & Tanks have best served the needs of the pulp and paper industry.

CANADIAN WOOD PIPE & TANKS
LIMITED
550 PACIFIC STREET VANCOUVER, B. C.

Bailey Meters meet demand for streamlined efficiency at Columbia Cellulose Company Limited



This huge, new mill is one of the most advanced of its kind in the world. Before plans were finalized, every factor for increased efficiency, safety, and savings was evaluated. One of the results: Bailey Meters and Controls in the steam plant.

- **Bailey equipment positively reduces fuel consumption, operating costs; adds greatly to plant safety.**
- **Fullest range of meters, instruments and automatic control for all types of steam generating equipment.**
- **Experienced Engineering Service. Bailey men know their job—and yours.**
- **Branches across Canada mean Bailey engineers get on the job faster, at less cost.**

Write for free booklet

For further information write for Bulletin 15-H. Or, call your local Bailey engineer for prompt and expert technical advice.

Bailey Meter Company Limited

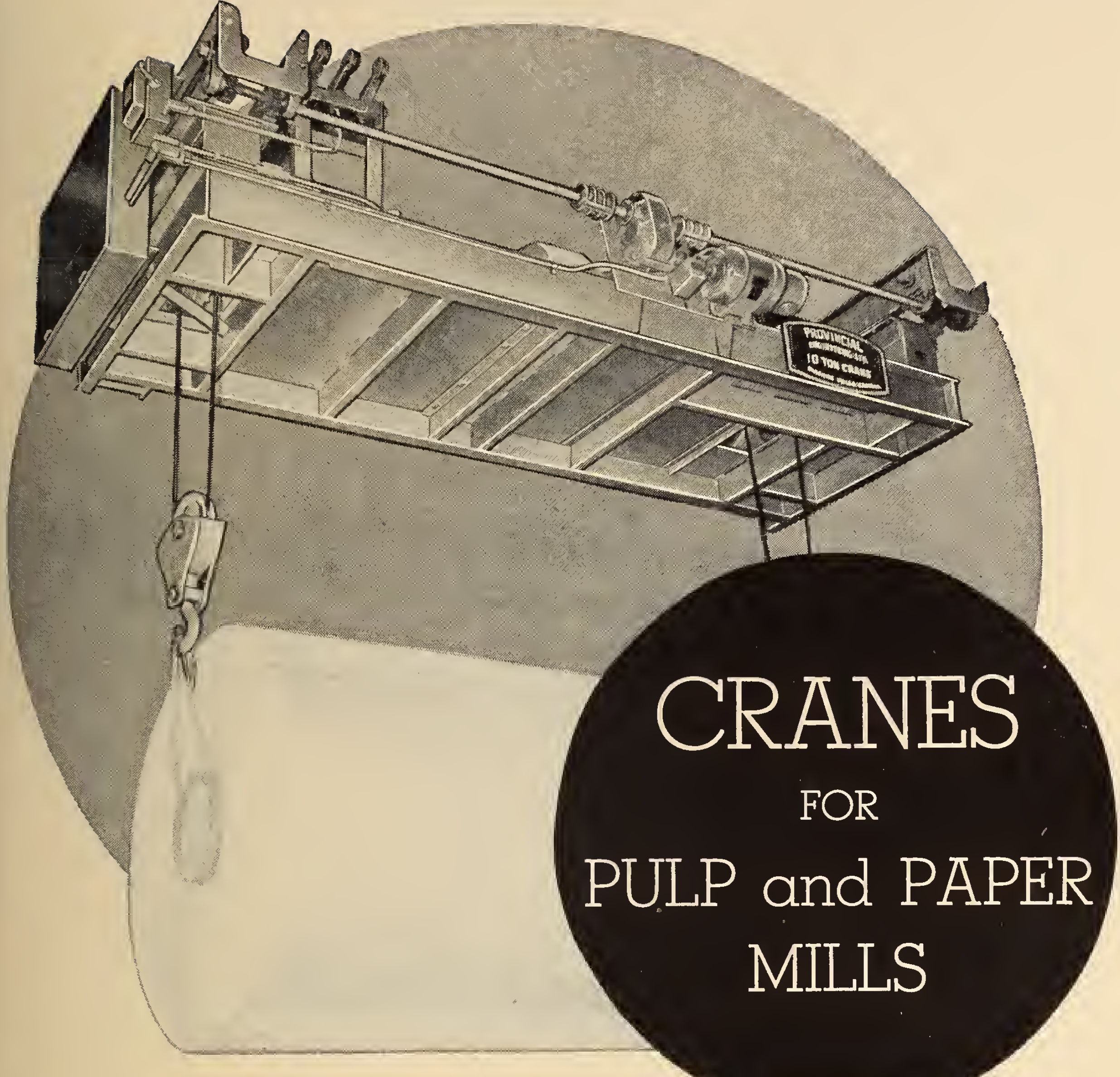
HEAD OFFICE: 1980 CLAREMONT AVE., MONTREAL
BRANCH OFFICES: HALIFAX TORONTO WINNIPEG VANCOUVER

Mammoth spreader-stoker-fired boilers are equipped with Bailey Boiler Meters, Draft Gauges, Temperature Recorders and Automatic Combustion Control.

Bailey recording controllers and Bailey spray type desuperheaters control within close limits steam temperatures in the 175 lb. and 75 lb. process headers.

Numerous Bailey Meters, strategically located, record and integrate steam flow to turbines, extraction and exhaust steam from turbines, steam to boiler house auxiliaries, to feed water heaters, etc. Others record and integrate total feed water flow to boilers, condensate returns, boiler make-up water. In most cases these meters also record the temperature and pressure of the metered fluid.

BM-71

★ Two "Provincial" 10 ton 2 motor Twin-Lift Underhung Travelling Cranes were supplied for handling rolls of paper, as shown on the photograph. The span of the cranes is 14′-2″. Hoisting and travelling speeds are 12½ and 100 feet per minute respectively. All gearing, except the final reduction at the crane trucks, is enclosed in oil-tight gear cases which are equipped with Timken roller bearings. Anti-friction bearings are used throughout the cranes. Each hoisting motion is equipped with an electro-magnetic brake and an automatic mechanical self-sustaining load brake to give absolute security when lowering loads. Hoisting and travelling motions are controlled from a pendant push button unit which operates full magnetic control equipment to provide three selective speeds in each direction of motion.

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ANUFACTURERS OF ALL TYPES OF ELECTRIC CRANES AND HOISTS

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 819*)

The text is short and to the point and most of the illustrations show graphically the correct and incorrect ways of solving chain installation, operation and maintenance problems.

For a copy of the publication ask for Bulletin No. 51-7. Write to Chain-Belt Company, 1600 West Bruce Street, Department PR, Milwaukee 4, Wis.

B.I. Callender's Cables.—British Insulated Callender's Cables Limited, Royal Bank Building, Toronto, Ontario, offer *Journal* readers a copy of a 16-page two-colour publication entitled "A few words about B.I. Callender's".

The bulletin describes what the Company is and what it does and gives information on the manufacturing plants and products. Copies may be obtained by writing to the address given above.

British Insulated Callender's Cables Limited also offer a number of films describing the manufacture and laying of cable. A complete list of films available for Canadian showing may be obtained by writing to the Company.

Core Drill Standards.—The Diamond Core Drill Manufacturers Association, 122 East 42nd Street, New York 17, New York, announces publication of their Standards Bulletin No. 1.

The bulletin lists the various types and sizes of core drill equipment in general use for which standards have now been written in whole or in part. The publication shows these parts clearly, with cutaway drawings and nominal dimensions.

Copies may be obtained at a cost of 50c each. Applications should be made to the Association in New York.

International Nickel Publications.—Reprints of a discussion on Diesel engine crankshafts cast in gray iron, are available, without charge, from the International Nickel Company, 25 King Street West, Toronto. The author is Alexander Finlayson, technical director of Pacific Car & Foundry Company. Other publications offered by the Information Service of International Nickel Company of Canada Limited, are a series of seven papers on nickel-alloyed brass and bronze; nickel-aluminum bronze; nickel-manganese bronze; cupro-nickel; and nickel-silver castings. These seven papers are now in the course of printing.

The behaviour of nickel and Monel in outdoor atmospheres is the subject of a technical bulletin recently released by the Company. The bulletin summarizes known facts about the weathering qualities of these metals, providing quantitative data on their atmospheric corrosion rates. Requests should be directed to the Company.

Drafting Machine.—Indamer Corporation, 11 West 42 Street, New York 18, N.Y. offers a Bulletin—No. V, 14—in which is described the Vibax isometric and dimetric drafting machine.

It is claimed that this machine will automatically produce isometric and dimetric views by tracing over the lines of standard orthographic drawings. Ellipses will be perfect and lines will be at the correct angles and to the same scale as the original drawing.

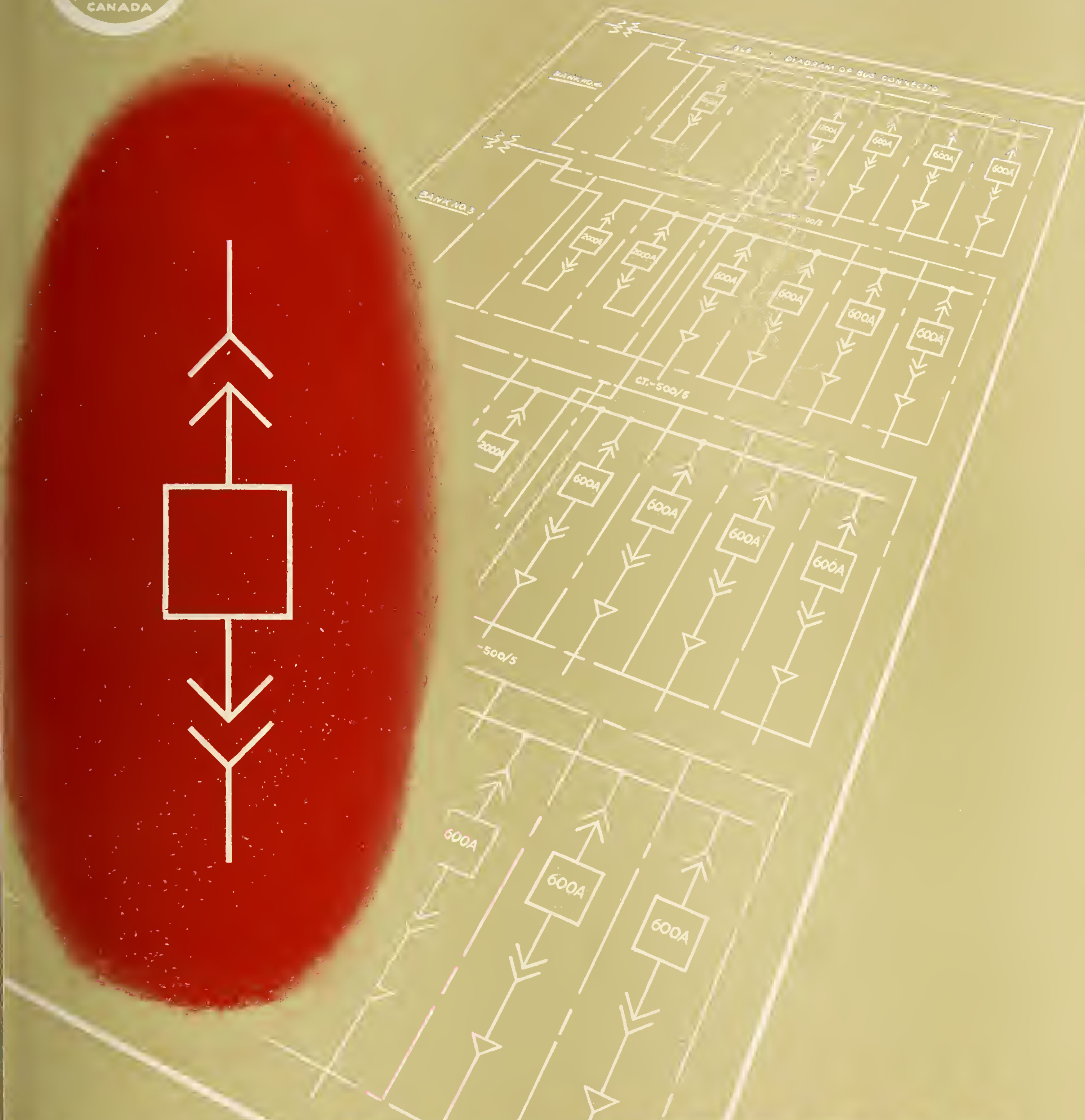
Crane Piping Manual.—Crane Limited, 1170 Beaver Hall Square, Montreal, offers a 30-page publication "Piping Pointers", which contains helpful hints on the application and maintenance of piping equipment. It is well illustrated and carefully planned to provide maximum information in minimum space. Copies may be obtained by writing to the Company.

New Conveying System. — Link-Belt Limited has announced that Link-Belt Company, Chicago, has developed and is now producing a new conveyor of oscillating trough type, called Link-Belt Flexmount, for the handling of a greater variety of loose bulk materials at moderate capacities.

The conveyor construction is claimed to be ideal for handling foodstuffs, chemicals, and other material where cleanliness, contamination, or corrosion is a factor, and that very hot, sharp jagged, or oily material, such as steel chips and turnings, are handled with virtually no wear of metal troughing. Informative literature may be obtained from Link-Belt Limited, Eastern Avenue at Leslie and Keating Streets, Toronto 8, Ontario.

CANADA

ENGLISH ELECTRIC



DOOR & OUTDOOR

SWITCHGEAR

How to beat a legal "threat" on WASTE DISPOSAL

WITH STATE AFTER STATE now imposing legal restrictions on industrial waste disposal, you may be faced with this problem quite suddenly. Only by starting to gather complete data *now* can you be prepared for necessary action when that time comes.

Foxboro has prepared a concise, informative bulletin on how to conduct a waste disposal survey. Based on specialized knowledge and long experience, this bulletin outlines the simple steps you can take to avoid hasty, last-minute plans. It shows how a careful, unhurried survey *now* can easily provide the facts on day-to-day quantities, concentrations, and constituents, so essential to efficient planning.

Send for a copy of "Waste Disposal Surveys", the first bulletin in Foxboro's series on Industrial Waste Disposal. Write **Peacock Brothers Ltd., 412 St. Patrick St., Montreal, P. Q.** Also Calgary, Noranda, Sudbury, Sydney, Toronto, Vancouver and Winnipeg.

TYPICAL FOXBORO INSTRUMENTS THAT LEAD TO BETTER WASTE DISPOSAL

The Model 40 . . . "The finest modern controller" . . . is the foundation of many outstanding Foxboro Waste Disposal Systems. It is used for the control of flow, pH, conductivity, temperature and other variables. Thousands are in use daily.

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New Equipment and Developments

New Concrete Vibrator.—A new pneumatic concrete vibrator has been announced by the Independent Pneumatic Tool Company.

Designed to compact freshly poured concrete and to direct its movement as it is poured into the form, the new vibrator consists of a 2¾-inch diameter steel cylinder 17½ inches long, at the end of a 5-foot length of combined air and exhaust hose. A ball-bearing rotary air motor and a vibrator are sealed in the steel cylinder.

Features of the vibrator include an adjustable automatic air line oiler, roll-type throttle providing up to 8,000 vibrations per minute, and an exclusive steel sleeve around the vibrator unit eliminating the possibility of great loss from bearings. For details write to the Independent Pneumatic Tool Company, 175 N. State Street, Aurora, Ill., and mention vibrator No. 521.

●

Unified Screw Threads.—The Steel Company of Canada Limited has announced that its Canada Works in Hamilton is now producing all regular machine screws to unified thread specifications in the fine and coarse thread series.

Considering the detail involved in a major project of this nature, the rapid conversion is a considerable accomplishment which will be welcomed by all Canadian users of machine screws.

It represents many hours of concentrated effort on the part of works managers and operating departments of the Company's Canada Works.

●

Nickel Production

R. L. Beattie, vice-president and general manager of the International Nickel Company of Canada Limited, announced recently that the Company is now producing 1,000,000 lbs. per month of refined nickel in excess of estimates.

Previously scheduled to be realized by the year-end, the increased rate of production has been accomplished almost six months in advance. It has been made possible by the installation of emergency facilities at the Company's Canadian plants and by the acceleration of a major programme of expansion of underground mining capacity and by metallurgical process changes.

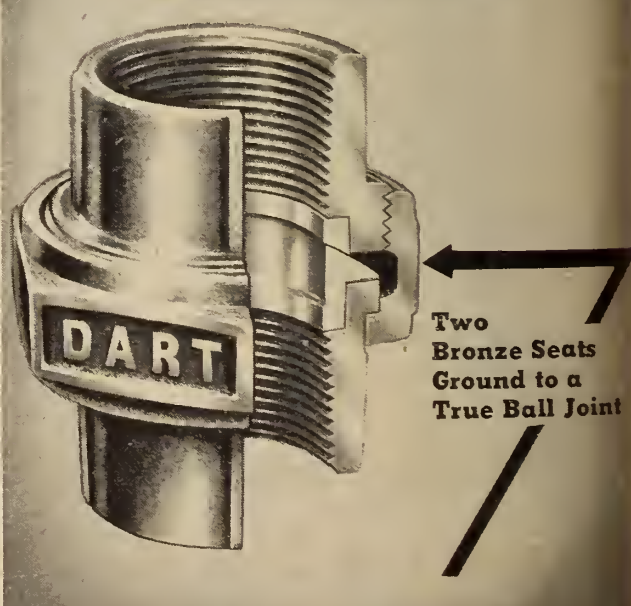
Through this increase Inco's production will be, at full capacity, 21,000,000 lbs. per month.

●

New Plant in Port Hope.—B. Elliott & Co. Ltd., owners of the Cardiff Lathe and Tool Works, Taff's Well, Wales, plan to build a machine tool factory at Port Hope, Ontario. When completed the plant will employ 1,500 people.

●

(*Continued on page 835*)



Professional Cards

Professional Cards

3USINESS AND INDUSTRIAL BRIEFS

(*Continued from page 830*)

Iew Coal-Gas Turbine.—The first gas urbine in Britain to run on pulverized oal is being tested at Newcastle. The ngine develops 500 h.p. It is claimed hat it is more compact and cheaper to un than most power units.

●

3rown Boveri in Canada. — The first Canadian plant of one of the world's est-known manufacturers of electric nd thermal power equipment is under onstruction at St. Johns, Quebec, for 3rown, Boveri (Canada) Limited, subidiary of the Swiss firm of the same ame.

Manufacturing operations are expectd to begin late this year. Initial proluction will include distribution and ower transformers, air-blast circuit reakers and switchboards, but plans ake into account the possibility that dditional lines will also be manufacured in Canada. Equipment and nachine tools of the latest design are eing installed.

The new Brown Boveri plant will mploy at first about two hundred vorkers, along with some 35 technical pecialists who will be brought over rom the parent company in Switzerand. Canadian workers will have opportunities to acquire valuable skills rom these highly experienced specialsts in the manufacture of equipment or the generation, distribution and tilization of power.

The Provincial Government's Techical School at St. Johns, conducting pecial courses for young workers, is ontributing importantly to the soluion of the skilled labour problem. ssisting in this work is a qualified intructor from the Company's own staff.

Construction of this new Canadian lant coincides with the 60th anniverary of Brown Boveri & Company Limited, whose organization includes eight large plants in Europe with a total staff of 40,000 people.

●

Canada Cement Expansion.—At a meeting of the board of directors of Canada Cement Company Limited, Montreal, July 16th, the installation of an additional kiln at Belleville, Ontario. was authorized. This will increase the output of the Belleville plant from 2,600,000 barrels to 3,800,000 barrels annually.

Orders have been placed for the necessary machinery and equipment, and construction will commence immediately. The new unit will be in operation by May next year. It is expected that production in Ontario will then be sufficient to meet all demands.

Including this new project, Canada Cement now has under way an expansion programme which will result in an increase in production of 3,200,000 barrels annually, i.e. from 14,000,000 to 17,200,000 barrels. The additional projects are at Havelock, N.B. and Exshaw, Alberta.

●

Alaska Pine Plant Modernization.—W. C. Koerner, vice-president and managing director of Alaska Pine & Cellulose Limited, announced on July 31st that this Company will spend $6,000,000 on a modernization programme for the dissolving sulphite mill at Port Alice, B.C.

The programme includes a whole log barker and chipping plant, a new modern bleach plant, a bleached pulp screen room, a high pressure 225,000 lb. per hour steam boiler, and major changes in the mill water supply. The programme, now under way, will extend over the next two years.

All planning and engineering is being conducted by the Company in its Vancouver office under W. A. Bain, chief engineer, L. C. Kelley, general superintendent, and L. Cleminson, general manager of the cellulose division.

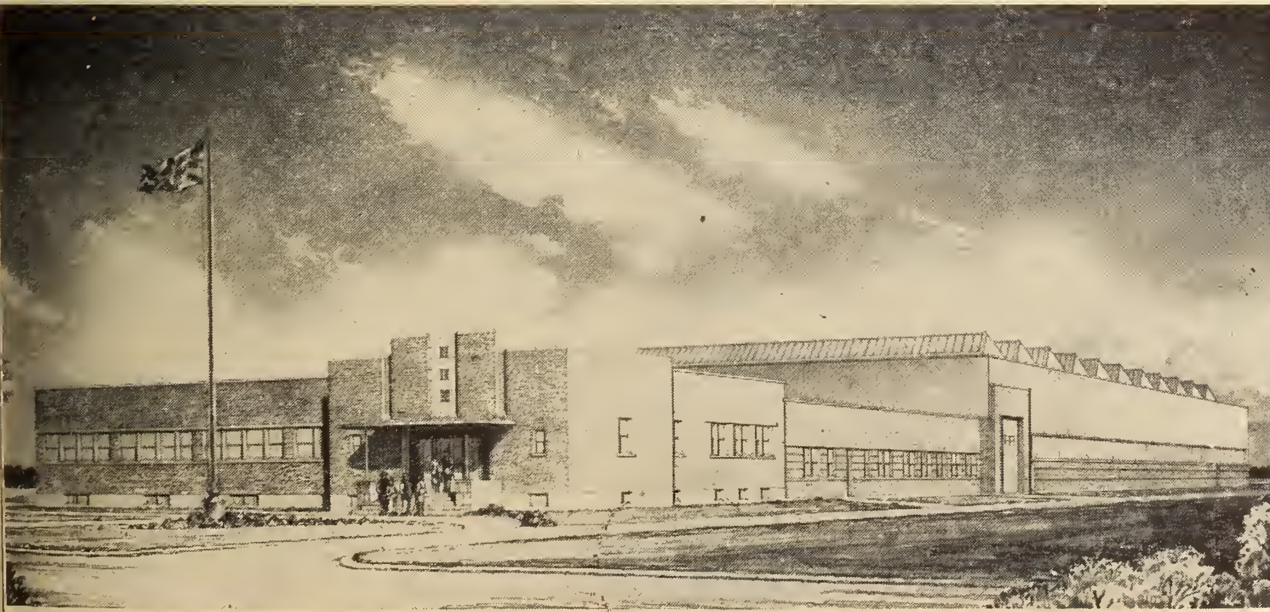
●

Silicone Rubber Jointing.—A method of joining silicone rubber to steel and other surfaces in a permanent bond stronger than the rubber itself, has been developed by Canadian General Electric Company Limited.

Key to the process is a thin, glue-like "primer", which forms a strong bond between silicone rubber and many surfaces beside steel, including glass, ceramics, aluminum, tin, and copper.

Typical applications will include engine and shock mounts, and mountings for delicate aircraft instruments.

●



rchitect's drawing of the new Brown Boveri plant now under construction at St. Johns, Quebec, and expected to be operation late this year.

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From above the Arctic Circle to far below the Equator, in homes, in industry, in a thousand and one applications, "Electrically Engineered" Canada Wire products are serving the electrical world and serving it well.

Because Canada Wire research and engineering staffs are never satisfied, better methods and better products result. Because every product is tested and inspected at every stage of production, more uniform and reliable products result. This is electrical engineering applied to the products you use—to bring to you the best in wires and cables for the electrical field.

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THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

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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."

★ ★ ★

CONTENTS

15,000 copies of this issue printed

Some Modern Aspects of TUNNELLING

by

Brian H. Colquhoun, M.E.I.C.

Brian Colquhoun and Partners,
Consulting Engineers,
London, England.

A paper presented before the 65th Annual General and Professional Meeting of The Engineering Institute of Canada at Montreal, May 11, 1951.

Commencing with the early history of tunnelling, by the Egyptian Pharaohs, the Aztecs and the Romans, this paper outlines the three main types of tunnelling work; in rock, in dry ground and in water-bearing ground. Describing past and current practice for headings, drilling and loading in rock, accounts are given of procedures adopted in rock tunnels through the Alps, and the Severn, Simplon and Mersey tunnels.

Turning to tunnelling through earth, the author tells of the development of various types of shields used through dry and water bearing ground. Methods used for tunnels with mixed faces of earth and rock are discussed and the hazards from "blows" and fire are pointed out. In conclusion, experience with tunnels for the London underground railways is related, and the similarity of underground conditions in London and in Montreal is pointed out.

The history of tunnelling goes back into the Dark Ages, as even the early cave dwellers did a certain amount of excavation on their own. In the days of ancient Egypt, works were done for water supply and irrigation. Other tunnels were also constructed in the building of tombs and temples for the Pharaohs of Egypt, and by early Indians and the Aztecs of Mexico.

Tunnelling for the quarrying of stone for building works was carried out extensively in early Egypt. Blocks of stone were laboriously cut out from the solid rock, resulting in the formation of large galleries 300 to 400 feet long, which were interconnected by transverse galleries. Generally, the blocks were cut out with chisels and bars, but where it was granite or diorite or other such hard rock, tube drills and saws, supplied with corundum dust as an abrasive, were used and worked much in the same way as diamond and shot drills are today.

There are also records of tunnels in the Roman times, constructed for the purpose of irrigation and water supply. One of the most interesting of these works was constructed for the draining of Lake Fucino in Italy. This tunnel was about three and a half miles long, and was ten feet high by six feet wide. Construction work was carried out from about forty vertical and sloping shafts, and the excavated rock was removed by means of copper buckets, which were hauled to the surface by windlasses. There were some 30,000 men employed on this work over a period of about eleven years.

Until the development of the use of gunpowder, there was practically no advance in tunnelling methods; in fact, until the 17th century, rock was still excavated by means of crow bars and picks. From an early book on tunnelling, published in 1556 by a German engineer, Georgius Agricola, it is noted that the method practised in those days was to light fires against the face of the headings and to douse the hot rock with a mixture of vinegar and cold water. The shattered rock was then prised out with crow bars. Naturally such methods were very slow and expensive, and discouraged expenditure of capital on any tunnelling except for the purpose of mining where some direct return could be expected for the capital outlay.

Towards the end of the 18th century, work on the construction of canals in England and France made necessary the construction of tunnels. Many small tunnels were built on the canal routes, where a long detour would otherwise have been necessary to circumvent a topographical obstruction. An early example was on the Grand Trunk Canal at Harecastle in England constructed in the year 1766. This tunnel, which was twelve feet wide and nine feet high and 1.63 miles long, took eleven years to build. No other tunnelling work of any magnitude was attempted until Brunel constructed the Thames Tunnel between the years 1825 and 1843.

Types of Tunnelling Work

Generally speaking, tunnelling work may be divided broadly into three main types as follows:

NOTE:—The cover picture, and photos appearing as Figures 4, 5, 6, and 10, are reproduced by courtesy of the Mersey Tunnel Joint Committee. Figures 13, 14, 15, 16, and 17, appear here by courtesy of the London Transport Executive.

1. Tunnelling in rock.
2. Tunnelling in clay or dry ground.
3. Tunnelling in water-bearing or bad ground.

Tunnelling in rock is normally straightforward work. The speed of excavation is governed by the rate of drilling and the speed of the removal of the excavated material. However, there may be considerable water troubles to be contended with in this type of work, in which case the work becomes difficult, and special methods such as compressed air working or shield driving may have to be adopted.

Tunnelling in loose rock involves the holding up of the roof during excavation. The work is slowed down by the other work of timbering and poling.

Tunnelling in soft water-bearing ground is the most difficult of all, in fact it is one of the most difficult of engineering works, and calls for the greatest ingenuity and skill on the part of the engineer to ensure safety, economy and success.

There is another type of underground work which is not true tunnelling, and will only be referred to briefly here. In this method, which is known as the cut and cover method, a trench is excavated in which the tunnel structure is built and the trench is then back-filled. When this work is done across a river, as was the case in Rotterdam, Detroit, Mobile and Paris, and is at present being done in Houston, Texas, the engineering difficulties are great. The method may, however, prove to be the more economical, especially where land is available for the entrances to the tunnel close to the river banks, thus obviating the need for much expensive expropriation of property in the more heavy built-up sections.

Rock Tunnelling

Progress in the technique of tunnelling, especially in rock, has been the direct result of the development in the design of drilling equipment and excavating machinery. The methods used in supporting the roofs and sides of tunnels in bad places are much the same as those adopted in early times, as may be seen from a study of the works of Georgius Agricola, previously mentioned, and Simms, the British engineer who prepared a well-illustrated book in the early 19th Century.

However, until the development of the mechanical drill, any kind of rock tunnelling was a very slow process. It took several years to build a tunnel of any reasonable cross section, even though of short length. The development of the early French and Swiss pneumatic and hydraulic drills trebled the rates of progress which had been obtained before, and reduced the cost of driving considerably.

In driving any tunnel, it is essential to work from as many faces as possible and to gain this end, shafts are sunk at intervals along the route of the tunnel. Driving is then carried out in both directions from these shafts. This is not always possible, especially in tunnels under mountains or in tunnels which are mainly subaqueous, where only two faces can be worked; that is, from each end of the tunnels, except where a pilot heading has been driven through first. The methods of driving the tunnel depend to a great extent on the type of ground encountered during the work, and vary considerably with the size of the tunnel cross section.

Headings and Drifts

A system practised in America in the past, and which, in fact, is still adopted in large tunnels, is the top heading and bench method. A top heading is driven in advance, the full width of the tunnel, and is followed up fairly closely by a

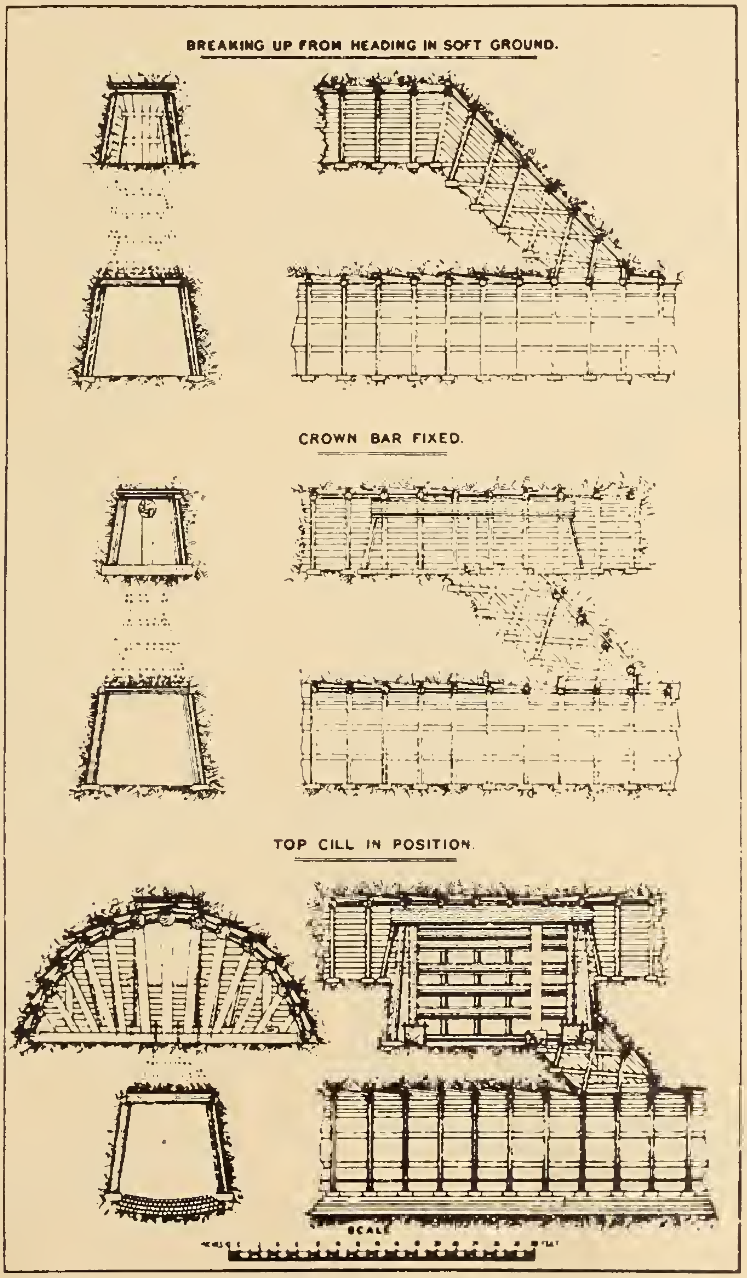


Fig. 1. Breaking up from bottom heading in soft ground.

bench occupying the remainder of depth of the tunnel. The holes are all loaded together, but the bench holes are fired slightly in advance of those in the heading. As a result, a compact pile of rock from the blast is thrown into the invert of the tunnel. This method may be used to advantage in bad ground, where the top heading is taken well in advance of the bench and timbered up as the work proceeds. The roof timbers are temporarily blocked up from the bench. The benching is carried forward in short advances, and vertical posts are then put in one at a time to support the roof timbers.

The side drift method may be used for large tunnels in bad rock. Two drifts or headings are taken along the sides of the tunnel, and wall plates and posts are set up along them. Breakups are then made into the roof and the roof timbers put in, the men working off the dumpling left in the centre of the tunnel. Lastly the dumpling is removed, and the final tunnel lining may then be put in.

In Great Britain a common practice, especially in large tunnels, is to drive a pilot tunnel down the centre line of the main tunnel throughout the whole length of the run, and to break out the main tunnel from this heading. This method has a particular advantage in that it enables the engineer to study the ground through which he must pass with the larger tunnel. He is thus warned of any rock faults, and can also deal with any water incursions before starting on the main tunnel.

It also provides him with good ventilation, and is economical in explosives. However, in tunnels of small or medium diameter, the main work has to be delayed until the pilot heading is holed through. Otherwise the mucking and blasting in the pilot heading would cause great interference to the main tunnel drillers. From the pilot heading the main tunnel is taken out by one or the other of the methods described above.

In tunnels of large diameter, two pilot headings may be driven, one in the top and one in the bottom of the cross-section. When these have been holed through, breakups may be made at points along the tunnel and excavation of the full diameter worked from the number of faces so gained.

In subaqueous or mountain tunnels, where the number of working shafts are reduced in number, this method therefore provides a number of working faces, and enables the tunnelling work to be carried on in much the same way as if shafts were available. The problems of muck removal have to be most carefully worked out to avoid congestion and delays at the main access shafts or at the portals.

Drilling

A modern method which has superseded most of those given above, especially where the rock is reasonably good, is the driving of the full face in one operation. To facilitate this, a drilling carriage or Jumbo is provided, consisting of a framework, usually of steel, on which the drilling equipment is mounted. This carriage travels on rails, and is moved forward to the face at each operation. Each drill operator has a section of the face to drill and is able to carry out his work without obstructing the other

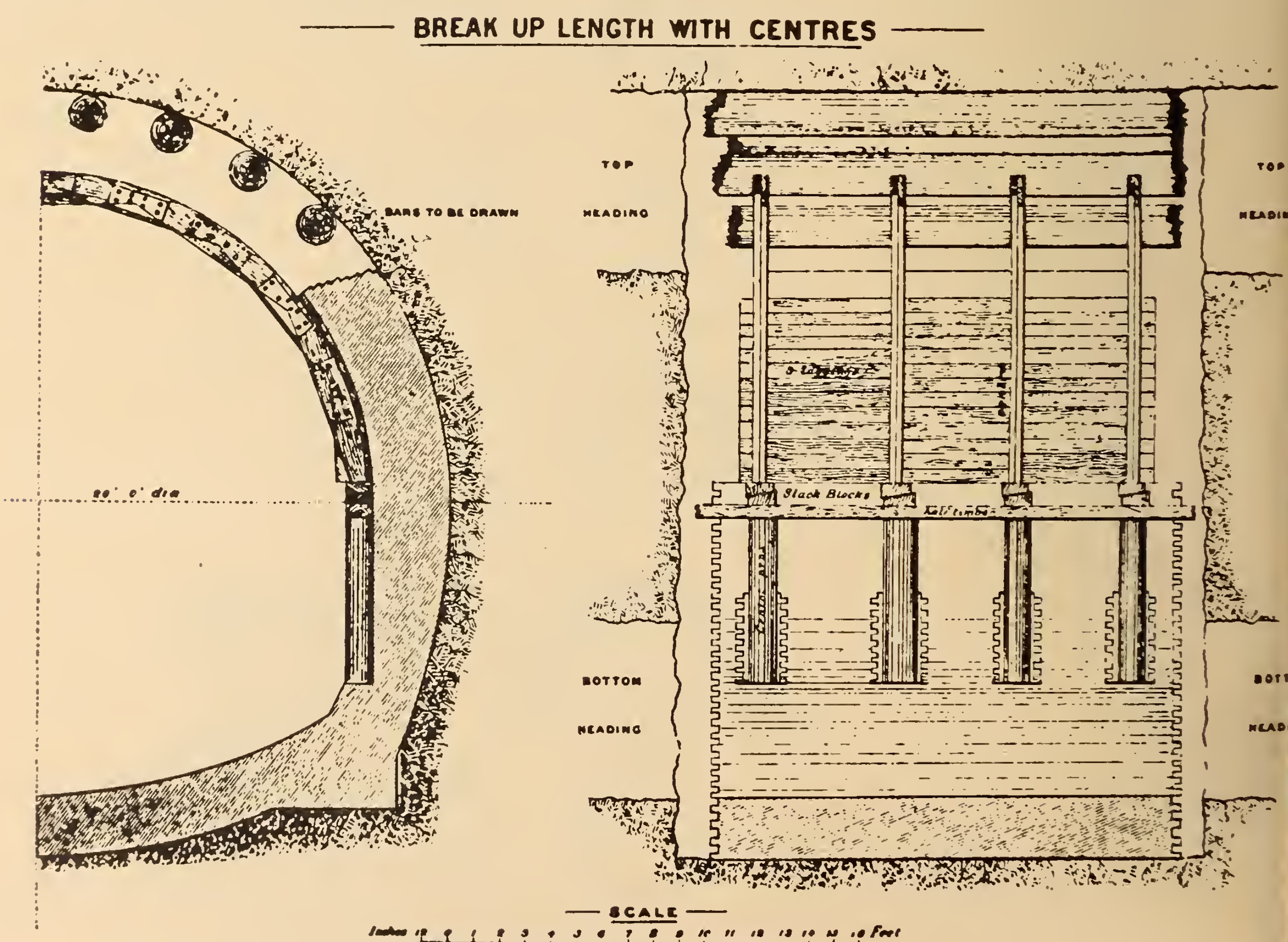


Fig. 2. English method of timbering in tunnels.

— TIMBERING IN SOFT GROUND —

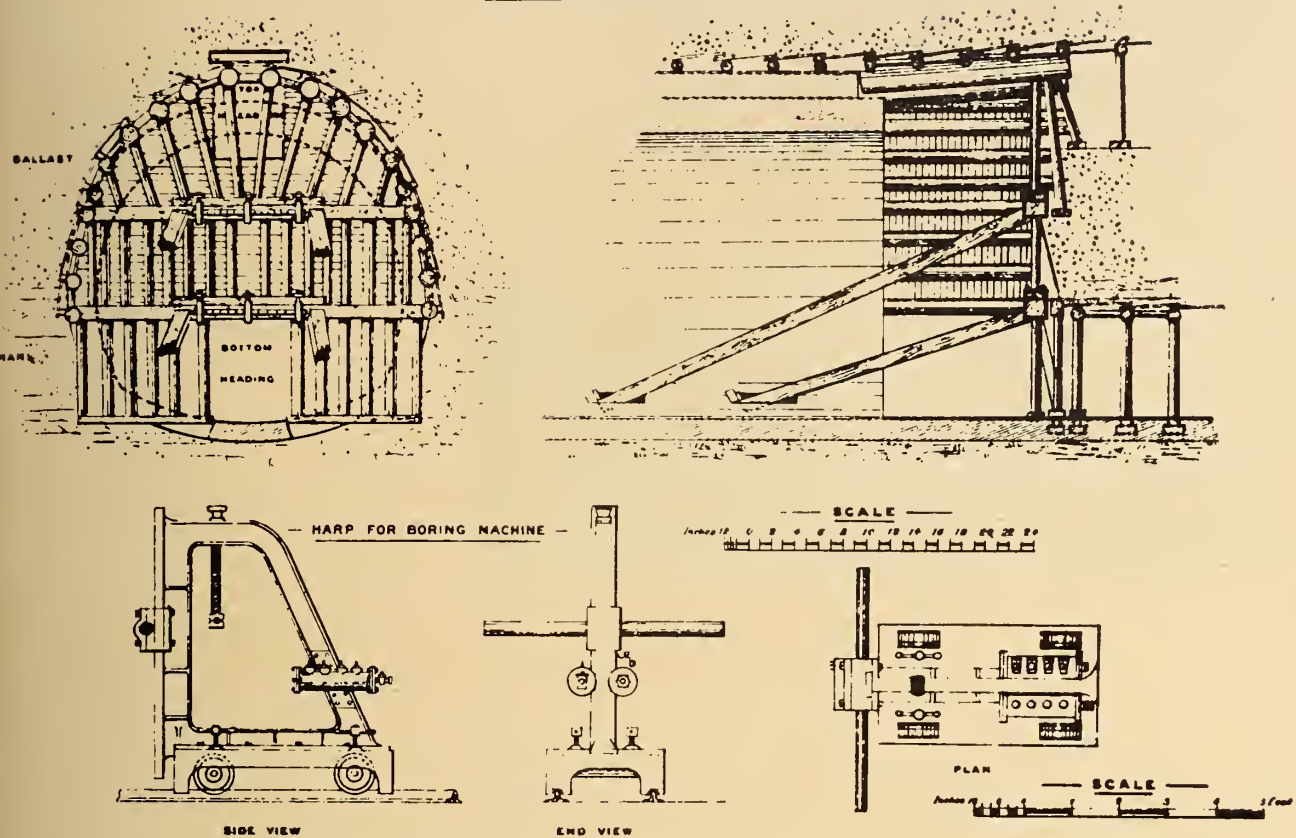


Fig. 3. Timbering in soft ground showing top and bottom headings.

drillers on the carriage. The pattern for the full face may thus be quickly drilled, loaded and stemmed.

The carriage is then run back to a safe distance and the round is fired. The carriage must be designed to allow the excavating machine and mucking skips to pass through while it is back from the face, and must not hamper the mucking-out operations in any way. Where the roof is bad, the timber or steel supports may be put in from the carriage. Much labour is thus saved, as all necessary supports may be loaded on the carriage in advance before the blasting operation.

On a tunnel constructed recently near Madras in India, as part of a hydro-electric scheme, a development of this method was used. While the face drilling was going on, holes were drilled in the side walls close to the face at various levels. When the round had been fired, bars were driven into these holes and light lattice girders of aluminium alloy, which could be handled easily by two men, were fixed to the bars. A platform was laid on the girders from which the drilling of the top holes commenced without delay. Meanwhile mucking out was carried on in the bottom part of the tunnel without inconveniencing the drillers in any way.

For work in smaller tunnels up to about 15 feet in diameter, drilling machines mounted on wheeled or caterpillar carriages have been developed over recent years. Carriages may be designed to carry three drifter drills, supported on hydraulically operated booms, which may be adjusted and locked in any position. The drilling machine is provided with an automatic feed, which advances the drill into the face. Such a rig may be moved speedily to and from the face, but has to be taken right back to clear the tunnel for excavating the rock. Single drills with jacking legs also achieve good results, and the time spent in rigging up the drilling columns is thus saved.

Although drills mounted on hydraulic or pneumatic jacking legs have been tried out for many years past, they have not until recently come into general use. Until recent years, drilling bits and drill steel were not durable enough to stand up to more than a few feet of drilling before changing over. In fact in tough, abrasive rock, bits had to be changed over every two or three feet. This involved considerable delay in the case of a drill carried on a jacking leg. The drill had to be taken down and set up again, whereas with a drill fixed to a column, the operation was comparatively simple.

However, the invention of the tungsten carbide bit has brought out the advantages of the jacking leg as this detachable bit, being much tougher than the earlier steel bits, has a much quicker drilling speed and is capable of about 200 times the footage. Thus even in the hardest rock several holes may be taken to the full depth without the delays caused by the changing over of bits.

The design of the drilling pattern and the quantity of explosives used are dependent on many factors, such as the nature of the rock, the depth of the holes, the size and shape of the tunnel and the type of drilling machinery used. The decisions on these matters usually rest with the tunnel superintendent, and may be altered as the work proceeds. There are so many different opinions on this subject that it is impossible to discuss them in a paper of this length.

Loading

The increased speed of drilling and the larger volumes of rock blasted out at each pull has demanded the improvement of excavating machines, and older methods have now been superseded. The type of machine must be selected to suit the work. In general they are all small mobile machines with rapid action and of robust and compact construction.

The rocker shovel is manufactured in various sizes. It is air operated and is run on narrow gauge rail track. The machine has a cleaning-up range of up to six feet on each side of its centre line. The bucket, which is supported on arms extended from rockers working on the machine framework, is lowered to rail level and run forward into the rock heap. The bucket is then centred on the machine and is jacked up on the rocker, so that the rock in the bucket is slung into a waiting skip behind the machine.

Another air or electrically operated machine has a dipper hinged on front of an apron which is in turn hinged on the frame of the machine. The dipper and apron are capable of movement in an arc in front of the machine. The dipper is loaded and lifted to discharge onto the apron. The apron when fully loaded is then lifted to discharge on to a belt conveyer which carries the spoil over into skips drawn up behind it.

Another type of loading device is the slusher. After the round is fired, drill holes are put in the new face and ring-bolts are wedged in. A rope is run through these ring-bolts and the tail block of the drag bucket is attached to this rope. The drag bucket is then pulled out to the tunnel face, dropped into the rock heap and dragged back, loaded, to the machine and delivered to a moving belt where it tips the rock which is then run over into skips. In this machine an extension of the belt conveyer may be supplied, so that a long rake of wagons may run under it and be loaded one at a time without recourse to crossings or other devices for passing empty and loaded skips. Such a method is particularly advantageous in small tunnels.

In larger tunnels, air, electric or diesel powered, fully revolving shovels are frequently used. These shovels are mounted on caterpillar tracks and have short booms and dipper sticks to facilitate their working in a small headroom. However, the width of these machines restricts the room for passing the drilling carriages, and the caterpillar tracks cause damage to any rail tracks in the tunnel invert.

Early Tunnels Through Rock

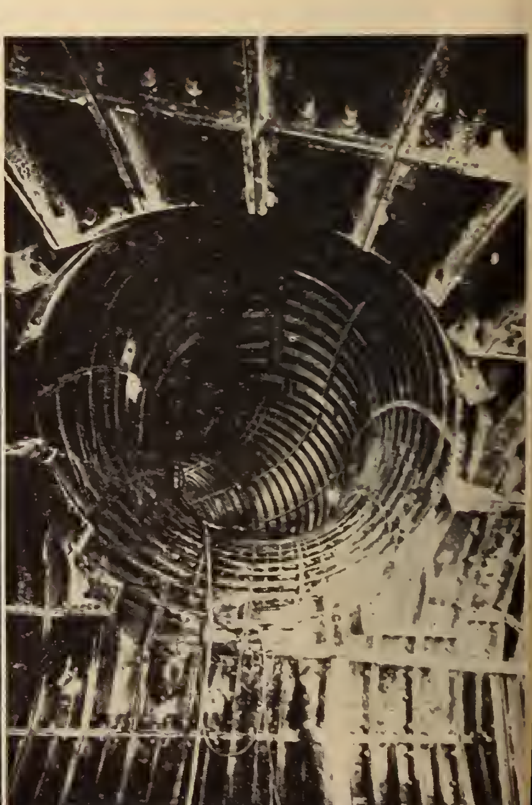
Over the past few years a tremendous amount of tunnelling has been carried out all over the world for railways, roadways, hydro-electric schemes and for the transportation of water and sewage. Time does not allow for discussion of many such works, but it would be of interest to remark upon the great tunnels which were constructed in the latter half of the 19th century. These tunnels, although they still rank among the largest undertakings of their kind in the world, were really the pioneer works in rock tunnelling. They were carried through against tremendous difficulties without any of the advantages of our modern methods. It is from the experience gained in them that the technique of modern tunnelling has been developed.

Tunnels Through Alps

In 1857, by agreement between the French and Italian Governments, work was started on the eight mile long Mont Cenis Tunnel connecting the French and Italian railways, which then terminated on the opposite sides of the Alps, passengers and baggage being unloaded and transported over the mountain passes by coach. Twenty-five years was the estimated time for this work which, by modern standards, seems fantastic. No mechanical drilling equipment had been invented at that time, and gunpowder was the only blasting agent available. Furthermore, the tunnel passed under a mountain where the rock cover was over a mile at the

Fig. 4 (left). Excavation of large subaqueous tunnel showing overhead road for conveying muck wagons to shaft.

Fig. 5 (right). Complicated cast iron segment work in ventilating shaft of vehicular tunnel.



deepest place and it was only possible to work from the ends of the tunnel. It is not surprising, therefore, that in the first five years only two miles of tunnel had been completed.

In 1861 compressed air drilling was introduced and this had the effect of reducing the time of tunnelling to a tremendous extent. In a further seven and a half years the contractors were able to finish the work. It is noteworthy that, about this time, compressed air drilling was first used in America on the Hoosac Tunnel in Massachusetts, and nitro-glycerine was first used as a blasting agent.

The opening of the Mont Cenis Tunnel revolutionized travel from France and England to Italy, and transferred much of the Eastern mail and merchandise traffic from Marseilles to Genoa and Brindisi. So great were the advantages gained that the Swiss were determined to effect railway access to Italy through the great barrier of the Lepontine Alps. By inter-Governmental agreement, work on the St. Gotthard Tunnel was put in hand in 1872, and was opened to traffic nine years later. The tunnel is nine and a third miles long, and was worked from both ends, but with no intermediate shafts.

Compressed air drills of advanced design were employed and dynamite was used for blasting. The system adopted in the construction was to run top galleries in advance, and to break them out laterally and downwards to the full section of the tunnel. Steam locos were at first used for mucking out, but due to bad ventilation, these caused considerable sickness amongst the men and compressed air locos were later substituted.

In the Arlberg Tunnel in Austria, which began in 1880, a different method of driving was adopted. Here, instead of the driving of top headings as was done on the St. Gotthard, a bottom heading was taken forward and from this heading vertical shafts were driven up at intervals. Top headings were then driven both ways from these shafts, parallel to the bottom heading. The tunnel was then enlarged to full size by gangs following up the heading drivers. The length of the tunnel is six and a third miles and, due to the improved drilling equipment and the progress gained by the method of excavation, the estimated driving time of five years was reduced to three years. Ventilation was much improved in the Arlberg Tunnel and both air pipes and water pipes, for spraying the face, were taken ahead with work.

Fig. 6. View of completed vehicular tunnel 44 ft. 0 in. internal diameter.

The Brandt drill was responsible for this advance in the drilling rate, and showed a great improvement on the compressed air drills then in use. The Brandt drill was hydraulically operated and was not a percussion drill. It was rotary in action, and was at the same time forced against the face by a hydraulic ram which exerted a thrust on the drills of over ten tons. The drilling rate in granitic rock was 39 inches in twelve minutes. This, although not comparable with drilling rates achieved today, was a great improvement on the drilling rates of those days.

Severn Tunnel

In 1873 the Great Western Railway Company put in hand the construction of the Severn Tunnel, carrying the railway under the estuary of the River Severn in the west of England, thus connecting Bristol by a short route to the South Wales industrial area. The tunnel is 4.33 miles long, and takes a double line of railway track. The maximum depth of water over the route at high tide is 104 feet. At the lowest point in the tunnel there is only 45 feet of sandstone above the top of the brick lining. Tremendous difficulties had to be overcome during the construction, both from the underground streams which were encountered and the sea, which broke into the workings on two occasions.

The land portions of the work were commenced from several shafts, and it was decided to drive a pilot heading through the whole length of the tunnel. First of all, however, it was decided to sink a drainage shaft to a level below the lowest level of the tunnel invert, and to drive a heading from the bottom of this shaft towards the middle of the river and below the tunnel line. This was a fortunate decision as later, when a heading was being driven from an adjacent shaft at a higher level, and on an upwards slope towards the west portal, a spring was struck and a great flood of fresh water poured into the heading. Had it not been for the respite gained while the flood poured down into the drainage heading 40 feet below, the men would have been drowned.

It was necessary to beat the incoming water before the work could proceed, and the heading from the shaft was stopped off by divers and pumping was started. However, no headway was made and it was realized that leakage through the drainage tunnel was the cause of this trouble. Hence it was deemed necessary to close a sluice which had been installed in this heading some 1,000 feet from the shaft. A diver named Lambert undertook this task. He descended 150 feet to the bottom of the shaft and made his way along the drainage adit, pulling his hose behind him.

When he was within 100 feet of the sluice the friction of his air hose against the head trees to which it had floated, was too much for his strength. He could not make another foot of headway, and was forced to return. Subsequent attempts, with a team of divers assisting him, failed also. It was only after oxygen equipment was designed specially for the task that he was able finally to close the sluice so that the shaft could be pumped out. Then the heading, in which the Great Spring (as it came to be called) was situated, was walled off and driving proceeded elsewhere. On another occasion the sea broke through the roof of the tunnel and a large cavity which was discovered in the sea bed had to be filled with clay bags.

In 1882 a tidal wave swept up the Severn estuary, overflowed the banks and cascaded down one of the shafts into the workings. The men were trapped in the tunnel, and were forced to retreat up the inclined heading as the water rose. Fortunately, a party on the surface managed to throw up a bank of clay around the shaft and the water was held back until the tide fell. The trapped men were then rescued by a boat which was lowered into the tunnel.

The tunnel was finally completed in 1885, but the Great Spring was never beaten and to this day pumps are working continually to relieve the pressure on the brick lining of the tunnel. Recently a considerable amount of remedial work has been done by careful cementation. For various reasons, including that of the strength of the lining, the underground streams were not entirely sealed off, but the amount of water to be pumped has now been considerably reduced.

The Simplon Tunnel

One of the most interesting rock tunnels ever to be built is the Simplon Tunnel in Switzerland, constructed between the years 1898 and 1906. The Simplon is twelve and a third miles long. In this case, instead of the usual tunnel for two tracks, the designs provided for the construction of two smaller tunnels 56 feet apart and interconnected by cross passages every 600 feet. This system greatly facilitated the ventilation and, by providing two separate tunnels, prevented any possibility of a serious accident occurring in the event of a train derailment.

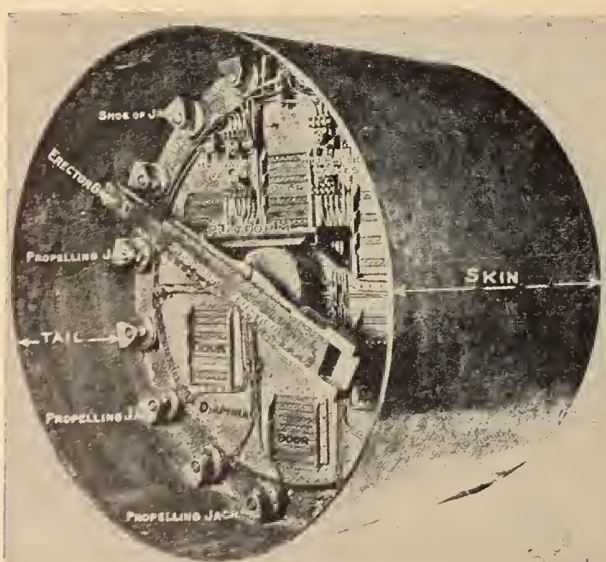
Events showed later that, had the engineers chosen to construct one large tunnel instead of two smaller ones, then it might well have been necessary to abandon the work. At a point three miles from the Italian frontier, bad rock was encountered out of which water gushed in enormous quantities. Simultaneously, the rock began to rise in the floor and crush the timbering. Additional timbering proved to be of no avail, and it was only when heavy steel arches were installed that operations were able to go ahead. Although the bad length was only 130 feet long, it took six months to get through it.

Other troubles were encountered in the nature of cold and hot springs and, as there was a rock cover of over 7,000 feet, considerable heat was developed within the workings. This was alleviated by spraying the face with fine jets of cold water at high pressure. This induced a powerful down draught of cold air which, assisted by large fans installed at the portals, kept the temperature at the face within endurable limits.

Near the junction with the Italians the Swiss struck a spring of high pressure hot water. Although they attempted to overcome this spring, the heat in the workings became unbearable and they were forced to abandon the heading, trapping the water behind a hastily constructed steel door. Shortly afterwards the Italians fired their last blast which broke into the Swiss heading, and released the hot water impounded there. Their hasty retirement precluded the mutual congratulations usual on such an occasion.

The Mersey Tunnel

Between 1925 and 1935, a tunnel was constructed under the River Mersey in England, connecting the cities of Liverpool and Birkenhead. There are several entrances, and the total length of tunnelling is 2.62 miles. The main tunnel under the river is 46.3 feet diameter outside the rings, and is the largest subaqueous tunnel ever constructed. The rock through



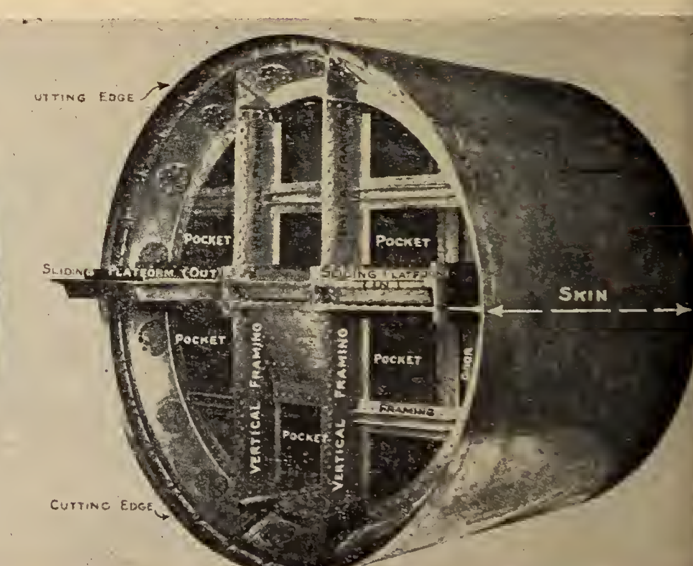


Fig. 7 (left). Tunnel shield, back view showing jacks and erector for cast iron lining.

Fig. 8 (right). Tunnel shield, front view.

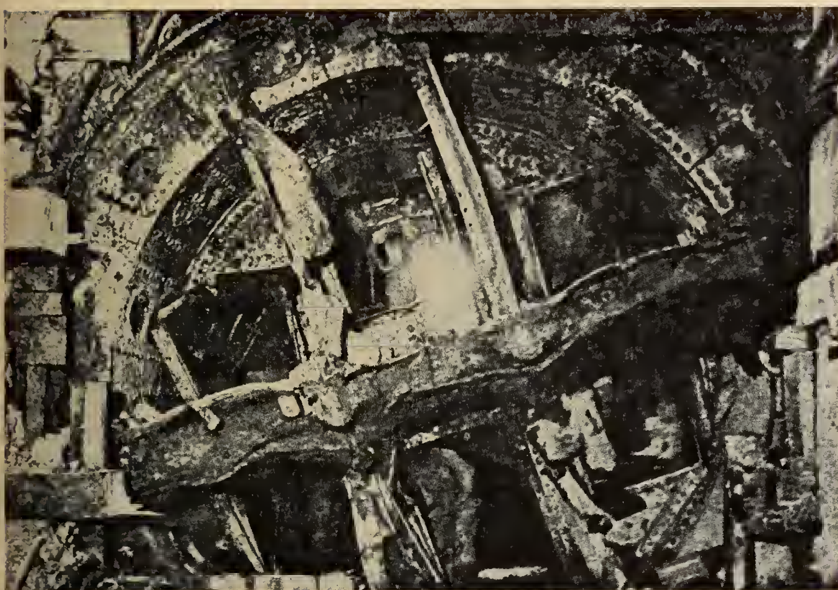


Fig. 9. Tunnel shield at the end of its journey after passing through mixed ground, rock and silt.

which the tunnel passes is a red sandstone and the rock cover at one point is only three feet.

In the construction of this tunnel, shafts were sunk on each side of the river. Two pilot headings, one in the top and one in the bottom of the tunnel, were driven across before the excavation of the main tunnel was started. The rock was extensively fissured and water troubles were anticipated. A drainage heading was driven at a low level to discharge into a sump formed in one of the shafts. Cementation work was carried out in the pilot headings as the work advanced.

As soon as the pilot headings had been completed, breakups were made between them, as previously described, and tunnelling was carried ahead for the main tunnel, 14 faces being worked simultaneously in the under-river section. The top half of the tunnel was excavated first and lined with cast iron segments. The roof and sides were blasted into the heading, then the sides were excavated in radial sections until the full half diameter was reached. As this work proceeded, shoots were cut down to the lower tunnel and the excavated rock was tipped down into hoppers below, which fed the rock into skips running in the lower tunnel.

In excavating the bottom half of the tunnel, holes were drilled down from axis level and the rock was dropped through the roof of the bottom pilot heading. The gorge thus created was then worked out to the full section. As the work proceeded a roadway was slung from the top of the tunnel and excavated rock from the bottom of the tunnel was hoisted up to this working road for removal.

On the Liverpool side, at one tunnel entrance, it was impossible to bring the tunnel to the ground level in cut and cover, as had been done at the other entrances. This was because of the presence of vital city service mains, and the interference which would have been caused to the traffic in this busy area. It was therefore decided to construct this length in tunnel and, because of the type of ground, with a shield. The face varied considerably, commencing with a full face of rock which gradually gave place to boulder clay and made ground. The shield was semicircular in cross section, as was the tunnel over this length and work was carried out in free air. 880 feet of tunnel was constructed with this shield.

At one place where the shield was about 12 feet out of the rock, a run-in occurred, causing subsidence in the ground above. Fortunately, adequate precautions had been taken by equipping the water mains in this area with screw down valves, and consequently the inflow of water from the broken mains was speedily checked. In subsequent investigations it was found that during the Parliamentary Wars in the 17th century, a deep trench had been dug at this point as part of the defences of Liverpool. In the development of Liverpool this trench was filled in and a road was built over it and the trench forgotten. However, settlement took place continuously over the years and water mains which had been laid in the trench settled and developed leaks. Hence the trench had become completely waterlogged and as soon as the shield reached it the run-in occurred.

Control of Water

In the foregoing paragraphs, reference is made to the cementation work which was carried out in the Mersey Tunnel as a means of overcoming trouble from the incoming water. There are, of course, various methods of treating water-bearing ground to assist the tunnel

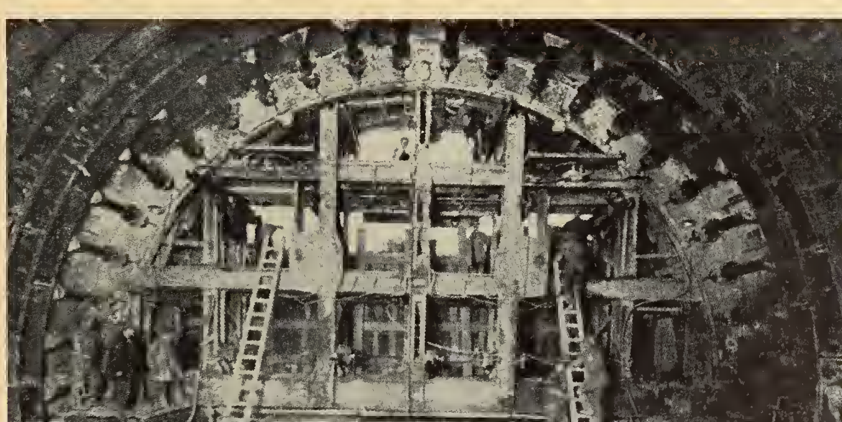


Fig. 10. Semi-circular shield for excavating through soft ground and rock in free air.

Fig. 11. Tunnel driven in river silt. Silt flowing through bottom door.

construction. Cementation, or the injection of cement grout into the ground, is sometimes resorted to where the rock is badly fissured and water-bearing. The grout is forced into the fissures and closes them up when it sets. However, this operation is not always effective, as the pressure within the rock while forcing grout into existing crevices may also open up new ones and the water problem is not solved. Furthermore, if there are large fissures leading into the open or under water, then great quantities of grout may be pumped to waste, incurring great expense. Cementation is not effective in ballast or close ground.

The most effective method in such cases is the Joosten Process, which involves the injection of solutions of sodium silicate and calcium chloride into the ground under pressure. Silica gel is formed in the voids of the ballast, which is thus converted into a rough conglomerate having the consistency of a poor concrete. This process is effective only in gravel; in fine grained silt or sand satisfactory results have not been achieved.

Well pointing, or the sinking of small bore shafts over the area of the works and lowering the level of the ground water by pumping, has been tried with some success in tunnel works. This method has been used mainly for shaft construction and in the building of the open cut approaches to the tunnels. Well pointing is, of course, ineffective in subaqueous tunnels.

Control of ground water by electro-osmosis is an expensive process, and limited in application. The process may be defined as the flow of water through a capillary orifice as the result of an externally applied electromotive force. It is mainly applicable to fine grained soils, and has been used to good effect in draining areas for foundation work in Norway. It has not yet been applied to tunnelling work, but there are possibilities here which are worth consideration.

Freezing of the ground has advantages in the construction of tunnel shafts in bad ground. The process is slow and very expensive, and has not been used on the actual tunnel driving. On the Scheldt Tunnel at Antwerp, the shafts at each side of the river were in particularly bad ground, and were taken much deeper than the tunnel to serve as drainage sumps. The ground was frozen around the site of the shafts, which were then sunk to formation level. The shields broke through the ice walls as they reached the shafts, and tunnelling work was carried on in compressed air. Ground freezing was carried out in the construction of the Moscow subway for the underpinning of buildings during cut and cover construction, and for the shafts on the tunnels constructed for the power station at Swansea, Wales.

Tunnelling in Clay or Dry Ground

The method to be adopted in dry ground is dependent upon the nature of the ground through which the tunnel passes. If, for instance, it is dry sand or well compacted non-cohesive soil, then the tunnelling may be carried out by any of the methods previously described, but must be fully timbered as the work proceeds.

Where, however, the ground is of clay or similar cohesive soil, the supports may be subjected to considerable uneven pressures brought about by the swelling of the clay when exposed to the air. If the tunnel is dry, then it may prove difficult to contain the floor, which may rise under the pressures from the sides.

In this case it is advisable to construct the tunnel by the shield method, following behind with a segmental lining of cast iron or concrete. In moving ground where a shield is not used the face of the work must be fully timbered all the time. The tunnel becomes a mass of cumbersome timber, which has only a temporary value. In addition, there is always danger of collapse in bad ground.

For a fully economical use of the shield, segmental lining must be used and very good progress may then be made. The shield consists of a horizontal cylinder of steel plate slightly larger in diameter than the outside of the tunnel lining. The front of the shield is provided with a circular cutting edge and a diaphragm of steel and set back from the cutting edge, and so constructed as to resist the pressure of the ground in front of it.

The section of the shield behind the diaphragm is known as the tail. The diaphragm is fitted with doors, which give access to the working face, or may be closed when necessary. Around the inside of the tail at a short distance back from the diaphragm are a number of hydraulically operated jacks. These are fitted with flat shoes for pressing against the lining and forcing the shield forward when sufficient excavation has been taken out in front.

The sequence of operations in shield tunnelling is as follows: First, excavate ahead of the shield to a distance equal to the width of one ring of the lining. Next, push the shield forward the distance excavated by means of the jacks against the lining already erected. When this has been done withdraw the jacks into their cylinders and erect the lining in the space thus provided in the tail of the shield. The tail of the shield must, of course, be of sufficient length to overlap the rings already in place, when the shield has been moved forward for the next ring to be erected.

Shields have been used for practically all the tunnelling work on the London Underground, where much of the work was carried through a stiff clay which swelled considerably upon exposure, and rendered other tunnelling methods dangerous and costly.

Tunnelling in Soft Water-bearing Ground

Shield work is essential in soft-water bearing ground, and in nearly every case compressed air is also necessary. In loose ground, such as river gravel or silt, the pressure of the air must be brought up to balance the hydrostatic pressure in the ground. This has the effect of driving the free water back out of the ground, which then becomes fairly dry. River silt which is semi-liquid when charged with water, becomes firm and has the appearance of a sandy clay. If the ground is stiff, no air is able to escape through it to the surface or into the ground. Driving may be carried out as previously described, although any headings in advance of the shield must be carried out with extreme caution.

In open water-bearing ground, the problem of maintaining air pressure may be acute. This is especially the case in a tunnel of large diameter, where there would naturally be a considerable difference in hydrostatic pressure between the top and the bottom. The balancing of air pressure becomes extremely difficult. If the compressed air is supplied at such a pressure as to keep the bottom of the tunnel dry, the pressure at the top becomes excessive and there is a danger of a blow occurring with dire results. If, on the other hand, the pressure is supplied to balance the hydrostatic head at the top only, silt or water runs in at the bottom of the shield and working is difficult, particularly for the grouting.

When compressed air was first used in tunnel work in 1879, a disaster resulted from the use of air at too high a pressure. This was on the first Hudson Tunnels which were started by Haskin. There were two tunnels driven side by side, 18 feet high by 16 feet wide and lined with brickwork. No shield was used, and the ground was supported by means of steel liner plates, the brick lining following the face as closely as possible.

The Hudson river silt was very treacherous and the air pressure was applied to dry out the ground over the whole depth of the tunnel, the ground being excavated in benches. In 1880 there was a serious blow from the top of the tunnel. The liner plates collapsed as the pressure was released, and twenty men working at the face were trapped and drowned. This seriously delayed the work, and it was halted until a caisson was sunk over the bad place and the damage rectified. Work then proceeded, but was abandoned in 1882.

The First Shield

The methods of excavating in bad ground are many and varied, and below are given some details of some of the shield-driven tunnels constructed in compressed air in the past. First, however, some note must be made of the first shield tunnel ever to be driven. Although no compressed air was used during its driving, the hazardous operation was carried through successfully after many trials.

This tunnel was the Thames Tunnel, constructed between 1825 and 1843 under the direction of Sir Marc Isambard Brunel. It was the first tunnel to be driven under the River Thames. It was a stupendous task, as the cross sectional dimensions were 37 ft. 6 in. wide by 22 ft. 3 in. high. Its area has been exceeded by only two subaqueous tunnels up to the present date, namely the Elm Tunnel in Germany and the Mersey Tunnel in England.

Brunel patented a shield in 1818 which was circular, but the shield he constructed in 1825 differed in form from this. Although it has not been repeated, the fundamental principles embodied in it form the basis of the modern shield. This shield was constructed as a number of separate units, each about three feet wide and about 22 ft. 6 in. deep. Each section consisted of a framework supported on a foot-plate, and carrying a slider plate on top of it to support the weight of the ground above. These plates extended from the face of the work to overlap the brickwork lining, which followed about six feet behind. Each section frame was divided into three stages from which the miners excavated the face.

The side sections of the shield were plated in and the face was completely covered by poling boards. These were held tight against it by jack screws, which abutted onto the frames. The shield was advanced at the rate of about five inches at a time. The miners excavated in front of the boards one at a time and jacked each board tight against the face on completion. When the shield was ready for forward movement, the post of the vertical frame was screwed up off the footplate, which was then moved forward. Then the post was screwed down onto the foot-plate and the slider plate was moved ahead. Then the frame was jacked forward up to the new position by means of screw jacks

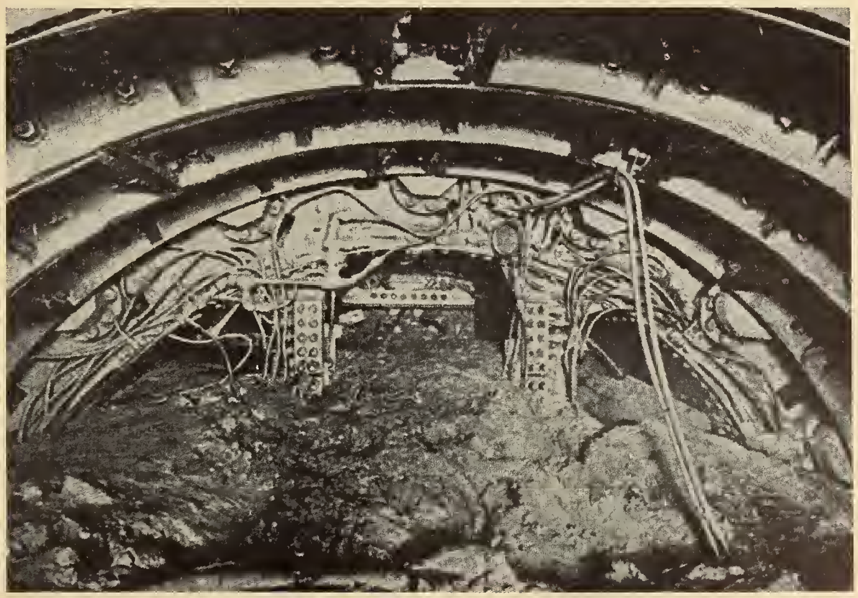


Fig. 12. Tunnel shield after serious blow.

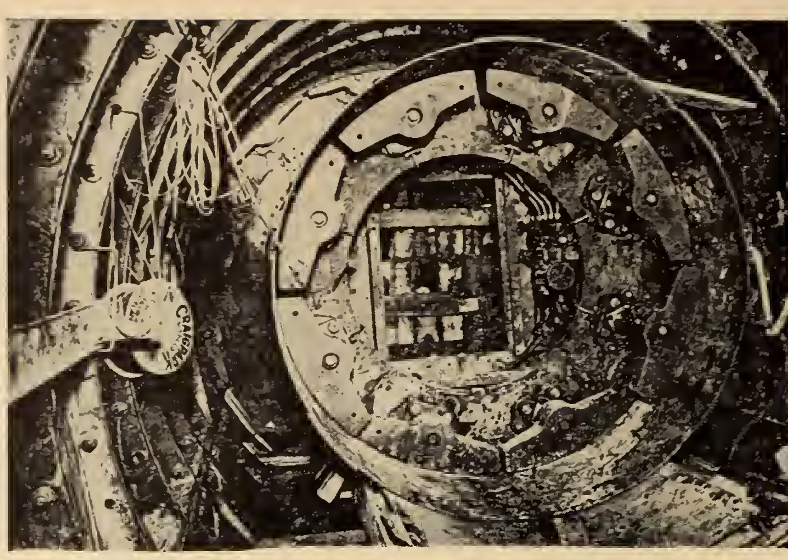


Fig. 13. London underground railway tunnel shield ready for travelling forward.

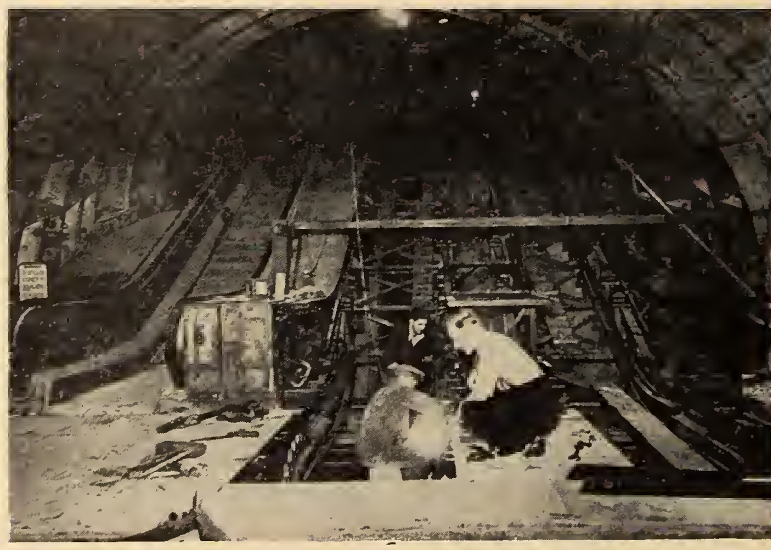


Fig. 14. London underground railway escalator tunnel showing escalator in course of construction.

abutting against the brick lining. In this way the forward progress of a foot a day was achieved.

Great difficulties had to be overcome during the driving. The ground through which the tunnel passed was river silt and loose gravel. Although it was proposed to Brunel that compressed air should be used on the work, the tunnel was constructed throughout in free air. Twice the river broke into the tunnel, and work was abandoned over a period of seven years because of lack of funds, and the tunnel face was bricked up.

When Brunel returned he found his old shield had rusted up and was useless. He therefore had a new shield constructed and took out the old shield piece by piece for replacement. The Thames Tunnel was finally completed in 1843. It was originally intended for horse carriages and pedestrians, and was used later as a railway tunnel until recent years, but is now used as a pipe tunnel.

The Greathead Shield

No other shield tunnels were constructed until 1869, when James Henry Greathead developed a patent taken out by Peter Barlow. This shield was built for the construction under the River Thames of the Tower footway tunnel, completed in the same year, this being the first all-steel shield ever to be used. The Tower subway was a small tunnel, being only 7 feet in external diameter, but the Greathead shield was the forerunner of the modern tunnel shields. At the same time as the Tower Subway was being built, Beach constructed a shield for the Broadway Subway. This shield was propelled by hydraulic jacks, an improvement on Greathead's screw jack propulsion.

From this time onwards, many subaqueous tunnels were built in compressed air with the Greathead shield, both in the United States and Canada, as well as in England where the great system of the London Underground was being developed. Important among these tunnels is the Hudson Tunnel, which had been abandoned in 1882 and for the continuation of which, the famous British engineers, Sir Benjamin Baker and J. H. Greathead were called in as consultants. The British firm of S. Pearson & Son contracted for the work, and a shield was built in the existing tunnel and work commenced in 1889.

This tunnel is particularly noteworthy in that it was here that real progress was made to overcome the terror of compressed air disease, which took such dreadful toll of men's lives on the early works. E. W. Moir (later Sir Ernest Moir, Baronet) one of Pearson's staff, found that in Haskin's tunnel the men had died at the rate of 25 per cent and "nobody seemed to care anything about it". He set out to find the causes of the trouble, and was the first to construct a medical lock for treating the casualties on the spot. Although the incidence of the disease in the Hudson and subsequent compressed air driven tunnels was still high, the number of deaths fell to a very small figure. A set of regulations were drawn up which protected the men, and made it possible for them to get treatment for any recurrence of the disease after they had left the works.

The Blackwall Shield

At about the same time as the Hudson Tunnel was going ahead, work was started by the Canadians on the Sarnia Tunnel, carrying a railway track under the St. Clair River between the Province of Ontario and the State of Michigan. The Sarnia Tunnel had an external diameter of 21 feet, and was carried through the whole of its 6,170 feet length without accident.

When work stopped on the Hudson Tunnel in 1890, owing to lack of funds, S. Pearson & Company commenced work on the Blackwall

Tunnel under the Thames at London, England. E. W. Moir was brought back from the United States as superintendent. The shield used on this work was a development of both the Greathead and Brunel shields. The face was provided with moveable steel shutters, from behind which the ground was excavated to allow them to be screwed up to the face. The work was carried out under considerable difficulty.

The ground through which the tunnel passed was loose ballast. Such great quantities of air were lost through the face and around the tail space in the shield, that it became very difficult to maintain pressure in the tunnel. On one occasion water poured through the shutters, and it was only due to the presence of a safety curtain behind the shield that the men escaped. The trouble was finally overcome by laying a clay blanket across the river bed over the tunnel line.

An attempt was made in the Blackwall shield to regulate the air pressure at the face. The diaphragm was divided into chambers, so that a higher pressure could be provided at the bottom of the shield than at the top. However, this proved to be unworkable. The high pressure air escaped through the ground in front of the shield and equalized with the air at lower pressure above.

Mixed Faces

In many cases tunnels have to be taken through mixed ground where there is soft ground at the top of the shield and rock in the lower part. This presents great difficulties, as the soft ground above must be supported while the rock is blasted out below. The first tunnel to be constructed in such ground was the Ravenswood Gas tunnel in New York. The contractor expected that the tunnel was to be all in rock, and commenced work in free air without a shield. However, badly fissured rock was struck, and although the contractor installed compressed air plant and worked up to the very high pressure of 48 lbs. per square inch, he was finally forced to abandon the work.

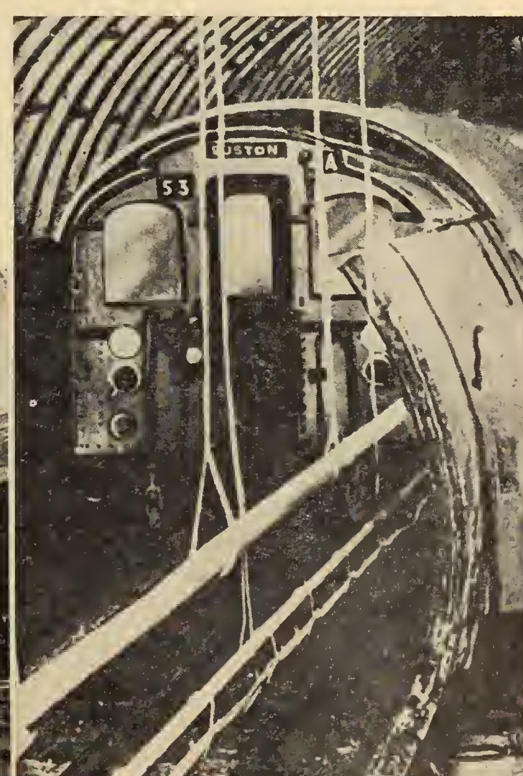
The work was reorganized, a shield was introduced and driving recommenced. At one place the top of the shield was in soft mud, while the bottom was in hard rock. Blasting was carried out under great difficulties and it caused considerable disturbance to the mud. So much so, in fact, that on one occasion an inrush occurred which gave direct connection with the river bed. Crabs, live fish, old boots and tin cans were carried into the workings. These difficulties continued until the shield emerged into a full mud face.

When the Queens Midtown Tunnel was constructed a few years ago, a mixed face was encountered. In one place the shields of the twin tunnels had to be carried through the solid rock, and then through mixed ground until entering the full face of river silt. Naturally, such an operation is very slow and costly. In the case of the Queens Midtown, shields weighing about 200 tons had to be moved forward over a rough rock bed. This involved much preparation work before travelling ahead.

The Hudson tunnel, which was started by Haskin and carried forward by Pearson, but was abandoned in 1890, was again started in 1902. W. G. MacAdoo initiated this work and appointed the English engineer, C. M. Jacobs, who had carried out the Ravenswood Tunnel, as engineer. Pearson's old shield was adapted and driving commenced, but soon a rock reef was encountered which sloped up along the tunnel line, until at its highest level it nearly reached the top of the tunnel. Blasting was carried out and in view of the probable disturbance that would be caused two scows loaded with clay stood by in case of blows.

Fig. 15 (left). London underground railway construction of station tunnels in compressed air.

Fig. 16 (right). London underground railway. Increased length of station showing running tunnel ironwork still in place. Note small clearance around rolling stock



This was a wise precaution, as two blows did occur. They were checked by dumping the clay over the holes. Blasting at the point in the tunnel where the rock was at its highest level was carried out under very bad conditions. At this point the silt was semi-fluid, and had to be reinforced with tipped clay. The clay crept forward over the work and all efforts to hold it back were of no avail. Finally a very unusual expedient was adopted. Kerosene tanks were installed in the tunnel, and supplied kerosene under pressure to blow pipes which were lighted and turned onto the clay. In due course the clay was baked hard under the intense heat, but water jets had to be played continuously on the shield to avoid damage due to the high temperatures.

Although excavation through mud is probably the most hazardous in ordinary mining methods, it is the easiest ground to travel through with the shield driven tunnel. It is not necessary to excavate ahead of the shield. The shield is shoved forward with the doors open, and the mud is squeezed through into the tunnel like toothpaste from a tube. Shoving blind, or jacking the shield forward with all doors closed so that no ground is taken in at all, has been tried. However, it is extremely difficult to control the direction of the shield in this operation. It shows a tendency to dive or run out of line, imposing also a severe strain on the lining already placed.

Furthermore the ground is shoved away from the front of the shield, and may form a wave in the ground above. This is, of course, immaterial in the bed of a river, but cannot be allowed to occur on the landward ends of the tunnel, where buildings would be seriously affected. In this method of driving, considerable attention must be paid to the many factors which all have a vital effect on progress. The amount of mud taken in if correctly regulated can be a strong aid to the steering of the shield. The air pressure must be adjusted to suit the type of silt, and pressures on the jacks watched carefully. Some remarkable rates of progress have been obtained by this method. On the Hudson Tunnel, 346 feet of advance was obtained in a week. On the Pennsylvania Railroad Tunnel the maximum advance in one month was 545 feet.


Fig. 17. London underground railway. Gants Hill Station.

Hazards from Blows and Fire

In the foregoing, reference has been made many times to the danger of blows or escapes of air from the face of the shield. This can be rated as the worst danger facing the tunnel engineer. He relies upon his air pressure to hold back the water in the ground through which the tunnel is being driven and if this air escapes, then mud and water enter the tunnel. Not only are the workmen placed in grave danger, but the work is stopped, and great expense is involved in restarting it. In most cases where blows are feared, clay loaded scows are kept constantly in the river above the face. As soon as a strong air escape is observed, the clay is dumped over the site.

When a blow occurs in a tunnel, prompt action is required, and cool heads are needed in the fight to beat the trouble. The air pressure drop in the tunnel is accompanied by a fogging up of the air and the lights become dim. As soon as an air leak appears on the face the experienced miner will immediately thrust anything he has handy into the hole, such as straw, which is usually kept by for that purpose, planks, spades, buckets, clothing, or will even jam his shoulders against it.

On one occasion, in the Steinway Tunnel, N.Y., a miner, in his efforts to stem a blow did, in fact, thrust his shoulders against the weak place. The air had taken control however, and he was forced clear of the shield and shot up through the overlying silt within a huge bubble of air. He travelled thus, up to the surface, where he was rescued unhurt and taken into a boat which happened to be standing by. A similar occurrence took place in the Glasgow Tunnel in Scotland. A number of men were blown through the silt up to the surface, unfortunately with fatal casualties among them.

The danger of fire is very serious in compressed air, as the extra oxygen in the air aids combustion, and even damp straw and timber will burn quite fiercely. On the Queens Midtown Tunnel such a fire occurred, and despite all efforts to extinguish it, it gained control. In the end the air pressure was lowered and the tunnel flooded.

London Underground Tunnels

In the foregoing, most of the tunnels described have been constructed for the carrying of railways or vehicular traffic under rivers. Another type of tunnelling now familiar to travellers in big cities is that carried out for underground transit systems. This work is singularly interesting because of the complexity of its construction. Stations, running tunnels both straight and curved, and junction and crossing tunnels are all carried on below the surface of the ground, without causing disturbance to surface traffic, existing underground city services or the foundations of buildings.

Usually tunnel works extend over a length of several miles, as was the case with the recently completed Ilford Tube extension in London, England. A great variety of ground may be met with during the course of the work, from mixed ground to clay or loose water-bearing ground. The diameter of the running tunnels is now standardized at 12 feet on the straight, but in the early days of the London Underground development, the diameter was only 10 ft. and subsequently 11 ft. 8¼ in. Work has been going on for many years in London, and there is now 63 miles of tunnel work in the system which has in all 232 miles of running lines.

J. H. Greathead was the pioneer of London tube construction. It was his shield that was used to a very large extent on the early work. In the London clay it is possible to drive without compressed air and there are several systems adopted for the excavation work. One method is to take a heading in front of the shield for a distance of about 8 feet. This heading is timbered up and is about 6 or 7 feet high and 5 feet wide. Pointed stakes or "piles" are then put into the clay around the edge of the shield and the shield is shoved forward. The "piles" cut into the clay and cause the heading, which has been partly detimbered before the shove, to collapse against the face of the shield and the muck is carted away.

A type of shield which has been adapted for use in London clay was invented by John Price for work on the pilot tunnel for the Rotherhithe Tunnel under the Thames. This shield is of the same general form as other shields. It is however, provided with a central shaft, on which is mounted the excavator in front of the cutting edge. The excavator has radial arms, each with cutting knives extending in front of them. The radial arms are revolved by means of a motor provided with a system of gearing accommodated in the tail of the shield. The knives cut into the face and cause a complete breakdown of the ground in front of the shield.

A bucket on each radial arm gathers the broken clay and discharges it into a chute leading into the tail of the shield. While this operation is going on the shield is being moved slowly forward. Considerable skill is needed in operating the shield in this way. It is inclined to run out of line and level, a defect which could be serious in tunnels where the allowable tolerance in line and level is only one inch.

Much air may be lost in open water-bearing ground, not only through the face, but through circular spaces left between the tail of the shield and the lining as it moves forward. This is of course a serious defect, and many solutions have been sought for this problem. In London gravel, one method of overcoming the trouble was to rake out a number of holes in advance of the top part of the shield, and to pack them with clay. When the shield was shoved into this clay belt, a skin of clay was left on the outside of the shield, which kept the ground airtight until grouting could be done.

In a recently constructed tube in the east end of London, the shield was carried through exceptionally poor open water-bearing ground. At one point the running line gradients demanded that the levels should be brought up so that only a shallow cover was available under the bed of a small river. Any settlement in the river bed, due to the passage of the tunnel, would have endangered the foundations of an adjacent bridge. Chemical consolidation was therefore carried out from barges in the river, and also from a 7 ft. diameter shield driven pilot tunnel taken in advance of the main running tunnel, with satisfactory results. A vault of hard ground was formed, through which the main tunnel was driven.

Chemical consolidation was used on several lengths of tunnelling in the construction of this line. In one place the tunnels passed within nine feet of the foundations of a bank building. Ground was chemically consolidated in advance, and the tunnel was carried through without causing the slightest disturbance to the building at the time, nor has any subsidence occurred since.

Station Tunnels

Station tunnels which occur at about ¾ mile intervals on the London Underground have been constructed of circular cross sections of 21 feet diameter. One of the latest stations to be constructed gives a wide concourse between the platforms. The station tunnels, when in bad ground, are constructed throughout with shields. If the nature of the ground is favourable, they may be broken out from the running line tunnel, which is first carried right through the site of the station during construction of the running lines. First a headwall is built at the end of the station, working from the running tunnel. Rings are then put in to support the ground over the full diameter of the station tunnel. Then the excavation is advanced along the station tunnel, away from the headwall, with the roof poled ahead. The face is then fully timbered, until the whole of the station has been excavated. Then the running line iron is taken out.

In the normal station, there are two such tunnels driven side by side and interconnected by cross tunnels at intervals along their length. Gant's Hill Station in the north-east of London has, however, a clear platform width of 53 ft. To achieve this, a complicated form of construction was necessary. First, two 21-ft. tunnels were shield-driven the length of the concourse at 25-ft. centres. The inside arcs of these were broken out in short lengths, and the space between the bottoms of the two tunnels was spanned by heavy steel beams concreted in solid. Two small tunnels were driven outside the 21-ft. tunnels and two more 21-ft. tunnels were constructed at 13 feet centres from the first two 21-ft. tubes.

Heavy columns were constructed to support the roof of the station. The four 21-ft. tunnels were interconnected to give a clear space of 73 feet between the outside walls of the tunnels. Then heavy longitudinal beams were placed in the top of the tunnels, and a pilot tunnel driven through at high level from which the roof of the tunnel was constructed. The result has been the provision of a spacious station which represents a great step forward in the design of underground railways.

London Provides Pattern for Montreal

I have deliberately left my brief description of the London Underground railway system till the end of the paper, since such a system must be in the minds of all of you who are acquainted with the Montreal transportation problem. The sub-soil of Montreal is, near the River, rather poor alluvial silt and gravel, and in the uptown area, rock of the Laurentian Shield. The surface of the ground, by reason of the Mountain, varies considerably in level. The system of constructing a subway in cut-and-cover, at present in use in Toronto, would be entirely unsuitable in Montreal.

In fact, all the circumstances in Montreal are right for tunnelling methods of constructing an underground railroad system. The tunnels would be partly in rock, partly in gravel, partly in alluvial silt, and would therefore involve many different methods of tunnelling. For economy and safety, the size of the tunnels would clearly be kept to a minimum, and thus one is inevitably led to the conclusion that the right system of underground railroads for Montreal would be based upon that developed over the last 50 years in London. The system of London's underground railways is generally recognized to be the finest and the best in the world.

As you will appreciate, it would be impossible in the time at my disposal to discuss all the aspects and opinions on tunnelling. This is one of the largest and most complicated subjects in civil engineering. I have now covered as many facets of tunnelling as is possible in the time available, but I cannot conclude my paper without recording my sincere thanks to my colleague, Mr. Alan U. Shiach, who is with me here today, for the great and valuable help which he has given in the preparation of this paper.

The "Bristol" Type 173 Helicopter

The Bristol Aeroplane Company Ltd. has released preliminary information on the "Bristol" Type

173 Helicopter, the prototype of which is expected to begin flight trials in the near future.

This twin rotor aircraft is designed primarily as a medium or short range transport for 13 passengers and luggage, but has a variety of possible military uses. It can be readily converted to carry 2,500 lb. of cargo, or can be used as a "crane", lifting greater weights over short distances. The machine can hover at an all-up-weight of about 13,500 lb.

With rotor blades folded, the aircraft is 78 ft. long, 17 ft. wide and 15 ft. high. Maximum cruising speed on weak mixture is estimated at 105 m.p.h., maximum speed at 142 m.p.h., and maximum rate of climb at 1150 ft. per minute. Service ceiling is approximately 19,600 ft.

The two Alvis Leonides engines are located at each end of the fuselage below the rotors, which rotate in opposite directions and are in tandem. A synchronizing shaft ensures that both turn at the same speed and permits either engine to drive both rotors in the event of the failure of the other power unit. A free wheel and clutch located in the drive between each engine and the nearest rotor permit isolation of a dead engine or full autorotation with both engines cut if desired.

The main portion of the fuselage is of conventional type light-alloy semi-monocoque construction, of ovoid section. Ample glazing is provided both for the passengers' and pilots' cabins.

A four-wheel undercarriage is provided. Almost symmetrical distribution of loads about the centre makes the four-wheel arrangement preferable to any tricycle. Propulsion during taxying is obtained from the rotors which are set with a slight forward tilt relative to the fuselage.

One of the main features of the Type 171 four-seater helicopter retained in the present design is the use of rotors with comparatively high moment of inertia, and capable of running at high r.p.m. so that the kinetic energy in the rotors is sufficient to permit plenty of hovering time after destroying the sinking speed of the machine in case of autorotative landing.

Utilization of Natural Gas in Canada

A paper presented before the 65th Annual General and Professional Meeting of The Engineering Institute of Canada, Montreal, May 9, 1951.

by

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Fuel will always be of prime importance in Canada's economy because of our climate. It is also true that our industrial expansion and living standards are in no small measure related to our capacity to meet our requirements for fuel. Not only must that fuel be in such forms as will ensure the most advantageous use. It must provide as well convenience in handling and efficiency in burning, so costs may be reduced to a minimum.

For many reasons fuel oil is preferred by many domestic consumers for space heating in place of coal, even though in some instances the cost may be somewhat greater. Natural gas for heating has a number of advantages over fuel oil. Indeed of all fuels in common use today, it most nearly approaches the ideal. Its high heat value, about double that of manufactured gas made from coal, gives it a great advantage where a supply is available.

Whereas for domestic use the burning of fuel oil is dependent upon electricity for blower operation, the use of natural gas is dependent alone upon the maintenance of a small pressure in the distribution mains. Thus under present conditions in these days of war uncertainty there might be a strategic advantage in the use of natural gas instead of fuel oil for space heating. Gas mains, when broken, can be readily and quickly repaired, whereas extensive damage by bombing to power plants generating electricity might cause prolonged and serious difficulties for a population thrown into confusion by the disruption of its services.

This paper, presented by Canada's foremost authority on petroleum geology, summarizes his own and other appraisals of Alberta's natural gas reserves, and compares them with that Province's estimates of domestic requirements. Enumerating the various pipe line projects proposed for exporting the gas, he discusses the economic advantages and dangers for each, as well as for the alternative proposals for importing Texas gas. The value of a supply of natural gas to Eastern provinces is assessed.

To many people vaguely familiar with the use of natural gas its advantages are little appreciated, but to engineers who understand the efficient consumption of fuels no exhaustive statements of its comparative values are needed. It can be taken for granted, that, given a selection at comparable prices, the public would choose natural gas above all other forms of fuel, especially for the heating of dwellings. Where natural gas was available in quantity it would be the choice also for many commercial and industrial purposes.

This paper attempts to outline the availability of supply, and the markets that are within possible economic reach of the areas where natural gas can be produced. Most of the information is from reports presented to the Petroleum and Natural Gas Conservation Board of Alberta by those seeking permits for gas export. The only original investigations made are those contained in Geological Survey of Canada reports by Ignatieff and myself covering the Natural Gas Reserves in situ in the Prairie Provinces[1] to June 30, 1950.

In our natural gas appraisal the reserves of the Prairie Provinces were classified as follows:

Proven

These were mostly in fields where production history had given an indication of volume in relation to decline of pressure. Some discretion must be used, however, in ar-

[1]Hume, G. S. and Ignatieff, A., Geol. Surv. Canada, Special Report, Natural Gas Reserves of the Prairie Provinces.

riving at a well-balanced result, because of the tendency in some fields, slowly drawn upon, for the restoration of the pressure in the gas area by the encroachment of edge water under hydrostatic head.

Probable

These reserves are in fields where only a few wells or single wells had been drilled, and in which the calculations had to be based on the volume of gas contained in the pore space of an often vaguely defined area. In such cases information on the percentage of pore space and the amount of moisture or connate water in the gas reservoir are obtainable only from cores, and in many wells the pressures in the gas zones have been imperfectly measured. Thus the reserves based on this method of appraisal are of a lower order of precision than those considered to be proven.

In making an appraisal, the application of geological knowledge of formations and gas zones becomes important in arriving at decisions regarding the porosity, permeability, and connate water content. Hence with a cautious approach, the overall appraisals have been found to be quite reliable. It is for this reason that most gas engineers regard the reserves called by us as "proven" and "probable", as proven or indicated reserves. As of June 30, 1950, our appraisal of the proven and probable reserves at 14.4 p.s.i.a. and 60 deg. F amounted to 6.992 MMMcf for Alberta and 38.5 MMMcf for Saskatchewan, or a total of 7,030.5 MMMcf for the Prairie Provinces.

Appraisals of Reserves

Our report pointed out that there are numerous areas, particularly in Alberta, where wells in drilling have encountered substantial gas flows, but because of lack of markets or for other reasons the wells have been abandoned. Without adequate data no accurate appraisal of these areas is presently possible. Other regions have single gas wells in isolated areas, very imperfectly known geologically, and hence again cannot be quantitatively calculated. These areas are distributed over the whole of the Southern half of the Province where drilling has been mostly concentrated, and constitute the potential reserves for which no estimate was made. It is beyond question that the potential reserves exceed by many times the indicated reserves of 7 trillion cubic feet as at the middle of last year.

Recently De Golyer and McNaughton, well known firm of Petroleum Engineers in the United States, have made the most complete report to date on the Natural Gas Reserves. On May 7th this was presented to the Petroleum and Natural Gas Conservation Board, with estimates at 14.4 p.s.i.a. and 60 deg. F as of January 1, 1951. These are as follows:

Proved	8,169,943	MMcf
Probable	2,224,278	"
Total Proved and Probable	10,394.221	"
Possible	2,277,365	"
Total	12,671,586	"
Available for sale	7,878,497	"
Deferred by oil production	429,621	"

As already stated, the estimates of reserves by Ignatieff and myself are for gas in place in the various fields. There is a considerable difference between these reserves and the disposable reserves. This difference may be illustrated by the Pincher Creek gas field, for which our estimate of in situ reserves is 1.583 trillion cubic feet. In this gas 15 to 16 per cent is hydrogen sulphide and carbon dioxide. It is certain that the economic limit of production will be at a considerable higher abandonment pressure than in less deep fields. The problem that concerned the Alberta Petroleum and Natural Gas Conservation Board was therefore the amount of disposable gas, and in order to arrive at a conclusion, hearings were held where evidence was presented. The estimates of disposable gas were as follows:

Petroleum and Natural Gas Conservation Board, Interim Report with respect to applications now before the Board for permission to remove gas or cause it to be removed from the Province under the provisions of The Gas Resources Preservation Act. p. 15, 1951.

Estimates by:	Disposable gas MMMcf
Westcoast Transmission Brief Dec. 30/50	7,023
Northwest Natural Gas Company Brief Dec. 30/50.	5,006
Prairie Pipe Lines	4,684
Western Pipe Lines	5,614
McColl Frontenac & Union Oil Company	6.284
Liesemer[2]	3,635

[2]An employee of the Petroleum and Natural Gas Conservation Board, but presenting his own views.

From the data presented, the Board arrived at the decision that the disposable reserves in the Province of Alberta were as follows:

	MMMcf	
Local use	382	
General use	4057	
	4439	MMMcf
Beyond economic reach	219	"
	4658	MMMcf

In this summary, the reserves in fields for general use included those for the two major distribution systems supplying Calgary and Edmonton respectively. Wells in the Lac La Biche, Wabiscaw, Pelican and Peace River areas were considered beyond economic reach. With these also was included the gas from such fields as Redwater and Stettler where, on account of the low quantity of gas with the oil, it was considered the gas could not be economically collected.

Domestic Requirements

In dealing with the present and future requirements of Alberta it was considered that, with a population of 887,000 in 1950, the consumption on a per capita basis was: Domestic Mcf per year 21.2; commercial Mcf per year 14.2; Industrial Mcf per year 18.5; or a total Mcf per year of 53.9.

In estimating the future growth of the Province, a population growth of 2½ per cent per year was assumed for the period 1950 to 1960, and 1½ per cent per year thereafter to 1980. This was then combined with the trend in per capita gas consumption, and the total requirements of the Province for the next 30 years was estimated at 3,059.9 MMMcf, divided as follows: domestic 873.7 MMMcf commercial 751.7 MMMcf, industrial 1434.5 MMMcf, with a total requirement for the year 1951 at 53.6 MMMcf and a total requirement for the year 1979-80 at 13 MMMcf, with a peak load of 16 MMcf in 1951 and a peak load of 388 MM in 1979-80.

Thus, of the established reserve of 4,658 MMMcf, the Board considered Alberta's future needs to 1980 would be met by 3,059. MMMcf. Necessarily, the problem of deliverability was considered. Gas from none of the fields as presently developed in the southern part of the Province was considered surplus. It was also conclude that further development, possibly in the area north of Edmonton, would be needed for the requirements of the Province in the early 1960's. Thus, in the opinion of the Board, "None of the major reserves or any part of them could be allocated to a market outside the Province". It recommended, however, that applications for export permits by several companies be continued until September 4, 1951, but indicated that the establishment of further reserves might permit export.

Gas Export Applications

Alberta Natural Gas Company, incorporated in Canada, and its corresponding company, The Northwest Natural Gas Company in United States are seeking the right to export natural gas from Alberta to the Pacific Coast market. Several routes were studied and plans submitted. The best pipe line route to the Pacific Coast is considered by officials of this company to start at Pincher Creek, thence through the Crowsnest Pass to Kingsgate, B.C. Here the proposed pipe line would go southwest to Spokane with a branch line from Newport to Trail. From Spokane it would go almost due west to Monroe, Washington, with a branch south to the Hanford atomic energy plant. From Monroe one line goes south to Seattle, Tacoma, and Portland and the other north through Bellingham to New Westminster and thence to Vancouver.

This is the route preferred by the Northwest Natural Gas Company because (a) it is claimed it is the shortest line to the largest markets for natural gas in British Columbia, Washington, and Oregon, (b) it is readily accessible from existing roads and the relative regularity of the terrain is claimed to be an important factor in contributing to lower initial construction costs and maintenance expense, (c) it is also claimed the average rainfall and snowfall along this route is lower than any other, (d) it is considered the route is less subject than others to landslides which could cause interruptions in service, and (e) because of the lower capital costs the Alberta producers will receive the best possible price for their natural gas. The Northwest Natural Gas Company, however, offered to build a line to Vancouver by an all Canadian route if this were desired. The gas would be drawn from Pincher Creek and from a grid system built by Alberta Natural Gas Grid Limited.

Westcoast Transmission Company Limited, proposes to build a line from the vicinity of the Pouce Coupe field in the Peace River area through Pine Pass to Prince George, and down the Fraser Valley, with the main line going to Abbotsford and thence to Vancouver. From here a line would go south to supply Seattle, Portland, and intervening points. A branch line was also proposed down the Okanagan valley to Osoyoos and thence to Hanford. It was also proposed, as and when required, to build a branch line from Edmonton through the Yellowhead Pass to connect with the Peace River line at Prince George.

In its recommendations concerning reserves for Alberta, the Board excluded the Lac La Biche, Wabiscaw, Pelican, and Peace River areas as being beyond the economic reach necessary to be held for Alberta. Thus Westcoast Transmission Company has concentrated its recent efforts to develop gas mainly in the Peace River area. Not only have these been quite successful, but other companies drilling in the same general area have found large isolated gas wells which, in part at least, must indicate prolific gas fields.

Officials of Westcoast Transmission Company now estimate the reserves in the Peace River area within reach of its line as 1,132 (Jan. 31, 1951) MMcf. Thus since the Board completed its report at the beginning of 1951 the gas reserves in the Peace River area have been greatly augmented. Since the Board has excluded this gas from that necessary for Alberta, it would be assumed that this large volume may be available for export when a sufficient quantity is proven to justify the building of the gas lines to the export market.

Comparing the Projects

In this statement concerning pipe line projects it is desired only to give the relevant facts of each project, without forming any conclusions as to which are the most advisable. It should be pointed out that British Columbia would profit greatly by the development of its own Peace River area, provided natural gas is taken from it and the adjoining part of Alberta for use in Vancouver, New Westminster, etc., and northwestern United States. Without the markets in Northwestern United States, no oil or gas pipe line to the coast from Alberta can be built on an economic basis. Hence the supplying of the Vancouver area from other sources might tend to retard the development of the B.C. Peace River area for an indefinite period, unless some other major project was built which called for lines this far northwest from Edmonton. There is no doubt from the standpoint of geological appraisal the Peace River area is capable of being developed, particularly for gas, to the point where exceedingly large reserves can be made available. The advantages of developing this gas for the Vancouver market were mentioned in reports written in 1947[3], and since then developments have made the prospects much more certain than could be indicated at that time.

It must be always remembered in dealing with any gas pipe line project that easy access to the line at all times is a requisite to keeping the line in continuous operation. Thus transportation facilities built to service a Peace River-Vancouver pipe line would give as direct access to Vancouver as can be provided through the mountains. The effects on the development of the Peace River area from this alone would be exceedingly great.

It seems probable that, unless a market occurs for gas from the Peace River district within a reasonable time, the oil developments will lag because of the necessity of disposing of gas produced with oil without undue waste. Waste of gas such as occurred in Turner Valley would not now be tolerated, and any oil fields with a considerable production of gas would be shut in pending a market for the gas, just as the Pincher Creek gas condensate field in southwestern Alberta has been shut in for several years for lack of gas market. Thus, without a gas market for the Peace River area the search for oil fields northward will be greatly retarded.

A third company, Prairie Pipe Lines Limited, has now become affiliated with Pacific Northwest Pipeline Corporation, which proposes to bring gas from Texas to

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[3]See Western Business Nov. 1947 p. 88. Also the Precambrian Vol. XX No. 12 Dec. 1947 p. 9. and 43.

the United States Pacific Northwest area. Prairie Pipe Lines applied for the right to export 100 MMcf a day to supply the British Columbia market. It is proposed to build a line from Pincher Creek through the Crowsnest Pass, following much the same route through Canada as the most favourable route chosen by the Alberta Natural Gas Company. Its line would join with that of Pacific Northwest Pipeline Corporation in United States.

Dangers Arising From Various Choices

It should be realized that when the Federal Power Commission in the United States grants a pipeline charter to any company, this is an exclusive right. Only by arrangement can any other company enter the same area. Thus the building of Pacific Northwest Pipeline from Texas to supply the Pacific northwest area would cut Canada off from any export market in the United States Pacific area, other than such gas as this company desired to buy. The Vancouver area market is not large enough to justify the building of a pipe line to supply it alone, thus the export of gas from Alberta to the Canadian Pacific Coast would not be possible unless a partial market in United States was obtained.

It should be realized also that if Westcoast Transmission Company were to build a line from Peace River to the Vancouver area, and thence to United States, this would probably bar or greatly delay the export from southern Alberta to the same area. Alternately, should gas from southern Alberta go to the Pacific area, including Vancouver, the pipe line from Peace River to the Pacific would not be built. Under these circumstances it will be important in relation to export to make full enquiries as to what will not only serve the immediate interest, but will as well serve the long term interest of developments in Alberta and northeast B.C. for the benefit of Canada.

According to the report of the Petroleum and Natural Gas Conservation Board (p. 54), Northwest Natural Gas Company and Westcoast Transmission Company each is applying for about 79 billion cubic feet a year (fifth year requirement), of which 12.6 billion cubic feet are for British Columbia's requirements and the remainder for the Pacific northwest area of United States. Market surveys have been made and that of Ford, Bacon and Davis, Engineers, filed with the Board and reviewing a former report made by Ebasco Services, indicates that the market in the 5th year for Westcoast's proposed line would be 56,053,600 Mcf., divided as follows:

	Mcf
British Columbia	
Domestic	5,691,600
Commercial	1,897,200
Firm Industrial	1,590,000
Interruptible	2,700,000
Total	11,878,800
United States	
Domestic	15,611,100
Commercial	5,203,700
Firm Industrial	10,884,000
Interruptible	12,476,000
Total	44,174,800
Grand Total for B.C. and U.S.	56,053,600

It was also indicated that the maximum daily load would be 284,310 Mcf.

Pincher Creek Main Source

It will be noted that all pipe lines so far proposed from Southern Alberta have the Pincher Creek field as one of their main objectives. This is easily understood because that field is presently not being produced. The reserves in it are large, amounting according to the Board, to 1,825 MMMcf in situ. This was slightly larger than the appraisal by Ignatieff and myself. Of this large reserve, the Board considers 1,170 MMMcf are established reserves for general use to an abandonment pressure of 400 p.s.i.a.

The Board has concluded also that the field can supply "for every 100 million feet of residue gas, some 3,500 barrels of natural gasoline, 700 barrels of butane, and 550 barrels of propane, the last two of which would serve as raw materials in petrochemical industries. In addition, some 430 tons of sulphur could be produced with every 100 million feet of marketable gas."[4] The production of the Pincher Creek field on full development would be of the order of 100 million cubic feet or more a day so that the figures for production of condensate and sulphur as given above could, with an adequate market for the gas, be considered as daily yields.

As to the present lack of markets for gas, the search for gas and oil fields in the foothills has recently been largely neglected. This is because the finding costs are high and gas is likely to be present in large volumes even if oil occurs with it. It should be remembered that the estimated original gas reserves of Turner Valley, Pincher Creek, and Jumpingpound fields exceeded 4.5 trillion cubic feet in places. The discovery of new fields of this type could speedily make sufficient gas available for export, but at present the incentive to seek them is largely lacking.

Other Pipeline Applications

Three other pipeline export applications have been made. McColl Frontenac Oil Company and Union Oil Company Limited, have gas reserves principally in the Pendant d'Oreille and Manyberries fields (Pakowki Lake area) of southern Alberta. These companies have at the request of the Director of Mobilization of the United States to the Minister of the Defence Production Department in Canada, been granted a short term permit by the Alberta Government to supply gas to the Montana Power Corporation for the use of Anaconda at Butte. The mining and smelting operations use about 10 billion cubic feet a year, equal to about 1,666,670 barrels of oil, or 500,000 tons of coal. The Bill enacted by Alberta allows an export of gas from the Province not exceeding 40 million cubic feet a day or 10 billion cubic feet a year. The permit is for 5 years.

An application for a permit to export has been made by Western Pipe Lines, who proposes to take gas from the Pincher Creek and other southern Alberta fields following a pipe line route through the towns and cities of southern Saskatchewan and Manitoba to Winnipeg, thence to Duluth and Superior, Wisconsin. It is estimated that, in the fifth year when consumption has been built up, the requirements would be 58.4 billion cubic feet, of which 19.5 would be used in Canada. It has been stated that "this line would supply more Canadian requirements than any of the companies proposing to supply the British Columbia market".[5]

The high possible winter domes-

[4] Alberta Petroleum and Natural Gas Conservation Board interim report p. 52, 1951.

[5] Alberta Petroleum and Natural Gas Conservation Report p. 55.

tic consumption, and the much lower summer consumption, make for a low load factor for a pipe line to Winnipeg alone. Although this does not necessarily make such a pipe line uneconomic for Canadian consumption alone, the extension to United States with a much higher commercial and industrial load would considerably lessen the price to the consumer.

Proposal to Supply Eastern Canada

Finally, the last export permit is being requested by a group of Texas operators representing Delhi Oil Corporation of United States and Canadian Delhi Oil Limited, for Trans-Canada Pipelines, to bring gas from the Princess area, eastward to Winnipeg, thence across the Precambrian Shield via Fort William and Sudbury to Toronto, thence to Montreal, with a branch line to Ottawa. Various routes across the Precambrian Shield from Fort William to Sudbury are being investigated. This pipeline as proposed would be 30-inch diameter capable, with the requisite number of compression stations, of carrying initially 365 million cubic feet a day, increasing to a maximum of about 500 million cubic feet a day. The cost is estimated at about 250 million dollars.

In addition to the gathering lines in Alberta, the main line to Toronto (30-inch) would be approximately 1,780 miles. The 325-mile line from Toronto to Montreal would possibly be 24-inch, with lateral lines from Morrisburg to Ottawa and from Toronto to southwestern Ontario. The main line from the Princess area to Toronto and Montreal would thus not be less than 2,100 miles. Company officials and engineers have stated that such a line can be built at a cost which would allow natural gas to be sold in Toronto, Ottawa, and Montreal at prices competitive with present prices for fuel oil or coal. It is understood Trans-Canada Pipelines would not distribute gas, but would sell it in each consuming centre to a distributing company, of which a number are now operating on artificial gas. In 1949 in southwestern Ontario 6 billion feet of natural gas for domestic use produced a revenue at the rate of about $1.13 per Mcf. Industrial sales of 1,285,978 Mcf in the same period yielded revenue at the rate of about $1.05 per Mcf, and commercial sales brought almost the same rate as industrial sales. These gave a total of 7,985,365 Mcf sold for $8,883,653[6]. Thus Trans-Canada Pipelines, transporting 365 to 500 million cubic feet a day, would deliver natural gas which, to the consumer, would represent a very large sales value. If efficiency in burning is considered, the pipe line, when operating at full capacity of 500 million cubic feet a day, would replace the equivalent of about 25,000 tons of good grade coal a day.

There are certain features for a pipeline project of this kind which appear to be essential if the pipeline is to operate with the greatest efficiency, and hence provide as reasonably priced gas to the consumer as can be obtained. One such is underground storage, such as in depleted or partially depleted gas fields of Ontario during the off-peak summer months, so that the load factor of the pipe line could be kept up as nearly as possible to the maximum. A low load factor on such a pipe line would make it uneconomic. Thus underground storage facilities for gas is a prime consideration from the price standpoint, even if the pipeline could operate economically without such storage. In addition to providing a means of taking care of off-peak loads, storage also gives a considerable measure of insurance in the consuming area against interruptions in service due to breaks of the transmission line. Many long pipe lines are operated, of course, without underground storage facilities.

There are various ways of taking care, at least in part, of the variable load. One such is to sell gas at an attractive price to industrial users in the summer with the provision in the contract that they will be cut off in the high peak load periods. These are what are known as industrial interruptible sales. This is a partial compensation for more nearly uniform sales throughout the year. There is no doubt all these features will be fully dealt with before the pipeline project reaches the final stages.

Application for Imports from United States

At present applications for imports of natural gas on behalf of the Union Gas Company of Chatham, and the Consumers Gas Company of Toronto, are before the Federal Power Commission in Washington. It is understood that under the application Union Gas Company is to receive gas from the Panhandle Eastern Pipeline Company, which has a pipeline from Texas to Detroit. Some time ago a pipeline was built across the Detroit River in the expectation of deliveries. Relatively small amounts of gas have already been received and stored in the Dawn field in Lambton county in the summer off-peak periods. The other application involves the building of a pipeline from Toronto to Buffalo to tie into the Tennessee Gas Transmission Company's line there, but little information has been made public.

As is well known, the Union Gas Company and the Dominion Gas Company have for many years distributed gas in the southwestern peninsula of Ontario. However, for several years now the volume of natural gas produced has been such that the requirements have been met only with considerable difficulty, with adequate restrictions for the protection of domestic consumers. In Ontario the consumption of imported fuel is very large as, other than wood, there is only a crude oil production amounting to 260,670 barrels in 1949.[7]

For convenient conversion, taking into account the difference in efficiency in burning, it is considered that one ton of good grade coal is equivalent to roughly 20,000 cubic feet of natural gas of about 1,000 B.t.u.'s or to approximately 4 barrels (145 gallons) of fuel oil. Thus the amount of coal used for domestic and industrial purposes in Ontario for the period of a year is equivalent to about 280 MMMcf of natural gas and the fuel oil to about 55 MMMcf or a total of 335 MMMcf.

These figures are given only to show the size of the market in Ontario, and do not include that part of Quebec that would be served by the Trans-Canada pipe line. They thus give only an indication of the possibilities for conversion, because it is obvious, even if natural gas were available in unlimited quantities, there would only be a partial replacement of

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[6]Department of Trade and Commerce, Dominion Bureau of Statistics. The Crude Petroleum and Natural Gas Industry 1949 p. H. 18.

[7]Dominion Bureau of Statistics, op cit p. H4.

other fuels by it. This figure, however, confirms the large possible markets that might be supplied in central Canada by natural gas either from Alberta or Texas.

A pipeline like Trans-Canada, operated to transport in the beginning 365 MMcf a day, would deliver 130 to 135 MMMcf a year if operated continuously at this capacity. Actually the deliveries would be somewhat less. The applications for export from United States to Ontario on behalf of the Union Gas Company and Consumers Gas Company of Toronto, if granted by the Federal Power Commission, will take care of only a small part of the market envisaged by officials of Trans-Canada Pipelines.

The original application for export of natural gas from the United States on behalf of Union Gas Company was authorized by the Federal Power Commission on April 23, 1946, and the term was 20 years[8]. Deliveries were not to exceed 5,500,000 Mcf annually, and no deliveries were to be made during the months of January, February, March, November, and December. They were to be interrupted or curtailed whenever required by the needs of United States consumers. New transportation facilities have now been provided, and Panhandle Eastern has applied on behalf of Union Gas Company to export volumes of 25,000 to 67,000 Mcf daily.

The question of export from United States to Ontario is now before the Federal Power Commission and it is expected a decision will not be long delayed. Ontario needs this gas urgently and immediately from United States to augment its own production and it is hoped it will be received particularly as the part of Ontario to be served by it is highly industrialized. Canada has already agreed to send up to 10 billion a year to Montana for the next five years to help the preparedness effort.

Benefits from Natural Gas

There can be no doubt about the benefits of the delivery of large quantities of natural gas to Ontario and Quebec at prices competitive with coal and fuel oil. It has been asserted that it will be possible to bring gas to Ontario from Texas cheaper than from Alberta. Presumably this is correct, but transportation in United States would be paid in U.S. funds also the whole situation needs careful study. There is no doubt that the bringing of natural gas across the Precambrian Shield of northern Ontario could provide immense benefit to our paper, and more particularly to our mining communities such as Sudbury, Steep Rock, Fort William, and perhaps to Sault Ste. Marie, although this is, as far as known, outside the present plans and would have to be considered in relation to the size of the market for the length of pipe line needed to supply it.

Northern Ontario, except for wood, is entirely deficient in fuel, and natural gas at a moderate price would be a boon of inestimable value. The building of a Canadian natural gas pipe line from western to eastern Canada could be as important a national asset as was the building of the Canadian Pacific Railway across the Precambrian area. Thus national considerations in reference to the use of Canada's natural gas resources may be expected to have a considerable bearing on the ultimate decisions that will be made in reference to pipeline projects. The development that will result from the utilization of the gas cannot fail to bring great benefits to Canada.

[8]Brief of Commission Staff Counsel before Federal Power Commission Washington, D.C., April 25, 1951.

Discussion

J. R. Donald, M.E.I.C.[9]—Gentlemen, I am sure you will agree with me that Dr. Hume knows a great deal more about this subject than any other speaker we could have got. In the course of his address there was one point which I think always seems unusual to an Easterner. In Alberta they speak of exporting gas. They do not mean exporting it necessarily outside of Canada; they mean exporting it outside of Alberta.

I have made a rough calculation, and this reserve of 12 trillion cubic feet of natural gas is equal to 450 million tons of high-grade bituminous coal. This has been a most interesting paper and I am sure many of you would like to participate in a discussion of it.

B. G. Ballard, M.E.I.C.[10]—In arriving at the reserve which should be retained for the Province, how can they determine a thirty-year period? It seems a very short period of time to plan ahead.

Dr. Hume—I think originally it was planned to figure on a fifty-year period, but the Petroleum and Natural Gas Conservation Board decided it would be rather difficult to estimate what was going to happen in the next fifty years. It was felt that the tendencies for more than a thirty-year period could not be foreseen, and that has been generally accepted. I think throughout the mining industry as a whole that would be accepted because, as you know, though the reserves of a mine may run on for twenty years, there may be only three or four years' reserves in sight at any time.

The amount of gas that can be developed in Alberta, this potential gas, is, in the opinion of almost all the geologists I know, exceedingly large. It is hoped that as time goes on there will be a development of more and more gas, which is the history of what has happened in the United States.

B. G. Ballard—What sort of pressure do they contemplate using?

Dr. Hume—At the compression station, when the pipeline is operating at full capacity, it would be something of the order of 750 pounds per square inch.

E. A. Cross, M.E.I.C.[11]—Building a Trans-Canada line would depend pretty much on getting all of Eastern Canada, wouldn't it? If Toronto and the Union Gas Company made satisfactory arrangements with the United States, the chances of getting Alberta gas to Eastern Canada are slim, are they not?

Dr. Hume—I really cannot answer that. I think I pointed out the amount that Union is asking, or the amount that Panhandle is

[9]President, J. T. Donald & Co. Ltd., Consulting Chemists, Montreal.

[10]Director of the Radio and Electrical Engineering Division, National Research Council, Ottawa

[11]Consulting Engineer, Toronto, Ont.

asking, on behalf of Union is relatively small in relation to the amount that Trans-Canada would expect to sell. Whether or not this could be stepped up to supply a larger market is something I am not in a position to know. Unless it was stepped up considerably above the amount being asked, so it would curtail the market I don't think the Trans-Canada people believe it would make their line uneconomical.

M. W. Maxwell[12] — Could you say something about the capacity of the depleted wells?

Dr. Hume—The search for gas goes on constantly in southern Ontario. A few years ago Imperial Oil entered the search and I understand they have done very well indeed. I cannot tell you what proportion of the gas is being produced by Imperial Oil, but believe it is quite large.

Delegate—What is the capacity of the storage?

Dr. Hume—Something of the order of 15 billion in the Dawn field, I think. Undoubtedly if all the areas that are capable of storing gas were used, it would run much higher than that, but whether they would be available or not, again, I don't know. Becher field still has a lot of gas. It would be a very good field if it could be used for storage, if and when this was necessary, in addition to the Dawn field.

F. W. Gray, M.E.I.C.[13] — Do I gather from Dr. Hume's remarks that there is a possibility of reviving any of the oil storage fields of Ontario, say around Chatham?

Dr. Hume—That has already been done. The gas coming from the United States, from Texas, to Ontario, has been stored in the Dawn field in the summer for use in the winter. The Dawn field is ideal for storage. There is nothing new in the use of depleted fields for underground storage. As far as I know, in Ontario only the Dawn field so far has been used for this purpose.

F. W. Gray—Has that altered the use of coke oven gas in going through the pipe lines?

Dr. Hume—They take any gas that they have been able to get, but especially natural gas on account of its high heat value. The situation in southwestern Ontario is critical. There would be much more gas used if it could be supplied. The market could be much larger than at present. That is why Ontario needs gas from Texas urgently and immediately.

F. W. Gray—I would like to remark that we are all very much indebted to Dr. Hume for his most recent information about Alberta and the Peace River district. Speaking as a coal man, however, I don't see any aid to the producers of coal. Speaking in a general way, 97 per cent of the coal resources of Canada are in the West. It looks as if pretty nearly all of the gas and oil resources are in the West. They also have a fair average of water power, and in some respects they have an embarrassment of riches. I remember taking a few notes at a conference in Vancouver. Mr. Tanner was present, and I think you were there yourself. I ventured to joke about it with Mr. Tanner, and said that it struck me like a man who had too many girls; he didn't know which one to pick.

But speaking in more general terms, the people in Alberta are looking to industrialize that Province, and they take a rather dim view of the distribution of population in Canada. At the present time we are taking 60 per cent of our coal from the United States. We are using more coal in Ontario than is mined in the whole of Canada on an annual basis. You mentioned the necessity for national action. It looks as though it is going to take the greatest efforts of our best statesmen to preserve our national independence and prevent too great dependence on the United States, which is, of course, our very good friend. Years ago, in writing on the coal question, I said it was generally accepted that if we mined half our coal needs in Canada we might hold our national position. We have now settled down to buying 60 per cent from the United States, and contenting ourselves with producing 40 per cent, which is not a good position from the point of view of national independence.

I know in Alberta the government looks with some reluctance on any export outside of Canada of gas or oil, or any of the fuel resources from that very full, rich region. They are also hoping against hope that they may sell more coal in the East. It is rather interesting, coming through Sudbury, to see they are using Western coal. That particular region, Sudbury, Sault Ste. Marie, North Bay and the Algoma Peninsula, is nearer to any western supplies of fuel than any other part of Canada.

I would like to congratulate you on your suggestion that if you cross the Shield there, it is a good opening to that district. Although such a doctrine may not be popular in the East, I think the manufacturers of Canada might well consider decentralization of their industries to the west, where their dependence on United States fuel is less, and where the country would be glad to get them. I think from the point of view of national policy it might be casting an anchor to windward if some of our manufacturers would consider that suggestion.

Mr. J. C. Laverdure, M.E.I.C.[14]—What is the pressure in those wells?

Dr. Hume—That is always a matter of depth. Roughly, the hydrostatic pressure would be 40 pounds for every 100 feet in depth. That is very rough, because the bottom hole pressure in Pincher Creek is about 4,800 pounds in the wells. These are about 11,000 feet deep.

de Gaspe Beaubien, M.E.I.C.[15]—Could I ask you if in these natural reservoirs there is a shrinkage of gas material? In other words, is there an appreciable loss on the quantity brought in, after it is stored?

Dr. Hume—In Dawn field the results are very good. They can get practically everything out that they put in.

de Gaspe Beaubien — I was thinking perhaps I could get a little solace for the poor coal man. If the natural gas pipe lines were to be built as you have described, would they take the whole of the market and leave the coal man high and dry; and would this come about gradually?

Dr. Hume—The Department of Mines and Technical Surveys is vitally concerned about the coal industry. Many of you probably heard Professor Mordell describe

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[12]Chief of Development, C.N.R., Montreal.

[13]Victoria, B.C.

[14]Hydro Quebec, Montreal.

[15]Consulting Engineer, Montreal, Que.

the plan to build the turbine engine to help the coal people. We are taking an active interest in that whole problem. We realize in the Department that a healthy coal industry is essential to the welfare of Canada, but we certainly are not sure how that is going to be maintained. In the Crowsnest area, of course, the demand for coal and coke will continue. That is a big demand. But there are certain areas in which you cannot force people to burn coal if you have oil or gas available. They just won't do it. People prefer gas and oil because of their cleanliness and other advantages and their use adds to the standard of living. I don't think I can answer your question on the coal, but I do say that from the standpoint of our department we are very much interested in the coal problem. So is the Dominion Coal Board, of course.

A delegate—In the United States, when those oil and gas arrangements have been installed they have put the mines out of business.

Dr. Hume—Not altogether.

Delegate—But a good deal.

Dr. Hume — In our climate, where there is a high winter load and a low summer consumption, that is domestically, it is necessary to take care of the low load factor during the summer, hence gas is sold to industries on an interruptible basis. In winter, when the peak load is great, these industries use other forms of fuel and this constitutes what is known as an interruptible load. We have a cold winter climate and a warm summer climate. I don't think that gas would ever wholly, in any area, replace coal, but it would certainly reduce its consumption by a large amount if made available at a price that is attractive. It is going to be a matter of price and availability.

J. R. Donald—I might add to Dr. Hume's statement that I believe the United States figures show that despite the large production of natural gas, the total quantity of coal consumed has not gone down. In other words, they have been losing the market to gas, but the growth of the market has been large enough to offset the fuel gas coming on the market.

Apropos of Dr. Gray's remark about the decentralizing of industry, I have been of the belief for some years that these enormous resources of Alberta in fuel and energy would undoubtedly be of benefit to all Canadian industry, and my hopes have been more than justified. Today we have investments in the metallurgical industry of something like $100,000,000 out there, which essentially represents decentralization of industry. √

B.C. Public Works Department Uses Timber and Concrete for Bridges

The British Columbia Department of Public Works has completed a unique timber-concrete highway bridge over the Serpentine River in the Langley Prairie district. The structure is 100 ft. long and 26 ft. wide and is made entirely of readily-available creosoted timber products and concrete, with the exception of dowelling and reinforcing steel.

The bridge is mounted on creosoted piling and has an interval between trestles of 19 feet. The pilings are braced and capped with creosoted timber upon which a deck of 2 by 12 creosoted planks on edge is laid. The tops of the planks are specially routed to hold the reinforced concrete deck which goes on top.

The Technical Services Department of the B.C. Coast Woods Trade Extension Bureau, at 837 West Hastings Street, Vancouver, will be pleased to supply further details.

The composite timber-concrete bridge provides the answer for public works departments faced with bridge replacements as labour and material becomes increasingly scarce and costly.

MANAGEMENT
and
PUBLIC RELATIONS

A panel discussion held at the Sixty-fifth Annual General and Professional Meeting of The Engineering Institute of Canada, Montreal, May 10, 1951

Moderator

Hugh Crombie, M.E.I.C., *Montreal*

Vice-President, Dominion Engineering Works Ltd.

Panel

F. W. Bruce, *Montreal*
J. A. Fuller, *Montreal*
H. H. Lank, *Montreal*
H. W. Tate, M.E.I.C., *Toronto*
W. C. Beamer, *Montreal*
J. H. Campbell, *Montreal*

Mr. Crombie.—Ladies and gentlemen, this is to be a panel discussion on "Management and Public Relations." According to the programme I have been named as moderator, probably by reason of an early association with the Presbyterian Church. I am supposed to maintain order and propose questions. With your help I will endeavour to maintain order, and if you will phrase the questions, I will propose them.

At the outset I want to give you my conception of public relations, which is that public relations are based on one simple belief, that belief being that it is very important what the public thinks of us.

Companies obtain their charters from the public—it is the public that authorizes them to do business. The employees of these companies represent the community and the companies are identified with the community. Their public relations are governed by the attitude of every employee in those companies. They are influenced by the sales policy, by deliveries, by how complaints are handled. They are also influenced by what the public thinks of the attitude of management toward its employees and the public. Most companies have a good story to tell. Unfortunately, too few of them take the time to make an effort to tell that story.

Good friends are an asset but you can't make good friends by acting like the proverbial oyster. You have to come out of your business shell to make friends and influence the public, and employees, and customers too. A good public relations programme must have its foundation in two things: first, a sound, progressive policy in the operation of all phases of the company's activities; secondly, a full explanation of this policy to the employees, the community, and the general public.

There are various means that can be used for communication. I shall mention only a few now, because we shall probably discuss this in detail later. There are contacts with supervisors and foremen, company magazines and newspapers, the pamphlets many firms use to indoctrinate new employees, press releases, "open house" meetings, plant tours. These are only a few of them.

Introduction of the Panel

On the platform with me are executives of six companies who have progressive public relations programmes. We are going to ask each of them in turn to tell us something about those programmes. We hope that discussion will be provoked and that questions will come forward. If at any time any one disagrees with anything a member of the Panel says, I hope he will interrupt. We want to make this as interesting and informal as we can.

The panel members are: W. C.

Beamer, assistant vice-president, Bell Telephone Company of Canada; J. H. Campbell, manager of public relations for the Canadian Pacific Railway; H. H. Lank, vice-president, Canadian Industries Limited; F. W. Bruce, sales manager, Aluminum Company of Canada Ltd.; H. W. Tate, assistant general manager, Toronto

Hugh Crombie, M.E.I.C.

Transportation Commission; and J. A. Fuller, president, The Shawinigan Water & Power Co.

Public Relations Defined

To start off I am going to ask Mr. Lank if he will tell us what he thinks good public relations ought to be.

Mr. Lank—In my opinion, public relations are just as varied as human nature. I think everybody interested in the field of public relations has his own idea of a proper definition. There was, a short time ago, a competition in a magazine in the United States called *Public Relations News* for an adequate definition of public relations. There were literally hundreds of definitions submitted and *Public Relations News* boiled them down to about a dozen which they considered satisfactory. The one they concluded was the most satisfactory was as follows: "Public relations is a management function which evaluates public attitudes, identifies the policies and procedures of an individual or organization with the public interest, and executes a programme of action to earn public understanding and acceptance."

If we analyze that definition I think we will find that it requires action in three categories. First there is the action involved in the evaluation—you must know where you stand. Second is the identification — identifying your policies and your procedures with the public interest. Insofar as public interest is concerned, there is quite a difference between the large and small organizations. Frequently it is an individual who carries the public relations load rather than the organization as a whole. In the case of International Business Machines for example, which is a very large organization, it is difficult to know where Thomas J. Watson stops and I.B.M. begins. That is public relations technique. That is a very astute plan, building up an individual. Another example of that type of public relations technique is Eddie Rickenbacker and Eastern Airlines. Its value has been proven.

The third action involves the execution of the programme. As a rule anything that is everybody's business is nobody's business. I think public relations is the exception which proves the rule because in public relations, in organizations of moderate and large size particularly, it must be everybody's business. You cannot dump a public relations programme into the lap of the technicians and specialists and forget about it. By the very nature of the problem it must be everybody's business because a telephone operator can nullify a company's programme or the same effect may result if there is no consonance in the advertising campaign, as far as institutional advertising is concerned.

Public Relations Depends on Individuals

Another very simple and effective definition of public relations was written recently in a pamphlet called *Grocery Trade Information.* It was to the effect that good public relations are primarily a lot of little things and they depend on the attitude of the individuals within the organization, whether it is a grocery store or a big corporation. A lot of little things come up every day which may be either very annoying or very helpful. The little things are frequently exemplified in correspondence.

I just cited to my colleagues a case which arose in our own organization just yesterday. We had a letter from a hardware dealer in Ontario complaining about the price of plastic wood. This is an item which used to sell over the counter at 2 for twenty-five cents. This chap buys it by the dozen. For the first time in 20 years the price went up—to thirty-five cents for two. He wrote a letter to the president of C-I-L complaining about this price increase, saying he thought it was completely uncalled for, and he said: "I should like to have this letter replied to by the president." There is a case of a chap who buys a few dollars' worth of stuff a year and he wants the president of C-I-L to reply to his letter! There is nothing you can do but comply. The president must reply to that letter.

If you have a public relations programme you must pay a lot of attention to the little things. You don't know in a particular case whether the person making the complaint, such as our friend from Ontario, might be a future member of parliament in the C.C.F. or Liberal party. You just cannot take any chance. That was a small example but I think it illustrates this particular approach to small details.

Mr. Crombie—One point, Mr. Lank. Here are two companies, one identified by the name of the family which originated the business and the other with rather an impersonal name, using "Dominion" or "Canadian" or some such name. They are competitors. Would you not say that the firm using the family name would have an advantage as far as public relations are concerned?

Mr. Lank—I think that is very much the case. I used to work for the DuPont Company and I know that the active interest of the DuPont family for 150 years in that corporation has been a tremendous asset in public-relations. The young chaps come along and they start off in modest positions, as clerks, salesmen, factory supervisors, etc., but there is a certain magic in the identification of the corporation bearing the name and the individual bearing the name. I think it is a very fine thing if you can be sure of a family continuity in a corporation. They have been particularly fortunate. They have had continuity for 150 years but few corporations can look forward to that.

Mr. Crombie—Mr. Fuller, as Mr. Lank has said, for a good public relations programme you have to depend not only on the president and executives, but on everyone right through the organization. Would you like to pick up from there and tell us something about employee co-operation?

Industrial Relations

Mr. Fuller—I should like to say a few words on the subject of industrial relations. One may perhaps wonder what industrial relations have to do with public relations. Personally I think they have a great deal to do with good public relations. If a company has a satisfied and interested body of employees, those employees, both as individuals and as a body, are perhaps one of the best media by which the company can maintain and improve its public relations. This is evident from the fact that our employees today have contacts with customers in all walks of life—contacts with the public in the communities in which they live—and the attitude of the employees toward their company is very important indeed in furthering the company's public relations. Therefore, if we look upon good employee relations as furthering the company's interests public-wise, then of course, the whole subject of industrial relations assumes a much broader scope than merely dealing with the application of wages, working conditions, and employee benefits.

Such things as that I regard as domestic affairs—affairs pertaining to internal matters, just as in any ordinary family where there are sometimes squabbles over who is going to get the biggest piece of pie—but that should not prevent harmony between employer and employee as far as outside relationships are concerned. This really means that all the employees, from top management down to the newest employee, should feel they are partners in the enterprise, and that they should therefore go to the public with this feeling of partnership—the feeling that their company is a good company to work for. If this attitude can be presented to the public, the company's public relations will be improved tremendously.

All this means, of course, that the employee must be satisfied in many other ways than just with the money he is getting for his work, and I think it also means that he should be well informed on company affairs. Only in that way can he realize that his own wellbeing, his own chances for improvement, his own chances in the company come from really serving the customer. All of us depend on our customers and we must keep our customers happy. I think a company must be prepared to keep its employees well informed on company policies and practices and in particular to have employees realize the dependence of the company on the customer.

This matter of partnership, from the top to the bottom, is one that must commence with management. Management must engender that feeling of partnership with all the employees, and that means communications, as Mr. Crombie has just said. To illustrate, I would like to read a short paragraph from our annual report.

"A business organization, regardless of the excellence of its plant and material resources, is essentially a group of people. We believe that our business will succeed only if all of us, management and employees alike, have confidence in each other and feel ourselves partners in a worth-while enterprise, and if we have a strong sense of responsibility toward the public we serve."

We go on to say:—"These things

F. W. Bruce

we feel we have in the Shawinigan Organization."

Customer Relations

Mr. Beamer—I agree with what Mr. Fuller and Mr. Lank have said and with part of what Mr. Crombie has said. Mr. Lank's definition of public relations is a good one, but I have heard a greatly simplified definition offered by a top-flight expert in the United States, whose name you would know. He said: "Public relations are simply relations with the public and the people who have them are our employees." Perhaps he was saying, as Mr. Fuller has intimated, that good employee relations are essential to good public relations.

In the days when a man ran a business single-handedly, he was the business. People knew him, liked him, trusted him, and became his customers; or they didn't like him, didn't trust him, and took their custom elsewhere. As the business expanded and he added help, his assistants took over his contacts to some extent and then it became a matter of his assistants becoming known, liked, and trusted, or not being liked and trusted; and the effect was the same on the business as if the boss had created those impressions.

It seems that public relations, as we regard them now, are a phenomenon of big business. People like to be treated as people. To them, their demands and requirements are important, and if we are to

J. A. Fuller

succeed in pleasing them we must show them that we regard them as important in spite of the fact that our volume may be tremendous in comparison with their individual requirements. It is important then, that we treat them—and by we, I mean through our employees—in an intelligent, personal, and friendly way. In other words, I am proposing, as I started to say, that good customer relations are essential to good public relations.

Mr. Bruce—I agree with what has been said, but I am afraid that Mr. Lank has already made my chief point which is that the customer is a very important factor in public relations. To my way of thinking public relations, like charity, begins at home, and the most important field is with the employees of the company and after that with the customers.

After all, the customer is one of the most important people to a business, and in times of shortage like the present it is up to the Sales Department to keep everlastingly at the problem of improving relations in this field. Advertising and other factors of course enter into this, but it is really up to the individual salesman to so conduct himself and explain the company's policies that public relations are improved in this important area.

At the present time most sales departments have little to sell, but it is obvious that salesmen can and should be selling goodwill.

In our case it is very difficult for Canadians to appreciate that, with the largest producer in the world in Canada, there is a shortage of aluminum here. The reason is of course not only the unprecedented demand, but the fact that the Canadian industry has been built up on export markets and it is important that these be maintained.

We firmly believe that if our customers understand our position, it won't be long until the public do.

H. H. Lank

Public Relations Organization

Mr. Campbell—There has been some brief reference to public relations, personnel relations, and public relations contributed by management itself and carried on down through the employees. That is a subject on which I thought some argument might develop. In this particular matter I find myself in disagreement with several of my own colleagues. There is a thought quite prevalent now that all public relations operations of a large company should be grouped, and the direct public relations appeal to the public, mostly by advertising or other technical means, should be combined with the contact public relations of the staff and directed from within the company by one unified command. This is an extremely warm subject among public relations men and I don't believe these features of the company's campaign should be grouped.

I might say our own manner of conducting this joint campaign will be through our technical public relations department, which I operate, which is largely concerned with direct advertising in all its forms—general publicity, movies, radio, all the technical modes of approaching the public. On the other hand, since we are a transportation company, a tremendous part of our staff must come into direct contact with the public and this phase forms a major part of our programme. That part of our business comes under the direction of the vice-president of personnel, it involves various departments, and our men who are in daily contact with the public—conductors, porters, hotel men, anybody of that sort—are directed through their own departments, through the training they receive, and through general supervision.

My objection to lumping these two activies—the general and staff public relations is that I don't think our staff or many other staffs, would take very kindly to the idea. I believe we must have co-ordination however, and use our staff to the absolute limit. For instance, in these two departments within the C.P.R., we work very closely together and, in fact, at times it seems that we overlap, although that is not really the case. As an example, in our advertising programme in the United States as anywhere else, we always see that an advertisement appearing in any paper carries the name and address of the nearest agent. We try to build him up in the public esteem, have him known there, and he then goes ahead with the conduct of the business of the company largely from an individual point of view. We do not urge, nor do we attempt to force or even suggest to our people in Canada that they should go out in the public eye, or take public offices, or go into community life generally, but we certainly like to see them do it. We feel that every one of our employees who takes an interest in community affairs and becomes a representative of that community, as president of the local Chamber of Commerce, for instance, or the Board of Trade, is doing us a great service in furthering the relationships of the Company in his particular community. We then come along with our techniques and attempt to give him every support in return. This is the type we like to try to build up in his own community through our advertising or by any other means available, and we try to co-ordinate these efforts although they are under two separate departments.

H. W. Tate, M.E.I.C.

We publish a staff magazine which we send to 95,000 employees and, in the province of Quebec and in any other sections where the French language is general, we print a supplement in that language. This is a very important part of our co-ordination of the efforts of the personnel and public relations divisions. We even run a Women's Section, recipes, etc. We focus our joint efforts in that magazine, with some success. I repeat, this is a very controversial subject, whether all this should be combined or not.

Mr. Crombie—Those of us who go to Toronto are impressed by the fact that it is the only city in Canada with a subway. I don't know whether that is due to good public relations or not, but there is a big sign in the Union Station which says "The only city in Canada with a subway." Perhaps Mr. Tate will tell us something about the public relations programme of the Toronto Transportation Commission.

Good Public Relations Depends on Good Service

Mr. Tate — That sign is just modesty on our part. I am somewhat hesitant in speaking after Mr. Campbell, who is a Canadian Pacific Railway man. They have such a big system, with over 95,-000 employees. We have only 6,-200. I will say, though, that we have broader tracks. They have tracks of 4 ft. 10 in. gauge and ours are 4 ft. 10⅞ in.

It seems to me that the best public relations are brought about through good service, and it is no use trying to fool the public. Unless you give them good service you cannot have good public relations. An illustration of this is our attempt to promote good public relations through the purchase of new equipment, which has cost us practically $20,000,000. I say this with all humility in Montreal, because I do not wish to make invidious comparisons, but we have spent a great deal on new equipment and, since 1945, we have improved our property to the extent of about $27,000,000, not including our small project of the subway.

We are like Woolworth's or Kresge's (except that we are cheaper than both of those) in that all of our transactions are small money transactions. Each day we carry nearly a million revenue passengers and half of those transfer. They get a free transfer and they are not allowed to shop on that transfer, so that in one day you have the possibility of half a million arguments over the use of transfers.

Sixty-five per cent of our employees are returned men, veterans of either the Zulu, South African, or the two recent wars, and an old soldier is a somewhat independent bird, no matter what his age. Therefore if you have a motorman or a conductor who was perhaps a pilot of a bomber, a Hurricane, or a jet plane, and he gets into an argument with a lady over the use or abuse of a transfer, he is apt to be a little ruthless. It is very important that this type of man, numbering some 3,000 in the T.T.C., should be taught to be courteous to the customers.

It is no use buying good equipment unless you have good public relations with the men dealing with the public. First our people go through schools of instruction and then they take lectures last-

W. C. Beamer

ing an hour or an hour and a half —not too long because the head can only absorb as much as the rear end can put up with. These men are trained in a multiplicity of problems arising every day, because the passengers using our railway judge the management by the attitude of the employees.

I was rather amused with the discussion about using the family name. We have a subsidiary which is not entirely in good repute with the steam roads. We run the Gray Coach Lines and we don't use the Toronto Coach Lines to serve outlying communities. We do not wish to use the name Toronto — nor Hogtown—and therefore we use the name of the Gray Coach Lines and we go through those communities modestly and anonymously and they cannot blame the service on Toronto.

We believe that it is most essential that the employees on our vehicles deal courteously with the public, because as I said before, the public gets its impression of management by its contacts with our conductors, motormen, etc. Some years ago I visited Chicago with an associate to have a look at their system and, walking up through the station quietly, as only Toronto men can walk in a foreign city, we were greeted by a policeman saying "Get the hell off that sidewalk!" We felt it was impossible that he could be addressing us, and said, "We just want to look around the station." A workman nearby said, "Gentlemen, we are taking some bricks off the roof and it's dangerous to be on the sidewalk at this time." But the policeman said, "To hell with them; let them get their blocks knocked off." Now perhaps that was before the trend toward good public relations started in the City of Chicago.

J. H. Campbell

On the other hand, I was in Boston travelling on the subway and wanted to go to a certain destination. I approached the trainman and said, "Will this train take me to Collier Hill?" The man answered politely, "Now, sir, isn't that too bad. If you will get off at the next stop, cross to the other platform, and take the first train that comes along, you will get there much quicker." He didn't say, "You got on the wrong train," or "You were on the wrong platform," he just said "that is too bad." As I told the President, that was one of the best examples of good public relations I had ever run across.

Mr. Crombie—A friend of mine, who stands well over 6 feet had a similar experience in London, but in reverse. He asked one of the bobbies for directions to a certain place. This bobby happened to be about 6' 6" and, when the man I know asked for the directions, a hurt look came over his face but he answered, "Sir, take the first turn on your left and walk up about three blocks, and, sir, may I suggest that the next time you might say 'please'?"

Questions from the Floor

Now, gentlemen, we have quite a number of questions here and I suggest we go ahead and get them answered. Here is a question for Mr. Campbell.

"Mr. Campbell states that he doesn't like to dragoon the employees as publicity agents. He expects this to develop spontaneously. Does he not use subtle influence to ensure this spontaneity?"

Mr. Campbell—That is certainly the spirit of our policy. We seldom dragoon anyone to do a job which can be done by our publicity men in their own right, through their training.

Mr. Crombie—This is for Mr. Beamer.

"If a telephone company has not developed its plant department to conform with the public needs, in what position will the public relations department find itself and how will it appease the public. This is a public commodity and no competition is involved."

Public Should be Told Facts

Mr. Beamer—I don't think the public relations department is going to help the situation a great deal. I believe any company has good public relations only if it deserves them. If the question refers to a matter of mismanagement, I don't think any manner of public relations will cure it; but if there is a logical reason for lack of development of the plant, then it seems to me it is the duty of the company, perhaps through its public relations department and perhaps otherwise, to inform people of the facts. The public is very reasonable. If it is in possession of the facts, and if the facts are reasonable, then the public is likely to take a reasonable view of the situation and the company's public relations will not be bad.

Mr. Lank—I might make one comment on that. You will notice that at this table, and in the field of public relations in general, the greatest attention, the most organized attention to public relations, is found in those companies which are not monopolistic or duopolistic in their position. I think the Bell Telephone Company, the Canadian Pacific Railway Company and the Toronto Transportation Commission are service organizations. Canadian Industries Ltd., the Shawinigan Water & Power Co., and the Aluminum Company are all representative of companies which have highly developed public relations techniques, and the reason for it is that by nature people are suspicious. I think they are fair-minded but nevertheless suspicious, and particularly suspicious of anyone enjoying a monopolistic position, whether it is monopolistic by reason of the nature of the service rendered or whether it is a product the manufacture of which no one else chooses to be concerned with.

Consequently it does become incumbent upon the supplier of the service or product to explain the story, and my own experience is that, once the question has been raised, you must answer it or you are really in hot water. If you attempt to answer it, and answer it satisfactorily, so much the better, but if you explain to the public that you recognize this situation and it is due to reasons beyond your control, they are as a rule satisfied. I have even seen cases where management said "Ladies and gentlemen, we are wrong." Let me mention a particular case.

There was a well known product, a patent medicine, for which all children used to cry. For some reason an emetic got into a batch of this particular patent medicine for children and it caused a tremendous amount of sickness among children in various parts of the United States and Canada. As soon as this was reported to the manufaturer he withdrew all stocks from the trade, paid all expenses, closed his factory down for 18 months until research was able to find out what caused that trouble. In all the trade journals he published advertising to the effect that this was a serious thing and that unless they solved it they were going to go out of business. Eighteen months later they were not only back in the market but their sales for the first 12 months following that shut-down were greater than for the 12 months before the shut-down. That, to me, shows the value of being perfectly frank with people.

Mr. Fuller—I would just like to take a minute to tell Mr. Beamer about something that happened just this morning. I went down to the station to see my daughter off to Hamilton, where she is to live in the future. She mentioned the fact that she expected to be able to get a telephone in September, 1952, but she added, "I guess they are doing the best they can. I have just been reading a Bell Telephone advertisement explaining the difficulty they have had in getting materials, and that delays are inevitable in supplying telephone service." She seemed to have accepted it and I think that is a tribute to the Bell Telephone Company. I wish we could achieve the same thing at Shawinigan sometime.

Mr. Lank—Just one more word on the Castoria case. There was a similar case, the Pyrene case which is a little closer to the engineering profession. They got a faulty tank of material for their fire extinguishers. They spent tens of thousands of dollars not only in getting every bit of the material back but in advertising the numbers appearing on the containers so that anybody buying it would realize that it was useless. That, incidentally, was the beginning of a very famous law-suit.

Mr. Crombie—Here is a question for Mr. Tate: "Does the T.T.C. handle the public relations of the Gray Coach Lines?"

Mr. Tate—Yes. Actually the Gray Coach Line officials are the same as those of the T.T.C., and the only separation of the two organizations is in the book-keeping and also in hiding our light under a bushel when we pass through places like Hamilton and London.

Shareholders Relations

Mr. Crombie—The next one is for Mr. Fuller: "The question of shareholder relations, which is a definite aspect of public relations has not been mentioned. Could we have a word on this?

Mr. Fuller—That is, of course a very important aspect of public relations. It is a rather difficult one because, in the first place under today's conditions, the shareholder sometimes thinks he is getting the dirty end of the stick. The employee gets larg increases because of the increased cost of living. The material supplier has to get more for his product, and while company earnings recently have been very good, it is always only what is left over that is available to the shareholder. Whether times are good or bad I think it is necessary to carry your complete story to the shareholder. I don't think it should be done just by a one-shot operation, by means of the annual report. I think it has to be carried on during the year by quarterly statements, with some informative letters to the shareholders showing the progress of business. In fact, I don't think any information should be hidden from the shareholders. One of the great criticisms I have for Canadian companies is that they do not in general issue quarterly statements. In the United States they do, especially those corporations listed on the stock exchange. I do think that in the United States they do a much better job in this regard. They even did it before the Securities Exchange Commission regulations came into effect.

Many companies I have known take the attitude that they are giving information away to their competitors if they issue too much information to the shareholders about the company figures and what the company is doing, etc., but I think any competitor will know anything he should know anyway. In order that a shareholder may judge properly the success or lack of success of his company he should know what are its sales and what are the returns on the sales, and he should be informed by means of statements from the management as to what it all means. You cannot always have good things to say and I think you should be frank in pointing out the good aspects, the difficult aspects, and the bad aspects, if you like, of the business. I think, after all, the shareholders own the business and they are entitled to all reasonable information available.

Mr. Crombie—Could we carry that a step farther? Some companies have a practice of sending their annual reports not only to the shareholders but to the employees as well, in order to keep the employees acquainted with the progress of the company. Some companies send exactly the same report, and some print a special report for the employees. Would either Mr. Bruce or Mr. Lank like to speak on that aspect?

Publicity for Annual Reports

Mr. Bruce—Our practice is to bring out a special report which we call "Highlights from the Record", giving not only the financial results in an easily understandable form but photographs illustrating developments in new plant during the year and in the widespread activities of the company.

These are distributed throughout our plants and go to the employees with a covering letter from the Works Manager.

We find that these reports serve a very useful purpose and, in the few years that we have been carrying this out, have felt that the employees tend to identify themselves more closely with the company.

In my judgment the most important factor in the industrial life of today is a feeling on the part of the employee that he is a necessary part of the team, no matter what work he may be doing.

Mr. Beamer—Like the Aluminum Company, we have had a special form of annual report for the employees and certain other people, and we also use our magazine and bulletins. Some one has said that is a little suspect. It implies that the general level of intelligence of the people employed by the company is not equal to that of the shareholders. Perhaps it would be a good idea to make the report itself available to employees. We have perhaps adopted that idea in principle because our annual report is addressed not only to shareholders, but to the employees as well, and to our customers. We recognize Mr. Bruce's principle, that we are all members of the same team.

Mr. Campbell — Mr. Beamer brings up a point. He said that employees might feel they are being written down somewhat, if the company sends them a simplified report. I don't think that would be the case because, of course, when we send an annual report to our shareholders we always publish a complete summary of all the details in our staff magazine which goes to all our employees. Many of our employees are shareholders. They get the report and the summary and we have had a great deal of favourable comment on our summary follow-up.

Mr. Hobart (Consolidated Paper Co.)—We publish our annual report in both French and English. As an experiment we mailed an annual report to every employee and followed this up with a questionnaire. We found that a very small percentage of the employees understood the report or even looked at it. The plan of sending the report to the homes of the employees was discontinued and copies were made available to them at the pay office. Very few copies were picked up, so we reverted to our former practice of mailing out a simplified statement this year and, as far as I know, it was well received. Certainly it was much better understood than the formal annual report.

Mr. Lank—I would like to corroborate what Mr. Hobart has said. We send our annual report not only to the shareholders and employees, but to our suppliers. We have even sent them to members of parliament—what we call our "rifle list". (There is a shot gun list which includes everybody who should have copies but this is a rifle list that we try to spot very directly.) For example, I personally sent a copy to Mr. Coldwell with my card and if he wants to enter into any correspondence I shall be glad to do so.

We put out a shareholders' report and an employees' report and we made what we call a wastebasket check on the latter. We distributed it at the various offices and had the cleaning staff pull out of the wastebasket every copy they found. We were surprised to find that 92 per cent of the employees at least took that report out of the office and we think that is conclusive proof of their interest.

Mr. Crombie—I am going over to the other side. The average employee, I believe, finds difficulty in understanding an annual report. I myself find it very difficult. Do you not think the average person, without some explanation, would have some difficulty also?

Mr. Hobart—Are you considering workmen or just office employees?

Mr. Lank—Our's is distributed at the gate. Any employee may have one.

Mr. Fuller — We have done it both ways. First we sent the same report to everybody. We followed this up by a questionnaire and found there was not too much interest. The difference is that, in a report to shareholders, we must include a lot of data on finances, and such things as a ten-year record of returns, and employees are not too much interested in this. At the same time we published a summary of the report in the house organ. Finally we have come to the point of having a separate report or employee statement but any employee may have the full report to shareholders if he wants it. This is the first year we have done this, and we have found a lot of interest in that report among the employees. It seemed to create more interest. We had 500 requests for complete reports. In other words, we are not trying to hold back from the employee the report that goes to shareholders and I think perhaps that is a fair combination of the two methods. The firm does not become suspect, either, for distributing something special to the employees.

Mr. Hobart — I think many shareholders would probably appreciate the simplified form. Many of these annual reports are almost impossible for the average man to understand.

Association or Individual Action?

Mr. Crombie—Here is a question for Mr. Lank: "A whole industry may be under criticism by the public. What in your opinion is the best way to combat this—action by an industry association or by the individual companies?"

Mr. Lank—There again, as Mr. Beamer said, you cannot whitewash any corporation and I think, if the majority of units of an industry need whitewashing, no difference whether you do it individually or collectively, it will not produce the desired result. This banding together of organizations is particularly evident in the Canadian scene. Take for example the newsprint industry. They have what I think is the most difficult public relations problem I have ever seen. It is always a question of whose ox is being gored, and in their particular case they are selling newsprint primarily to American publishers. The American publishers naturally want to get newsprint as cheaply as possible. It is an imported product and therefore they feel they can take certain liberties with the supplier because they are not stepping on the toes of advertisers. Let's be frank. I don't think that the newsprint industry can very well combat an organized opposition of their customers because their customers are the newspapers. In this particular case I think there is merit in the newsprint industry getting together and forming an association which can speak with one voice.

I don't think there is anything particularly unusual in the newsprint industry. Costs have gone up and prices have gone up. How are they going to fight a public campaign if the newspapers consider themselves as being the ones with the gored ox? They cannot very well turn to radio. There is one possible approach, to use the trade journals of the publishers themselves. In their particular case they have one organ which is called *Editor and Publisher*. That is a trade magazine with a circulation almost entirely among newspaper publishers. That magazine, as a trade journal, may be opposed to the newsprint manufacturers of Canada.

Advertising in Public Relations

Nevertheless, any newspaper, manufacturer, or association wishing to make a statement and pay for it would hardly find a publisher who would refuse to accept such a paid statement. That is, of course, the advantage of using advertising in a public relations programme. If you get yourself in a difficult position where you are not able to get the co-operation of the press and radio services, you can always explain your case in paid advertising space.

The A & P case in the United States was interesting from that point of view, and emphasized the necessity of keeping in mind the importance of public reaction. In this case they used 2,300 newspapers and, although their fight was with the Department of Justice, the words "Department of Justice" never appeared once in this whole campaign. Why? Because we get into the field of semantics and you and I find that we react favourably to such words as "affection", "love", "Justice", all those nice things. A & P realized that if they kept repeating the word "justice", even though they did not use the phrase "Department of Justice", they might be connoting to the general public that here was the A & P on one side, and "Justice" on the other. So their technique was to say, ad nauseam, "those Washington lawyers" and, of course, everybody has about the same opinion of a lawyer.

Mr. Crombie — Here's a question for Mr. Tate: "How are customer complaints against particular employees handled? Is the employee properly reprimanded and finally discharged if complaints are too numerous?"

Mr. Tate — We try to avoid using the word "complaint". In most cases the person writing in or making the statement against the employee is contacted by telephone and, if he or she appears particularly upset, then a personal call is made and we find that in the great majority of cases, this clears up the situation. A record is made, however, of every statement made and the name of the person making it. We find in a number of cases the complainants are repeaters — in other words, they probably have ulcerated stomachs and they come back again and again.

Mr. Crombie — Mr. Beamer: "Do you think public relations can be reduced to an absolute minimum in cases of public service companies where no competition exists and complete disregard for the customer takes its place, the company still being successful financially?"

Mr. Beamer—Mr. Lank pointed out that monopolies were more likely to be criticized than companies who were in competitive business and it would seem to follow that we have even more need for good public relations. Apart from that, we have to live and do business with our customers. We depend on their co-operation to enable us to give them good service and operate profitably. We cannot have good relations with them unless we deserve them. I think the answer reduces itself to this, that a monopolistic corporation is in the position of having to do more to achieve good public relations than a competitive organization.

Employee Relations in Private Companies

Mr. Crombie—Would you like to tackle this one, Mr. Fuller? "In the case of a private company which does not publish its balance sheet, (due perhaps to wide fluctuations in earnings, i.e., varying from a loss in one year to earning 30 per cent the next year) how far should one go in informing employees of this situation?"

Mr. Fuller—I don't know that I fully understand the question, especially in its reference to a private company. Does that mean a family company, with no outside shareholders?

Mr. Crombie—I think we will have to assume that.

Mr. Fuller — I think, in that case, even though the public generally does not need to know about the financial affairs of the company, the employees should. The employees are going to be very much at sea if they are refused wage increases to which they might feel they are entitled. What is the answer? If wages are going up generally and the employees are being refused increases, what is the company to do, if the earnings are poor in the current year, even though they were good the previous year? That would be a difficult situation. If you take the attitude that the employees are partners in the business, even though they are not shareholders, I think they are entitled to know what the business is doing. That is perhaps a difficult matter to handle, when the owners of the business don't want them to get detailed information of the activities, but it seems to me they have an obligation to keep employees informed as to whether the year has been a good one or a bad one.

Mr. Bruce—Operating as we do, with associated companies all over the world, I can think of a definite illustration.

During the depression, when our Toronto Works were operating three days a week, an enquiry for a large order of their product came from India, but it appeared likely that this would go to a Japanese mill.

The Works Manager in Toronto got the men together and explained the situation, and it was agreed that everybody would work harder in an attempt to get the order and to show that Toronto could compete with Japan. This was done, and as a result extra work was found for that plant.

To me this has always seemed a good illustration of what can be done by means of co-operation—which can only be reached by properly informing all employees of what is going on not only in the plant but in other plants and the outside world.

We are engaged a great deal in foreign trade, and you could not reasonably expect employees to understand all the complications of such business without taking them into your confidence. They should know what is going on, and we consider this a most important feature of our public relations programme.

Mr. Crombie — This one, Mr. Lank, has been aimed at you, I think through a misguided sense of humour. The question is: "What is it that has four legs and runs?" The questioner has also supplied the answer in the event that you are unable to provide one: "Two girls in nylon stockings."

Mr. Lank—I insist on answering that more fully. This is an excellent chance to discuss one of our problems. First of all we don't make nylon stockings, we only make nylon thread but a good many of the runs are blamed on us. The stylists have convinced the ladies that they should wear very sheer stockings, not more than 15 denier. It so happens that, prior to the last war, 15 denier stocks were unknown because you just couldn't get them that fine with natural silk. The lowest known denier was 20 and they were reserved for very formal functions—in fact, at Buckingham Palace receptions or other Court functions, when the ladies wore 20 denier stockings, they always carried an extra pair because they did not think they could get through the afternoon or the evening with just one pair. That shows what stylists can do to a chemical concern. No lady—and I tell this to my wife — should listen to those stylists and put a cobweb on her legs as a general habit. The public does not seem to see that it is being influenced by the stylists and not by the chemical concern. I wonder what would happen if the stylists suggested tarpaulin?

Employee Participation

Mr. Crombie—Here is an aspect of public relations that has not been considered so far. It is a good question. "May we have some remarks on the efforts made by corporations to have their employees buy stock in the company, e.g., by selling stock annually at a special price by payroll deductions?"

Mr. Fuller—That is a very difficult question. Back in the golden twenties, of course, there were many corporations that thought it a good idea to sell stock at what they considered favourable prices to employees. Most of us here today know what happened when the depression struck. It was an unhappy and unfortunate experience for many companies. In principle I don't know what the answer is to that question but I personally think it is a good thing to have employee shareholders. The Bell Telephone Co., I think, has done the best job of any company in Canada on that score. They are in a favourable position in this respect because their earnings are relatively stable and their dividend rate is of such long standing it has almost become like bond interest.

However, the industrial companies are in an entirely different position and I think they have to tread very cautiously indeed. Some companies have had great success. Generally speaking I am in favour of the proposition if it is carefully handled, that is, to issue stock at a fair market price but to get over to the employees the fact that stocks can go down as well as up. I don't think the idea should be forced by management in any way. It should be handled delicately and, if the employees are anxious to buy shares let them do so, but tell them that there may be some years when earnings may not be very good.

Mr. Lank—There is an alternative and that is, of course, to give the employees the stock. In our particular case in C-I-L we have a bonus plan for executives and junior executives and instead of paying the bonus in cash we pay it in stock. We recognize that there is a very great advantage in having employees, particularly key employees, shareholders of the company. On the other hand we must guard against what happened in the 1920s when some of the large banks sold stock over a ten-year basis at $230 a share and watched it go down to $25 and were fearful of losing it altogether, and they had to pay for it on the higher basis. That could not happen with the bonus plan such as we have, paying it in stock rather than in cash.

Mr. Crombie—Mr. Lank, I will refer the next question to you also: "Do you think newspapers would publish a paid ad by the newsprint makers as readily as the A & P ads were published? Are they prepared to gore their own ox?"

Mr. Lank—I am convinced they would do it. If a newspaper should refuse to run such an ad, then the newspaper manufacturers are on extraordinarily strong ground. I think there is no doubt that they would.

Handling of Individual Cases

Mr. Crombie—We have all experienced examples of poor public relations by individual employees such as conductors on trains or trams, telephone operators, the policeman in Chicago, etc. What methods are employed in training or educating those in contact with the public as to the manner in which they should handle their public relations; and if an individual employee fails to conduct himself properly, what form of disciplinary action is taken?

Mr. Campbell—That question brings up again the training required to be done in public relations. Such training comes through the individual units of the company. It starts right down at the grass roots and is conducted in the different divisions and regions, etc. We have a form, a job training plan, which the younger and newer employees use for instructions within their own departments and on interlocking jobs in other departments. In our case most of these instructional techniques are the same in all three regions, Eastern, Prairie, and Pacific, and have come through the vice-presidents, the general manager and the general superintendent and are carried on down to the grass roots.

In the matter of complaints, strangely enough we do not have a great many complaints. We have far more letters of commendation but we do sometimes get letters of complaint about individuals, sometimes a fair criticism and sometimes unfounded, but every complaint is carefully checked and most of them find their way into my department. I note the region involved and take the matter up with the division. This is not an expensive process, and it finally gets to the supervisor, who investigates the thing very fully. If he finds that the complaint has merit, he reprimands the individual. If he finds that a serious breach of rules exists or has taken place, he can take steps to discharge the employee. That will probably happen only if he is a constant offender, but we have not had any constant offenders for a long time and a great many of our complaints boil down to something which is not really important.

Mr. Crombie—There is a question for Mr. Beamer. "Let's get down to grass roots. Is it not true that most public relations programmes are directed toward persuading the public to approve of what the companies are doing whether it is for the good of the public or not, e.g., insufficient telephones?"

Mr. Beamer—I think public relations are designed to obtain the approval of the public for what the company is doing. I don't think that you can always expect it or even ask for it. If you feel that you are in a position temporarily where you cannot expect approval, then you owe it to the public—and this is public relations—to explain the situation to them.

Mr. Crombie — We did discuss annual reports but here is another question on that subject: "On the subject of annual reports do you not think it is better to have a company official explain the report in group meetings rather than merely distribute a copy which is hard to read?"

Employee Publicity

Mr. Lank—I think that is a very laudable technique. There is another technique on the point of explaining annual reports. A few companies go to the financial editors of newspapers a couple of days before the report is published and discuss with them the various phases of that particular annual report. I know of no case where the editor has violated the confidence placed in him by virtue of the confidential nature of the discussion and, as a result, the publisher in his financial column has had a much better digest of the points which the company would like to get over to the public. This has been actually due to the co-operation of the financial editor. I think the same thing applies in your discussions with employees. If you give an opportunity to the employees to ask questions, even if they don't ask them, they are much happier about it.

The financial report, to most employees, is rather a complex document. The mere fact that you offer to explain takes any suspicion out of the subject matter. If you can do it in small groups it is certainly a very desirable thing but also very time-consuming.

Mr. Crombie — Mr. Bruce: "Does it make for good employee and public relations to devote news items to the worker and top management activities leaving out the middle group, which includes engineers? In other words, would it not be better to give the same emphasis to the interests of all groups as a means of attaining good employee attitude?"

Mr. Bruce—Our policy there is directed primarily at the employee. Our plant papers very seldom give publicity to people outside the plant, and then generally only in the case of senior people when important changes are made. We feel that senior people should be known by people in the plant as much as possible by seeing and meeting them rather than by the publicity route, although there are certain obvious difficulties in attaining this.

Mr. Crombie—How can the engineers in a company take an active part in a public relations programme? Are the engineers assuming their responsibilities in this field?

Mr. Bruce—This is a matter in which I have been interested for some years and about which I was speaking to Dean K. F. Tupper, of the University of Toronto, before the meeting.

I happen to be an engineer, but am now proud of being a salesman. It has always seemed to me that the engineer has not given enough attention to public relations. All of us in our company are very conscious of the achievements of the engineer, but I often get the feeling that the public do not appreciate the very real contribution of the engineer to the development of our country.

I think it is natural for the average employee at the plant to associate himself with the production side of the business, and consequently with the engineer, so that anything that can be done to increase the prestige of the engineer is good business. However, in doing this it should be brought out that all parts of the business make a contribution. I well remember the opinion I formed of the selling side of the business as a young engineer. Surely it is apparent to all of us that it is normal in North America to be able to produce more than can be sold, and also that one has to produce more cheaply all the time. In short, one comes back to "team work", and it seems to me that the engineer can make a real contribution and be more generally recognized if he understands and appreciates the efforts of other branches of the business.

Mr. Crombie—Here is a question for Mr. Campbell: "Mr. Campbell mentioned that his company uses its house organ as a medium for carrying its management propaganda to its employees. I would suggest this is somewhat risky. Do not the employees tend to resent this unless it is well disguised?"

Mr. Campbell—No, I think I quibbled a bit on the use of the word propaganda at the time. I don't know what information other employees want but I know that is the sort of thing ours want. They want a boiled-down summary of the annual report. I don't know if you would call that propaganda.

We recently established a large freight yard in Montreal *(The St. Luc Yard—see The Engineering Journal, June, 1950—Ed.)*. It is a very interesting operation and the whole course of its construction was covered month by month in the staff magazine. Would you call that propaganda? It was an illustration of what the company is doing and the progress it is making and is of great interest to the employees.

I want to add a word about the staff magazine, about the matter of the publication of news items concerning officers and employees, if you can divide them. We take care that the magazine is kept well on the employee level. On the other hand, if the president shakes hands with a section man on a tour of inspection, he always likes to have his picture taken and sends it to me to be printed. Perhaps that is propaganda.

"Selling" Private Enterprise

Mr. Crombie—"Should management attempt to 'sell' the idea of private enterprise to employees and to the public?"

Mr. Fuller—That is a very difficult question. You have all seen recently, in magazines and other publications, material from companies who are undertaking to tell as many persons as possible that the private enterprise system is the proper system for our way of life. A great deal of literature has been circulated to the public generally and in many cases this has been followed up by an attempt to sell the private enterprise system to their own employees. This sort of thing is primarily a sales job using general platitudes about how wonderful it is to have our freedom to say what we want to say, etc., etc. I don't think it gets over very well. It is always a bit dangerous to feed that sort of stuff to employees —"We have a higher standard of living than anybody else in the world," etc. I think probably they know they have and they may perhaps feel it is something of an insult to their intelligence to be told, "You should appreciate free enterprise." Most of them today are against communism in any event, and against socialism, and they may resent the fact that you feel you have to sell them on free enterprise. If you persist in emphasizing free enterprise, the first thing you know they will be saying "Darn free enterprise." I think it is a mistake to issue a lot of propaganda to employees saying how lovely it is.

Mr. Crombie — Here is a very simple question: "It has been reported that some of the large nationally sponsored public relations programmes in the United States have gone sour. What is the reason?"

Mr. Lank—I don't think they have. Perhaps they may have gone sour temporarily, for the reason that Mr. Fuller has just stated. Of course there are many ways of skinning a cat. After all, you apply to most problems the same principle throughout all phases of your life. If your wife comes home with a new hat that you think is an atrocity you don't say: "Take it away; I can't stand it." The right thing to say would be: "It is just like Mrs. Fuller's hat" or perhaps, "It is just like the hat you had a couple of years ago." You don't have to ask her to take it back. It goes back.

Mr. Crombie — You see, ladies and gentlemen, why Mr. Lank is considered an expert.

Mr. Lank—I have a great belief, as you see, in the indirect approach. I think we can do a greater service for private enterprise by acting right and living right and showing these people that we are good examples, all of us, without going out and making a frontal attack on communism.

Mr. Crombie — Here's one for Mr. Tate: "A few days ago the Globe and Mail carried an editorial criticizing the T.T.C. for what it described as 'arbitrary closing of streets during subway construction.' Does the T.T.C. take any specific action when such unfavourable publicity appears?"

Mr. Tate—We have given talks to a variety of service clubs, technical societies, etc. We have addressed about 50 groups in the past year to describe the work, how soon we hope to get it completed, the problems arising from day to day, the trouble we have getting material, and to ask their kind forbearance until that happy day when the job goes into operation.

Public vs Customers

Mr. Crombie—Thank you, Mr. Tate. This one is for Mr. Beamer. "What is the difference (and why refer to the two as separate entities) between the customer and the public? Is not the present public your future customer and therefore ready for treatment as a customer?"

Mr. Beamer—I suppose we do hope that all the public who are not customers will be customers sometime. I think, if I have made that distinction, it is between those members of the public who are users of our service, whose co-operation and understanding we seek, and those who are non-users. By and large, I think I would agree that "public" and "customers" are synonymous.

Mr. Lank—I would like to add that in the early days when I was just entering the field of public relations, a piece of advice was given me which I have found of great value. "Your approach to public relations is going to be a very important thing if you are to be a success. Just think of it as a parade rather than a mass meeting." That stuck with me. I thought and still think it pretty good advice. In other words, a lot of public relations programmes of companies have fallen down because they have been one-shot affairs. They solved the problem of the moment by addressing a mass meeting. But problems do not come up only at mass meetings; they are happening all the time. In other words, there is a parade of problems. People are being born and are dying every day and problems are coming and going. That's why I say that every public relations campaign has to be a continuing affair rather than an address to a mass meeting.

Mr. Crombie—We have discussed relations of employees and employers and the public, and there was one reference to our relations with other departments. Here is a question for Mr. Campbell: "Should the public relations department check up on the purchasing department policy?"

Mr. Campbell—I think "check up" is a pretty tough phrase in that respect. It sounds like interference. We do not have to check up on the purchasing department because, if public relations are involved, they come to us beforehand and ask us what we think of any course of action they might be contemplating.

Publicity Activities

Mr. Crombie—Mr. Lank: "Which is preferable for small town local news, a technically correct article written (probably late) by the publicity department which is not familiar with the circumstances, or an informal article by the local staff who are not experienced in publicity?"

Mr. Lank—I think the latter. I think, however, that it is not necessary for them to be inexperienced in publicity, and on that point the C.M.A. has recently put out a helpful bulletin explaining how to make a publicity release. We all have pride in our home town and we like to talk with people whose faces we at least recognize and for that reason I believe a publicity release for Kingston or Chatham, insofar as my company is concerned, is much more effective if it is localized. They can, however, take advantage of our organization facilities and confer with our public relations section and our publicity section. In our particular case, we have a bulletin which goes to every works manager, a 50-page bulletin called "Your relations with the local press" explaining the techniques. And here is an important point—there are a lot of publications and various engineering material that go to the sales department. In those publications you will find a very clear cleavage indicated between the editorial part of the newspaper and the advertising part. Newspaper people fight, just the same as the engineering department and the sales department. It is for that reason, because there is a cleavage, that I feel it advisable for any company to separate the advertising and the public relations activities.

The same thing prevails now. I can cite a specific case. I don't know if any of you are familiar with the C-I-L magazine called "The Oval." We think it is a pretty good publication. It is brought out by our public relations department and our advertising department has been trying to sell us on the idea for years that it is a wonderful advertising medium. We feel if we use it as an advertising medium it will lose its disinterested appeal to the public. In any public relations campaign if you over-stress the advertising angle you are going to get into deep water.

Another example:—we have a radio programme called "Singing Stars of Tomorrow." That programme has reached a point where the listener is much more interested in the star, the young Canadian who is trying to make a name for himself or herself, than in C-I-L. The consequence is that if we over-emphasize our products it is going to boomerang.

These are things that are all important to our people in the field and we have tried to point out that if they make a local release they should be sure to keep it on the community level of interest rather that on the level of C-I-L. We had a specific case a few months ago. We are going to open a $4,000,000 plastics plant in Calgary. That release was not made from Montreal. I put in a telephone call to the chairman of the Industrial Board of the City of Calgary and asked him to do me the favour of making that announcement locally. The amount of co-operation we have had from the City of Calgary since then is simply marvellous. They can do a better job than we can from head office.

Mr. Crombie — Speaking of magazines that cross my desk, "The Oval" is one of the few that I take home and read.

Employee Attitudes

Mr. Fuller, this question is for you: "In many companies employees are prone to speak disparagingly of their employers. How can one inspire these employees to change their attitude and speak well of their company?"

Mr. Fuller — I don't think that is a matter of inspiration at all. I don't think attitude can be changed over-night. I really think it is a question of fair-dealing with the employees over a period of years. The attitude of fair dealing must come from top management, by giving the employees a break, not necessarily giving them the highest wages of any company, but of being willing to communicate with them on a two-way basis; you might say, the policy of confidence or the feeling that an employee can go to the top management for advice on his personal problems or to discuss anything whatsoever. This is a hard thing to put down in black and white but it is most important to the general attitude and I don't think it is a matter of inspiration.

By suddenly turning nice to them and boosting the employees in a sudden kind of way, I really do not think you can change an employee's attitude. He will only suspect you and it is going to take a long time to change an employee's attitude toward the employer unless real confidence exists in the first place.

Engineering Public Relations

Mr. Crombie — Mr. Bruce, will you try this question? "What can the Engineering Institute of Canada do to improve public relations for the benefit of the profession?"

Mr. Bruce—I find this rather difficult to answer because I believe it is a matter for the individual engineer rather than for the E.I.C.

Basically, the engineer should have—and I believe is now getting—more general training at the university level.

It has always seemed to me that some professions have what you might term better public relations because they are better able to explain what they are doing.

The engineer is essentially a busy man, engrossed in interesting and immediate problems, and generally finds it difficult to explain what is being done in language that others will understand. For example, I have found from experience that the average layman will understand a chemical process in terms of the kitchen much better than in technical terms. In short, it is up to the engineer to improve the public relations of the profession, and I do feel that good progress is being made in that field.

Mr. Crombie—"What is the opinion of the members of the Panel of the value to be gained in employee interest by providing opportunities for employees to see where the parts or assemblies that they work on are used in the final product or products of the company?"

Mr. Lank—I think that is a question of employee morale building. It is very tiresome to do exactly the same type of work for 365 days of the year and not know what is going to happen to it. That can be overcome by booklets, etc., of course, and in most instances most effectively, if such material is geared to the family and not only to the man himself. The best example of that sort of thing was done by the Steel Corporation recently. They have had a series of "Open Houses" and the results have been remarkably successful. The men themselves have been trained to explain to the visiting public and to their families (they have a Family Day) how all these operations fit into the final product, how each one dovetails into the other. That, of course, is even more dramatic than the use of booklets. If you can give a man an idea of the ultimate use and worth of his particular product and his particular operation, it makes a notable contribution to employee morale.

Mr. Crombie—Now, Mr. Campbell, "Do you believe public relations as such should be a function of the Personnel Department?"

Mr. Campbell—No.

Mr. Buchanan (London, Ont.)—May I go back to the second last question? It asked what the Institute could do to advance recognition of the profession. I would like to ask if the companies, and those of you who are sitting at the head table representing companies who are engaging large numbers of engineers, are doing anything to enhance the status of that very large and important body of men whom they employ? Recently a very fine brochure was published by General Motors on the history of the automobile and in that, everybody that could be thought of was mentioned, from mechanics to financiers and everybody in between, but the word "engineer" was not mentioned once in that brochure.

Mr. Crombie—In my opinion it is not up to the company employing the engineer to enhance the engineer; it is up to himself. Far too few of them are able to express themselves.

Mr. Tate—In our organization, which has over 6,000 employees, practically all the principal positions are held by graduate engineers but, to get those engineers up to senior positions, you have to train them to write understandable English.

Mr. Fuller—I think it is probably true that the companies perhaps do not think enough of, or give enough publicity to the contribution that the engineer employees have made. Take your firm, Mr. Crombie, Dominion Engineering.

Mr. Crombie—I believe we did include an appreciation to our engineers in our annual report.

Mr. Fuller—We try to, in the Shawinigan Co. by referring to the work of the Shawinigan Engineering Co., which is a separate company but a part of our show, and we try to point to their achievements, to the excellence of their work in the construction not only of our own power plants and other installations, but also outside work they do for other companies. I still think a great deal more could be done for the engineer.

Mr. Crombie—Would you take this one, Mr. Lank? "To what extent can relations with union organizations be useful in improving a company's public relations?"

Mr. Lank—I would like to go back, if I may take the liberty, to the question Mr. Buchanan raised concerning the engineer blowing his own horn a little. I am just a little in disagreement. With all due respect I think the E.I.C. can do something about it. I think the technical organizations can do something about it, but of course it is mostly going to depend on the individual reputation, the reputation of the individual engineer and the co-operation of the individual engineer. I believe when an engineer or a doctor or a lawyer or chemist joins a company he has a tendency to affiliate himself more with his employer than with his profession and, as a consequence, I don't see how the problem is going to be solved properly unless these two factors can be integrated.

Mr. Hobart—An annual report cannot pick out one particular class of employee and disregard all the others.

Mr. Tate—It has nothing to do with engineering. It has to do with public relations. We believe in the axiom "A little Child shall lead them" so we have put out a booklet giving the history of our transportation system from its inception and this is handed out to the various schools, to be put into the hands of all the children so that they will have a kindly feeling toward us from the start, from their early childhood.

Mr. Crombie—Well, gentlemen, thank you for your patience. Believe it or not, it is 12 o'clock and we have to get out. It is an interesting thing that when this panel met in Dr. Wright's room just previous to the start of this session, most of its members were very dubious as to whether enough interest would be shown to keep the discussion going beyond ten o'clock, or half past ten. I still have three questions that have not been answered but time is up and I shall now have to adjourn this meeting. Thank you very much, gentlemen. √

Fig. 1. Aerial photo of St. Mary Dam, looking west. Reservoir and mountains in background.

SAINT MARY RIVER DAM

NOW IN SERVICE

On July 16th, 1951, an official ceremony took place in the south-eastern corner of Alberta to mark the completion of the St. Mary River Dam. It was attended by many federal and provincial and municipal officials and guests from all parts of Canada. The Right Honourable J. G. Gardiner, Federal Minister of Agriculture, in opening the valves to let the water into the canals, referred to the irrigation project for which the dam will store water as "a new national asset which has been created for Canada".

The dam was commenced in 1947, and is the first step of a plan intended to overhaul the natural moisture distribution of Southern Alberta. Of heroic proportions, it is 186 feet high and creates a lake 18 miles long and six miles at its widest part. Though it is a half-a-mile long at the top, the length below in the river bed is only 300 feet.

Water is diverted from the reservoir to the main canal through a 17-ft.-diameter tunnel 2,900 feet long. A concrete spillway structure is also provided between dam and tunnel entrance, to discharge excess waters at flood periods when needed, and thus protect the dam against overtopping.

Master Plan

To the rural and urban population an assured water supply brings with it the possibility of new industrial crops, of fodders and grasses, of gardens, of a better way of life and above all of a freedom from the ever present fear of the losses and disappointments arising from drought.

It is the first time in the history of Canada that a major irrigation project has been undertaken with the federal authority, a provincial government and farmers being partners.

Launched under such a partnership to beneficially utilize more of the available waters for irrigation of areas where it is both urgently needed and justified, the St. Mary's project is generally regarded as constituting the master plan for developing other major irrigation projects in Alberta and Saskatchewan.

First Concept of the Project

During the period 1894 and 1931, extensive surveys were made of the area by engineers of the Dominion Department of the In-

The opening ceremony for the St. Mary River Dam in Southern Alberta is an event of National importance and of wide interest to Canadian engineers. This article, prepared from reports, inaugural addresses and news items, contains a general description of the project as a whole. The more technical features of planning, design and construction have already been covered in the October 1932, May 1945, and September 1948 issues of *The Engineering Journal*.

terior. These investigations resulted in water being diverted from the St. Mary River in 1901 to irrigate lands between Magrath and Lethbridge. During the period 1911 to 1923, hundreds of thousands of acres of fine irrigable land was plane tabled, to form what was then called the Lethbridge Southeast Project. It was obvious that other sources of water in addition to the Milk and St. Mary Rivers, would be required to serve this huge area. During the period 1912 to 1919, detailed surveys proved the feasibility of diverting water from the Waterton and Belly Rivers for the Lethbridge Southeast Project, now called the St. Mary-Milk Rivers Project.

In 1922, Interior engineers retained Mr. D. W. Hays to study the project and report. On June 30th, 1923, Mr. Hays submitted a comprehensive report and water supply study, in which he described a layout to irrigate over 465,000 acres from the Milk, St. Mary, Belly and Waterton rivers. At about this time, the Taber Irrigation District was developed, a further step in the development of what is now the St. Mary-Milk River Project. In 1931 the Reclamation Service in the old Department of Interior was abolished, and nothing was done in the way of further studies until 1938.

P.F.R.A. Takes Over

In June, 1938, engineers were sent to Alberta by the P.F.R.A. to investigate the St. Mary project. Considerable survey and engineering work was done during the next two years, and the results of this work formed the basis of the Meek Report.

Plans made previous to 1919 included utilizing Waterton Lake as a reservoir, with capacity of 150,000 acre-feet. However, opposition from the Parks Department forced the abandonment of this site. In the early twenties a reservoir site on the Waterton river was surveyed which provided capacity of about 28,000 acre-feet. In 1941 a site was partly surveyed which would provide 132,000 acre-feet, but limited wartime staff prevented revising the layout in time for publication of the Meek Report.

Growth of the Project

Early 1939 saw the organization by south Alberta citizens of the Water Conservation Council. This body of irrigation leaders kept before the authorities the necessity for storage facilities to protect existing projects, and the desirability of extending irrigation to dry areas.

Though engineering activity on the project was curtailed by the war, the South Alberta Water Conservation Council kept busy and in February, 1941 a committee was appointed by the Federal Government to report on the project.

This report is more commonly called the Meek Report, and in it the committee recommended the St. Mary Project as a sound one, and that it be financed jointly by the two Governments, with the farmers paying a fair share of the capital costs.

Federal Share

According to the Dominion-provincial agreement under which the St. Mary's Project is being constructed, the federal authority assumed the responsibility of obtaining, storing and making available for irrigation the necessary water. This involves all the construction necessary from the watersheds providing the irrigation waters eastwards to and including the Ridge reservoir five miles south of Raymond.

Also included in this federal government's share of the construction is the building of an even larger dam across the Waterton River, the Pothole Coulee dam and many miles of main canal from the Waterton River reservoir to the Ridge reservoir.

Fig. 2. St. Mary spillway with water dropping 150 ft. on uncompleted chute section. Chute section will be paved when completed.

In addition, the federal government also assumed the costs of engineering, construction supervision and other such work for the entire project, this being carried out by the Dominion's Prairie Farm Rehabilitation Administration.

Provincial Share

Meanwhile the Alberta government has assumed costs for all construction necessary eastwards from the Ridge reservoir, as well as the responsibility for colonization and management. This, in effect, means taking the water being made available by the federal government and making it available to farmers. It involves the construction of a network of thousands of miles of canals and ditches, several reservoirs and water distribution systems to serve the additional 390,000 acres of dry land being brought under irrigation.

Cost of Financing

The project as laid out in the Meek Report was estimated at about $13 millions construction cost at prewar prices. With the locating of a larger reservoir (132,000 ac. ft.) on the Waterton river in 1941, the project was enlarged from 465,000 acres to 510,000 acres. The construction cost of the latest layout was increased by nearly $2 millions at prewar prices, but the new irrigable land was increased from 345,000 acres to about 390,000 acres, leaving the cost per acre about the same. However, power potentialities were increased from 7,000 kw. to 12,500 kw., and net revenue therefrom nearly doubled. The larger layout is therefore the most economical. Due to higher price levels, the 1951 estimate of final construction cost, including right-of-way, is some $30 millions.

Generally speaking, $30 millions for completing the project will be divided almost evenly between the Dominion and Alberta governments. The federal authority is making its share an outright contribution in the interests of developing the nation's resources, while the Alberta government will recover part of its outlay through the sale of water rights to farmers.

By the end of this year the Dominion and Alberta governments will have invested approximately $16 millions in the project, the federal authority spending $11 millions and the province $5 millions.

Construction Programme

During the first few years of the construction programme, work has been concentrated largely on the St. Mary River dam and main canals so that the way would be cleared for impounding spring runoff waters and then delivering them during the growing season to areas earmarked for irrigation. With the St. Mary River dam completed and work well advanced on main canals, the emphasis has been shifting to building water distribution systems. This now can be accelerated to bring an additional 50,000 acres or more under irrigation every year.

While actual construction work on the St. Mary-Milk Rivers irrigation project started less than six years ago under a construction programme then mapped out over a 15-year period, the half way mark in the development has already been passed, and the entire programme is within five or six years of completion.

Will Absorb Coaldale and Taber Districts

The vast development, which is turning into reality the long sought scheme formerly known as the Lethbridge Southeast Project, is being established about a nucleus formed by 120,000 acres of irrigated land served for many years by existing projects.

This 120,000 acres has been absorbed by the St. Mary River District and, like the additional land being placed "under the ditch", will obtain its water from the huge scheme of which the St. Mary dam is the key structure.

The flow of the Belly River and the water diverted into it from the Waterton River will then be diverted out of the enlarged stream a few miles northeast of Hillspring and will be carried by a 20-mile canal across the Blood Indian reserve. This diversion canal, which will carry 2,000 cubic feet of water per second, will enter the St. Mary River reservoir on the west side and about six miles southwest of the St. Mary River dam.

Thus the water from three rivers will be accumulated against the key structure for the entire project and will be released from the St. Mary River reservoir as it is needed for irrigation purposes.

Four-Rivers Involved

The entire development is based on the use of water from four streams—the St Mary, Waterton,

Fig. 3. St. Mary Dam and spillway.

Belly and Milk Rivers—impounding some of their heavy spring runoff in storage reservoirs so that this water can be made available for irrigation purposes as crops need moisture.

When fully developed, the St. Mary-Milk Rivers irrigation project will have 11 reservoirs giving an effective storage capacity for 818,200 acre-feet of water, or for enough water to cover 818,200 acres to a depth of one foot. The largest of these reservoirs is the St. Mary River dam, which is ready to impound 290,000 acre-feet at an elevation high enough to make it available for irrigation purposes.

Waterton Dam

The overall construction programme for the entire project also calls for a huge earth dam across the Waterton River at a point about 10 miles downstream from Waterton Lakes. This dam will provide a storage reservoir able to hold 132,000 acre-feet of water. The Waterton dam is designed as an earth-fill 170 feet high and three-quarters of a mile long at its crest. It will form a lake nine miles long and 150 feet deep at the dam. After being released the water will flow down the river for about four miles, where it will be diverted into a canal emptying into the Belly River. This canal, about eight miles long, will make a large loop just west of Hillspring.

A National Asset

The re-arrangement of water flow following the completion of the works on the St. Mary and the junction with the Milk River water-storing project will change the face of agriculture and industry as well in this district, as it did in the other parts of Southern Alberta already irrigated.

Large acreages, endowed with uniform soil and climatic conditions, are well adapted to the production of a large volume of bulky agricultural products, such as vegetables, which are expensive to transport. With sufficient moisture, volume can be maintained as yield does not tend to fluctuate.

While such benefits are of national importance, however, the major benefit a project such as St. Mary provides is insurance for the livestock industry against drought and the general stability it provides agriculture. The livestock industry is growing in western Canada and conservation measures such as the St. Mary Dam will enable further progress with safety.

Fig. 4. Control house of irrigation tunnel, showing controls for outlet gates. Gates 90 ft. below floor of control house.

Operation of Project

With respect to organization of the development, it was suggested by the St. Mary and Milk Rivers Water Development Committee and fully realized by the Alberta government, that government ownership of the then existing irrigation facilities from the St. Mary was essential to the further extension and enlargement of the project.

With this in view the necessary legislation and agreements were negotiated with the Canadian Pacific Railway Company by which these facilities were transferred to a manager of the St. Mary and Milk Rivers Development, a position created by legislation. The present manager, P. M. Sauder, M.E.I.C., has very wide powers under the legislation and is also colonization manager for the development.

All the crown lands and certain municipal lands have been transferred to the colonization manager for disposal and it will be the manager's policy to hand-pick settlers, giving priority to World War veterans and those on adjoining dry lands with some experience in irrigation farming. Water rights will be sold to the present owners of the irrigable lands at very reasonable costs and on easy terms.

Personnel

General administration is under the P.F.R.A. head office at Regina, with Dr. L. B. Thomson, director, and G. L. MacKenzie, M.E.I.C., chief engineer. Charged with project administration, surveys, designs and supervision of construction is the Lethbridge project headquarters, headed by W. L. Foss, M.E.I.C., supervising construction engineer.

Men employed by the various contractors also deserve credit. No job was too tough to be undertaken by such contractors and their men as Bennett & White, W. C. Wells Construction Company, Assiniboia Engineering Company, Nodwell Brothers, Mathewson and Belanger, and O'Sullivan Construction. √

FROM MONTH TO MONTH

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

Ninth International Management Congress

The Ninth International Management Congress was held in Brussels, Belgium from July 5 to 12. It was the latest in a series of International meetings organized by C.I.O.S., The International Committee of Scientific Management. This organization is well known in Europe as Comité International de l'Organisation Scientifique (from which the initials C.I.O.S. derive), and has been the focal organization for people interested in the progressive aspects of management for over 25 years.

As a point of interest, Dr. Frank Gilbreth was to have addressed the first Congress at Prague in 1924, but he died suddenly and his wife, Dr. Lillian Gilbreth, Hon. M.E.I.C., attended and gave his paper. She has been active in the Organization since that time.

Composition of C.I.O.S.

The constitution of C.I.O.S. requires that each country shall be represented by a single co-ordinating organization of all groups interested in management. Canada has been a member since 1947, the Canadian member body being known as the Canadian Management Council. The chairman is C. A. Peachey, M.E.I.C., works manager, Communications Equipment Division, Northern Electric Company Ltd., and the constituent groups are: Engineering Institute of Canada, Institute of Administration, Chartered Institute of Secretaries, Society of Industrial and Cost Accountants, Society for Advancement of Management, Toronto Personnel Association, National Office Management Association, and the Young Men's Section, Montreal Board of Trade.

About 1200 people registered at the Congress, approximately as follows:

United States	110
Brazil	40
Canada	13
Great Britain	200
Australia	20
South Africa	12
Sweden	25
Finland	7
France	100
Denmark	15
Netherlands	50
Switzerland	25
Austria	10
Norway	15
New Zealand	8
Belgium	550
	1200

In addition, Italy, Germany, Spain, Yugoslavia, and Japan had several observers each in attendance but those countries are not at present members of C.I.O.S.

Twelve Subjects Considered

The Congress was officially opened on July 5th by His Royal Highness Prince Baudouin of Belgium. This was his last official act before being crowned King of Belgium a few days later. The City of Brussels had splendid facilities for that meeting and for all the other small and large gatherings of the Congress. Meetings were held in several different very finely appointed buildings, the like of which are non-existent in Montreal. The official languages for these congresses are French and English, and, in the twelve Management Sessions, an I.B.M. translator system was used. A skilled translator followed the speaker so that a speech was immediately translated from French to English or vice-versa, and one could listen on earphones powered by a battery to small receivers.

Twelve subjects were discussed:

1. Structure of Large Enterprises.
2. Working Methods and Personal Effectiveness of Top Managers.
3. Work Measurement (Methods

Cover Picture

The *Journal* this month features the paper "Some Modern Aspects of Tunnelling" presented at the Annual Meeting last May by Brian H. Colquhoun, M.I.C.E., M.E.I.C.

The cover illustration, from the paper, shows a section of the 46-ft.-diameter Mersey tunnel under construction. The cast iron lining is in place and the overhead structure carries the muck road back from the working face of the tunnel.

Panel Number 2 in session — Working Methods and Personal Effectiveness of Top Managers — at the International Congress of Scientific Management, Brussels, July 1951. Left to right, front row — I.B.M. translator — members of panel — H. C. Torbol, Denmark; H. C. Coes, United States; Count P. Baruzy, France; C. A. Peachey, Canada, chairman of the panel; Prof. Sune Carlson, Sweden; F. C. Hooper, Great Britain; W. Kaufmann, Switzerland. The gentleman on the right was an assistant of the Belgian committee, collecting questions from the floor. In the background can be seen members of what was known as the secondary or inactive panel, who screened questions from their countries. Representatives from Australia, Brazil, Finland and the Netherlands can be seen.

of Establishing Production Standards).

4. Recent Developments in Quality Control.
5. The Establishment of a Sense of Common Purpose between Management and Employees.
6. Job Evaluation.
7. Tested Procedures for Reducing Unit Costs of Distribution.
8. The Flexible and the Variable Budget.
9. Home Design for Simplified Household Routines.
10. Fundamentals in Effective Farm Management.
11. Advanced Procedures in Public Administration.
12. Education for Management.

Papers had been prepared earlier by a leading country with committees in other countries supporting the leading country and providing it with information. The papers therefore represented the best possible views of several countries. The papers were not read at the Congress but a panel discussion took place on each subject. The panel was headed by a chairman who was responsible for the conduct of the panel. A rapporteur from the leading country spent a few minutes highlighting certain aspects of the paper, other members of the panel had time to express specific views concerning the paper, and the balance of the time was taken up with questions from the floor, or by members from the floor.

As an example, Mr. Peachey, of the Canadian Management Council, was chairman of panel 2 — Working Methods and Personal Effectiveness of Top Managers. This panel was reported on by eight different countries and several other countries formed a secondary panel, bringing the total number of countries reporting on the panel to 12. The occupancy of the chair for this panel was a delicate task but it was surprising how well the various panels performed, having in mind the large number of countries represented. Two sessions were conducted simultaneously.

Canadian Delegates Impressed

Mr. Peachey felt there was little doubt that the United States and Canada are well in advance of the European countries on such specific items as Job Evaluation, Quality Control, and Work Measurement. It was obvious however that there were large gaps in the thinking, or perhaps some considerable disagreement in all countries, when such subjects as Education for Management, Working Methods of Top Management, and Structure of Large Enterprises were discussed.

It was a splendid sight to witness so many different countries working so harmoniously together for a common purpose, and one cannot help but feel that it made a real, if small, contribution to world peace and understanding. The inspiring contribution of this organization toward the development of good, even statesmanlike management practices, is also evident. It fosters the setting and attaining, on an international basis, of higher and higher management standards which can only help the national economy and economical well-being of all countries concerned.

It is safe to say that the Canadian delegates, including the General Secretary of the Engineering Institute of Canada, found the Congress both broadening and stimulating, and the end result should be a greater interest in the Scientific Management Movement in Canada.

The twelve papers have been printed and will be available for those who wish to purchase copies. Details, when received, will be published in the *Journal*.

His Royal Highness Prince Baudouin, in his last official act before succeeding his father as King of the Belgians, opened the Congress. He is pictured here with a few of the delegates. C. A. Peachey, M.E.I.C., chairman of the Canadian Management Council is second from the left.

Frank Vaughan—Pioneer Canadian Engineer

Frank P. Vaughan, M.E.I.C., of Saint John, N.B., is one of Canada's most eminent pioneers in the engineering profession. Educated in Britain and at the Massachusetts Institute of Technology in Boston, his professional training included two years in the General Electric Research Laboratory at Schenectady. His active career extends back to the year 1892, when he was employed by a telephone corporation in Vancouver, B.C. Later he was associated with several industrial enterprises, in Nova Scotia, Boston and New York City, before coming to Saint John to establish himself in business.

He was one of Canada's first experimenters in wireless telephony, telegraphy, and high-potential high-frequency current transmission. In 1904 he was granted the first license from Ottawa for a wireless telegraphy set. Front pages of newspapers all across Canada proclaimed how in 1906 he talked by wireless telephone with an operator at the Marconi station on Partridge Island, at the entrance of Saint John harbour.

He built and operated New Brunswick's first radio broadcasting station, heard 1200 miles away. He supervised many electrical installations on some of the largest hydro-electric and industrial developments in the Maritimes.

Mr. Vaughan's eminent status as an electrical engineer and as a trail blazer in the sphere of experiment and invention is attested by the many honours conferred upon him, among them life memberships in The Engineering Institute of Canada and the American Institute of Electrical Engineers. He is past-president of the Electrical Engineers of New Brunswick, and has been a chairman and councillor of the Saint John Branch of the E.I.C. The University of New Brunswick awarded him the honorary degree of master of science.

He presented a paper, with demonstrations on high-potential, high-frequency currents, before the Fifth General Professional Meeting of The Engineering Institute at Saint John in 1919, and another on electrical welding before the Eighth General Professional Meeting at Halifax, in 1920.

After many active years as president and manager of his own contracting business, the Vaughan Electric Company in Saint John, he retired in 1942. After his retirement he found that "the hardest thing in the world is to do nothing". He took up sketching as a hobby, specializing in pictures of animals, particularly cats and dogs. Painting landscapes, too, Mr. Vaughan finds, is a wonderful way to widen your horizons. Today, at 77 years of age, he feels he has found a way to banish worry and to live longer.

R.C.E. Scholarships for 1951

The Royal Canadian Engineer Memorial Scholarship Committee, of which Brigadier J. L. Melville, M.E.I.C., is chairman, has made final selection of the Royal Canadian Engineer Memorial Scholars for 1951. These Scholarships are awarded annually in the sum of $125.00 each to applicants who are students in engineering at the major Universities in Canada, and who are also members of the C.O.T.C.

The object of the scholarship is to form a memorial to the personnel of the Corps of Royal Canadian Engineers who gave their lives in the Second World War. This is the third year in which Scholarships have been announced and each of the eleven Universities eligible to nominate a scholar has done so this year. The eleven scholars selected are as follows:

Frank R. MacKenzie, N.S. Technical College, R.C.E.

G. Murdock Whitcomb, S.E.I.C., University of New Brunswick, R.C.E.

Yvon LaFlamme, Laval University, R.C.E.

Robert Garneau, S.E.I.C., Ecole Polytechnique, R.C.E.M.E.

Ronald S. Scott, McGill University, R.C.E.

Harold George Pinder, S.E.I.C., Queen's University, R.C.C.S.

Charles Edward Wilkinson, S.E.I.C., University of Toronto, R.C.E.

Ross Fletcher Linklater, S.E.I.C., University of Manitoba, R.C.E.

William J. Riddell, University of Saskatchewan, R.C.E.

John Duby, S.E.I.C., University of Alberta, V.A.T.P.

William David Sneddon, University of British Columbia, R.C.E.M.E.

News of Other Societies

The triennial reunion of the **Engineers' Alumni Association** of the University of Toronto is planned for Friday and Saturday, October 26 and 27, 1951, at the Royal York Hotel.

The thirty-third annual western meeting of the **Canadian Institute of Mining and Metallurgy** (1117 St. Catherine St. W., Montreal) will be held at the Palliser Hotel. Calgary, October 3, 4, 5, 1951, under the joint auspices of the Calgary Branch of C.I.M.M., and the Petroleum and Natural Gas Division of C.I.M.M.

W. D. C. Mackenzie, chairman of the meeting, has announced an interesting programme.

Centennial of Engineering, 1952

Major Lenox Lohr, president of the non-profit corporation, Centennial of Engineering, 1952, Inc., has supplied a further report on preparations for the great exposition and convocation which will centre in Chicago next summer to mark the hundredth anniversary of the founding of the American Society of Civil Engineers.

Headquarters of the Centennial Corporation are at the Museum of Science and Industry in Chicago, where the centennial exposition will be housed. The museum already houses a great variety of industrial and educational exhibits and it is proposed to add new exhibits covering a wide scope of engineering which will remain in the museum on a permanent basis.

The principal event of the Centennial programme will be a convocation of engineers scheduled for September 3 to 13, 1952. Some forty-six technical societies, including the Engineering Institute of Canada, have already agreed to participate or send delegations and it is expected that the meeting will be the greatest gathering of engineers ever assembled.

It is anticipated that the Centennial Corporation will require about $1,000,000 to realize its programme and the executive committee under the chairmanship of Charles F. Kettering, research consultant for General Motors Corporation, has embarked on a programme to raise these funds.

Britain's National Physical Laboratory is Fifty Years Old

The British counterpart of Canada's National Research Council is the National Physical Laboratory, founded fifty years ago to work out and maintain accepted standards of measurement. Today, at its large establishment near Kew Gardens, London, N.P.L. is doing work in a variety of highly specialized fields such as radio, radar, aeronautics, hydraulics, etc., in many cases paralleling the work of N.R.C. at Ottawa.

The illustrations on this page will give readers an impression of the facilities of and the variety of projects undertaken by the Laboratory. Clockwise from top right the pictures show:

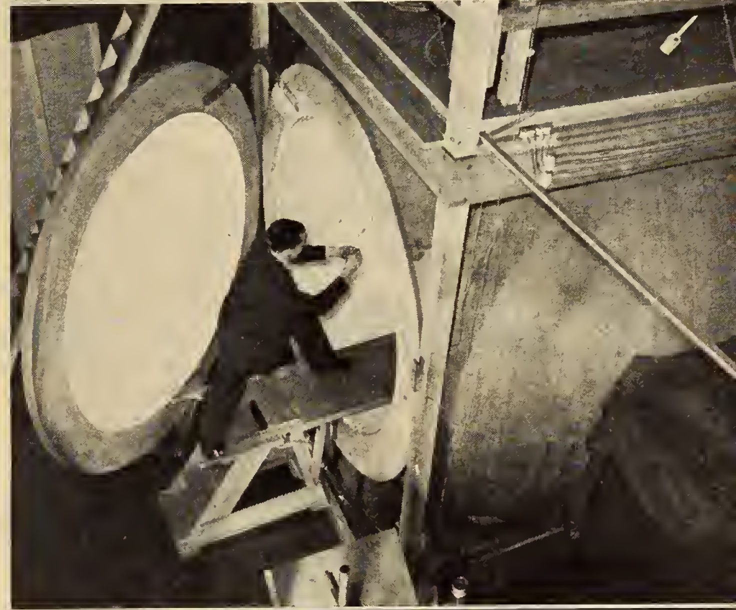
The main Physics Laboratory, built in 1931.

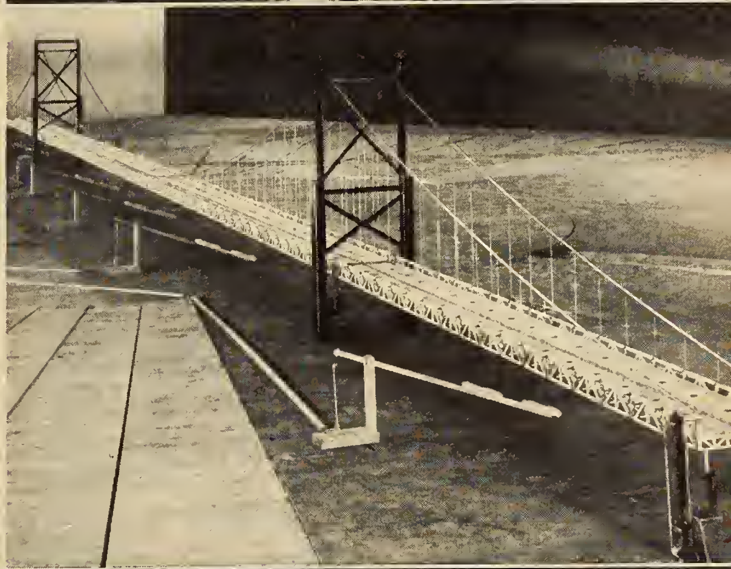
The N.P.L. has determined many units of measurements and is responsible for keeping the standards which have been accepted. Here the luminosity of a lamp is about to be compared with that of the Laboratory's standard lamp.

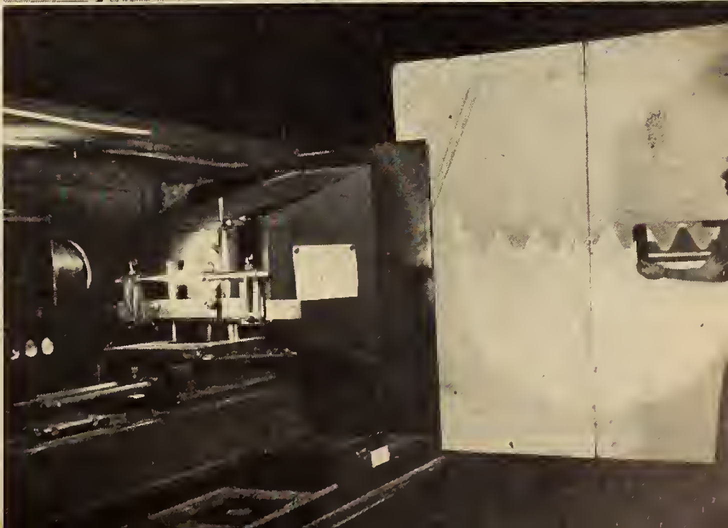
Fifty-foot model of the proposed Severn Road Bridge, employing the latest improvements developed as a result of scientific analysis. Tests in the N.P.L.'s wind tunnel have revealed the effects of the various winds on the bridge's structure.

Accuracy of a screw thread being tested by the projection method against a standard profile.

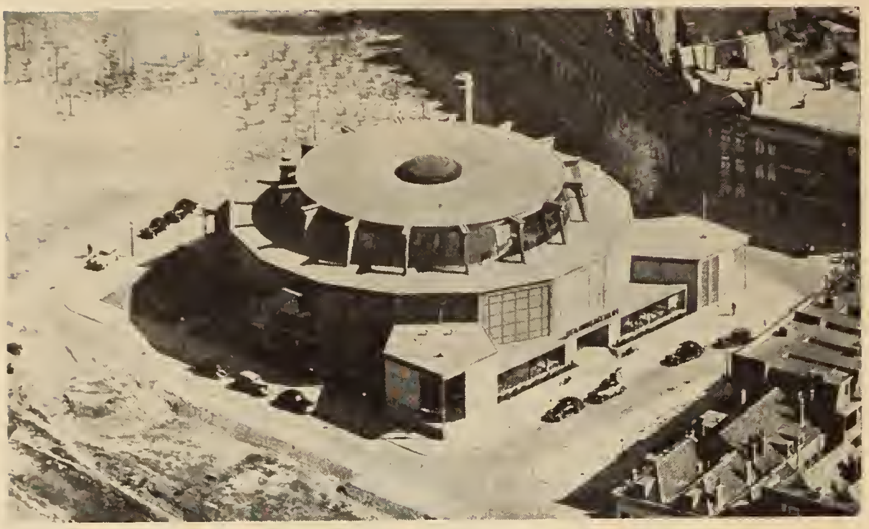
Model of the new House of Commons chamber built to half scale was used by the N.P.L. to investigate the novel system of ventilation. The behaviour of currents was observed through a special glass panel and lamps were used to simulate the heat which each member would generate. This insured that as far as possible the new building is well ventilated. The acoustics were also tested on the scale.







International Centre for the Building Industry



Airphoto of the Bouwcentrum.

In the March, 1951 issue of the *Journal* there was published a page of photographs illustrating contemporary building trends in Europe. The photographs together with other data now on file in the Headquarters Library were supplied by the International Information Centre and Permanent Exhibition for the Building Industry (Bouwcentrum) in Rotterdam, Holland.

Additional details have now become available concerning this interesting centre of construction activity. The building was completed in 1949 and was designed expressly to house an international building information institute. As the illustrations on this page indicate, it is of unusual design.

The main building is a regular polygon of 16 sides and, to provide the maximum of exhibition space, the main walls have no windows. Natural light is admitted however through a truncated cone of glass which surmounts the main structure. Two information desks are located on central discs, one above the other, and are stepped in relation to the annular main floors. The reinforced concrete staircases form "bridges" between the discs and the annular floors.

On each side of the entrance facade are wings containing lecture theatres, library, offices, and a restaurant.

The main building is 147 feet in diameter and 50 ft. high exclusive of the glass cone. Total floor area (main floor, annuli and centre discs) is about 54,000 sq. ft. The foundation comprises 176 reinforced concrete piles 56 ft. long. The columns on which the glass cone rests and the floors and roofs are one monolithic vibrated reinforced concrete structure. Walls and partitions are of brick. The main building is air conditioned and auxiliary rooms in the wings are heated by hot water.

Centre photograph. The lower information desk.

Bottom photograph. View of the upper and lower annular main floors.

Personals

News of the Personal Activities of Members of the Institute

Civil Defence Report for the month of June shows that much progress has been made during the preliminary planning period for the Montreal Metropolitan area and that training is well under way of personnel who will provide protection in the event of any future air-attack on the city.

Several members of the Institute are connected with the Shelter Committee, which is under the chairmanship of **Dr. Ignace Brouillet,** M.E.I.C., director of L'Ecole Polytechnique. They are **J. L. Busfield,** M.E.I.C., of the Rotary Club of Montreal; **D. C. MacCallum,** M.E.I.C., of Charles Warnock and Co. Ltd., and **E. G. Clossy,** M.E.I.C., of the building inspection department of the city of Montreal.

E. G. Cameron, M.E.I.C., chief engineer of the National Harbours Board, Ottawa, Ont., retired in July after 38 years in the government service.

Mr. Cameron graduated from the Royal Military College and from McGill University, where he received a degree in civil engineering in 1907. For seven years he worked on the Trent Canal as an instrumentman and as resident engineer of Section 1, Ontario-Rice Lake Division, and as division engineer of the Holland River Division. In 1914 he was appointed resident engineer of Section No. 2 of the Welland Ship Canal. In 1918 he went to Saint John, N.B., as engineer for St. John Dry Dock and Ship Building Company. He was chief engineer of the Company from 1920-1924. He returned to the Welland Ship Canal in 1924 as principal assistant engineer. He was placed in charge of the Welland Ship Canal, as assistant engineer in 1931, by the Department of Railways and Canals. In 1936 he transferred to the Department of Marine at Ottawa. He was appointed an engineer with the National Harbours Board in Ottawa, in 1937, and his appointment as chief engineer came several years later.

Alexander Hrennikoff, M.E.I.C., professor in the department of civil engineering at the University of British Columbia, will be given this fall the Arthur M. Wellington Prize of the American Society of Civil Engineers.

He holds the degree of Doctor of Science from the Massachusetts Institute of Technology. B.A.Sc. and M.Sc. degrees were obtained at the University of British Columbia. Prior to joining the university staff in 1933, he served with Dominion Bridge Company as a designer.

F. V. Seibert, M.E.I.C., who retired in 1950 as industrial commissioner for the Canadian National Railways, has taken the position of business manager for Longco, The Lee Oil and Natural Gas Company at Edmonton, Alta.

C. G. de Tonnancour, M.E.I.C., recently elected chairman of the St. Maurice Valley Branch of the Institute, is plant engineer for Canadian Resins & Chemicals Limited at Shawinigan Falls, Quebec.

Mr. de Tonnancour was born in Montreal. He studied at McGill University, where he obtained his engineering degree in 1940. After graduation he went to Shawinigan Chemicals Ltd. as assistant to the development engineer.

C. G. de Tonnancour, M.E.I.C.

He joined Canadian Resins and Chemicals Limited in 1943 as plant supervisor and was appointed plant engineer in 1945. He had charge of construction and design of the fabricating division of the company, and on later expansion of the plant facilities.

Mr. de Tonnancour has been active in the Institute Branch activities, serving on the executive for several years.

W. C. E. Robinson, M.E.I.C., of Canadian Pacific Railway Company has been promoted to the position of assistant engineer maintenance of way, for the eastern region.

Mr. Robinson has been with C.P.R. for many years, serving in Quebec and Ontario. He was division engineer of the Bruce division at Toronto, in 1929-1933; division engineer of the Laurentian Division, at Montreal 1933-38; and later division engineer and district engineer at Toronto.

J. A. Tames, M.E.I.C., of Canadian Westinghouse Company Limited has been transferred from Vancouver, B.C., to be the district manager of the Company in Montreal.

Mr. Tames went to Vancouver for the Company in 1927 as a sales engineer, and has been associated with power sales and apparatus sales.

Dr. Andrejs Pakalnins, M.E.I.C., assistant professor in the department of civil engineering of McGill University, was appointed in May, a member of the Board of Health of Montreal.

H. E. Archibald, M.E.I.C., who was township engineer of Teck Township, for the past five years has left Kirkland Lake, Ont., to join the staff of the city engineer's department of the city of Hamilton, as assistant design engineer.

Mr. Archibald attended the University of Toronto, where he graduated in civil engineering in 1943. After service as a lieutenant with the R.C.E. from 1943 to 1945, he worked successively with the Ontario Department of Planning and Development as assistant planning engineer, and with Proctor, Redfern and Laughlin, in Toronto, as an assistant engineer. He went to Kirkland Lake in 1946.

Major A. L. Maclean, M.E.I.C., whose election as chairman of the Kingston Branch was announced in the August *Journal.*

H. S. Grove, M.E.I.C., designing engineer for a number of years with Power Corporation of Canada, has gone to the British Columbia Power Commission in Victoria.

James A. Lynch, M.E.I.C., has taken the position of instrument engineer at the Montreal Refinery of the McColl-Frontenac Oil Company Limited. He had worked for the National Research Council in Ottawa, since 1945 in the mechanical engineering division and in the low temperature laboratory.

Group Captain C. W. Crossland, M.E.I.C., on completion of the National Defence College course at Fort Frontenac, has been transferred to the position of Deputy Air Member for Technical Services Development at Air Force Headquarters, Ottawa.

He is a graduate of McGill University, Montreal, and of Massachusetts Institute of Technology. After obtaining an M.Sc. degree, from the latter in 1932, he worked in the aircraft industry in England. Returning to Canada he became an assistant engineer in the aeronautical branch of the department of National Defence at Ottawa. He joined the R.C.A.F. in 1940.

W. P. Cheney, M.E.I.C., has joined Husky Oil and Refining, Limited at Saskatoon, Sask. He was formerly with British-American Oil Company in Calgary, Alta.

W. J. Dyck, M.E.I.C., is in the process department of The Lummus Company in New York, N.Y. Previously he was a research investigator for the B.C. Research Council at the University of British Columbia.

T. H. Dobbin, M.E.I.C., is a road engineer for the City Works Department of Saint John, N.B.

Mr. Dobbin graduated in civil engineering from the University of New Brunswick in 1949, and has worked since 1950 for the city of Saint John.

M. Billings, M.E.I.C., has left the Distillers Corporation, Ville La Salle, Que., to work in Sarnia, Ont., for Dow Chemical of Canada Limited.

Mr. Billings graduated from the University of Saskatchewan in 1949 receiving a B.Eng. degree in chemical engineering.

E. R. Hammond, M.E.I.C., is working for C. D. Howe Company Limited in Montreal, Que. He had been with the National Research Council, Canada, in Chalk River, Ont., for a time. He went to N.R.C. in 1950, from the Electric Tamper & Equipment Company of Canada Limited, Montreal.

J. Maurice Mace, M.E.I.C., former manager of rural electrification and power company sales for Northern Electric's eastern district, has been appointed wire and cable manager for the district.

A graduate of McGill University in electrical engineering, Mr. Mace joined Northern Electric in 1936, in the power apparatus sales department, and during World War II was made a sales engineer for marine power and degaussing equipment. In 1946, he was transferred to the rural electrification department. He was appointed manager at Quebec City in 1947.

J. M. Mace, M.E.I.C.

Robt. P. Ouellette, M.E.I.C., of Montreal, has been appointed district engineer and representative for the Province of Quebec of the steel division of the Department of Defence Production in Montreal. He worked after his graduation from McGill University in 1942, for United Shipyards Ltd., in Montreal. He joined Dominion Bridge Company in 1946 as a structural designer.

C. B. Matthews, Affil.M.I.C., who was assistant to the city engineer of Belleville, Ont., has been appointed superintendent of the Board of Works of Belleville.

G. L. White, Affil.E.I.C., has joined the B. L. Smith Publishing Company in Toronto, Ont. He was associated with Westman Publications Limited, Toronto for many years, as editor and assistant business manager and latterly as advertising manager. He received a B.A.Sc. degree from the University of Toronto in chemical engineering in 1933.

Thos. P. Hutchinson, M.E.I.C., is with the Aluminum Company of Canada Limited at Isle Maligne, Que. Previously he was in Toronto working as assistant engineer for Canadian National Railways.

Mr. Hutchinson graduated from the University of Manitoba with a B.Eng.

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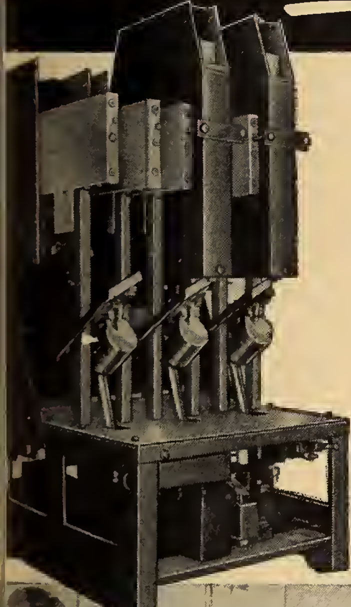

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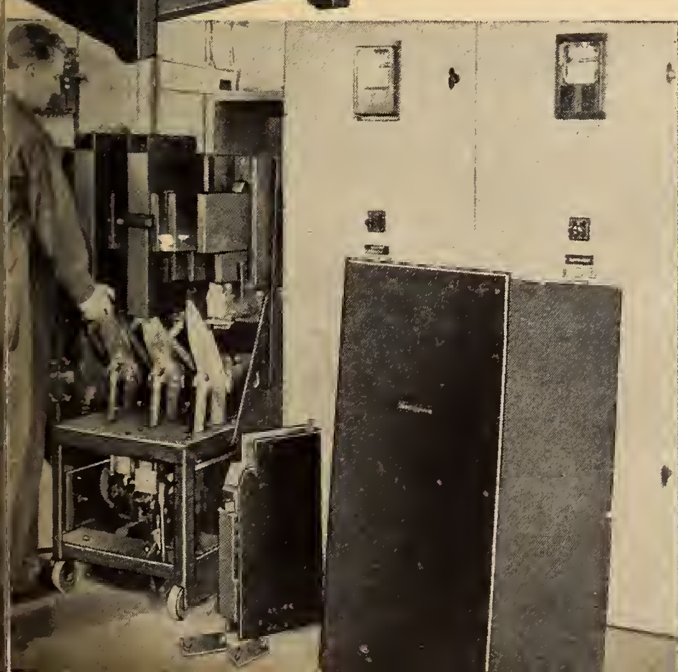
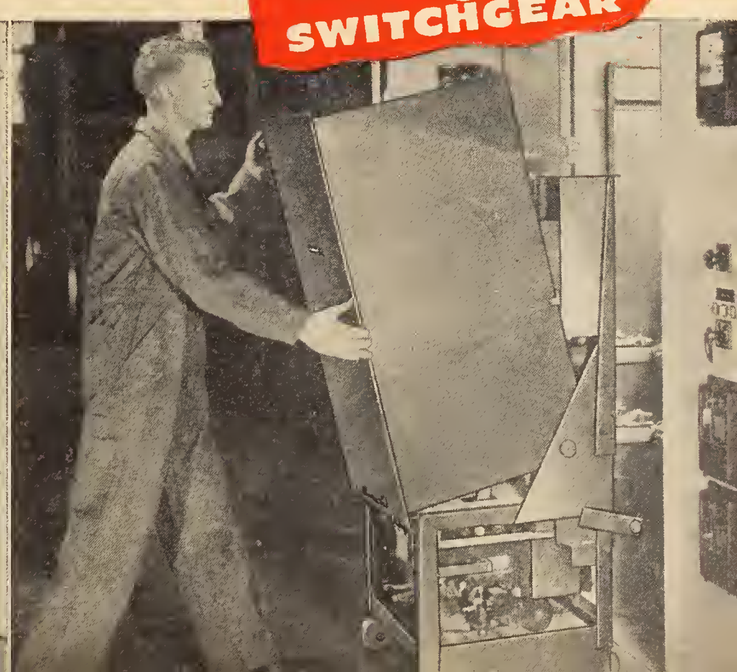




in civil engineering in 1944. After serving with the R.C.E., he worked during 1946-48 for James Maclaren Company Limited at Buckingham, Que.

D. W. Campbell, M.E.I.C., of Montreal, recently joined the sales staff of Forano Limited, Plessisville, Que. He was formerly manager of the Farand & Delorme Division of the United Steel Corporation Limited, Montreal.

D. W. Campbell, M.E.I.C.

Mr. Campbell graduated in mechanical engineering from Queen's University and served with the R.C.E.M.E. during World War II.

He will be connected with the power transmission and material handling division, servicing the mining, pulp and paper, and heavy industrial fields.

Frank Binns, M.E.I.C., is with the Saint John Sulphite Company of Saint John, N.B.

Mr. Binns was the instructor in drawing at Mount Allison University for the past seven years. Previously he was an instructor in drawing at Purdue University, during which time he obtained a masters degree in mechanical engineering. He had previously done engineering in industry. He had graduated in 1909 from Tufts College, in mechanical engineering.

Harold V. Page, M.E.I.C., recently appointed construction engineer of Dow Chemical of Canada, at Sarnia, Ontario. He had worked at Arvida, Que., for the Aluminium Co. of Canada since 1947.

He received a B.A.Sc. degree in chemical engineering from the University of Toronto in 1943 and was for three years in the R.C.E. and for one year with the National Film Board.

At Arvida Mr. Page was chairman of the Junior Section of the Saguenay Branch of the Institute.

R. E. Simpson, M.E.I.C., of Montreal, has been appointed the branch manager of Durham Industries (Canada) Limited, at Toronto, Ontario. In Montreal he worked for White Motor Company of Canada Limited, on sales and service since 1946, soon after he returned from service overseas with the R.C.E.M.E. He had graduated in 1940 from Queen's University in metallurgical engineering.

C. G. Alley, JR.E.I.C., is with C. D. Howe, consulting engineers in Montreal. Previously he was employed by the Northern Electric Company Limited, Montreal.

Mr. Alley graduated from the University of New Brunswick in electrical engineering in 1949.

D. R. Atack, JR.E.I.C., is in Kingston, Ontario, working on technical sales to the pulp and paper industry, for the Dye & Chemical Company Limited. Previously he was a control assistant for Bathurst Power & Paper Company in Bathurst, N.B. He graduated from Queen's University with a B.Sc. in chemical engineering in 1949.

H. D. Archibald, JR.E.I.C., is a civil engineer for Standard Iron & Engineering Works Limited, at Edmonton, Alberta. Formerly he was an instructor at the University of Alberta, where he received a B.Sc. in civil engineering in 1949.

D. T. Bourke, JR.E.I.C., who was formerly with Turner & Newall (Canada) Ltd., in Montreal, is now with Drummond McCall & Company Limited, Montreal. He graduated from McGill University with a degree of B.Eng. in mechanical engineering in 1949.

Harrison G. Burbidge, JR.E.I.C., is a project engineer for the Aluminum Company of Canada Ltd., in Montreal. Previously he was control chemist for the Provincial Paper Ltd., at Mille Roches, Ontario.

R. E. Crysler, JR.E.I.C., has left the National Harbours Board to take a position with the Carter Construction Company in Toronto.

Mr. Crysler graduated with a degree of B.A.Sc. in civil engineering from the University of Toronto in 1949.

J. J. Conrath, JR.E.I.C., is employed as an engineer in the gas turbine division of A. V. Roe Canada Limited Toronto. He received the degree of master of engineering, mechanical, from McGill University this year.

R. G. Cowan, S.E.I.C., is a foreman on the staff of Building Products Limited in Montreal. He graduated from Nova Scotia Technical College in mechanical engineering in 1950. He worked in Halifax as a mechanical engineer for Hagen & Co. Halifax Ltd., before coming to Montreal.

F. A. DeLory, JR.E.I.C., is with the Aluminum Company of Canada in Montreal. Previously he was with Consolidated Mining and Smelting Company of Canada Limited at Trail, B.C. He is a graduate of McGill University where he received a B.Eng. degree in 1948.

E. J. Durand, JR.E.I.C., is a design engineer in the automotive engineering department of the special products division of Ford Motor Company of Canada Limited, Windsor, Ontario. Mr. Durand received the degree of M.A.Sc. from the University of Toronto in 1950.

G. Gow, S.E.I.C., who has been with the Consolidated Paper Corporation Ltd., at Grand'Mere, Que., is now employed by the Electric Reduction Company Limited at Buckingham, Quebec.

Mr. Gow graduated from Queen's University, with a B.Sc. in electrical engineering in 1950.

J. B. Herbich, JR.E.I.C., of Aluminum Company of Canada, Limited has been transferred from Montreal to the Peribonka power development at Chute au Diable, Que. He has charge of the concrete laboratory.

F. H. Johnson, JR.E.I.C., of Dawsonville, N.B., is an instrumentman for Drake-Merritt Construction Company, of New York, at Goose Bay, Labrador. Previously he was a hydrographic engineer in the Department of Mines and Resources at Ottawa, Ontario. He received a B.Sc. in civil engineering at the University of New Brunswick in 1949.

H. M. Lapp, JR.E.I.C., has been appointed assistant agricultural engineer in the Manitoba Department of Agriculture, at Winnipeg. Previously he was in Weyburn, Sask., working for Prairie Farm Rehabilitation Administration.

G. O. Lucas, JR.E.I.C., is a civil engineer with Defence Construction Company Limited at Edmonton, Alberta. Previously he was resident engineer for the Drainage Branch for the Manitoba Government.

D. D. McLean, JR.E.I.C., is in Hamilton, Ont., in charge of government sales, in the newly formed electronics division of Canadian Westinghouse Company Limited.

Mr. McLean is a graduate of Queen's University where he received a B.Sc. degree in electrical enginering in 1943. After service as a lieutenant in the R.C.N.V.R., and as a radar officer on loan to the Royal Navy, he worked for Canadian Marconi Company, and later for Trans-Canada Airlines at the Montreal Airport. In 1950 he joined the National Research Council, as a technical representative of the Technical Information Service.

F. F. Newton, JR.E.I.C., a graduate of McGill University in the civil engineering class of 1950, is a resident highway engineer for the Province of Alberta, Department of Highways.

N. L. Reid, JR.E.I.C. (University of Alberta, M.Sc. 1951) is a structural designer for Haddin Davis and Brown Limited, consulting engineers, in Calgary, Alta. Previously he was bridge design worker for the Department of Public Works at Edmonton, Alta.

G. R. Seviour, JR.E.I.C., formerly with Canadian Industries Limited, Montreal, Quebec, is now in Grand Falls, Newfoundland, working for the Anglo Newfoundland Development Company in the control department. He received a B.Eng. degree from Nova Scotia Technical College in 1949.

George E. Thomas, JR.E.I.C., is an estimator for A. Janin & Company in Montreal, Quebec. Previously he was with Stadler Hurter Company.

H. J. Wallace, JR.E.I.C., has received the appointment as a sales engineer with Midland Electric Manufacturing Company Limited in Winnipeg, Manitoba. Previously he was with the Hudson Bay Mining and Smelting Company in Flin Flon, Man., working as a junior electrical engineer.

D. J. Williams, JR.E.I.C., is working for Canadian Industries Limited in Montreal, Quebec. He has been in Toronto working for the Water Works Section.

Morton R. Slone, JR.E.I.C., is with T. Pringle & Son Ltd. Previously he was with Stadler Hurter & Co., Montreal.

Lionel Issen, JR.E.I.C., has received an appointment with Preload Inc., in New

York City. Formerly he was in Montreal working as estimator for Serrentino Construction Company. He graduated from McGill University in civil engineering in 1949.

L. A. Pearce, JR.E.I.C., has been associated with the Department of Mines & Resources in Jasper, Alta., since his graduation in civil engineering from University of Alberta in 1948. He was recently appointed resident engineer at Riding Mountain National Park in Manitoba.

R. N. Payton, JR.E.I.C., is an assistant project engineer for Canadian Industries Limited in Montreal. He has been in Sarnia, Ont., working for Canadian Synthetic Rubber Ltd. for the past three years.

Raymond Westwood, JR.E.I.C., is in Montreal working for C. D. Howe Company Limited.

Mr. Westwood graduated in mechanical engineering from the City & Guilds College, London, England, in 1949. He worked for Austin Motor Company in Grimsby, Ont., in 1950.

Guy Babineau, JR.E.I.C., is with Canadian General Electric Co., in Quebec City. He had worked for Quebec Power Company since his graduation from Laval in 1946, as an assistant engineer and as a meters and contract engineer.

Lieut. Gilmour Boa, JR.E.I.C., of Toronto, who is in the 48th Highlanders of Canada, recently won the King's Prize at Bisley, England, the top marksman's award in the Annual Commonwealth Competition.

The King's Prize is the most exacting test of marksmanship of all the varied competitions of the Bisley meet. Lieutenant Boa shot 285 out of a possible 300 to win £250 given by the King, and the National Rifle Association Gold Medal and Badge.

Lieut. Boa is a designer in the engineering department of Dominion Bridge Company Limited in Toronto. He graduated from University of Toronto in 1946, where he received a B.A.Sc. in civil engineering.

John Cathro, JR.E.I.C., is a draughtsman in the design office of Consolidated Mining and Smelting Company at Trail, B.C.

Mr. Cathro graduated from Dundee Technical College, Scotland, and from Stockport Technical College, England. He worked in England as a design draughtsman for Simon Carves Ltd. In Canada in 1950 he joined Standard Iron & Engineering Works Ltd., as a mechanical draughtsman where he remained until his recent change.

J. W. Lukey, S.E.I.C., is with C. D. Howe Company Limited, Port Arthur, Ont. Previously he was in Regina, Sask., working for Ducks Unlimited. He graduated from University of Saskatchewan in civil engineering in 1950.

Adrien Lemelin, S.E.I.C., who graduated from Laval University in electrical engineering in 1950, and was associated with the provincial department of mines, is now employed with Canadian Fairbanks-Morse Company Limited in Montreal, Que.

E. Belsheim, S.E.I.C. (University of Alberta, B.Sc., civil, 1951) is resident highway engineer for the department of highways, at Innisfail, Alta. He was previously a soils inspector for the Alberta Department of Public Works.

G. Flater, S.E.I.C., is with Longlac Pulp and Paper Company Limited at Terrace Bay, Ontario. Previously has was in the engineering department for Canadian International Paper Company at Gatineau, Quebec.

J. T. J. Anderson, S.E.I.C., is a mechanical engineer in Dominion Engineering Works, Lachine, Quebec. Previously he was an engineering drawing instructor at the University of Toronto. He received a B.Eng. degree in mechanical engineering from the University of Saskatchewan in 1950.

Jacques Barriere, S.E.I.C., will study at the Bureau of Highway Traffic of Yale University for a year, on a scholarship awarded by the International Road Federation. Announcement was made by Canadian Good Roads Association, an affiliate of the Federation.

Mr. Barriere is at present employed by the Montreal Public Works Department. He will be on leave of absence for a year to attend the Yale Traffic Bureau, one of the outstanding schools of its kind in the world.

Mr. Barriere received the Ernest Marceau Prize of the Engineering Institute for 1950.

Jacques Benoit, S.E.I.C. (Laval University, B.A.Sc. chemical, 1951) is employed as a supervisor in the agricultural chemical department of Canadian Industries Limited at Beloeil, Quebec.

David A. Foster, S.E.I.C. (University of British Columbia, B.A.Sc., mechanical, 1951) is an assistant shop engineer in the motive power shops of Canadian National Railways at Stratford, Ontario.

P. E. Fuller, S.E.I.C. (University of Alberta, B.Sc., chemical, 1951) has been appointed a sales representative of Canadian Industries Limited, in Winnipeg, Man.

Frank D. Grant, S.E.I.C. (Nova Scotia Technical College, B.Eng., 1951) is employed by the Department of Public Works of Canada at St. John's, Newfoundland.

N. F. Gordon, S.E.I.C. (University of British Columbia, B.A.Sc., mechanical, 1951) is on the staff of Dominion Tar & Chemical Company Limited at Cornwall, Ont.

Roland Harnois, S.E.I.C. (Laval University, B.A.Sc., chemical, 1951) is with the Aluminum Company of Canada in Montreal.

J. H. Hearn, S.E.I.C., is working for M. F. Schurman Company Limited at Summerside, P.E.I. He graduated from Nova Scotia Technical College in mechanical engineering in 1950.

R. T. Hill, S.E.I.C., has been appointed a junior design engineer for Township of York, Toronto, Ont.

Mr. Hill graduated from the University of Toronto in 1950 in civil engineering and has since worked for Defence Construction Ltd., at Petawawa, Ont.

J. R. Inglis, S.E.I.C. (University of Manitoba, B.Sc., electrical, 1951) works in Peterborough, Ontario, for Canadian General Electric.

John S. Keeler, S.E.I.C. (University of Toronto, B.A.Sc., 1951) is a junior research officer in the heating and ventilating section of the National Research Council in Ottawa.

F. F. Kieran, S.E.I.C., is employed by the Pentagon Construction Company at Isle Maligne, Quebec. He received a B.Eng. degree in civil engineering at McGill University in 1950, and has since worked as an inspector for Dominion Bridge Company.

G. J. Melanson, S.E.I.C. (Nova Scotia Technical College, B.Eng., mechanical, 1951) is in the mechanical department of Building Products Limited in Montreal, Quebec.

Brian C. McGrath, S.E.I.C., who graduated from McGill University with a B.Eng. degree in mechanical engineering in 1950, is with Bowater's Newfoundland Pulp & Paper Mills, at Cornerbrook, Newfoundland.

A. D. MacLeod, S.E.I.C., who graduated from Nova Scotia Technical College with a B.Eng. degree in electrical engineering in 1950, is a student engineer with Nova Scotia Light & Power Company Limited at Dartmouth, N.S.

A. R. MacInnis, S.E.I.C. (Nova Scotia Technical College, civil, 1951) is instrument man with Canadian National Railways at Campbellton, N.B.

R. L. McCarther, S.E.I.C. (Nova Scotia Technical College, B.Eng., 1951) is a mechanical engineer on the staff of Babcock-Wilcox & Goldie-McCulloch-Ltd., at Galt, Ontario.

D. A. McCann, S.E.I.C., who graduated from the University of Saskatchewan in mechanical engineering in 1950, is a mine engineer for The Hudson Bay Mining and Smelting Company Limited at Flin Flon, Man.

Headquarters Records

Each time the *Journal* or other Institute mail is dispatched we are advised of undeliverable items due to incorrect addresses. Our records staff must follow up these changes and the regular service to members suffers thereby. *Please* advise headquarters when your address or occupation changes. The form below can be completed, clipped, and mailed to headquarters in a few moments.

Please Print

Name...

Surname Given names

Home Address... ☐

Employer...

Employer's Address.. ☐

(Check address to be used for Institute mail.)

Product or Service..

Position or Title..

Degree, Year & College...

Advise Headquarters Promptly of Changes

G. R. Nayler, S.E.I.C. (University of Manitoba, B.Sc., electrical, 1951) is a junior engineer and estimator for The British General Electric Company Limited in Toronto, Ontario.

Gordon H. Petherick, S.E.I.C., does power equipment engineering work as an assistant engineer for The Bell Telephone Company of Canada. He received a B.A.Sc. degree in engineering and business from the University of Toronto in 1950.

C. D. Ratelle, S.E.I.C., who graduated from Ecole Polytechnique in civil engineering in 1950, is a hydraulic engineer in the aqueduct division of the city of Montreal.

Louis P. A. Robichaud, S.E.I.C. (University of Michigan, M.S., electrical, 1951) is a research assistant in aeronautical engineering research at the University of Michigan, Ann Arbor, Mich.

G. M. Stephen, S.E.I.C. (McGill University, B.Eng., civil, 1951) is with Fraser Brace Engineering Company at St. Joseph d'Alma, Quebec.

George T. Tamura, S.E.I.C. (University of Manitoba, B.Sc., 1951) is an engineer-in-training for A. V. Roe Canada Limited, in Toronto, Ontario.

Harry Triandis, S.E.I.C. (McGill University, B.Eng., mechanical, 1951), of Montreal, is now in Hamilton, Ont., working for Procter and Gamble Company of Canada.

James H. Toms, S.E.I.C. (University of British Columbia, B.A.Sc., civil, 1951), is a junior engineer with Stone and Webster Canada Limited, consulting engineers in Trail, B.C.

D. R. Troop, S.E.I.C. (Nova Scotia Technical College, B.Eng., civil, 1951), is a civil engineer for Canadian Industries Limited in Montreal.

R. Valliers, S.E.I.C. (McGill University, B.Eng., electrical, 1951), is with Trane Company of Canada Limited in Montreal, Quebec.

P. C. Veinot, S.E.I.C. (Nova Scotia Technical College, B.Eng., civil, 1951), is a junior civil engineer for Montreal Engineering Company in Montreal.

C. R. Wilson, S.E.I.C. (Nova Scotia Technical College, B.Eng., mechanical, 1951), is assistant development engineer for Canadian Industries Limited in Shawinigan Falls, Que.

A. R. Wood, S.E.I.C. (Queen's University, B.Sc., electrical, 1951) is with English Electrical Company in St. Catharines, Ontario.

Visitors to Headquarters

D. R. Beckett, M.E.I.C., Fort William, Ontario, July 19, 1951.

Dr. M. M. de Leva, Turino, Italy July 23.

T. R. Beckett, England, July 23.

Ira B. Hughes, Sydney, Australia, July 31.

E. J. R. Gibson, Sydney, Australia, July 31.

H. A. Templeton, JR.E.I.C., Guelph, Ontario, August 1.

S. Heeley, Sao Paulo, Brazil, August 3.

Paul E. Buss, M.E.I.C., Thorold, Ontario, August 16.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Murray Alexander Stewart, M.E.I.C., city works commissioner of Toronto since 1947, died at his home on August 25, 1951.

Mr. Stewart, who worked for 46 years with the Toronto works department, was born at Hamilton, Ont., in 1881. He was educated in Hamilton, at Upper Canada College, and at the University of Toronto, from which he graduated as a civil engineer in 1905. After graduation he joined the staff of the works department as an engineer with the roadway section. He was later promoted to head the roadway section, which position he held for some years. In the late 1920's he was appointed

M. A. Stewart, M.E.I.C.

principal assistant engineer, and in 1945 he became the deputy commissioner of the department. In 1947 he received the appointment as city works commissioner.

Mr. Stewart was instrumental in organizing the Public Utilities Co-ordinating Committee at the beginning of the Second World War. He was the committee's first chairman and undertook the compilation of plans of all underground construction in the city. These plans, showing the location of all underground wiring, sewers, pipes and telephone lines, were of great importance when work on the T.T.C. subway began. This committee, first of its kind in Canada, was among the first three in North America. During the Second World War he headed the utilities branch of A.R.P.

Since his appointment as works commissioner, Mr. Stewart had been in charge of such civic projects as the Clifton Road extension, the Dufferin St., Lake Shore Blvd., and University Ave. widenings, the completion of the city sewage disposal at Ashbridge's Bay and the large water works programme.

Mr. Stewart was cited as a most valuable civic servant.

He was a member of the Engineering Institute since 1912, and had attained Life Membership in 1947.

William Anderson, M.E.I.C., retired consulting engineer and one of the original professional engineers of the province of British Columbia died on June 26, 1951.

Mr. Anderson was born in Scotland in 1860. He served his apprenticeship with Moss Bay Iron and Steel Co. from 1876 to 1881, and he was then appointed an assistant engineer. In 1887 he was sent by his company to the State of Washington to establish a steel mill. He worked for two years as draughtsman for the San Francisco Bridge Co.

In 1896 he went to British Columbia, where he worked as engineer and superintendent of construction of the Bonnington Falls power plant on the Kootenay River, and at Cascade for the West Kootenay Power Co.

From 1909 until his retirement some years ago he was in consulting practice in Vancouver.

Mr. Anderson joined the Institute as a Member in 1913 becoming a Life Member in 1932. He was one of the founders and a life member of the Association of Professional Engineers of British Columbia.

Edgar C. Thrupp, M.E.I.C., former consulting engineer in scientific research, in private practice in Vancouver, died on June 26, 1951.

Mr. Thrupp was born in Adelaide, South Australia in 1863. He was educated in England, studying civil engineering at King's College, University of London and serving an articled pupilage in civil engineering. He was in private practice in London for several years.

In 1908 he came to British Columbia and settled in Kamloops, and he carried on his private practice there and in Vancouver until his retirement in 1932.

He became known for his activities in the forecasting of weather; and during the war years his predictions of earthquakes and weather phenomena were reported in papers in Canada and United States.

He joined the Institute in 1913 as an Associate Member becoming a Member in 1935. He attained his Life Membership in 1947.

Paul F. Sise, M.E.I.C., noted Canadian industrialist and chairman of the board of directors of the Northern Electric Co. Ltd., Montreal, died on August 1, 1951, after a brief illness. Mr. Sise was president of Northern Electric for 29 years until his retirement in 1948, and was also a director of a number of Canadian firms. He was also widely known for his interest in community affairs.

Mr. Sise, the youngest son of Charles Fleetford Sise, founder of The Bell Telephone Co. of Canada, was born at Boston, Mass., in 1879. He was educated at Bishop's College School in Lennoxville, Que., and he graduated from McGill University in 1901 with the degree of B.Sc. He then attended an apprenticeship course with the Westinghouse Electrical Manufacturing Company in Pittsburgh, after which he

Paul F. Sise, M.E.I.C.

worked with Canadian Westinghouse in Montreal until 1904. He entered the Northern Electric and Manufacturing Company Limited as secretary-treasurer. In 1910 he was appointed managing director of the Company. When the Company was amalgamated with the Imperial Wire and Cable Company in 1914, he became vice-president and general manager of the new organization. He was president from 1919, until his retirement in 1948, when he was appointed chairman of the board.

Companies of which he was a director are: Royal Bank of Canada, The Bell Telephone Co. of Canada, Montreal Trust Co., Lake of the Woods Milling Co., Dominion Engineering Co., Industrial Acceptance Corporation, Canada Steamship Lines Ltd., Amalgamated Electric Corporation, Belding Corticelli Ltd., Price Bros. and Co. Ltd., Shawinigan Water and Power Co., Dominion Bridge Co. Ltd., and Dominion Tar and Chemical Co. Ltd.

During World War I he went overseas as adjutant to the 148th Battalion, from Montreal. Later he was attached to the War Office in London. He was sent to the United States on the staff of the British Recruiting Mission, after which he served with the Canadian Forces in Siberia, as second-in-command of the 259 Battalion, Siberian Expeditionary Force.

In 1938, Mr. Sise was asked by the War Office in London to form Canadian Associated Aircraft Limited, which pioneered the manufacture of bombers in Canada.

Mr. Sise joined the Engineering Institute in 1920 as a Member, attaining Life Membership in 1950. He was a member of Board of Trade, and of the

Canadian Manufacturers Association. He was the first president of the General Hospital, a governor of McGill University, a former chairman of the Board of Directors of Bishop's College School. He was president of the McGill Graduate Society in 1920-1921.

L. C. McMurtry, M.E.I.C., vice-president of Horton Steel Works Ltd., Fort Erie, Ont., died July 17, 1951. He had been vacationing near Bracebridge, Ont., but had gone to Parry Sound to inspect a tank built for Canadian Oil Company.

Mr. McMurtry was born at Galt, Ont., in 1896. During World War I he enlisted with the Heavy Artillery Unit of the University of Toronto, and saw active service in France. He was later transferred to the Imperial Corps and saw extensive service in the Mesopotamia Area. He graduated from the University of Toronto with a B.A.Sc. degree in civil engineering. In 1922 he joined Horton Steel Works Ltd., as a draughtsman. He was appointed superintendent of erection in 1923, and became vice-president of the Company in 1945.

Mr. McMurtry joined the Institute as an Associate Member in 1927, becoming a Member in 1940. He was a past-chairman of the Niagara Peninsula Branch of the Institute. He served also, for many years, on the Fort Erie Board of Education.

Edgar C. Cowan, M.E.I.C., who was construction engineer for Powell Equipment Company Limited in Winnipeg, Man., died on July 6, 1951.

Mr. Cowan was born at Thornhill, Manitoba, in 1894. He graduated from the University of Toronto in 1919 with a degree of B.A.Sc., in civil engineering. He was a veteran of World War I, having served overseas from 1915-1918 with the Royal Canadian Engineers. He worked for one semester as a demonstrator in engineering at Manitoba.

In 1920 he was employed as municipal engineer at Springfield, Man. In 1927 he was appointed district engineer with the Highways Branch of the provincial government at Boissevain, Man. He was transferred to Brandon in the same capacity in 1928. He resigned in 1945 to become a civil engineer for the Powell Equipment Company Limited in Winnipeg.

He joined the Institute in 1919 as a Student, transferring to Associate Member in 1922, and becoming a Member in 1940.

H. V. Haight, M.E.I.C., of Sherbrooke, Que., died July 3, 1951, following a short illness.

Mr. Haight was born at Sparta, Elgin County, Ontario, in 1873. Following his graduation from the University of Toronto where he received the degree of B.Sc. in mechanical and electrical engineering in 1897, he joined the Canadian Ingersoll Rand Company Limited. His first post with the Company was that of sales engineer in Nova Scotia. He was transferred to the Sherbrooke plant in 1900 where he became chief engineer of the Company. In 1931, he was transferred to the Rand plant in Painted Post, N.Y., and in the autumn of 1932, he was transferred by the Company to Manchester, England, as works manager, and there he also served as Rand consulting engineer for Europe, investigating new inventions. He retired in England in 1938, and returned to Sherbrooke shortly after.

During World War II, Mr. Haight's engineering experience was required by the Federal Government, and he served for the duration at the National Research Council in Ottawa.

Mr. Haight became a Member of the Institute in 1920. He attained his Life Membership in 1950.

M. Haight was well-known also for his work in fraternal and service organizations. He was president of the Sherbrooke Branch of the Y.M.C.A. for several terms. He took a keen interest also in the World Service division of the Y.M.C.A. He was a member of the Canadian Institute of International Affairs, and a past-president of the Sherbrooke Chamber of Commerce.

Dr. Boris A. Bakhmeteff, M.E.I.C., who was Russian Ambassador to the United States during the Kerensky regime, and since 1931 was professor of civil engineering at Columbia University, died at his home in Brookfield, Conn., in July, 1951.

Born in Tiflis in the Caucasus in 1880, Dr. Bakhmeteff graduated from the Classical Gymnasium, Tiflis, in 1898, and five years later received the degree of civil engineer from the Institute of Engineers of Ways and Communication in St. Petersburg. The Polytechnique Institute of St. Petersburg made him a doctor of engineering in 1911. He had come to the United States in 1904 to engage in work on the New York State Barge Canal, and on his return to Russia he spent several years on the St. Petersburg Institute's faculty.

In 1915, Dr. Bakhmeteff returned to the U.S.A. as a member of the Russian Government's central war industries purchasing committee, and upon the fall of the Czarist regime in 1917 he was appointed Vice-Minister for Commerce and Industry for the Provisional Russian Government of Prince Lvov. Later that year, with Kerensky heading the Provisional Government, he was sent to Washington as head of the Extraordinary Russian Commission and as Ambassador. He continued as Ambassador until, in June, 1922, the Kerensky regime having fallen he declared himself an Ambassador without a country, and resigned.

Secretary of State Charles E. Hughes concurred in the wisdom of the action, but at the same time cordially thanked Dr. Bakhmeteff for his personal efforts in liquidating the affairs of the Russian Government and making some measure of settlement of claims against Russia by United States citizens.

Dr. Bakhmeteff then established himself in New York as a consulting engineer, thus resuming a profession he had followed in St. Petersburg from 1907 to 1915.

While at Columbia further honours came to him. In 1947 he and Prof. William Allan of City College, received the Norman Medal, awarded annually by the American Society of Civil Engineers for the best technical article published in the society's journal. Recently Columbia made him an honorary professor, the fourth time in the university's history this title had been bestowed.

Dr. Bakhmeteff, who had been an American citizen since 1935, was the author of several works in his special field of science.

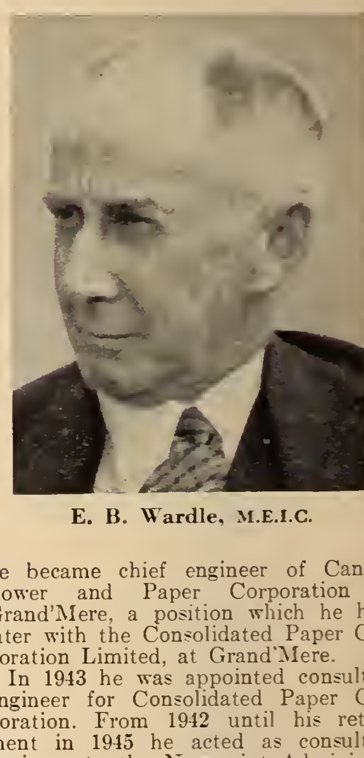
Dr. Bakhmeteff joined the Institute as a Member in 1947.

E. B. Wardle, M.E.I.C., retired consulting engineer of the Consolidated Paper Corporation Limited, died July 10, 1951, at his home at Meriden, Conn.

Mr. Wardle was born at Slatersville, R.I., in 1874. He was educated at Dartmouth College, Hanover, N.H., where he graduated in 1899 with the degree of B.Sc.

Upon graduation he accepted a position as draughtsman with the firm of Tower and Wallace, consulting engineers, New York. In 1902 he was transferred by the firm to Rumford Falls, Maine, where he was engineer in charge of the Oxford Paper Company, and later in the year held the same position at the Champion Coated Paper Company at Hamilton, Ohio.

From 1902 to 1914 he was engaged as engineer-in-charge for George F. Hardy, consulting engineer of New York, for whom he did paper mill construction in Quebec, Ontario, and Newfoundland. From 1914 to 1928 he was chief engineer of the Laurentide Company Limited, Grand'Mere, Quebec. He had worked on the design and construction of the Laurentide Mill at Grand'Mere, while with George F. Hardy. In 1928



E. B. Wardle, M.E.I.C.

he became chief engineer of Canada Power and Paper Corporation at Grand'Mere, a position which he held later with the Consolidated Paper Corporation Limited, at Grand'Mere.

In 1943 he was appointed consulting engineer for Consolidated Paper Corporation. From 1942 until his retirement in 1945 he acted as consulting engineer to the Newsprint Administration, Wartime Prices and Trade Board.

Among the many noteworthy contributions of Mr. Wardle to engineering in Canada were several of a pioneer character. He designed and made workable the first high-speed wide-paper machines at Laurentide. He was largely responsible for the building of the first highway suspension bridge in Canada, having built the concrete approaches for it long before the bridge was erected.

Mr. Wardle joined the Institute as a Member in 1929. He was a member of Council in 1939-1940. He was active in Institute work, being elected the vice-president for the Province of Quebec in 1943. He had served on the Council in 1939-40, representing the St. Maurice Valley Branch. He also held membership in the American Society of Civil Engineers, the Corporation of Professional Engineers of Quebec, and the Technical Association of the Pulp and Paper Industry.

Floyd R. McDonald, M.E.I.C., vice-president and general manager of Peacock Brothers Ltd., Montreal, died on August 16, 1951.

Mr. McDonald was born at London, Ont., in 1898. He studied at London Collegiate, at Oakwood College Institute, Toronto, and at the University of Toronto, where he received a B.A.Sc. degree in mechanical engineering in 1921. After graduation he took a cadet engineering course with Bailey Meter Company, Cleveland, Ohio. He joined Peacock Brothers Limited in Montreal in 1923, where for years he sold and serviced engineering equipment in all parts of Canada. He made a major contribution to the industry by introducing the use of automatic control equipment for process industries. He was named director of the company in 1946, and was appointed vice-president and general manager in 1950.

Floyd R. McDonald, M.E.I.C.

In the First World War he served with the 3rd Battalion of Canadian Engineers overseas in 1918.

He joined the Institute as a Member in 1945. He was also a member of the Corporation of Professional Engineers of Quebec, and a past-president of the University of Toronto Alumni Association, Montreal Branch. Active in civic affairs, he served with the Police Protection Committee, N.D.G., and with the N.D.G. Community Council. For the Engineering Institute, he was a member of the Publication Committee of *The Engineering Journal* for the past two years.

J. A. Gordon, M.E.I.C., who was manager, in the Maritime Provinces, of the apparatus division of Canadian General Electric Company, died after a short illness on July 2, 1951.

Mr. Gordon was born at Bay Roberts, Newfoundland, in 1918. He graduated from Dalhousie University with a B.Sc., and received B.Eng. degree from McGill University in 1941.

In 1941 he enlisted as a lieutenant in the R.C.E.M.E., and served in France, Belgium, Holland and Germany. He was awarded the M.B.E., and was discharged at the end of the war with the rank of captain.

Returning to General Electric, he was for a time in Peterborough, Toronto, and Windsor, Ont., before his appointment to the Maritimes, with headquarters in Halifax.

He joined the Institute in 1941 as a Student, becoming a Member in 1946.

F.O. William B. Pollin, S.E.I.C., of Westmount, Quebec, died on July 6, 1951, when his Harvard training aircraft crashed near Centralia, Ont.

F.O. Pollin, a war-trained airman, had re-enlisted in the R.C.A.F. a few months ago. He was an instructor at the Centralia service flying training school.

Mr. Pollin was born at Verdun, Que., in 1923. A veteran of World War II he attended McGill University, where he received a B.Eng. degree in mining engineering in 1950. After graduation he worked for a time as a surveyor in the engineering office of Lamaque Mining Company Limited at Bourlamaque, Quebec.

He joined the Institute as a student in 1948.

NEWS of the BRANCHES

Activities of the Thirty-three Branches of the Institute and abstracts of papers presented at their meetings

Halifax Branch

W. E. Jefferson, M.E.I.C.
Secretary-Treasurer

M. F. Dean, M.E.I.C.
Branch News Editor

Supper meeting, Nova Scotian Hotel, May

The meeting was followed by an informative talk on Dominion Steel and Coal Corporation operations in mining in Cape Breton, delivered by Mr. Louis Frost, chief mining engineer for D.O.S.C.O.

By far the greater proportion of the Corporation's mines in Cape Breton are under the ocean. The workings are now 4 miles from the shore line, at a maximum depth of about 2,500 ft. The economic limit was once considered 5 miles and 4,000 ft., but recent modern improvements in equipment and methods make this limit an underestimate.

The old method of mining, Room and Pillar, allowed about 40 per cent of the coal to be removed down to the 1,000 ft. level. Below this, considerably more can be recovered.

To maintain present output from the eleven collieries, 266 miles of roadways have been constructed, at an average overall cost of $100,000 per mile. Some of the main roadways are lined with concrete and steel at a cost of $250,000 per mile.

Among the modern developments and installations that have been added are diesel locomotives for underground hauling, conveyer belts from the working face to the shaft, and at the end of this year 13 automatic continuous miners will be in operation. Faster transportation for personnel to the working face, heavier rails, also contribute to the fact that 80 per cent can now be extracted under moderately heavy pressures.

The present development and expansion, to be underway for five years, includes a new washing plant with a capacity of 325 tons per hour, and combining two collieries to produce a possible 10,000 tons per day.

Mr. Frost was heartily thanked by all present, and the interest was displayed by the many questions asked of the speaker.

Vancouver

Stuart S. Lefeaux, M.E.I.C.
Secretary-Treasurer

H. T. Libby, M.E.I.C.
Branch News Editor

Field trip to Powell River, July 18

Twenty-nine members of the Vancouver Branch met on C.P.R. Pier, the evening of July 18, and embarked on the good ship Princess Mary for Powell River. After a few social calls the party settled down for the night.

Bright and early in the morning all hands were on deck again, ready to disembark. Safely ashore, the party met again for a hearty breakfast after which they were formally welcomed to Powell River by H. Moorehead and G. D'Aoust. At the pulp and paper plant of the Powell River Company the party was divided up into small groups, each under a guide for the tour through the plant. They followed the logs from the time they came from the boom, into the mill where they are debarked by powerful jets of water, and then to the sorting chains where some logs are sent to the chipper, and others to the mill for cutting into blocks for the ground wood mill. The logs destined to make sulphite pulp are dropped one at a time down a chute where they come in contact with a huge fly-wheel with blades protruding from its flat side that cuts angular chips ⅝-in. long and about ⅛-in. thick from the inclined end of the log. It is really a most breathtaking spectacle to see a log as large as a telegraph pole seemingly melt off at the bottom until the whole thing is converted to chips in the matter of a minute or so.

The chips are carried by belt conveyers to the sifters, etc., and then to the storage bins. From the storage bins they go to the digesters where they are exposed under steam pressure, to a solution of free sulphurous acid and calcium bisulphite. After several hours of "cooking" the lignin (the glue that holds the fibres together), is dissolved, thus freeing the fibres which are practically pure cellulose. These fibres are washed, reduced to a suitable moisture content and pumped over to the paper plant where they are mixed with the ground wood pulp in order to give the resulting paper strength.

The logs that are destined for ground wood production go to a saw mill where they pass through a band headsaw and are reduced to planks about 6-in. thick. The planks proceed to an edger where they are cut to strips approximately 6-in. wide. The strips then go to a gang saw where they are cut to uniform blocks about 2½ feet long in one pass.

The blocks then go to the grinding room where they are placed in a machine which forces the flat of their grain against huge scored sandstone grinders which are kept wet. The ground wood goes to washers where any sand or foreign matter settles out. The pulp then has part of the water removed and is piped to the paper makers.

The sulphite and ground wood pulps which are blended in proportions of roughly 1 to 5 have some of their water removed and go to the beaters. The pulp is extruded in a thin ribbon about 18 feet wide onto a large belt of blanket-like material where much of the moisture is sucked out of it. It then passes through a maze of hot rollers where it is further dried, pressed and polished, and made into a roll about 3 feet in diameter at the end of the machine. It is most interesting to watch a roll being changed without stopping the machine or wasting any paper.

The paper is then cut and rerolled into order widths, wrapped and delivered to the warehouse for shipment.

The Powell River Company is the largest producer of newsprint in the Province, accounting for approximately 70 per cent of the output. An idea of the size and capacity of the plant can be pictured when it is realized that their daily output would cover with newsprint a road 18 feet wide from Powell River to San Francisco. They also produce 140 tons of high grade unbleached sulphite pulp per day. Their steam plant produces 10 million pounds of steam per day in its 16 boilers. The plant also generates and uses 9,400 hp. of electrical energy and uses 2 billion gallons of water per day.

The party met again for lunch and visited the Company's power house at Stillwater about half an hour's drive from Powell River where the two 13,500 k.v.a. generators are driven by Francis wheels operating under a 250 ft. head.

After a delicious supper by courtesy of the Powell River Company, a panel comprised of Messrs. Jamieson, Chard and Stewart answered numerous questions.

A vote of thanks to the Powell River Company was expressed by Jack McDonald and was heartily endorsed by the members.

The party, in due course, embarked again, and again enjoyed a social evening. In the morning the boat docked in time to allow everybody to have breakfast before going back to the daily grind.

Winnipeg

C. S. Landon, M.E.I.C.
Secretary-Treasurer

Electrical Section

K. Hallson, Jr.E.I.C.
Secretary-Treasurer

J. G. Dickinson,
News Editor

Branch picnic and field trip

Some two hundred engineers, their wives and friends were very graciously entertained by the City of Winnipeg Hydro Electric System recently. The entertainment was in the form of a picnic and visit to Slave Falls and Pointe Du Bois, sites of the City Hydro Electric Plants on the Winnipeg River. Each party brought its own basket lunch for two meals, fishing tackle, bathing suit, etc., and had a wonderful time. Transportation, tea, coffee, and gallons of soft drinks were supplied thorugh the courtesy of the City Hydro.

From Lac du Bonnet, journey proceeded twenty five miles over City Hydro's own railway to Slave Falls, six miles south.

Employees and their families live at Pointe du Bois, the Slave Falls staff commuting to and fro each 8-hour shift. The community at Pointe du Bois includes a medical clinic with a resident nurse, an employee owned general store, a church, school, skating rink, curling rink, community hall, and other facilities.

The new school building is acknowledged to be one of the finest in Western Canada. Married employees rent houses; single male employees live in a modern, four story staff residence.

The Hydro-electric plant at Pointe du Bois was the first constructed by the City of Winnipeg. Opened in 1911 with an original capacity of 20,000 horse power, additional machines were added as required until the full capacity of the plant, 105,000 horse power was reached in 1926. The Poine du Bois development consists of a reinforced concrete power house, 550 feet in length, and a series of dams, spillways and sluice gates terminating in a rockfill dam 700 feet long on the far side of the river.

To keep pace with Winnipeg's growing demand City Hydro developed the Slave Falls power site. The plant opened in 1931 with two 12,000 horsepower units installed. Third and fourth units were added in 1937 and 1938 respectively. In 1945, work started on the completion of the superstructure for the addition of the final four units to bring the plant to its full capacity of 96,000 horsepower. This work was completed early in 1948.

The Slave Falls power plant, six miles downstream from Pointe du Bois, has a head of 30 feet. The eight units installed are the vertical type.

The trip was sponsored by the Electrical section of the E.I.C., Winnipeg Branch.

The Winnipeg Branch recently visited the power plant at Slave Falls (left), and the power plant at Pointe de Bois (right).

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without eharge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notiees appearing in the SITUATIONS WANTED column will be diseontinued after three insertions. They will be reinstated, on request, after a lapse of onc month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may bc arranged *by appointment*.

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER required by Montreal organization with knowledge of plant layout, material specifications A.S.M.E. code design and job scheduling. Experience of three to four years in the foregoing is desirable. Some knowledge of control instrumentation also beneficial. Salary according to qualifications. Apply to file No. 4023-V.

CHEMICAL ENGINEERS preferably with post graduate training to act as process development group leaders for an expanding technical division in a large chemical plant in Southern Ontario. Applicants should have about five years experience in development and for operations in a chemical industry. The work will involve direction of a group of chemical engineers working on laboratory and pilot plant investigations plant tests, and will include the evaluation of proposed new processes or process improvements. Apply to file No. 4036-V.

A PROMINENT CHEMICAL INDUSTRY has an opening in a plant in southern Ontario, for a Ph.D. with about ten years experience in research and development work. Some experience in administration is required in addition to that in the direction of research and development activities. Chances of advancement are excellent. Apply to file No. 4036-V.

CIVIL

EXPERIENCED GRADUATE CIVIL ENGINEER for standard design and supervision of wood, steel and concrete buildings in architect's office located at the Lakehead, Ontario. Pension, P.S.I., Blue Cross and other benefits. State experience and salary desired in application. Permanent position for the right person. Apply to file No. 4035-V.

MUNICIPAL ENGINEER for town in Niagara Peninsula, population 7,000. Requirements are for civil engineer who has had experience in maintenance of pavements, side walks, sewers and surveying for new subdivisions. Salary open, middle-aged man preferred. Apply to file No. 4025-V.

YOUNG CIVIL ENGINEERS required by organization in Province of Quebec, duties include design and field work on construction. Apply to file No. 4024-V.

CIVIL ENGINEER to supervise construction of addition to plant located in province of Quebec. Salary $5,000. Apply to file No. 4040-V.

MECHANICAL

MECHANICAL ENGINEER, recent graduate required by large transport company in Montreal. The work consists of the design of complete steam generating power plants and involves considerable field work in a variety of plants now in operation, affording excellent opportunity for gaining experience and advancement. Apply to file No. 4030-V.

McGILL UNIVERSITY requires graduate mechanical engineers in the department of mechanical engineering; qualified in the design field for full time appointment, instructors and demonstrators for seven months, from 1st of October, 1951. Apply to file No. 4022-V.

MECHANICAL SALES ENGINEER with three or more years experience on hydraulic presses or rolling mills, design layout, application, servicing and sales. Salary commensurate with ability. Responsible position in Montreal office of firm with international reputation. Apply to file No. 4032-V.

MISCELLANEOUS

MECHANICAL OR CHEMICAL ENGINEER to act as junior project engineer in chemical organization in Ontario. Applicant would work with plant engineer on piping layouts and design, plant and equipment layouts, some process and machine development, maintenance problems etc. Preferably graduate with one or two years experience or 1951. Apply to file No. 4034-V.

CIVIL, MECHANICAL OR CHEMICAL engineer (2), required by firm located in Toronto, Ontario. Minimum of three years experience in structural, steam and piping design. Some process and equipment design and knowledge of specifications and estimating would be advantageous. Preferably 28-35 years. Apply to file No. 4033-V.

PATENT ANALYST to organize patent records, investigate violation of patents, also investigate possibility of manufacturing new products. Carry out and assist in market research studies. Preliminary work on new patent applications. Applicant should have Bachelor's degree in chemical engineering or honors chemistry. Age minimum 27 years. Experience in sales, development or production of organic chemical dyestuff. Experience in patent work desirable but not essential. Location Ontario. Apply to file No. 4033-V.

ENGINEERS REQUIRED with experience in heating and plumbing by consulting engineering firm in Montreal. Apply to file No. 4031-V.

SENIOR INDUSTRIAL ENGINEER required to supervise manufacturing methods and standards. The location is approximately 16 miles east of downtown Toronto. Salary open. Apply to file No. 4029-V.

SALES ENGINEER preferably chemical or mechanical as representative in Montreal and vicinity on exclusive commission basis. The man we require must be experienced in industrial applications as he will be required to call on chemical, food and other processing industries. This is a real opportunity as the commission rate is good, equipment is top quality, and the successful applicant will be given the opportunity of acquiring an interest in the company after proving his worth. Apply to file No. 4028-V.

MECHANICAL AND ELECTRICAL ENGINEERS required by newly formed organization in Canada, with some knowledge of heating and ventilating installations. Location Montreal. Apply to file No. 4027-V.

REFRIGERATION ENGINEER required in Montreal to do design and development work on ice cream cabinets, refrigerated merchandising equipment. Preferably graduate from Canadian University 1950 or 1951. Practical experience in commercial refrigeration possibly through summer work would be advantageous as a supplement to a theoretical knowledge of refrigeration. Age under 30 years. Applicant should have initiative and perseverance, should be interested in engineering as a profession rather than as an immediate key to an administrative position. Salary open. Apply to file No. 4026-V.

MECHANICAL OR ELECTRICAL ENGINEER to supervise the erection and assembly of gas equipment supplied only to industrial organizations in Montreal and area. Apply to file No. 4039-V.

ENGINEER REQUIRED to act as assistant purchasing agent for manufacturer of engineering supplies, located in Province of Quebec. General duties consisting of preparation of engineering quotations, sales correspondence and purchasing of equipment. Preferably bilingual but not essential. Apply to file No. 4038-V.

MINING OR METALLURGICAL ENGINEER required by Canadian organization with experience in iron (Magnetite). Possibilities for advancement are of the highest order. Apply to file No. 4037-V.

These advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMICAL ENGINEER required for research department of organization in Quebec. Recent graduate or experienced engineer for work on existing processes and original development. Apply to File No. 4006-V.

CIVIL

EXECUTIVE ASSISTANT, Dominion - Provincial board, Fraser River Basin, headquarters Victoria, B.C. Applications will be made in writing accompanied by appropriate references and mailed to Mr. Geo. J. Alexander, Secretary, Deputy Minister of Fisheries, Parliament Bldgs., Victoria. Must be graduate civil engineer eligible for registration in B.C. and one who has had experience along hydraulic lines and capable of supervising hydraulic studies and other investigations throughout the watershed. Technical knowledge and administrative experience essential. Starting salary $4,800.00 per year. Apply to File No. 3083-V.

ELECTRICAL

ELECTRICAL ENGINEERS with experience in electronics and radar for positions in Ottawa. Salaries open. Apply to File No. 1588-V.

THE PUBLIC SERVICE OF CANADA REQUIRES electrical engineers (electronics and communications), appointments at Ottawa, Toronto and Montreal. Salaries up to $4,740.00 per annum. Details and application forms may be obtained by writing C.S. Comm., Ottawa, Competition No. 50-158-B. Apply to File No. 2016-V.

SENIOR ELECTRICAL ENGINEER who can actually head up electrical design work on a hydroelectric project, required by consulting engineering firm in B.C. Apply to File No. 3069-V.

ELECTRICAL ENGINEER required in Montreal by manufacturer. Applicant should have some experience with electrical contractor. For estimating and general engineering duties. Apply to File No. 3077-V.

MONTREAL ELECTRONICS MANUFACTURER has vacancy for an electronics engineer for design development and field testing of television receivers. Should have at least two years experience in television engineering. Apply to File No. 3079-V.

ELECTRICAL DRAUGHTSMAN required by western Ontario chemical industry. Applicant should have thorough knowledge of explosion proof Class 1, Group D installations, powerhouse control wiring, synchronous motor installations substation layouts and underground distribution systems. Senior man with 5-10 years experience sought, capable of preparing detailed drawings, bills of material from sketches prepared by electrical engineer. In addition, drawings of existing installatoins have to be brought up to date. Permanent position. Apply to File No. 3080-V.

ELECTRICAL ENGINEER required in Montreal for the installation of equipment in new plant. Some previous experience necessary. Age 25 to 35 years. Apply to File No. 3085-V.

ELECTRONICS ENGINEER with about 5 years experience in circuit design and graduate electrical engineer for position of electronic circuits design draughtsman, preferably with experience. Position with manufacturer in Ottawa. Apply to File No. 3098-V.

RADIO ENGINEER, senior design engineer with 8 to 10 years experience in low, medium and high frequency communication, transmitter design. Must be capable of heading a section and have the qualities necessary for advancement. Starting salary $6,000.00 per year. Location Montreal. Also Junior Radio Engineer with 3 to 5 years experience in electronics design. Apply to File No. 4010-V.

ELECTRICAL ENGINEER required in Province of Quebec with a minimum of four or five years experience in supervising an electricians crew in an industrial plant. Applicant must have a proven record of success in industrial electrical maintenance. Salary open. Preference will be given to a man with pulp and paper experience. Apply to File No. 3091-V.

YOUNG ELECTRICAL OR MECHANICAL engineers required by electrical manufacturer located in Montreal for plant in Ontario. Apply to File No. 4002-V.

WELL QUALIFIED ELECTRICAL engineer to act as supervisor of underground distribution by a Canadian utility in Brazil for planning underground distribution systems and allied substations; standardizing present practices, special studies. Prefer 7 to 10 years experience. Quote File No. 13771. Apply to File No. 4014-V.

ELECTRICAL ENGINEERS with testcourse experience are required for specification writing, comparison of tenders, supervision of accepance tests, liaison with manufacturers and checking drawings. Possibility of going to Brazil in six months to two years. Quote File No. 14110. Apply to File No. 4014-V.

CHIEF OF SYSTEM PLANNING well qualified electrical engineer is required by a Canadian utility in Brazil for long range planning of generating, transmission and receiver facilities; supervision of distribution, relay protection, carrier current, research and standards department, forecasting capital expenditures. Prefer 7 to 15 years experience. Quote File No. 13737. Apply to File No. 4014-V.

THREE ELECRICAL ENGINEERS required by large organization in Montreal for specialized sales work in power apparatus. Applicants should have about 5 years experience partly or completely in test room or power house work. Salary commensurate with experience. Apply to File No. 4015-V.

MECHANICAL

MECHANICAL ENGINEER required by organization in Montreal. Applicant should have had experience in production planning and the design and application of mechanical equipment to production operations. Duties will include research and the development of mechanical equipment for one of the primary industries. Preferably single and free to travel. Apply to File No. 3020-V.

MECHANICAL ENGINEER required with several years' experience in a responsible position concerned with the maintenance and operation of large hydroelectric plants having reaction turbines. Applicants should be preferably graduate mechanical engineers and must be acquainted with the theory of strength of materials, fatigue phenomena and modern metallurgy with special reference to the alloy steels used in hydroelectric turbines. Location Rio de Janeiro, Brazil. Applicant must be willing to learn Portuguese and adapt himself to foreign living conditions. Age 30 to 40 years. Apply to File No. 3082-V.

GRADUATE MECHANICAL ENGINEER for position of structural and components design draughtsman, preferably with experience, also draughtsman for mechanical electromechanical and circuits layout with at least 2 years experience. Apply to File No. 3098-V.

TWENTY MECHANICAL Engineers, senior and junior, are required to work in Montreal office on, design of special machines, design of heating and air conditioning systems. Must have college degree or equivalent background. Some practical experience in either field is desirable. Apply to File No. 4008-V.

YOUNG ENGINEER preferably mechanical required for Montreal sales office of Toronto manufacturer. Apply to File No. 4018-V.

MECHANICAL ENGINEER required for Toronto sales office of large manufacturing firm in Montreal. Training period in Montreal. Good opportunity offered. Apply to File No. 4020-V.

MINING

MINING ENGINEER, recent graduate required by organization in Province of Quebec. Apply to File No. 3097-V.

MISCELLANEOUS

CIVIL OR MECHANICAL ENGINEER required by paper industry located in Ontario. Applicant should have design and practical experience, preferably 5 or 6 years in pulp and paper mill. Apply to File No. 2083-V.

RESIDENT ENGINEERS AND INSTRUMENTMEN required for work on the construction of the Quebec North Shore and Labrador Railway. Applicants should have some experience on highway work. Good working conditions. Salaries open. Apply to File No. 2086-V.

MECHANICAL OR AUTOMOTIVE ENGINEER with complete technical and practical training on modern automotive equipment prefer drawing office experience and a background in body design engine testing and tuning, repair testing and calibration of electrical units, diesel engine maintenance and modern automatic transmissions, such as dynaflow, vacuomatic and hydromatic. The position would be with a large Canadian Company in Rio de Janiero, Brazil, and the applicant would be dealing with 900 assorted vehicles, principally of American origin. Apply to file No. 3032-V.

TRANSFORMER DESIGNER required for new plant being built at St. Johns, Que. Applicant should have several years experience in the design of distribution and power transformers to Canadian Standards. A responsible and secure position is offered with wide scope of advancement both personally and in the design field. Salary open. Give full details of education and experience. Apply to File No. 3059-V.

CHIEF INSPECTOR REQUIRED by large oil refinery located in Montreal area. Applicant must be a graduate engineer and should have minimum of five years applicable experience in inspection and maintenance of refinery operating equipment. Duties would consist of scheduling and supervision of inspection policy, corrosion investigations, welding procedure, etc. Pension, accidents and sickness benefits provided. Excellent opportunity for ambitious man with executive ability in a rapidly expanding company. Salary open. Apply to File No. 3066-V.

MECHANICAL AND SENIOR ELECTRICAL engineers required by consulting firm in Montreal with experience in electronics. Salaries open. Apply to File No. 3070-V.

ENGINEERS required by municipality in Ontario. Applicants should have experience in structural design, sewer design or sewer construction. Salaries open. Apply to File No. 3072-V.

CHEMICAL OR MECHANICAL ENGINEER to act as buyer in chemical organization in Ontario. Duties to

CITY OF PORT ARTHUR

Applications for Position of City Engineer

1. Applications for the position of City Engineer will be received by the undersigned up to 5 p.m., 30th September, 1951.
2. Applications must be accompanied by a certificate of health from a duly qualified physician and the written recommendations from three responsible persons as to character and fitness of the applicant for the position to be filled.
3. Application to state age, marital status, educational qualifications, experience and service in armed forces, if applicable.
4. Salary dependent on municipal experience with minimum of $6,000.00 per annum.

ARTHUR H. EVANS,
City Clerk.

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assist in supervision of department and to do buying of technical equipment. Some experience in practical buying and expediting. Salary open. Apply to File No. 3073-V.

ENGINEER REQUIRED by large oil company in Montreal. Applicant should have some experience in the design of piping with a certain amount of administration office experience and field inspection work. Apply to File No. 3074-V.

TWO SALES ENGINEERS required. One English speaking to be located in Central Ontario, preferably in the general Toronto area. Applicant should be preferably an airforce veteran or one who has had some experience with aero-engine fittings. Second engineer should be bilingual and be located in the Montreal-Quebec area. Salary, all expenses paid, prepared hospitalization, group life, weekly indemnity and surgical benefits. Qualifications: mechanical engineer, preferably married, age 30 to 35 years with some selling experience and owning a car. Apply to File No. 3075-V.

RECENT GRADUATE required by manufacturer in Winnipeg. Applicant must be interested in production planning, time and motion study etc. Work will be in connection with the setting up of a modern production programme. Training period. Salary open. Apply to File No. 3076-V.

SALES ENGINEER, preferably mechanical with some pulp and paper experience. Location Montreal. Apply to File No. 3078-V.

PLANT ENGINEER required by manufacturer of chemically blown sponge. Applicant must be capable of organizing and supervising general plant maintenance. Also a broad background in the installation and maintenance of all types of rubber processing machinery would be helpful. Location Province of Quebec. Salary open. Apply to File No. 3086-V.

MECHANICAL OR CIVIL ENGINEER required for Northern Ontario Sulphate Mill. Recent graduate would be considered. Excellent opportunities to gain experience and good prospects for promotion. Apply to File No. 3087-V.

MECHANICAL OR CIVIL ENGINEER required by pulp and paper mill in Province of Quebec. Applicant should be bilingual and have considerable experience in design. Good salary together with social benefits. Apply to File No. 3090-V.

DUST CONTROL ENGINEER for a group of Asbestos mills. Applicant should be a graduate engineer with experience in ventilation and dust control. Work will consist of investigation and development of dust control methods and equipment and co-operating with the staffs of the various mines on the installation and operating of dust control systems. Apply to File No. 3092-V.

ONE ASSISTANT STEAM PLANT SUPERINTENDENT, required for large Newfoundland paper mill. Essential requirements—1st Class British Board of Trade Marine Engineers Certificate, sound Mechanical training, experience with high pressure boilers and turbines. Age limit 45 years. Attractive salary and good working conditions. Other detailed information available on application. Apply to File No. 3094-V.

ONE ENGINEER, required for large Newfoundland paper mill, with 2nd Class British Board of Trade Marine Engineers Certificate, to supervise small steam plant and act as assistant master mechanic over mechanical shops. Must have sound mechanical training. Single man preferred. Attractive salary and good working conditions. Other detailed information available on request. Apply to File No. 3094-V.

WANTED CANADIAN AGENT with pump engineering experience, to cover manufacturer's range of accelerators, boiler feed and condensate pumps. Write Ryaland (Manchester) Limited. 71 Welcomb Street, Hulme, Manchester, 15 England. Apply to File No. 3095-V.

CHIEF OF FOREIGN WIRE RELATIONS required by Canadian Telephone Company in Brazil. Prefer about 10 years experience with a manufacturer or utility; experience in design, operation and maintenance of telephone plants including carrier systems as well as a knowledge of the fundamentals of power generation and distribution would be valuable. Practical and theoretical experience in inductive co-ordination, electrical protection and electrolysis problems as applied to telephone plants with emphasis on the methods of protecting them from lightning and low frequency induction would be desirable. Apply to File No. 3099-V.

GENERAL MANAGER required to supervise the entire operations of water, light and power Commission in Ontario. State qualifications, age, experience, references and when available. Apply to File No. 4000-V.

THREE MINING OR MECHANICAL engineers required by large mining company in Quebec, also draughtsman for layout and design work. Apply to File No. 4003-V.

1950 or 1951 Mechanical or Electrical engineers, required by construction company located in Montreal. Apply to File No. 4007-V.

A CANADIAN UNIVERSITY wishes to receive applications from engineering graduates, preferably Civil, Mechanical or Electrical, under 30 year of age to teach engineering problems and drawing. Applications should state age, university and experience. The salary offered is $1,800.00 and up for the session depending on qualifications. Apply to File No. 4009-V.

HEAT TREAT SPECIALIST required in Montreal. Aplicant should have knowledge of electric heat treating of precision machined parts. Should be capable of assisting in department layout and selection of equipment. Apply to File No. 4011-V.

ELECTRO PLATING SPECIALIST with knowledge of electro plating high grade machined parts with cadmium, zinc, copper, tin and silver. Should be capable of assisting in department layout and selection of equipment. Location Montreal. Apply to File No. 4011-V.

CANADIAN COMPANY located in Ontario urgently requires engineers to fill key positions (1) works manager (2) graduate engineer for engineering division (3) chief inspector (4) methods engineer (tool design department). Nature of work is aircraft, on jet engine work. Apply to File No. 4012-V.

PROJECT ENGINEERS 1946 to 1949 mechanical or chemical graduates, preferably with experience in chemical or allied industry. Process engineers; recent graduates in chemical engineering. Location Ontario. Apply to File No. 4013-V.

A CANADIAN UTILITY in Brazil requires a well qualified business man with utility experience to direct sales promotion, billing, tariffs, consumer research, statistics, advertising and to correlate economics data. Duties would include correlating the business activities of nine public utilities. The successful applicant will report directly to Vice-President operations. Quote File No. 13740. Apply to File No. 4014-V.

A CANADIAN UTILITY IN BRAZIL requires a rate setting engineer or a retired rate specialist to set up a retail rate department in Rio de Janeiro and Sao Paulo. The position would be permanent for an experienced engineer but would last two or three years for a retired consultant. Quote File 13513. Apply to File No. 4014-V.

TWO SENIOR ENGINEERS with experience in general and detailed layout of mill buildings, equipment and equipment layout, including processing equipment, material handling, conveying, packaging etc. Location Quebec. Apply to File No. 4017-V.

FOUR SALES ENGINEERS required by Montreal manufacturer of automatic controls and industrial instruments. Two vacancies for bilingual mechanical or electrical recent engineering graduates. Apply to File No. 4016-V.

RESEARCH SCIENTIST to conduct research and development in food packaging and packing. This will involve work independently and in co-operation with manufacturers and other agencies on suitable container materials and methods of container fabrication, and will require a knowledge of such materials as paper and paper products, plastic films, metal foils, metal cans, enamels, adhesives and inks, etc. Applicants should have a Ph.D. or M.Sc. degree in chemical engineering, organic chemistry or physical chemistry and should have some experience with the container materials. Location Ottawa. Salary open. Apply to File No. 4019-V.

Situations Wanted

CIVIL ENGINEER, B.Sc. Queen's 1948, M.A.Sc. Toronto 1949. Prof. Engineer (Ont.) Jr.E.I.C. Age 26, single. Presently employed as assistant town engineer. Have 2 years practical experience in every phase of municipal engineering. Prior to present position have been on highway surveying and construction; precise surveying and mapping, hydro-

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graphic surveying. Also experienced in reinforced concrete design, sewerage work and waterworks design. Desires position where opportunity exists for acquiring of further experience in sanitary engineering designs preferably with a consulting engineer specializing in municipal and sanitary engineering. Apply to File No. 250-W.

MECHANICAL ENGINEER, 1950 graduate in industrial option, with 14 months varied experience in large manufacturing industry desires position in production organization. Apply to File No. 1216-W.

GRADUATE ENGINEER, 8 years draughting and design, including 3 years tool design; is available on short notice for group leader; chief draughtsman of small or medium size staff; tool designer; or tool engineer. Location is not a deciding factor. Salary desired $425.00 per month. Personal interview by appointment. Experience also includes structural steel reinforced concrete, steam plant, piping, oil refiner and chemical plant. Apply to File No. 1935-W.

POSITION AS SALES PROMOTION MANAGER sought. Age 34. Competent to handle all phases of advertising; produce sales literature; write and edit; promote general publicity. Experience with firm of consultants; journalism; assistant sales development manager; manager sales office handling heavy and light equipment. Will consider position as assistant if scope not too limited and permit initiative. Also consider allied work. Apply to File No. 2670-W.

B.A.Sc. Jr.E.I.C. Honours, Toronto, 1947, desires permanent position preferably with small but expanding firm. Experienced in production and technique of rubber and thermoplastic molding and extrusion. Apply to File No. 2888-W.

CIVIL ENGINEER, B.Sc. '47, Jr.E.I.C., P. Eng. (Que.), age 26, married, with car, 3½ years varied structural experience with architects, fabricators and contractors, covering design, detailing and estimating of structural steel and concrete as well as liaison work, desires position with responsibility. Must include outside work in design and supervision, and/or liason work, or sales promotion. Available on one months' notice to present employer. Ontario or Alberta preferred. Apply to file No. 3340-W.

ELECTRICAL ENGINEER, Manitoba 1950. S.E.I.C. Age 30, married with family, airforce veteran. Experience with power utility, dyke construction, pump station constructing estimating. Presently employed in signal department of Canadian railway. Prior to war, construction and mining experience. References and detailed experiences on request. Seeks employment where hard work and initiative will lead to advancement. Apply to File No. 3375-W.

EXPERIENCED ENGINEER, A.M.I.C.E., M.E.I.C. Age 31. 14 years combined Civil Mechanical background. Design and construction in road works water supply, sewage system and large factory construction in U.K. Hydro-electric construction and investigation in U.K. and Canada. Geophysical investigation and deep well drilling and operation for water supply in N. Africa. Aircraft component design and machine shop practice in U.K. Require progressive position where experience may be utilized combined with aptitude for administration organization and production. Apply to File No. 3435-W.

ENGINEER, M.E.I.C. Age 46, married. Wide experience design, construction, operation and maintenance of plants manufacturing Kraft pulp, coal and synthesis gases and bye products, and sugar; including refractories and brick work settings, concrete structures, steelwork, tanks and vessels, piping, mechnical conveyors, boiler plant and all ancillary equipment. Resident Engineer for the past 15 years. Available from mid-August. Apply to File No. 3505-W.

MECHANICAL ENGINEER, Jr.E.I.C., civil designer, and executive. B.Sc., P.Eng., A.S.M.E., A.S.C.E. Age 28, married. Five years experience in design, estimating, administration, and supervision of engineering for pulp and paper mill, dams, hydro-electric plants and related structures, bridges, filtration plants, industrial buildings, and foundations. Previous successful record established in shipbuilding, and automobile industry, and U.S. government road construction. Ambitious, aggressive, and serious businessman seeking permanent employment in construction, industry, plant engineering, or sales; where security and scope for advancement are unlimited. Present salary $5000.00. Ontario or West Coast preferred. Apply to File No. 3517-W.

METALLURGICAL EXPERT of considerable industrial experience, age 47, married, M.E.I.C., P.Eng., with educational background covering mechanical engineering, mathematics and physics, metallurgy and metallography. A disciple and coworker of one of those European Physico Chemists who laid foundations for the modern science of metallic structure. Thoroughly versed on research level in the modern statistical control of the mass production of quality. Able to develop metallurgical iron and steel business on any scale, especially for armament purposes. Even small firm with good prospects of development are considered. Apply to File No. 3521-W.

CHEMICAL ENGINEER, 30 years old, newly arrived from Sweden. 8 years experience in laboratory research work and production control, former assistant at the Technical Universities of Stockholm and Budapest, specialist in food, fermentation, cereal and agricultural chemistry, is looking for suitable position. Married, no children. No location preference. Apply to File 3526-W.

GRADUATE CHEMICAL ENGINEER, Toronto 1950, single. Experience in methods analysis, time and motion study and cost control. Desires to gain experience in a field more closely related to chemical engineering. Production or technical sales preferred. Willing to work anywhere. Apply to File No. 3527-W.

GRADUATE ENGINEER, Jr.E.I.C. Sask. 1948. Married, one child. Seeks responsible position in an engineering capacity with good chances for advancement. with a construction company or consulting firm in Western Canada. Experience includes survey work, draughting and design of building layout, piping layout, steam plant layout, earthwork and field supervision. Currently employed as field engineer with supervisory staff. Available on one months notice. Apply to File No. 3530-W.

CHEMICAL ENGINEER Ph.D. from University of Berne, Switzerland. Age 30. Recently arrived in Canada. Extensive experience in paper industry (research and production). Desire position in pulp and paper or allied industry. Available immediately. Apply to File No. 3531-W.

BRITISH SUBJECT, mechanical engineering degree 31 years; apprenticeship (2 years), design experience (1 year), commercial engineering experience (2½ years) on modern steam power plant projects, all with largest British manufacturer of mechanical and electrical power equipment, seeks suitable position with Canadian firm. Apply to File No. 3532-W.

ELECTRICAL ENGINEER, Jr.E.I.C. western Canadian university, 1949. Age 25, will complete two year graduate apprenticeship with an electrical engineering company in England this summer, desires position as sales or outside erection engineer. Apply to File No. 3533-W.

EX R.E.M.E. OFFICER, A.M.I. Mech.E. Age 35. Arriving in Canada in November. Experience of design of mechanisms, maintenance of vehicles, contractors plant, etc., and wide knowledge of management of engineering workshops dealing with machining, assembly, forging and heat treatment. Prepared to accept offers of employment now. Apply to File No. 3534-W.

MECHANICAL ENGINEER, S.E.I.C. University of Saskatchewan, 1950. Age 25. Naval Veteran. Experience includes automotive mechanics, pipefitting, heating system design and installation, design and draughting office since graduation. Interested in all mechanical fields, especially automotive and implement manufacture, pulp and paper industry, diesel and gas turbine design and steam generating plants. Willing to undertake training programme. Available on short notice. Apply to File No. 3536-W.

MECHANICAL ENGINEER, Queen's 1950, S.E.I.C., Member C.P.P.A. Desires employment in British Columbia preferably in pulp and paper industry. Veteran, age 33, married, 1½ years experience in general engineering office of pulp and paper company, 3 years on highway surveys. Presently employed, available September 30th. Apply to File No. 3537-W.

CIVIL ENGINEER, Jr.E.I.C. Toronto 1949. Presently employed in Ontario at good salary in responsible position. Desires association with responsible engineering firm operating in Br. Columbia or British Isles. Experience one summer U.K. one year Canada on heavy construction (steam power plants); one year present position in charge of initiating, designing, and manufacturing new reinforced concrete structural units. 3 years underground mining prior to war; ex pilot R.C.A.F. Married, one child. Age 31. Apply to File 3538-W.

PRODUCTION MANAGER (A.M.I.P.E.) of a medium sized engineering company in England is contemplating immigrating to Canada and wishes to offer his services to a progressive company who require a works or production manager in light, medium or heavy engineering. Industrial career:— apprenticeship, tool room foreman aero & motor works, machine shop superintendent aero and motor works, production manager of light engineering works (1,250 employees). Age 38 years. Married, Scot. Apply to File No. 3539-W.

GRADUATE ENGINEER: Jr.E.I.C., N.S.T.C., 1949. Married. Age 27—with qualifications and experience to handle position as workshops superintendent. Experience in production control, employing and interviewing personnel. Presently employed as workshops supervisor and as production engineer for a small assembly plant. Desires position where experience may be beneficial for administration and production duties. Apply to File No. 3547-W.

GRADUATE STRUCTURAL ENGINEER, M.E.I.C., A.M.I. Struct.E. with 10 years experience (about a year in Canada) in design and erection of reinforced concrete, steel and timber structures, well experienced in prestressed concrete design and construction, capable of supervising a team work. Would accept a position of Senior Designer. Apply to File No. 3552-W.

PART TIME WORK: Graduate Civil Engineer, B.A.Sc., S.E.I.C. desires to obtain part time work (evgs. and Sat.) drafting and detailing in Toronto. Some experience in reinforced concrete and steel design. Apply to File No. 3553-W.

ELECTRICAL ENGINEER, Jr.E.I.C., P.Eng., experienced at draughting, designing and estimating power and lighting layouts, substations, control schemes, etc., now fully employed, desires part-time work in Montreal area for evenings and week-ends. Apply to File No. 3554-W.

CIVIL ENGINEER B.Sc. V. of S. 1950 Jr.E.I.C. Age 32, Married. Veteran, presently employed as Resident Engineer on highway construction work. 12 years experience in all phases of survey work and 5 years as resident engineer. The latter position entails full charge of surveying, designing and construction of the 2 or more highway projects placed under my control. The position also demands considerable administrative ability. Desires permanent position with organization in which hard, good work and initiative leads to advancement. Wishes to get away from position which entails too much travelling. Would like to settle in one locality. Apply to File No. 3555-W.

CHEMICAL ENGINEER, British subject, 25 years old, B.Sc. (Chemical Engineer) A.C.G.I., 2 years experience Chemical and petroleum refinery development. Capable, and hard-working. Has served in Armed Forces. Apply to File No. 3560-W.

MECHANICAL ENGINEER, McGill, aged 31, Canadian, with capital, is interested in representing or becoming dealer for Canadian or English company to work in either Canada or Mexico. Has full working rights in Mexico, many business contacts and speaks and writes Spanish fluently. Apply to File No. 3561-W.

ELECTRICAL ENGINEER S.E.I.C. Age 31, single. Graduate of the University of Manitoba 1951. Experience in house service wiring, and topographical survey. Done some line tracing and mapping. Presently employed in hydro plant. Will be prepared to leave any time after October 1st. Would prefer work as designer or maintenance engineer in an electrical firm. Apply to File No. 3562-W.

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ABSTRACT

INSTITUTION OF ELECTRICAL ENGINEERS

Electrolysis and Earth-Leakage Current Investigation on the Witwatersrand Electrified Section of the South African Railways: G. Williams.

The paper presents a summary of the work of the Witwatersrand Electrolysis Committee during the period 1940 to 1948.

The nature of the problem before the Committee is outlined and the manner in which the investigation was made, results of selected cases being presented as representative of the general conditions in the area. Details are given of the precautionary measures to be taken on sections now being electrified.

The conclusion is reached that the earth in the area is not a conductor of practical value and should be regarded as an insulating medium containing occasional conducting areas and fissures, and as a result, earth connections do not form points of equal potential nor serve any useful purpose in the transfer of load or fault currents.

At no point has it been possible to accept any potential as representing the potential of the general body of earth, and potential measurements between rail and earth, rail and water pipes and between points on the rail, do not give any reliable guide to the probability or otherwise of leakage currents, and regulations based upon potential measurements have no practical application.

It appears that leakage current from the rails is not likely to be transferred from rails to buried structures via the earth except in very few areas and over short distances only.

The conclusion is reached that currents of large magnitude are transferred from the traction negative system to buried conductors by direct metallic contact at substations and where cables, water pipes, etc., and the traction negative are both in contact with buildings, bridges, etc.

It is considered that whilst direct leakage through the earth is of secondary importance, insulation between the electrification mast footings and foundation bolts is necessary because of the difficulty of accurately locating conducting areas and buried conductors, and to permit direct bonding of masts and rails in order to ensure that differences of potential do not exist between them.

It is recommended that negative busbars at substations should not be connected to earth or buried conductors, and that supporting steelwork, protective screens, etc., should be bonded to the common return formed by the rail system and be kept insulated from earth and buried conductors.

The recommendation is made that buried conductors should be made electrically discontinuous by the use of insulating joints where this is practicable, or alternatively, that buried conductors be well served in the relatively few low resistivity areas.

Partial back filling of trenches with sand should afford good protection.

BOOK NOTES

Prepared by the Library of
The Engineering Institute of Canada

Electric Circuits for Engineers. E. K. Kraybill. Toronto, Macmillan, 1951. 212 pp., illus., $3.85.

In this book a broad picture of steady-state electric circuit theory is presented by the logical combination of a.c. and d.c. relationships into an integrated and unified whole. Special features are a correlation of electric phenomena with related phenomena in the general scientific field; use of standard terminology, definitions and symbols; and use of actual values in the problems. A working knowledge of elementary differential and integral calculus and physics are essential.

Electroplating for the Metallurgist, Engineer and Chemist. J. B. Mohler. New York, Chemical Pub. Co., 1951. 257 pp., illus., $5.00 U.S.

Opening with the fundamentals of electroplating, and the mechanism of electro-deposition, this volume then considers all types of electroplating baths, and various methods of plating. More attention is given to detail on fundamentals than is normally required for an experienced plater or electro-chemist, but a general knowledge of science is essential.

Any trained metallurgist, engineer or chemist with a good background in science will find this book of value. Bibliographical references are included with some chapters. Appendices include instruments used in electroplating, and their use, and a glossary of terms. The book is also well indexed.

Eyes in Industry: a Comprehensive Book on Eyesight, Written for Industrial Workers. D. A. Campbell and others. Toronto, Longman, 1951. 234 pp., illus., $6.00.

The eyes are a part of our physical constitution, which are very much taken for granted, but which, perhaps, when injured, cause more immediate panic on the part both of the injured and of the by-stander, than any other emergency: likewise amateur tampering with eye injuries can cause untold and sometimes irreparable damage.

EYES IN INDUSTRY is divided into 3 main parts, namely, Eyesight and Work; Usual hazards in industry and their prevention; and, Special aspects of industrial eye injuries and the psychology of sight. Appendices cover first aid treatment, schedules of illumination, industrial visual standards, and certificates of blindness.

The book is written in a clear, methodical and easily read style. Excellent colour photographs of various types of eye injuries and infections are included for easy identification; bibliographical references are listed for parts 2 and 3, and the book is well indexed.

How to estimate: being the analysis of builders' prices. J. T. Rea. 11th ed. rev. London, Batsford; Toronto, Clarke Irwin, 1951. 716 pp., illus., $4.25.

In this eleventh revised edition of HOW TO ESTIMATE, most of the revision has

been done in the first three chapters, that is those dealing with actual costs, primary building and labour. These are now based on figures compiled in September, 1950, and percentage increases include each successive year from 1936-37 to that date.

All types of workers are included from bricklayers and masons, to tilers and thatchers, smiths and bell-hangers.

Tables, memoranda, and a most varied collection of technical data, both throughout the text, and in the appendix, make this an invaluable handbook for anyone engaged in any sort of building costs or estimating.

International Bibliography on Atomic Energy, Vol. 2: Scientific Aspects. Atomic energy commission group, department of security council affairs, United Nations. New York, United Nations, Toronto, Ryerson, 1951. $10.00 U.S.

This volume does not constitute an all-inclusive bibliography of the literature on atomic energy; however, the 24,000 articles listed represent a comprehensive coverage of the literature in nuclear science for the past 25 years. The coverage for the years 1948 and 1949, for obvious reasons, is less inclusive than for the period from 1925 to 1947. Since the volume is intended largely for technically trained persons, popular accounts have generally been omitted. The articles are arranged in alphabetical order of authors, and are grouped under broad subject-headings such as artificial radioactivity, engineering studies, etc. The volume contains a list of authors and a list of journals used.

Kempe's Engineers' Yearbook for 1950 - 1951. 56th ed., 2 Vols. B. W. Pendred, reviser. London, Morgan Bros., 1950. V. 1, 1467 pp., V. 2, 1448 pp., 66/6.

To old users of Kempe's yearbook, this 1951 edition will present a change in arrangement of information and of material.

There are no sections and part numbers in these new volumes, arrangement is logical according to subjects and related subjects, and the whole is thoroughly indexed with 100 pages of index at the end of volume 2.

In the Descriptive section preceding this index, material follows the same order of subject as that followed in the main body of the book.

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Non-members may consult the library, but may not borrow material.

Any annoyance or inconvenience caused by the new arrangement will quickly be dispelled if one bears in mind that the regular use of the comprehensive index makes quick reference much easier and more satisfactory than it has ever been before.

Methods of Operations Research. P. M. Morse and G. E. Kimball. New York, Wiley, 1951. 158 pp., $4.00.

The meaning of the above title is "a scientific method of providing executive departments with a quantitative basis for decisions regarding the operations under their control", otherwise known as weapons system evaluation, or operations analysis or evaluation; the operation research worker is the consultant to the user of equipment.

Besides providing a clear explanation of the science, METHODS OF OPERATIONS RESEARCH explains its boundaries of usefulness, the tools to be used, its successful application to military problems, and a detailed discussion of an organizations research group itself.

The whole volume is a compilation by a number of specialists on the subject and should be of interest to all engineers in any executive or managing capacity.

National fire codes. 5 volumes. V. 1 — **Flammable liquids, gases, chemicals and explosives.** V. 2 — **Dust explosions.** V. 3 — **Building construction and equipment.** V. 4 — **Extinguishing and alarm equipment.** V. 5 — **National electrical code.** National Fire Protection Association. Boston, the association, 1948-1951. illus. Prices: V. 1, $4.00; V. 2, $3.00; V. 3, $4.00; V. 4, $3.00; V. 5, $4.00.

With the increase of interest in fire protection, the Library is now adding all the National Fire Codes publications of the NFPA to its collection, and we will continue to receive all future ones as they are published.

Each volume is an assembly under one cover of all the standards pertaining to the subject of that particular volume, and each volume is indexed.

VOLUME 1, 1948, deals with FLAMMABLE LIQUIDS, GASES, CHEMICALS AND EXPLOSIVES.

VOLUME 2, 1950, is THE PREVENTION OF DUST EXPLOSIONS, and includes appendices on Static Electricity, Explosion venting, Record of dust explosions in the U.S., and Directory of Manufacturers of products which relate specifically to the prevention and control of dust explosion hazards.

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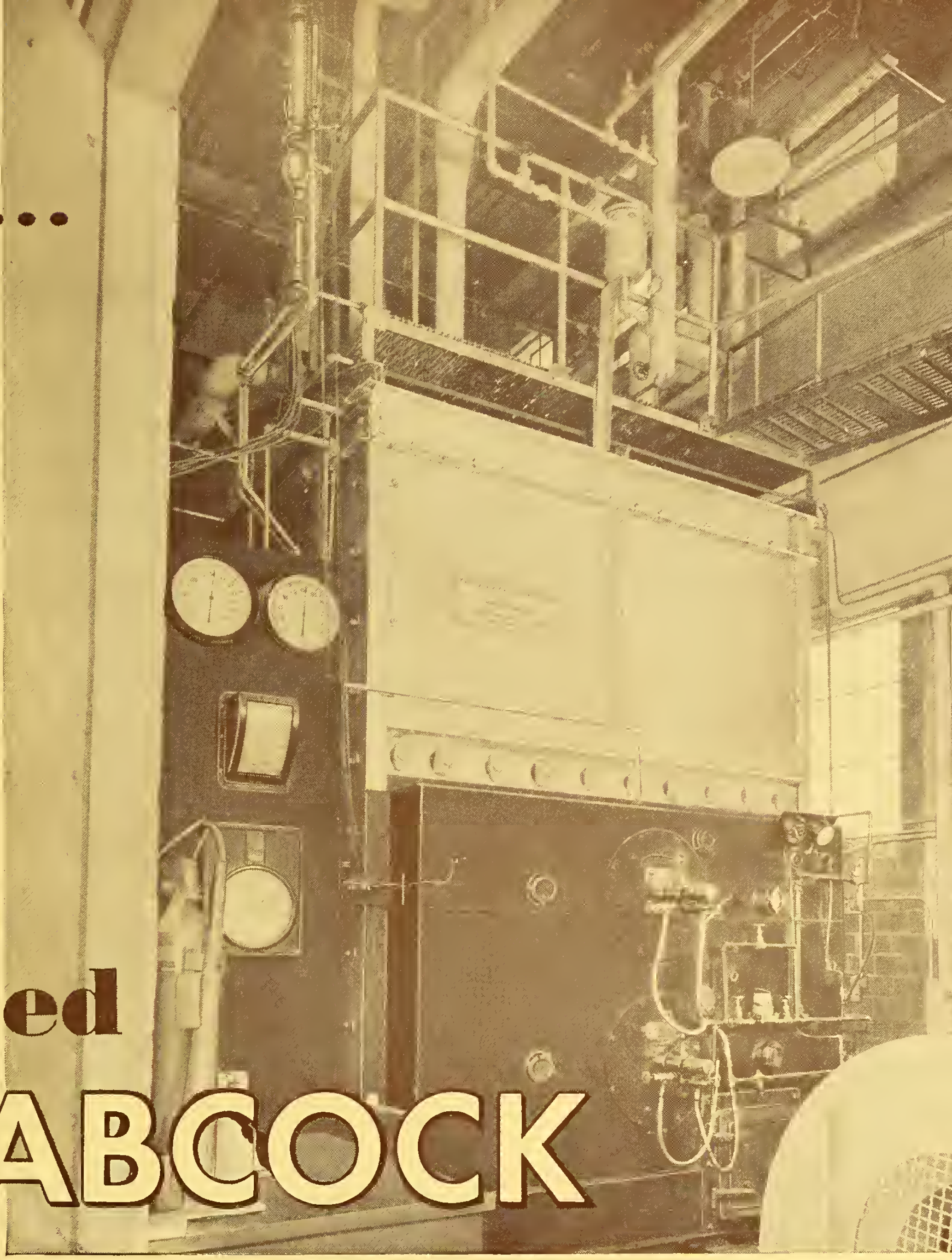

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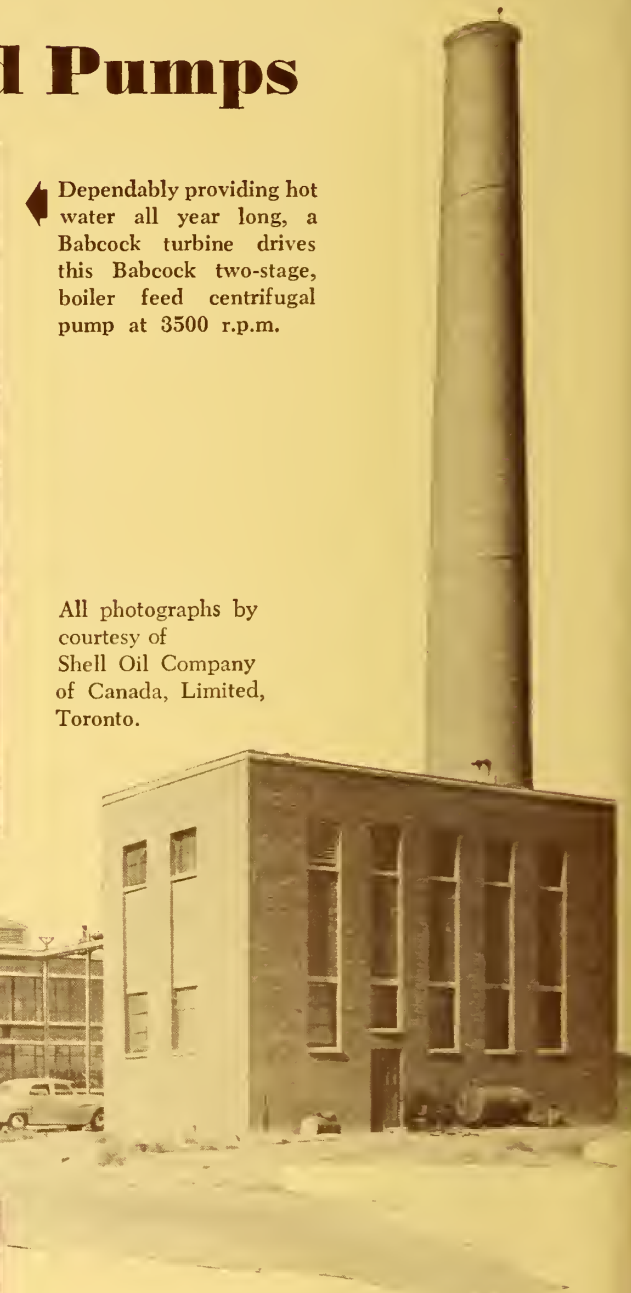

This Vee-belt driven Babcock two-stage centrifugal pump working at 3500 r.p.m. assures adequate feed water at low cost.

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VOLUME 3, BUILDING AND CONSTRUCTION EQUIPMENT covers, Life safety from fire, Restricting spread of fire, Chimneys and smoke pipes, Building equipment, Building details, Occupancy standards, Construction operations, Fire tests, and Historical standards. There are 2 indices, one by subject, and one by standard number.

VOLUME 4, EXTINGUISHING AND ALARM EQUIPMENT deals with, Water supply, Extinguishing and alarm systems of all types, and Employee organization, and a last miscellaneous chapter has special information for protection from fires involving Metal mines, Nitrocellulose motion picture film, Pyroxylin plastic, etc., and is also indexed by subject and number.

VOLUME 5, NATIONAL ELECTRICAL CODE deals with all types of electrical lighting and wiring equipment, and construction specifications. Tables, diagrams and examples form the 38-page final chapter, and appended are excerpts from many applicable NFPA codes. Index to Volume 5 is by subject.

Silicate Melt Equilibria. Wilhelm Eitel. New Brunswick, New Jersey, Rutgers university press, c1951. 159 pp., illus., $5.00.

This book is divided in four parts: binary, ternary, quaternary and polynary system, roughly half of it being devoted to the ternary. Non-equilibria as well as equilibria are discussed, the author's concern being to show the various anomalies resulting from undercooling, deficient reaction through coating formation of crystal zones, etc. There are many illustrations, as well as many examples from systems already worked out experimentally.

Space - Time - Matter. Hermann Weyl. New York, Dover, 1951. (First American printing of the fourth edition of 1922). 330 pp., $3.95.

Relativity theory as expounded in this book deals with the space-time aspect of classical physics. Thus the book's contents are comparatively little affected by the stormy development of quantum physics during the last three decades. This is not an elementary or over-simplified survey for the layman; it is rather intended for those who are already familiar with the methods and manipulations required for an understanding of the Einstein theories.

Synchronous Machines: Theory and Performance. Charles Concordia. New York, Wiley, c1951. 224 pp., illus., $5.50.

The present work develops the fundamental circuit theory of the transient performance of synchronous machines. This theory is currently used by engineers directly concerned with the prediction of machine performance. The general equations developed in this book are applied to the calculation of: 1) transient short-circuit currents and torques; 2) steady-state power, torque, and current, both in synchronous operation and during starting; 3) voltage disturbances occasioned by sudden application of load.

Tableaux, Abaques et Calculs Pratiques Relatifs aux engrenages. G. Henriot. Paris, Dunod, 1951. 166 pp., illus., 1450 fr.

This is a compilation of tables, curves and practical calculations concerning gears. These will enable the technician to solve quickly and surely most problems concerning gears and gear trains. The present work is intended for designers. However, it is claimed that workshop technicians and even skilled workers could find it useful. It is a complement to "Traité théorique et pratique des engrenages", by the same author, and also available from our Library.

Voltage Regulator Manual. R. J. Everest. Toronto, Macmillan, 1951. 185 pp., illus., $3.25.

This book provides a full explanation of the construction, operating principles and servicing of the voltage regulators used in automobiles. It shows the function of every element and circuit in the voltage regulator and in the battery and generator to which it is connected. Each of the major makes of voltage regulators is described in detail. Trouble symptoms and their possible causes are studied, procedures for testing and making adjustments being given in each case. The correct use of test equipment is emphasized, particular attention being paid to the adjustment of critical gaps.

Water treatment: for industrial and other uses. Eskell Nordell. New York, Reinhold, 1951. 526 pp., illus., $10.00.

A number of impurities of varying types may be found in water. These may be broadly classified as: dissolved mineral matter, dissolved gases, turbidity and sediment, colour and organic matter, tastes and odours, and micro-organisms.

Whether or not these impurities are harmful for industrial purposes depends on the nature and amount of impurities present, the uses to which the water will be put, and the tolerances for various impurities for each use.

The author of this volume covers the types of waters and their impurities, and processes and equipment used in conditioning the water.

Bibliographies are included with each chapter, and there is an appendix section containing forty-three tables of conversion factors and equivalents, three curves for making calculations, and an index.

STANDARDS

British Standards. British Standards Institution, 24/28 Victoria street, Westminster, London, S.W.1. British Standards are available from the Canadian Standards Association, National Research Building, Ottawa, Canada.

B.S. 57:1951—B.A. Screws, Bolts, Nuts and Plain Washers. 3/–.

General dimensions for all the common types of B.A. screws, bolts and nuts in sizes O.B.A. to 16 B.A. are included and the ranges of nominal sizes given in the tables are classified as "Preferred", "Second choice" and "Not normally stocked". General requirements in respect of material, screw threads and finish are given and dimensions are specified for 2 types of washers.

B.S. 494:1950 — Cold Drawn Seamless Mild Steel Boiler and Superheater Tubes for Design Steam Temperatures not Exceeding 850°F. (454°C). 2/–.

B.S. 512:1950 — Hot Finished Seamless Mild Steel Boiler and Superheater Tubes for Design Steam Temperatures not Exceeding 850°F. (454°C). 2/–.

B.S. 1652:1950 — Seamless half-percent molybdenum steel boiler and superheater tubes for design steam temperatures not exceeding 1000°F. (510°C). 2/–.

B.S. 1653:1950 — Seamless chromium-molybdenum steel boiler and superheater tubes for design steam temperatures not exceeding 1000°F. (538°C.). 2/–.

B.S. 1654:1950 — Electrically welded mild steel boiler and superheater tubes for design steam temperatures not exceeding 850°F. (454°C.). 2/–.

In the above standards, the processes of manufacture of the material from which the tubes shall be made are specified and the tensile limits are given with elongations varying with thickness of tubes and form of test piece. Flattening, expanding and hydraulic tests are also stipulated, together with permissible variations of thickness and diameter.

B.S. 561:1951 — Alternating-Current Line Relays Double Element 3-Position for Railway Signalling. 2/–.

The standard applies to alternating-current line relays of the 2-element, 3-position induction type, for use on railway signalling circuits not exceeding 250 volts. Requirements are laid down in respect of mounting, mechanical clearances, bearings, coils, contact capacity, contact pressure, contact resistance, flexible connections, terminals and terminal markings, etc.

B.S. 959:1950 — Internal Micrometers (including stick micrometers). 2/–.

This present revised edition has been prepared to include requirements for micrometers of the type intended for longer lengths of internal measurement and commonly known as stick micrometers. Notes on the method of testing internal micrometers are included in an appendix.

B.S. 1133, Section 17:1950 — Packaging Code. 2/6.

The present extension of the Packaging Code covers wicker and veneer baskets. It gives descriptions of the methods of weaving baskets and hampers made from willow or cane and of the construction of veneer baskets and punnets. Perhaps the most fascinating feature of this section is the definitions which, among other things, include references to baskets used for champagne and Stilton cheese.

B.S. 1671:1951 — Domestic Electric Kettles. 2/–.

B.S. 1732:1951 — Domestic Electric Irons. 2/–.

B.S. 1645:1951 — Domestic Electric Vacuum Cleaners. 2/–.

These standards cover operations on voltages exceeding 30 volts A.C. or 50 volts D.C. but not exceeding 250 volts A.C. or D.C. The aim of the specifications is primarily to ensure that the design and construction of the appliances are such as to afford adequate protection to the user, and in this respect the specifications correspond to the safety specifications which are in force in many other countries.

B.S. 1678:1950 — Cold Drawn Electrically Welded Mild Steel Boiler and Superheater Tubes, for Design Steam Temperatures not Exceeding 850°F. (454°C.). 2/–.

The standard provides for tubes manufactured from mild steel strip, resistance welded continuously by the passage of an electric current across the abutting edges. The steel strip shall be either hot or cold rolled and made from steel produced by the open hearth or electric processes. Tensile limits of 20 to 28 tons per sq. in. are specified.

B.S. 1712:1951 — Cast Iron Economisers with Extended Surface Horizontal tubes. 2/–.

This standard relates to cast iron economisers having extended surface horizontal tubes fitted with flanges and having a maximum water design pressure of up to and including 650 lb/sq. in. (gauge). It is concerned solely with non-steaming cast iron economisers. Requirements are layed down for materials, workmanship, construction, installation, inspection, etc.

B.S. 1718:1951 — Tolerances for Steel Drop Forgings and Upset Forgings. 2/6.

Tolerances are given in tabular form and are designed to cover the general range of forgings of average form in all ordinary specifications. Drop forgings are dealt with under thickness, width and length, draft, fillet and male edge radii, and quantity.

B.S. 1725:1951 — Thermodynamic Properties of Refrigerants. 10/6.

Tables of thermodynamic properties are given for the following refrigerants: ammonia, sulphur dioxide, carbon dioxide, methyl chloride and dichlorodifluoromethane. Tables of the properties of saturated vapour and superheated vapour for each of the above refrigerants are included in this standard.

B.S. 1726:1951 — Guide to the Method of Specifying Helical Compression Springs. 4/–.

This British Standard applies to the following classes of helical compression springs: hot coiled springs, hardened and tempered after coiling; cold coiled springs, not hardened and tempered after coiling; cold coiled springs, hardened and tempered after coiling. The main purpose of this standard is to clarify the specification of a spring by the designer, so that the manufacturer and the inspector will give him exactly what he requires.

B.S. 1727:1951 — Motors for Battery-operated Vehicles. 3/–.

The present publication covers the classification, rating and methods of test for D.C. electric motors forming part of the equipment of battery-operated road vehicles, industrial trucks and tractors, but does not apply to rail vehicles. The specification gives details of types of motor, temperature tests, overspeed tests, commutation tests, high voltage tests, efficiency, characteristic curves and performance and type tests.

B.S. 1735:1951 — Flanged Cast Iron Gate Valves Classes 125 and 250 for the Petroleum Industry. 5/–.

This covers flanged cast iron gate valves with either wedge gates or double disk gates and having either outside screw-and-yoke rising stems or inside screw non-rising stems, the seat rings being either separate or an integral part of the body wedge or disks. It includes provisions relating to design and manufacture, materials, workmanship, marking, tests, inspection, despatch, and guarantee.

P.D. 854:1950 — Safety Recommendations for the Use, Care and Maintenance of Chain and Chain Slings. 1/–.

This Display Sheet provides information to users of chain and chain slings, in standardized form suitable for posting in factories or workshops where chains and chain slings are in use, as required by Section 23 of the Factories Act, 1937.

The following is a list of British Standards which are Draft Copies for comment only. They may be consulted by members who may be interested in commenting on their pre-publication content, or making suggestions to the British Standards Institution.

CP (B) 975:1950 — Hydrant systems. 2/–.

CP (B) 982:1950 — Board and sheet coverings (external). 10/–.

CP (B) 984:1950 — Walls and partitions (blocks and slabs). 9/–.

CP (B) 986:1950 — Timber coverings (internal), cork slab coverings (internal) and rigid infillings for framed partitions. 5/–.

CP (B) 990:1950 — Loading. 4/–.

CP (B) 1000:1951 — Installation of optical projection equipment in educational establishments. 5/–.

CP (B) 1003:1951 — Sprinkler systems. 3/–.

CP (B) 1006:1951) Open fires heating stoves and cookers burning solid fuel. 7/–.

CP (B) 1009:1951 — Surface water and subsoil drainage. 2/–.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

Analysis of the Four-Bar Linkage, Its Application to the Synthesis of Mechanisms. J. A. Hrones and G. L. Nelson, New York, and Cambridge, Technology Press of Massachusetts Institute of Technology, London, Chapman, 1951. 730 pp., $15.00.

This volume is an exhaustive survey of the displacement and velocity characteristics of a four-bar linkage in the range of operation where the driving crank makes a complete revolution while the follower crank oscillates. Over 700 charts represent about 500,000 solutions covering 7,000 displacement paths with the velocity given at 72 equal intervals of drive crank angle along each path. An introductory section is devoted to a general discussion of the four-bar linkage and to an explanation of the use of the charts. The volume is very large, being about double the size of an ordinary book in each dimension.

Toll Roads and the Problem of Highway Modernization. W. Owen and C. L. Dearing. Washington, D.C., Brookings Institution, 1951. 204 pp., $2.50.

Concerned with highway economies and administration, this book analyses the advantages and disadvantages of the toll road, indicates the basic defects in state and federal policy which have led to its revival, and suggests changes in public policy which are necessary to restore the effectiveness of highway management.

BOOKS RECEIVED

Architectural graphic standards for architects, engineers, decorators, builders and draftsmen, 4th ed. C. G. Ramsey and H. R. Sleeper. New York, Wiley, Montreal. Renouf, 1951. 614 pp., illus., $10.00.

Art of administration. Ordway Tead. Toronto, McGraw-Hill, c1951. 223 pp., $5.25.

British Engineers' Association: Classified handbook of members and their manufactures, 22nd ed. London, The association, 1951. 664 pp., illus.

Canadian trade index. Toronto, Canadian manufacturers' association, 1951. 1106 pp., $7.50.

Canadian income tax act, 17th ed., consolidated to adjournment of Parliament June 30, 1951. Toronto, CCH Canadian Limited, 1951. 321 pp., $2.50.

Development of supervisory personnel. W. E. Fisher. Pasadena, California, California institute of technology c1951. (Industrial relations section, Bulletin No. 20).

Diversion and utilisation of the waters of the Snowy river. Commonwealth and states Snowy river committee. Sydney, N.S.W., Institution of engineers of Australia, 1950. 66 pp., illus.

Elementary problems in engineering. H. W. Leach and G. C. Beakley. Toronto, Macmillan, c1951. 269 pp., illus., $3.50.

Executive talent: its importance and development. F. W. Pierce. Pasadena, California, California institute of technology, 1951. (Industrial relations section, Bulletin No. 19).

Introductory soil mechanics and foundations. G. B. Sowers and G. F. Sowers. Toronto, Macmillan, c1951. 284 pp., illus., $4.75.

Plan for the national capital: General report and Atlas. Ottawa, National capital planning service, 1950. 308 pp., illus.

Report on the proposed extension of irrigation in the Jordan valley. London, Sir M. MacDonald & partners, 1951. 68 pp., maps, £1. 10s. 0d.

Simplified mechanics and strength of materials. Harry Parker. New York, Wiley, c1951. 275 pp., illus., $4.00.

Snow studies in Germany. M. G. Becker. Ottawa, National research council, 1951. (Technical memorandum No. 20).

Techniques of plant maintenance 1951. New York, Clapp and Poliak inc., 1951. 223 pp., illus., $6.00. (Proceedings of the technical sessions sponsored by the American society of mechanical engineers and the Society for the advancement of management held concurrently with the 2nd Plant maintenance show, Cleveland, January 1951).

Transients in power systems. H. A. Peterson. New York, Wiley, 1951. 361 pp., illus., $6.50.

Ultrasonics. P. Vigoureux. New York, Wiley, 1951. 163 pp., illus., $4.00.

Underpinning: its practice and applications, 2nd ed. E. A. Prentis and Lazarus White. Toronto, Oxford, 1950. 374 pp., illus., $12.00.

TECHNICAL BULLETINS RECEIVED

American Concrete Institute. Standards:
No. ACI 318-51 — Building code requirements for reinforced concrete.

American Institute of Electrical Engineers. Application guides:
No. 52 — Grounding of instrument transformer secondary circuits and cases.

. . . Proposed standards:
No. 16A — Electric control apparatus for land transportation vehicles.

American Society for Testing Materials. Edgar Marburg lectures:
1950 — Chemical spectroscopy, by W. R. Brode.

American Standards Association. Standards:
No. C39.1, 1951 — Electrical indicating instruments. Panel, switchboard, and portable instruments.

Canada. National Research Council. Associate Committee on the National Building Code. Codes:
Dwelling construction for buildings housing one or two families. Minimum standards to regulate the erection and provide for the safety of buildings.

Canada. National Research Council. Associate Committee on Soil and Snow Mechanics. Technical Memoranda:
No. 19 — Proceedings of 1950 soil mechanics conference.

Central Mortgage and Housing Corporation. Economic Research Department. Mortgage Lending in Canada, annual factual summary: 1950.

Chalmers University of Technology. Transactions:
No. 105 — Experimental observation of double-stream amplification; preliminary notes, by B. N. Agdur. No. 106 — Noise measurement on a travelling wave tube, by B. N. Agdur and C. G. L. Asdal. No. 107 — Vertical recording of rain by radar, by S. K. H. Forsgren and O. F. Perers. No. 110 — Some experiments with self-propelled models of twin screw ships. The influence of longitudinal centre of buoyancy on resistance and propulsion, by Anders Lindblad. No. 112 — On the mathematical analysis of an idealized multiplex electro-magnetic machine. An introduction to the theory of electro-machinery, by Konstantin Dahr.

Institution of Electrical Engineers. Papers:
No. M 1150 — The properties of insulating materials used in instruments, by C. G. Garton. No. S 1049 — The control of hydro-electric plant, by A. C. H. Frost and W. Brittlebank.

Institution of Mechanical Engineers. Advance copies:
Steam piping for high pressures and high temperatures, by R. W. Bailey.

Iowa Engineering Experiment Station. Engineering reports:
No. 6 — The mechanism of dry friction, R. S. Sherwood.

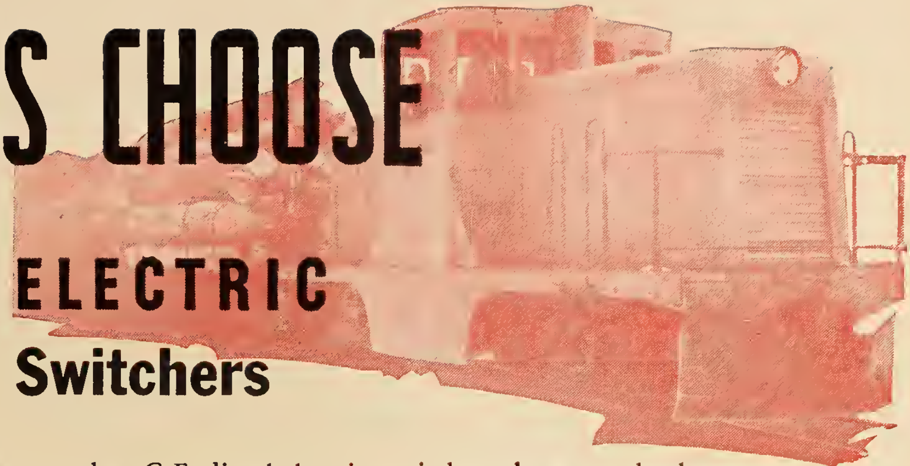
Philips' Gloeilampenfabrieken Laboratoria. Separaat:
No. 1971 — Quantitative spectrochemical analysis by means of the direct current arc; part 1, general methods, by N. W. H. Addink. No. 1973 — The degree of imperfection of crystals, by N. W. H. Addink. No. 1977 — Voltage-controlled secondary emission multipliers, by A. J. W. M. Van Overbeek. No. 1979 — On the condition determining the transition temperature of a superconductor, by K. F. Niessen. No. 1983 — A note on Kline's Bessel-function expansion, by C. J. Bouwkamp. and H. Bremmer. No. 1985 — Linear magnetostriction of homogenous nickel alloys, J. J. Went.

Philips' Research Laboratories. Reprints:
Flicker in television pictures, by J. Haantjes and F. W. de Vrijer.

U. S. Highway Research Board. Bulletins:
No. 36 — Pavement marking.

. . . Circulars:
No. 138 — Committee activity of committee on land acquisition and control of highway access and adjacent areas, department of economics, finance and administration.

CANADIANS CHOOSE GENERAL ELECTRIC Diesel-Electric Switchers



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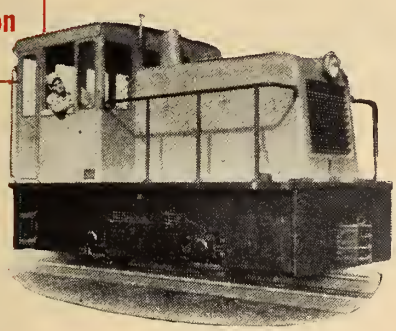
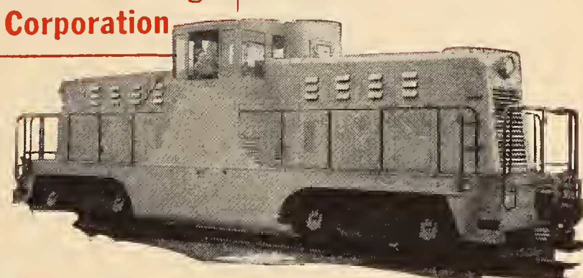
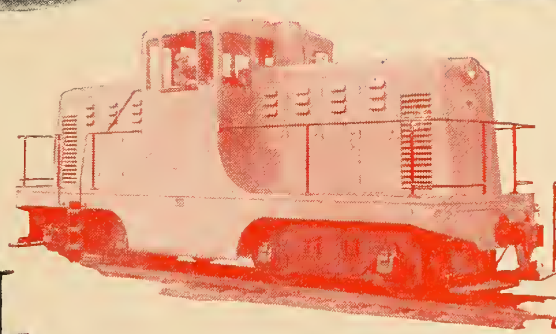


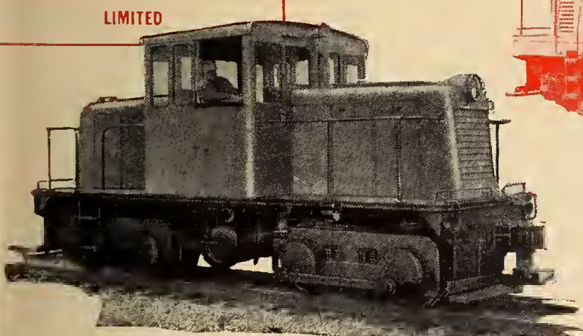
80 TON 550 h.p.
Normetal Mining Corporation





65 TON 550 h.p.
Dominion Iron and Steel Limited

45 TON 300 h.p.
Canada Cement Co.
LIMITED



50 TON 300 h.p.
Aluminum Company of Canada

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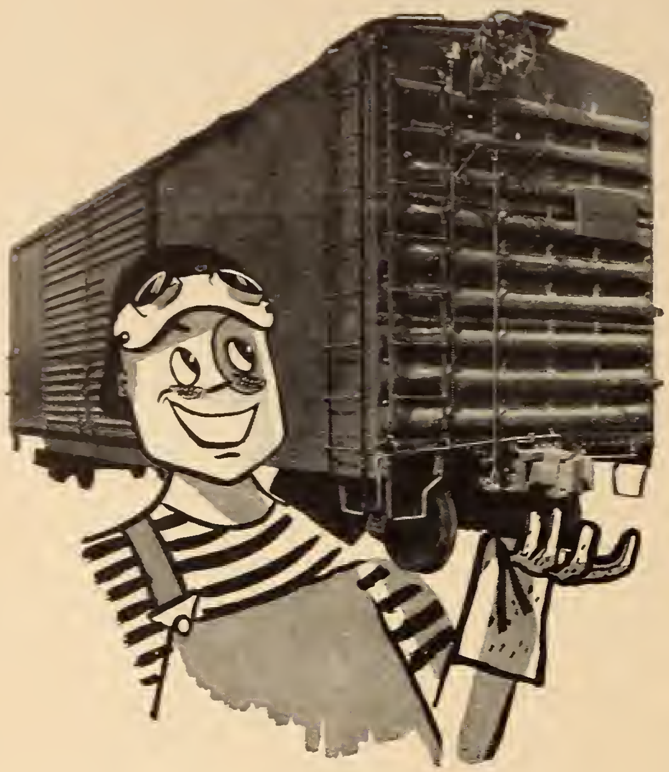

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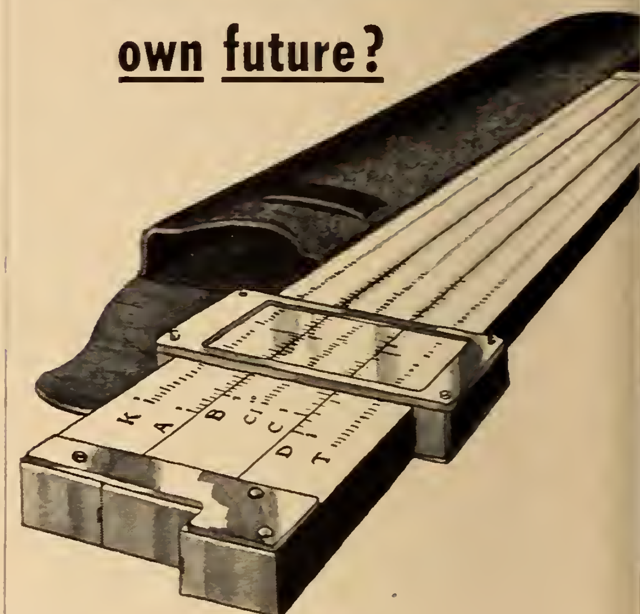

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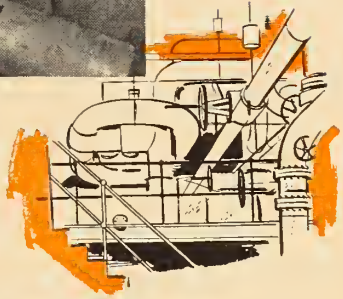

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The bending operation illustrated above is an example of Grinnell QUALITY CONTROL *in action* . . .

The tubing shown is made from a chromium alloy steel forging, turned and bored. Outside diameter is 14¾ inches: wall thickness 2⅜ inches. Temperatures of the tubing within the bending furnace were maintained and controlled within 20°F of specified temperatures. Bending was done with such skill and rapidity as to permit a temperature drop of only 100°F at the inside surface of the tubing. Maximum thinning was only .06 inch.

Designed for a central station power plant to accommodate 1500 PSI and 1050°F, this is typical of Grinnell's engineering knowledge which assures prefabricated piping of the right kind — for all types of installations no matter how complex.

QUALITY CONTROL is the result of Grinnell's 100 years of practical experience in the field of piping. Delivery of prefabricated piping sub-assemblies to exacting engineering requirements which meet all governing code requirements is assured by Grinnell Quality Control, which includes:

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E.I.C.

Technical Papers

The Institute maintains a fund for the separate publication of high-calibre original technical papers. Interest in such papers is limited to a relatively small audience of specialists in the subjects to which the papers relate, and it is not economically sound to publish them in the *Journal* which aims at the interest of some 14,000 engineers in all branches of the profession.

It is an obligation of the Institute to publish original works which contribute to the reference literature of the profession. The Technical Papers are distributed to the world's major engineering societies and technical libraries. Similarly it is an obligation of those engineers qualified to write these papers to submit them for possible inclusion in the literature. The publications committee invites authors to present such manuscripts for submission to qualified reviewers and publication if warranted. Written discussion will be accepted and published as supplements.

Technical papers issued to date are:—

No. 1—Flow in Conduits and Canals:—*French and Wood.* Comprises tables and diagrams for the solution of problems of flow in open and closed channels. Price $1.50

No. 2—A Revised Manning Flow Formula:—*Blench.* A discussion of the various hydraulic flow formulae in use or proposed. The author, formerly Director of Irrigation Research, Punjab, Pakistan, and now on the staff of the University of Alberta, concludes that the Manning formula, with modifications, is the best now available. Price $1.00

No. 3—Air Entrainment by Water in Steep Open Channels:—*Priest.* A theoretical solution of a problem of interest to hydraulic engineers. Price $1.00

No. 4—Graphical Solution of Partial Differential Equations with Engineering Applications:—*Wood.* Solution by simple, almost automatic, methods, of equations arising from the study of water hammer phenomena, impact, and other common engineering problems. This paper will be of particular value to hydraulic engineers and structural and machine designers. Price . . $3.00

No. 5—Economy in Rigid Frames:—*Monti.* Charts and diagrams to facilitate rapid preliminary design of the common types of rigid frames, eliminating the cut-and-try methods previously necessary before a final analysis could be attempted. This paper belongs in the library of every structural designer. Price $1.00

•

N.B.—Remittance with order please, payable at par in Montreal.

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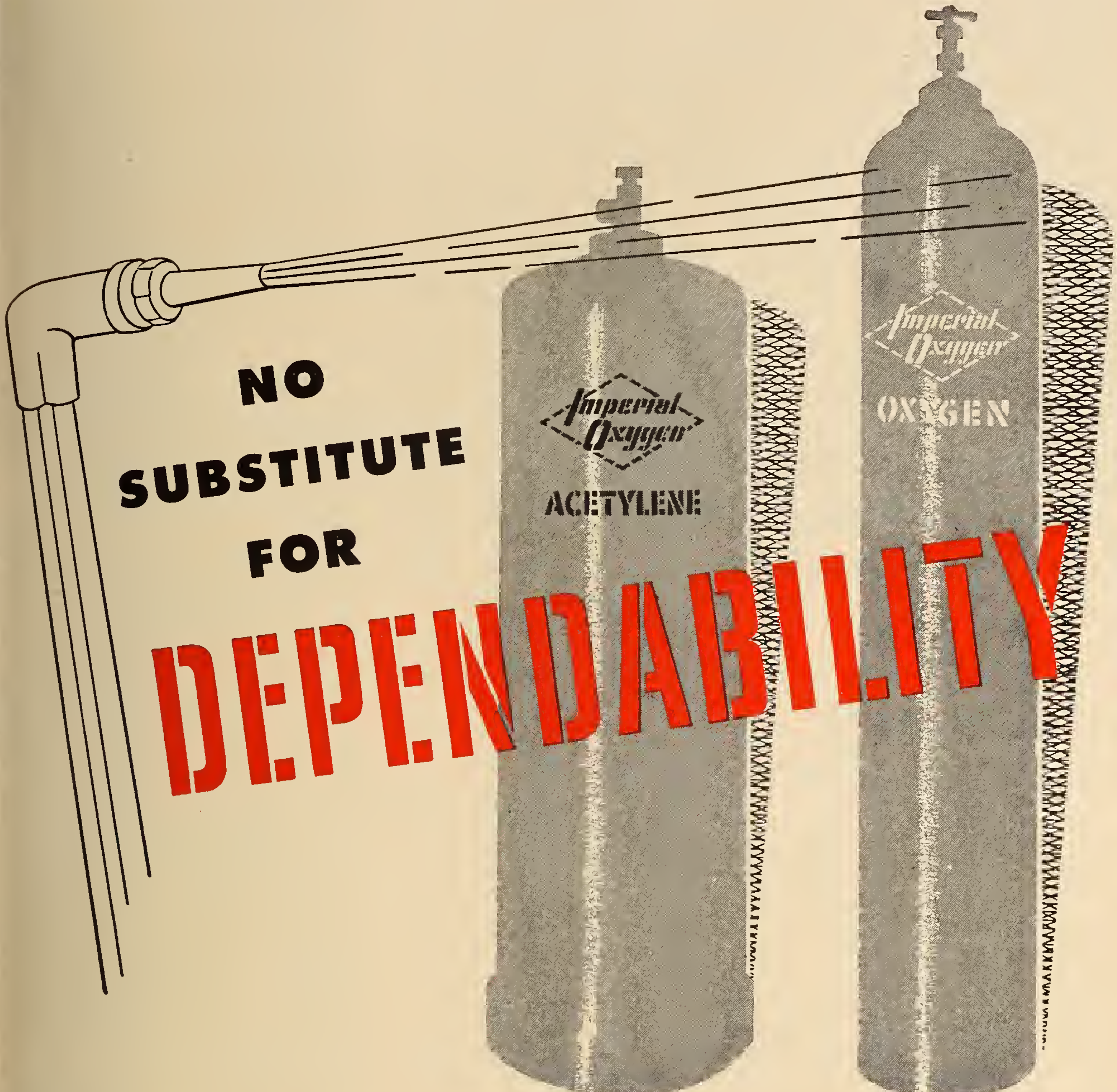

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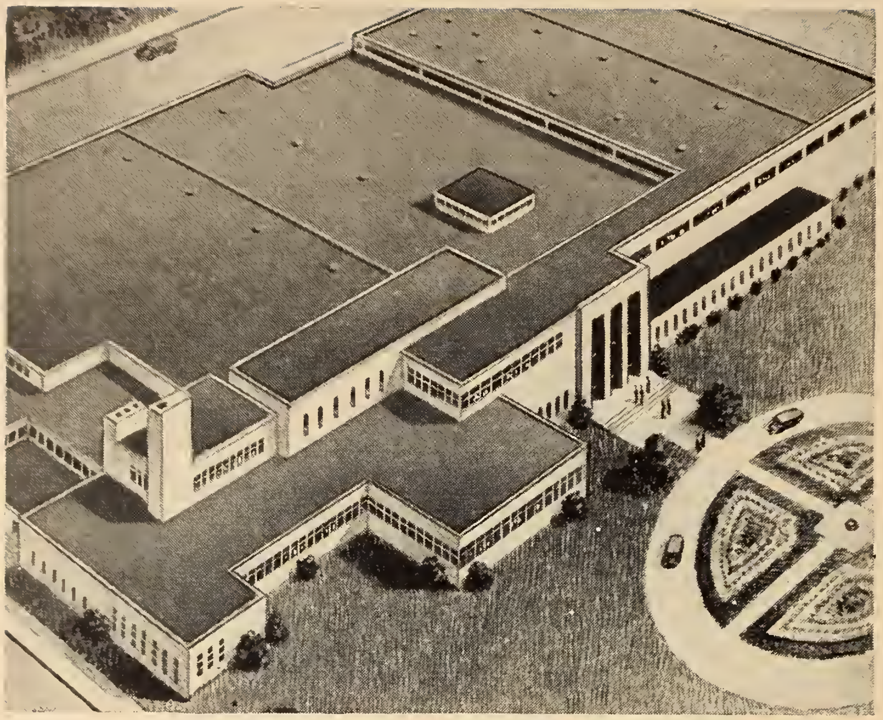

Maclean-Hunter Publishing Company Limited, Toronto.

RCA Building, Rockefeller Center, New York.

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TRANE CONVECTOR-RADIATORS

TRANE FANS

TRANE COILS

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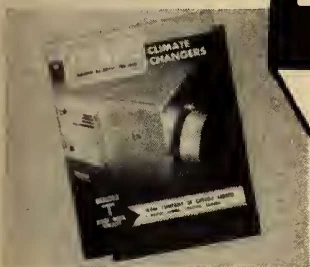

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Trane is a familiar name. For years Trane technical bulletins covering all Trane products have been available to you. Perhaps, like many another, these books have helped you to keep up-to-date on equipment and latest information in the field of heating, cooling and air conditioning. Perhaps you, too, depend on them for accurate, dependable data, simple to locate and easy to read.

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You can be sure of TRANE—confident that Trane has done everything possible to help you obtain greater satisfaction with Trane heating, cooling and air conditioning. Specify Trane with confidence.

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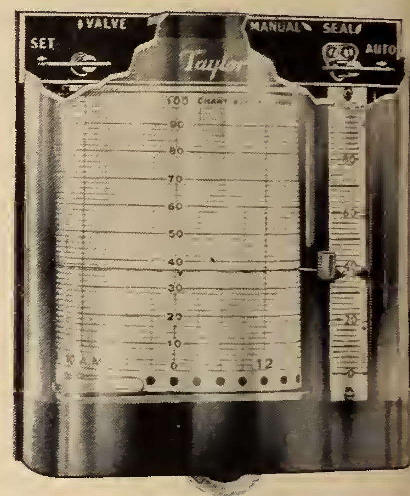
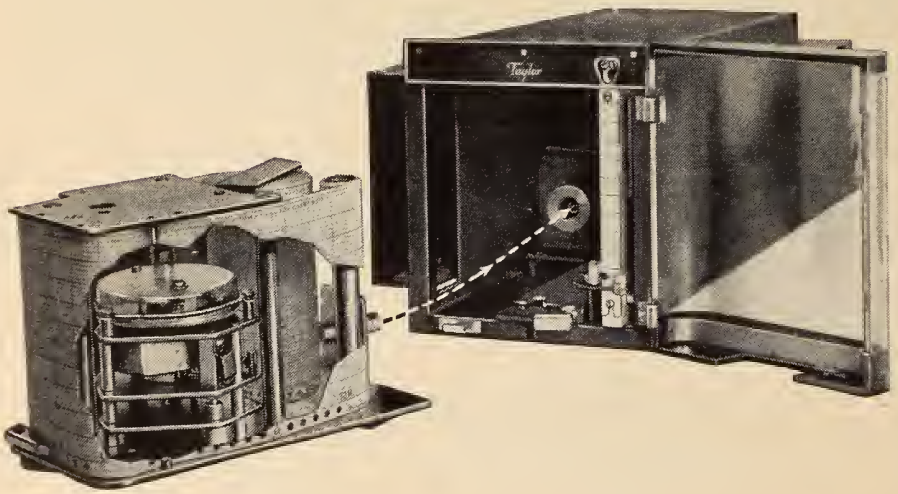
PNEUMATIC CHART DRIVE FOR HAZARDOUS ATMOSPHERES

on Taylor's TRANSET Recorder*



A 3-hour continuous record is visible on this thirty-day rectilinear strip chart. This Transet Recorder fits 4⅜″ x 5″ panel space, with automatic-manual unit, remote set point adjustment, valve position indicator—all with unmatched accuracy and dependability.



Another Taylor Hit! The air driven chart drive mechanism for the popular Transet Recorder makes all the advantages of the recorder available to installations in hazardous atmospheres. No electrical connections. The air jet turbine is geared to a self-starting escapement. The pneumatic chart drive is precision-built to give performance that equals or betters spring actuated clock mechanisms.

Accurate, Trouble-free performance is assured because the escapement mechanism is sealed in a rugged, air-tight, rust-proof housing mounted above the air jet out of the air stream.

Low Air Consumption! Only .08 scfm at 20 psi. Operates accurately even though air supply fluctuates within 15 and 35 psi.

Minor timing adjustments can be made externally, and the whole unit may be removed from the chart assembly by removing just three screws.

*Trade-Mark

Self-sealing air connection shuts off air supply automatically when chart drive is removed.

For Complete Details, send for Bulletin 98097-A.

Taylor Instrument Companies of Canada Limited, Toronto, Montreal, Winnipeg, Calgary, Vancouver.

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

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MEAN
ACCURACY FIRST
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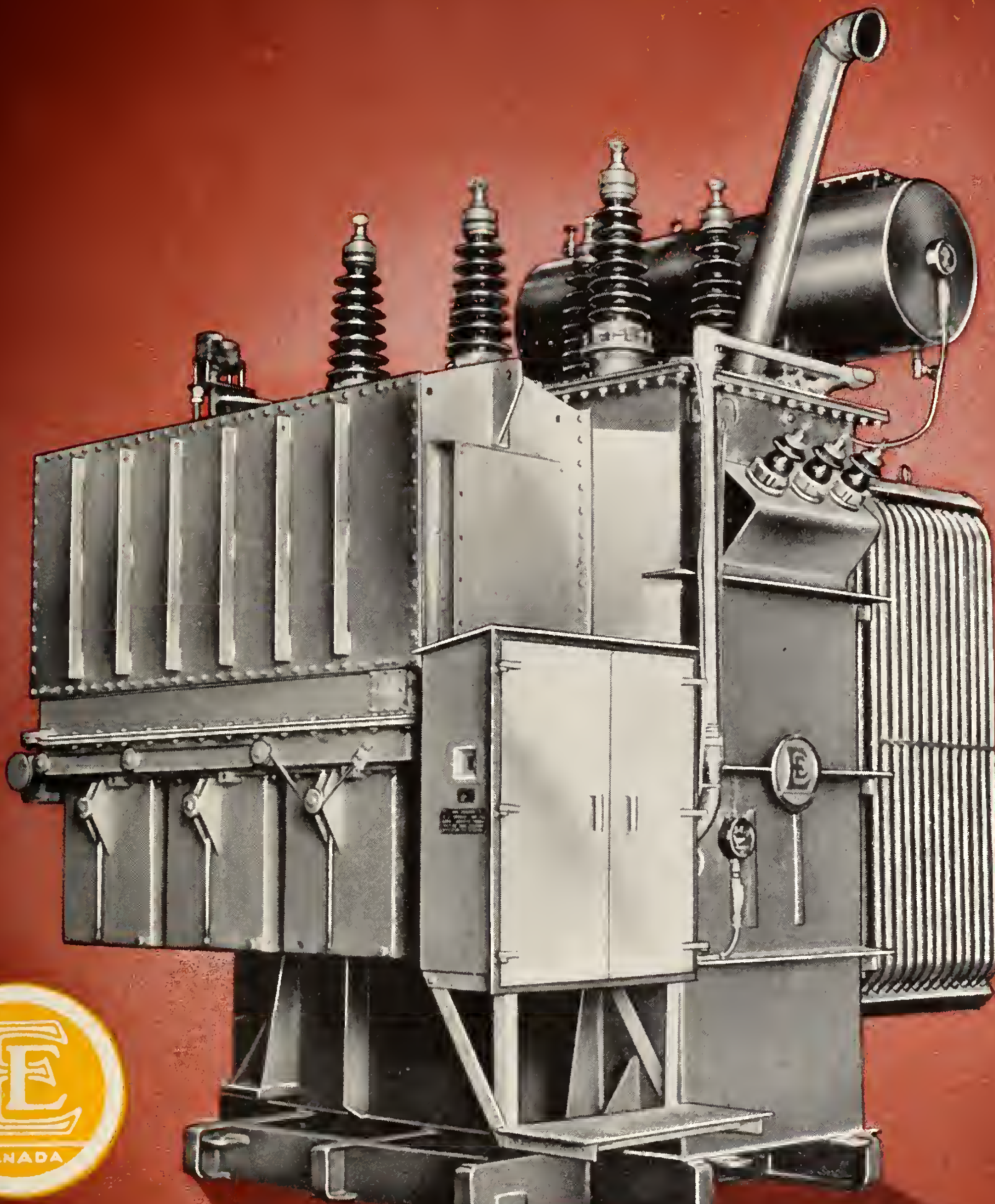


POWER TRANSFORMERS

BUSINESS & INDUSTRIAL BRIEFS

A Digest of Information

received by

The Editor

Appointments and Transfers

U. B. & J. Appointment.—Upton, Bradeen, and James Limited have been appointed exclusive distributors for the Province of Ontario—with the exception of the Greater Hamilton district—of Forklift trucks, Lodermobiles and Cranemobiles. The appointment was made by Canadian Mobile Company Limited, North Vancouver, B.C.

•

Maase Equipment Appointment. — Holman Vulcan Limited, Hamilton, Ont., has appointed Maase Equipment Co. Ltd., 2035 Aylmer St., Montreal, as distributor for the Province of Quebec of the Holman Vulcan line of compressors, pneumatic tools, and tungsten carbide bits.

•

D. F. Bowie.—D. F. Bowie of Montreal has been appointed president and general manager of the Crown-owned Canadian Overseas Telecommunications Corporation.

One of the best known Canadian authorities on overseas telecommunications, Mr. Bowie has been in charge of the Company's operations since the death, last June, of D. L. Howard who was the Corporation's former chief executive.

•

B.A. Oil Appointments.—W. K. Whiteford has been elected chairman of the board and Ole Berg, Jr., has been named president of the British American Oil Company Limited.

•

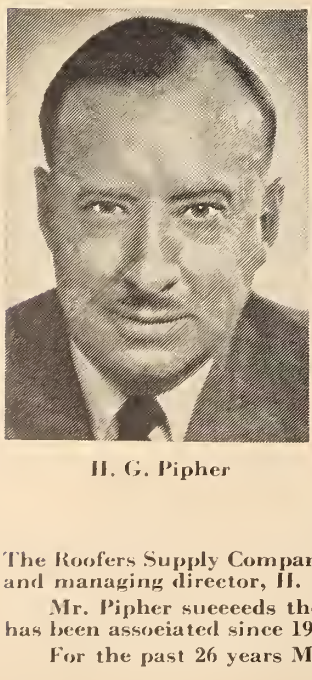
Bird-Archer Changes. — The Bird-Archer Company Limited has moved its general office and sales and technical department to Cobourg, from Montreal. The Company has maintained an establishment in Cobourg, Ont., since 1917. To further centralize operations a modern laboratory and office building have been erected at Cobourg adjacent to the Company's factory.

The Montreal sales office will continue to be located at 485 McGill Street.

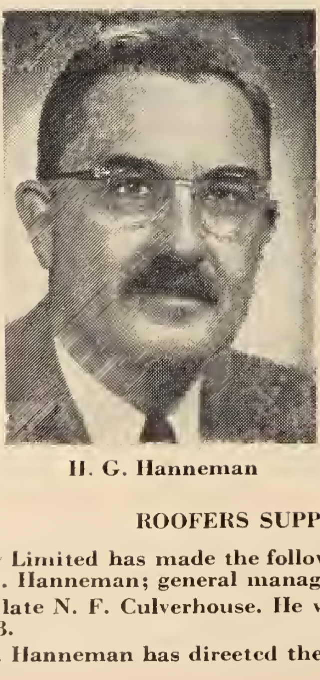
The Company has made the following appointments—Jack E. Koyl has been promoted to the position of manager of the railway service department. H. Murray Graham has been named district manager for western Canada. He will make his headquarters in Winnipeg and will be in charge of railway service work in the west. Herbert J. Hamm, for the past three years a service engineer for the company, has been promoted to the position of field engineer in the railway service department in western Canada. Roy H. Standen has been appointed to the service department and is located at London, Ont.

•

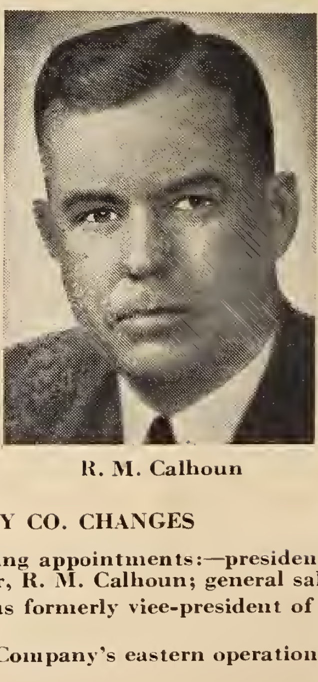
G. W. Beecroft Appointment.—G. W. Beecroft & Company, 15 St. Mary Street, Toronto 5, Ont., has been ap-



H. G. Pipher



H. G. Hanneman



R. M. Calhoun

M. A. Buell

ROOFERS SUPPLY CO. CHANGES

The Roofers Supply Company Limited has made the following appointments:—president, H. G. Pipher; vice-president and managing director, H. G. Hanneman; general manager, R. M. Calhoun; general sales manager, M. A. Buell.

Mr. Pipher succeeds the late N. F. Culverhouse. He was formerly vice-president of the Company, with which he has been associated since 1923.

For the past 26 years Mr. Hanneman has directed the Company's eastern operations from Montreal.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All Three
FIRST CLASS
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1 Every Dominion Bridge Water Tube boiler originates with a design prepared by our own combustion engineers to meet the exact needs of the particular application.
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pointed engineering and sales representatives for the Province of Ontario for Chiksan Company, Brea, California, manufacturers of ball-bearing swivel joints in aluminum, bronze, malleable iron, stainless steel, and forged steel, for pressures up to 15,000 p.s.i., and temperatures to 500 deg. F. The Beecroft Company offers descriptive literature on Chiksan and other products.

•

New Canadian Company.—The Canadian operations of Wheelco Instruments Company, Chicago, are now being handled by a new Canadian subsidiary, Wheelco Instruments of Canada, Ltd. Officers of the Canadian organization are R. A. Schoenfeld, president, Francis Beaupre, vice-president-secretary, E. J Stevenson, vice-president-treasurer.

The new Company is under the personal direction of Mr. Beaupre, and the offices are located at 601 Merton Street, Toronto 12. Mr. Beaupre has been in charge of Wheelco's Toronto district office for the past four years.

•

H. D. Cameron.—Hugh Donald Cameron has been named district controller of air services in the Department of Transport at Winnipeg. Mr. Cameron's appointment fills the vacancy created by the retirement of D. G. Joy.

•

W. D. C. Mackenzie.—W. D. C. Mackenzie has been appointed manager of Imperial Oil's western producing division. He was formerly assistant manager of the division.

•

Allen West (Canada) Changes.—Allen West (Canada) Limited, 620 Cathcart Street, Montreal, Canadian representatives of Allen West and Co. Ltd., Brighton, England, announce the following appointments:

William S. Munro, C.A., J. Wilson Craig, C.A., and C. D. Orchard have been named members of the board of directors.

Mr. Orchard has been appointed managing director. He succeeds E. R. Bonter who, at his own request, has retired after 25 years of service.

•

T. C. Clarke.—T. C. Clarke has been appointed vice-president in charge of sales of Northern Electric Company Limited. Mr. Clarke succeeds the late A. L. Brown. He was formerly general sales manager of the Company.

•

G. W. McPherson

G. W. McPherson.—Glenn W. McPher son has been appointed assistant to W C. Koerner, vice-president and manag ing director of Alaska Pine & Cellu lose Limited.

•

B.A. Shawinigan Appointments. — Three officials of Shawinigan Chemical Limited have been elected to the execu tive of B.A.-Shawinigan Limited, newly organized petrochemical com pany owned jointly by British America Oil Company Limited and Shawiniga Chemicals Limited. V. G. Bartra president of Shawinigan Chemicals president of the new Company, Dr. R. Jane, M.E.I.C., and P. W. Wright, vice president and secretary-treasurer respec tively of Shawinigan Chemicals, hav been elected to the directorate of th new B.A.-Shawinigan organization.

•

E. M. Lloyd.—E. M. Lloyd is the Can adian resident representative of Britis Insulated Callender's Cables Limite He has his headquarters in the suite o offices occupied by the Federation o British Industries, Royal Bank of Can ada Building, Toronto.

•

New Equipment and Developments

New Refrigeration Cars.—On August 21st an experiment in railway refrigeration, which may revolutionize traffic in perishable commodities, was commenced in Vancouver when forty tons of frozen fish were loaded aboard two new-type Canadian Pacific refrigerator cars for shipment to Montreal and Toronto.

Equipped with redesigned ice tanks, the cars are expected to maintain a temperature close to zero degrees F. ensuring better protection for perishables carried. Under present icing methods, temperatures from ten to twenty degrees are obtained.

•

New Westinghouse Plant.—When completed early next year the new west end plant of Canadian Westinghouse Company Limited, Longwood Road, Hamilton, will stand on more than seven miles of steel piling. To support the weight of the four storey building, 380 piles, each from 100 to 122 feet in length, have been driven into position.

They are said to be the longest steel piles ever used on a construction job in Canada. Two pile drivers, one of them the largest in Canada, have been in operation. The work was done by the Raymond Concrete Pile Company Limited of Montreal.

•

Predictions by H. M. Turner.—H. M. Turner, president of General Electric Company Limited, when addressing an audience at the automotive and electrical day luncheon at the Canadian National Exhibition, predicted that by 1960 a number of Canadian municipalities will have adopted a community wide use of household garbage disposal units in place of the present method of garbage collection. "By 1960", he said, "Canadians will have built another 750,000 housing units, with an annual building rate, by that time, of 115,000 homes or more."

•

New Minneapolis-Honeywell Office.—Minneapolis-Honeywell Regulator Company Limited has opened an office in Windsor, Ont. The new office is located at 1922 Wyandotte St. East. It is the twelfth branch office established by the Company in Canada. William Irwin, formerly with the Toronto office sales department, has been appointed manager of the Windsor office.

•

Trane Fluid Cooler.—Trane Company of Canada Limited has just completed the first fluid cooler to be built in Canada.

This type of cooler has shown increasing popularity in installations in the United States as a means of cooling liquids or gases in a closed system. Air, forced through coils by a large fan, is the cooling medium. Velocity of the air is easily regulated to summer and winter operations to compensate for seasonal changes in temperature.

Two or three liquids may be cooled. For example, the fluid cooler may be used for diesel engine cooling where the water and lubricating oil must be cooled. In addition to engine cooling, they can be used in pressure maintenance stations in the oil fields, as well as at booster stations of pipelines where cooling of compressors is required. For details of this new equipment, and for suggested uses, communicate with Trane Company of Canada Limited, 4 Mowat Ave., Toronto, Ont.

•

Microfilm Reproduction.—A modestly priced unit which provides high quality reproduction from all normal 35 mm. microfilm frames is now available in Canada through Canadian General Electric Company Limited.

All standard types of film strips and spools can be used. Handles are provided for winding spools in either direction. The film-gate, which is situated just above table level for ease of manipulation, may be rotated for reading material filmed either horizontally or vertically.

Known as the Ediswan Microfilm Reader the equipment operates on either 25 or 60 cycles and is available in two sizes. The larger models provide magnifications of 12.5 and 20 diameters, the smaller, 7.5 and 12.5 diameters. The equipment may be readily adapted for the projection of 16 mm. film frames, projection externally, and for tracing and photographic copying. For further information communicate with any C.G.E. office.

•

Vivian Engines for Defence.—The Department of National Defence has placed an order valued at one and a half million dollars with Vivian Diesel Engine Works of Vancouver—a company in which a British group of diesel engine manufacturers has the controlling interest. The equipment to be supplied consists of 33 Vivian 250 kw diesel generating sets.

•

New Flow Meter.—A new type of flow meter of functional design, giving fast and accurate response over an entire range and featuring low initial cost and maintenance, has been developed by Minneapolis-Honeywell Regulator Company.

The new meter is of the differential type, readily installed on a flow line. The meter body is mounted in a convenient location near the line, and the differential pressure lines from the orifice, or other primary element, are piped into the half-inch S.P.T. connections provided on the meter.

For electrical transmitting meters, a three-conductor cable is run between the meter body and the remotely mounted receiver. The new meter is supplied in three ranges: 53, 119.25 and 212 inches of water, and for 750 and 1,500 p.s.i. static pressure. For dry calibration the three ranges are slightly greater. For complete information communicate with Minneapolis-Honeywell Regulator Co. Limited, Leaside, Toronto, Ont.

•

Northern Electric Plant. — Northern Electric Co. Limited announces that work is progressing favourably on the new addition to its Belleville electronics plant. The extension will add a further 50,000 square feet of manufacturing space to the west side of the Sidney Street plant, making a total of 148,000 square feet. Production lines in the new section are expected to be moving by October.

•

New British Drill.—Holman-Vulcan Limited, 925 Barton Street East, Hamilton, Ontario, is a new company which has been set up to handle the sales and service of a British hand-held dust-free, dry rock drill. The *Dryductor*, as the drill is called, is based on the principle that it is better to extract the dust as it is made and not allow it to come out of the hole at all. The present model is a product of accumulated research, carried out by the parent British concern, over a period of many years.

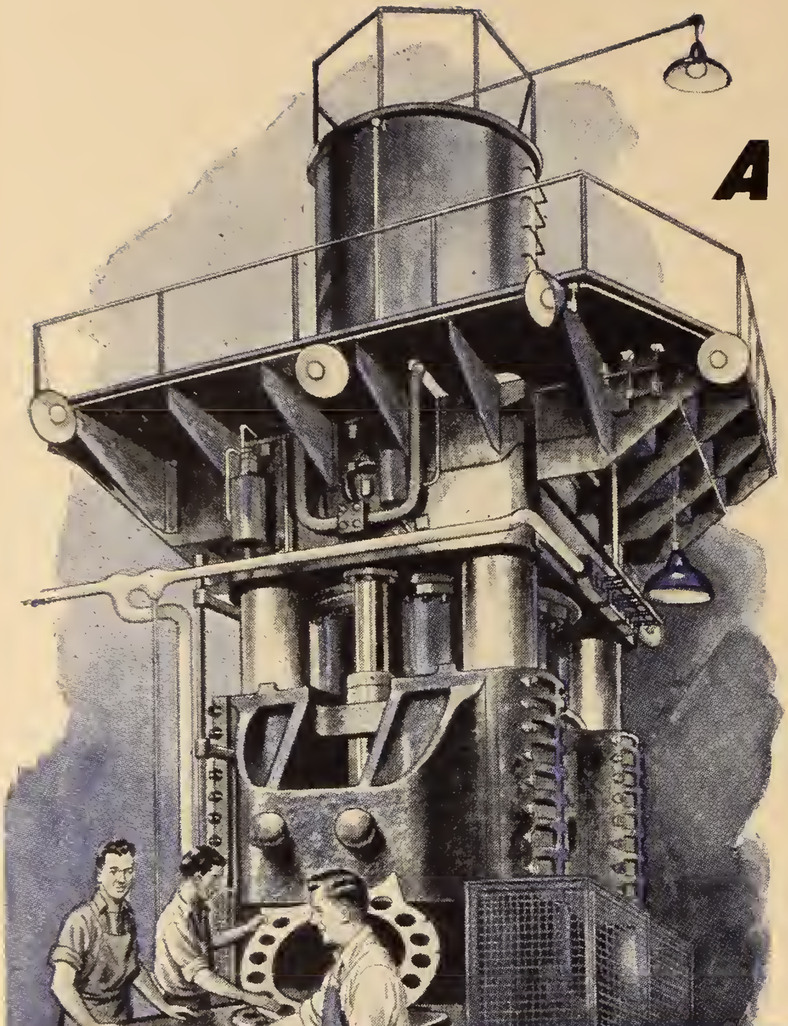
Immediate removal of dust and sludge from the hole increases the drilling speed of the machine as a new face is presented at each blow. The drill has a 2¾" bore and a stroke of 2¼". Its weight is 60 lbs. and each drill is supplied complete with 1'6" length of special educator hose. For further information, communicate with the Company at the address given above.

•

New C.I.L. Plant Laboratory.—Construction work has begun in York Township, Ontario, on a development and technical service laboratory for the paint and varnish division of Canadian Industries Limited.

The new laboratory will provide better facilities to meet the expanded demand for new and improved finishes and the technical services connected with their use. It will supplement the present laboratory located in C.I.L.'s West Toronto paint and varnish plant. The building is to be 100 feet by 58 feet, three storeys in height with a small penthouse. It was

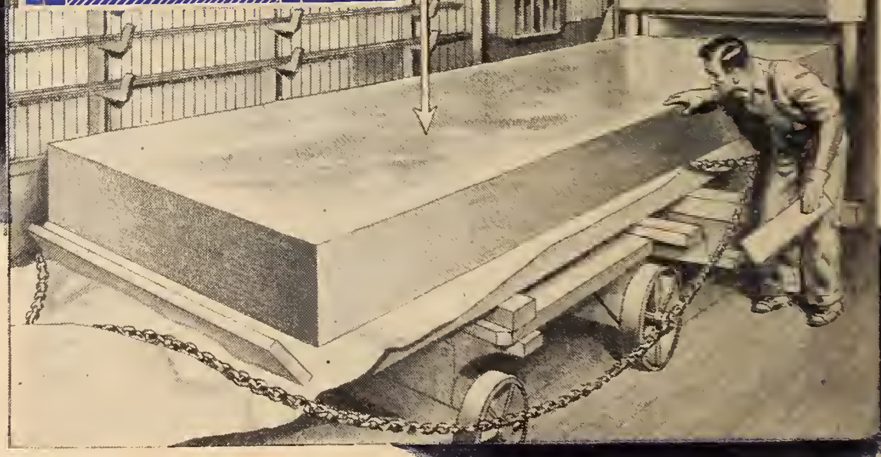
A 5000 TON Rubber Squeeze Shapes AIRCRAFT PARTS



In the press shop of AVRO Canada, Malton, Ontario, a big slab of rubber, made and formed by Goodyear, is used as a die. It plays an important role in producing accurate aircraft sections. Installed permanently in the upper moving press panel it transfers 5000 tons of pressure on impact to shape urgently needed parts. With this operation only one die is needed.

To produce a specialized rubber item of this type that weighs 3846 pounds and measures 14 feet by 50 inches and is 10½ inches thick requires a thorough knowledge of rubber's unique characteristics coupled with design and production skills. Goodyear engineers are constantly working with industry to develop molded and extruded rubber goods to fill special requirements.

Goodyear invites you to discuss your molded and industrial rubber goods problems with your nearest branch. Simply call or write Goodyear, Saint John, N.B., Quebec City, Montreal, Toronto, London, Winnipeg, Regina, Saskatoon, Calgary, Edmonton, Vancouver.



This is the largest press of its kind in Canada and can produce a variety of different shapes in one 5000 ton impact.

This 3846 pound slab of specially prepared rubber is shown about to be cured in the Goodyear steam press.

GOODYEAR

MG-5160

INDUSTRIAL RUBBER PRODUCTS ENGINEERED FOR THE JOB planned by C.I.L.'s engineering department. Construction work is being done by J. L. E. Price and Co. Ltd.

New Drying Unit.—The Patterson Foundry & Machine Company (Canada) Ltd., Toronto, has recently placed on the market a packaged drying unit for the drying of chemical products, raw materials, synthetic compounds, food products, and for use in many processes where the drying of expensive or delicate products is necessary.

The unit consists of a rotary dryer with drive, screw feeder, air heater, fan and dust collecter integrally mounted on a steel frame. This packaged construction results in a sturdily built, compact dryer assembly, economical to install and maintain.

Materials to be dried are fed continuously by means of a special feeder. To maintain optimum drying conditions the unit is equipped with a drive which permits variation of the feed rate over a range of 3 to 1, enabling the operator to meet any variation in drying characteristics of the material.

The unit is available in a number of standard sizes—2', 2'6", and 3' diameters, and in lengths from 10' to 24'.

British Exports.—Great Britain maintained her high figure of exports to Canada in 1950, as shown by a recent Ministry of Works report concerning the building trade. Exports of glass totalled $5,300,000, cement, $1,800,000, sanitary ware, $590,000, and glazed tiles, $290,000.

U.K. Farm Mechanization.—In terms of equipment per acre the United Kingdom is the most mechanized farming country in the world according to George Tomlinson, Britain's minister of education. The statement was made when Mr. Tomlinson was opening the new Agricultural Gallery at the Science Museum, South Kensington, London. He added that there are 13,000 combine harvesters and 300,000 tractors in current use on British farms.

Absorber Changer Attachment. — Tracerlab Inc., 130 High Street, Boston 10, Mass., has developed an automatic absorber changer attachment, consisting of a slide and switch assembly and a set of 25 calibrated aluminum absorbers, for use with the Company's Automatic Sample Changer.

The slide assembly mounts in the manual sample changer and allows the automatic sample changer to position the 25 absorbers over a source, thus making it possible to obtain absorption curves automatically. This is stated to be of great value in checking the purity of radioisotopes on a routine basis.

The absorbers range in value from 1.6 mg/cm^2 to 1.5 g/cm^2, are individually weighed and the weight per unit area, accurate to 0.1 per cent, is recorded in a table attached to the cover of the storage box. Absorbers are 1" in diameter by 5/16" high and are made of aluminum foil cemented in aluminum rings.

New Oil Tanks.—Installation of 10 additional crude oil storage tanks has begun at Imperial Oil's Sarnia refinery. With these tanks, and the 20 now built or nearing completion, the refinery will have a storage capacity of 4½ million barrels of Alberta crude.

The tanks will be used to store the oil over the winter months when navigation is closed and tankers can no longer move oil from the Superior, Wis., terminus of the pipe line from the Alberta oil fields.

The erection of the first 20 tanks will be completed in November and rough grading is now under way for the additional tanks. Construction of the last of the units is expected to be completed by next summer, if steel is available.

Each of the tanks has a capacity of 150,000 barrels. They are 150 feet in diameter, 48 feet high and weigh 500 tons. Contracts for erection of the additional tankage have been awarded to the same firms that built the first 20—Horton Steel Works, Limited and Toronto Iron Works Limited.

Microwave Installation at Aluminum Plants.—The Aluminum Co. of Canada Limited has just announced that microwave radio circuits will be installed at the plants of their new hydro-electric power development in the Saguenay District.

A single radio circuit will connect the four Alcan power stations located at Shipshaw, Isle Maligne, Chute-du-Diable and Chute-a-la-Savane. It will be possible to conduct simultaneously several telephone conversations, and a special circuit to Chute-du-Diable and one to Chute-a-la-Savane will be used for telemetering purposes.

All circuits will be terminated in telephone switchboards at each power house and will be operated in the same way as wire line circuits. The microwave system will provide complete protection against disturbances due to bad weather.

●

U.S. Ship Production.—Great Britain and Northern Ireland were building 39.7 per cent of merchant ships known to be under construction in the world in the three months ending June 30th, 1951. This represents a tonnage more than four times as great as that of any other country.

●

General Motors Diesel Production.—During its first year of operation, ending August 11, General Motors Diesel Limited, London, Ontario, produced 137 units totalling 177,100 horsepower.

General Motors Diesel Limited linked hands with a new Canadian frontier on its First Anniversary with the delivery of a 1,500 horsepower locomotive to the Quebec North Shore and Labrador Railway, which will service the Ungava iron ore country.

It was the first motive power built for the newly-incorporated Quebec North Shore Company. The General Purpose Diesel unit weighs nearly 125 tons. Also on the anniversary of the Diesel plant, a 3,000 horsepower multiple unit road freight locomotive for the Canadian National Railways was despatched.

●

New Avro Labour Contract.—Reduction of work hours and an increase in pay are the chief features of a new collective agreement between Avro Canada and Aeronautical Lodge 717, International Association of Machinists.

The agreement provides for a reduction of the work week from 45 to 42½ hours and for an increase of 10 cents an hour. Other changes to the last agreement include a new wage administration plan based on job evaluation, two weeks holiday with pay after one year's service, a comprehensive group insurance plan and the continuance of a cost of living bonus based on the General Motors formula. Some 4,000 employees are affected. The new agreement will run for one year.

●

Shawinigan Revenue Increase.—An increase of 20.7 per cent in gross revenues of the Shawinigan Water and Power Company during the first six months of this year, as compared with the corresponding period in 1950, was reported on August 4th by J. A. Fuller, president.

●

Concrete Cutting Saw.—Clipper Manufacturing Company, 2800 Warwick, Kansas City 8, Mo., has developed a diamond blade for cutting concrete. It is stated in information supplied by the manufacturer that it is now possible for the contractor or industrial plant to actually saw patches, trenches, or contraction joints in building floors, highways, streets, etc. These new concrete-cutting diamond blades are in addition to the 36 specifications of Clipper diamond blades especially designed for the cutting of hard-vitreous materials. The following is an extract from the information released by the manufacturer: "Concrete containing limestone aggregate can be sliced at up to 10 feet per minute when cutting at a depth of one inch. Asphalt containing the same aggregate, and cut to the same depth, can be sliced at the rate of twelve feet per minute. . . . Blades are manufactured in diameters from 8 inches to 18 inches and in thicknesses of 5/32 inch to 7/64 inch for use on any type of concrete saw."

●

Plastic Machine Tool Cover.—The South Bend Lathe Works, South Bend 22, Indiana, has available new waterproof covers for the protection of machine tools when they are not in use. These covers are not restricted to use with South Bend tools.

The covers are maroon in colour and have machine-stitched bound edges to insure sturdiness and long life. They are supplied in six sizes. For details communicate with the manufacturer.

●

Gas Turbine Blades.—The joint efforts of A. V. Roe Canada Limited and Modern Tool Works Limited, to devise a means of speeding up the production of gas turbine blades have resulted in a 14-Spindle Duplicator machine. The machine is now producing blades for the Orenda engine.

As its name implies, the basic principle of this machine is that of duplicating or tracing the contours of a master blade form simultaneously on to 14 work pieces. This is done through a hydraulic tracer system. The head, carrying the tracer stylus and 14 spindles, pivots on bearings at either end through the action of a hydraulic

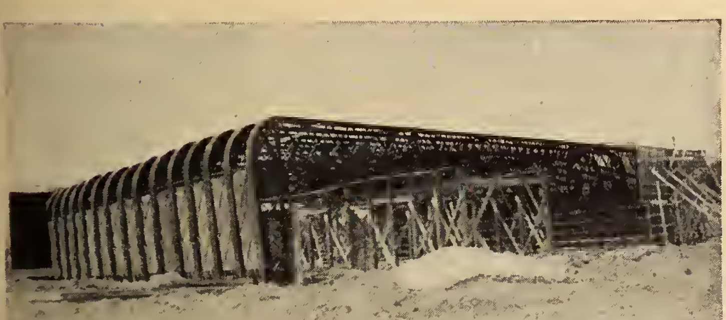
(Continued on page 940)

New plant at Hamilton for
Taylor Forge and Pipe Works of Canada, Ltd.

RIGID FRAME
WELDED CONSTRUCTION

OFFERS

- UNOBSTRUCTED FLOOR SPACE
- MORE HEADROOM
- ATTRACTIVE APPEARANCE
- REDUCED STEEL TONNAGE
- LESS ERECTION TIME



Steel structure for overpass at Intersection
of Toronto-Barrie dual highway and Toronto by-pass

Frame members are shop welded with low cost fast down-hand welding

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LACHINE CANAL LIFT BRIDGE
LOAD ON EACH BEARING-160 TO
BEARING CAPACITY-727 TO
INSTALLED 1940 — INSPECTED
Condition
Perfect

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 930*)

cylinder. The spindles themselves are driven from a common shaft by 90 degree skew bevel gears and each spindle can be removed for servicing.

The master blade and blade blanks are held by a special fixture on the work table which moves on precision bearings under the spindle head. As the spindle head pivots downwards towards the work, the stylus engages the master blade and while the spindle head continues its arc of travel the work table is actuated to and from the end mills under the exacting control of the hydraulic tracer, thus generating the desired form. Further details of the machine are available from Avro Canada, Malton, Ontario or from Canadian Patents and Developments Limited, Ottawa.

•

An Amusing Announcement.—The following letter was received by the editor. It is so different from the usual formal change of address notification that it is being reprinted in full:

We notified our customers, the water department, the telephone company, the paperboy, our ever-loving spouses, and the receptionist's boyfriends. Now, we'd like to pass the word on to your readers and our prospects.

We're no longer doing business at the old stand.

We've moved . . .

to . . .

600 Fifth Avenue
New York 20, N.Y.

If you're in the vicinity and have time, why not drop in and get acquainted. We'll be glad to meet you and to introduce you to the Silicones. They're good copy.

Very truly yours,
Dow Corning Corporation.

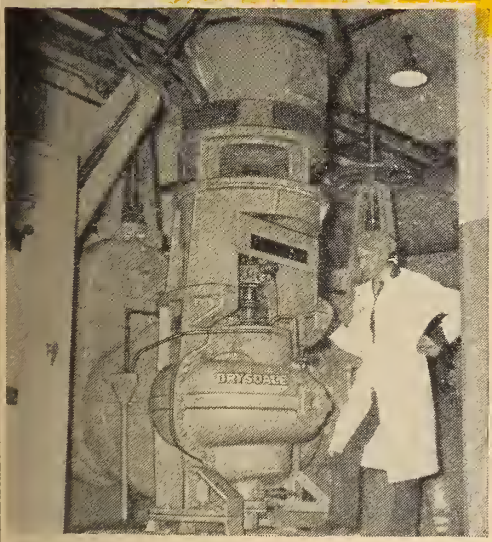
•

Canadian Trade Fair.—The following comments have been made regarding the Canadian International Trade Fair, 1951. A spokesman for the British Machine Tool Group said "We did $5,000,000 worth of business in the first few days. The whole display is entirely sold out or under such firm negotiation that sale is definitely assured. Three times the amount of business could have been done." A representative of the Israelis said "Coming back next year with more space to show a broader range of goods. Business excellent." The Germans said "Agreeably surprised, sold almost all the machinery exhibited by the middle of the second week." A Dutch commentator said "We were surprised at the volume of business. With just one or two exceptions, all 78 exhibitors from Holland are happy about the results."

Many Canadian exhibitors reported that they found new markets both at home and abroad. Buyer response was generally good in all trade classifications. A total of more than 35,000 business visitors from 53 different countries attended the show. Better than 90 per cent of the visitors were from Canada, with all provinces well represented.

•

Microwave Communication. — Under the terms of a three-way agreement signed recently by the Philco Corpn.,


DRYSDALE

Philco Corpn. of Canada Ltd., and Canadian Marconi Company, these companies will now pool their experience with respect to the microwave method of communication. Canadian Marconi Co. will manufacture and install in Canada the Philco microwave relay apparatus which has been adopted extensively in the United States. Adding to their own long experience in the manufacture, installation, and use of radio, radar, and electronic equipment, Canadian Marconi will provide Canadians with microwave communications equipment of the latest technical design. Microwave equipment is not affected by sleet, wind, or snow and at the same time is completely free from static or other electrical disturbances.

Microwave systems provide high quality circuits for telegraph, teletype, telephone, and facsimile communications. A more recent use of microwave systems in the United States has been for the low cost relay of television network programmes over long distances.

●

Aero Survey. — Aeromagnetic Surveys Limited of Toronto have commenced flying operations in connection with an airborne survey which will cover some 16,000 line miles in the southern end of the Labrador trough area for the Iron Ore Company of Canada. The equipment being used includes an airborne magnetometer and other geophysical instruments, including a newly developed airborne detection device for radioactive minerals.

●

Adhesive Reinforcing Tape. — A new reinforced felt tape with a pressure-sensitive adhesive back has just been announced by the V-Products Research Co. of Glendale, Calif. This new felt will be known as "Kling Felt". It does not require paper or other separation material between layers and as a consequence it can be applied very rapidly. Uses for this new adhesive-backed reinforced felt include rattle and squeak deadening; sealing against dust, wind, fumes and foreign materials; as a thermal insulator for vibration and shock cushioning in fragile crating and on machinery; for scratch protection and for many other protective applications.

Kling Felt is available in rolls from ¼ in. to 66 in. wide and in the following thicknesses: 1/64 in. 1/32 in, 1/16 in., ⅛ in., ¼ in. Kling Felt is also available as a cut gasket, die-cut to specifications. For further information write to J. N. Schien, Products Research Co., 5426 San Fernando Road, Glendale 3, Calif.

●

Controlled Materials Distribution. — The Department of Defence Production announced, on July 3, that arrangements have been completed which will allow Canadian manufacturers to participate on an equal footing with United States firms in the Controlled Materials Plan.

It is emphasized that the arrangements will apply only to those materials and parts imported from the United States for the production of products designated as eligible in that Country.

The Controlled Materials Plan now being introduced is similar to that used during World War II. It is based on the detailed allocation of steel, copper, and aluminum, although for the present, operations of the Controlled Materials Plan will affect few, if any, manufacturers of consumer goods, and will definitely not affect manufacturers who do not use as production materials, steel, copper, or aluminum, or components containing these materials.

Canadian importers of steel should continue to secure assistance through the Steel Division of the Department. Similarly, importers of copper and aluminum in mill forms may apply to the Non-Ferrous Metals Division.

Any other Canadian manufacturer seeking United States priority assistance on a material, or component entering into the manufacture of a product which is eligible under the United States plan, should contact the Priorities Division.

Application for assistance will be made on a new form—DDP-173. These forms may be obtained from any office of the Department of Defence Production and from a number of Canadian trade organizations.

●

Galion Iron Works in U.K. — The Galion Iron Works & Mfg. Co., Galion, Ohio, U.S.A., announces that Galion motor graders will, in the future, be manufactured in England as well as in the U.S.A. A new wholly-owned subsidiary company, Galion (Great Britain) Ltd. is located in Wakefield, Yorkshire. The new British plant will receive the full benefit of the long experience gained by the parent concern.

The first model to be placed in production in the British plant is the well-known Galion Model 118 extra-heavy-duty Motor Grader. Complete interchangeability of service parts between the British and American machines is guaranteed because, with the exception of the engine, the graders supplied by Galion (Great Britain) Ltd. will be exactly the same modern design, field-tested machines that are built in the American factory. The British model will use the Leyland 100-horsepower Diesel engine.

●

Rolling Toggle on Jaw Crusher. — Latest modification to the basic design of its "A-1" jaw crusher is the dry rolling toggle, according to an announcement by Allis-Chalmers Manufacturing Company.

Company engineers say that the new design results in reduced wear and maintenance and contributes to increased safety. Since the toggle ends roll rather than slide on the mating toggle seats, the least wear is induced.

The change from sliding to rolling action is accomplished by reversing the curvatures of the conventional toggle ends and seats and making the difference in curvatures sufficiently great so that the cotangent of the acute angle formed by the line of force and a tangent line passing through the line of contact is less than the coefficient of friction during the full angular movement of the toggle plate. A special rubber apron is provided to keep material out of the toggle seats.

The dry rolling toggle also incorporates a safety shear member on the portion between the pitman and the frame.

To assure a rolling action between mating toggle ends, a high coefficient of friction is desirable.

The "A-1" jaw crusher is especially suited to handling very hard stone and ore in sizes above 18 inch, ring size.

(*Continued on page 947*)

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investigate INCONEL

Inconel combines in a single alloy the inherent corrosion resistance, the high strength and great toughness of Nickel (the basic metal)—with the extra resistance to atmospheric and high temperature oxidation contributed by Chromium. Inconel resists scaling due to oxidation. It retains its strength and stiffness, without appreciable loss, up to 850°F. It withstands repeated heating and cooling in the range 0° to 2000°F. It is therefore widely specified for high heat applications where other metals would fail.

During the current period of metal shortages, when nickel alloys are not available for all applications, our technical staff is ready to help you with your metallurgical problems.

*Trade Marks

DEVELOPMENT & RESEARCH SECTION

THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED

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EMBLEM OF INCO INCONEL SERVICE
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Inco Nickel Alloys

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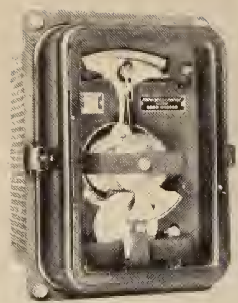
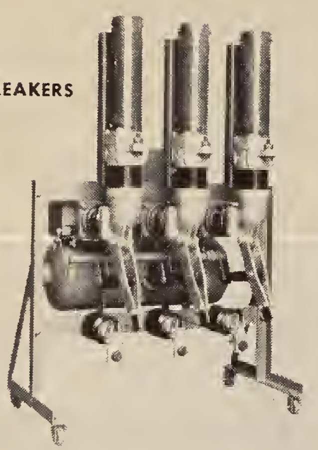
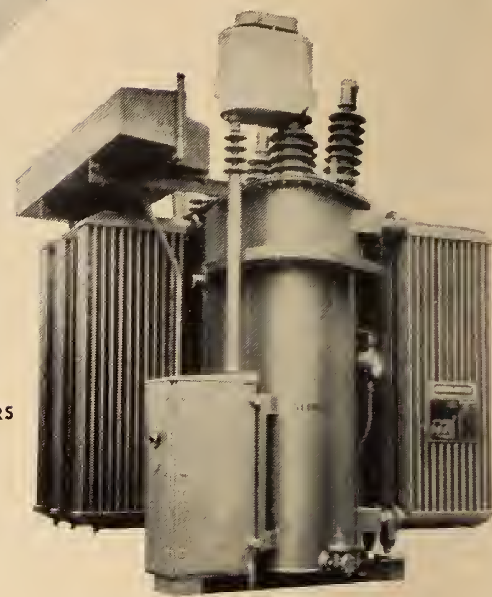


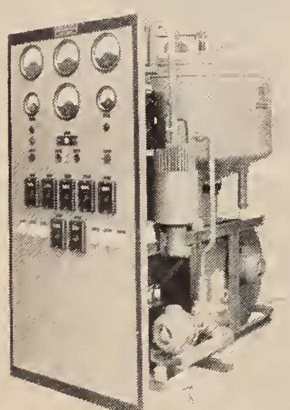
VOLTAGE REGULATORS



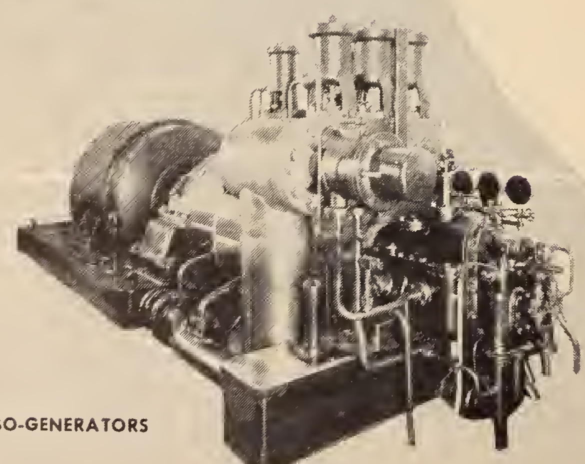
AIR-BLAST
CIRCUIT-BREAKERS



TRANSFORMERS



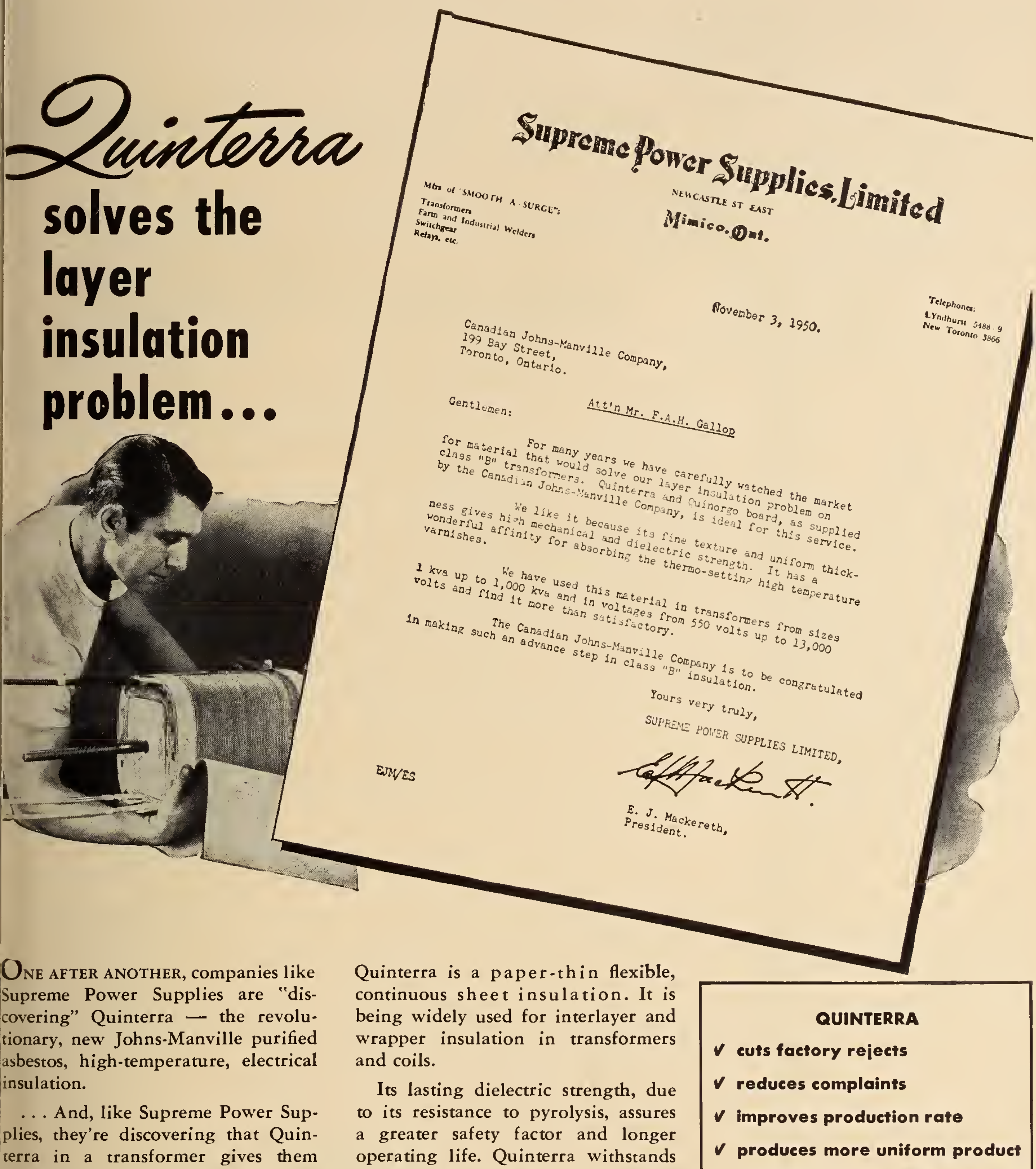
RECTIFIERS



TURBO-GENERATORS

Quinterra

solves the layer insulation problem...



Supreme Power Supplies, Limited

Mfrs of "SMOOTH A SURGE"
Transformers
Farm and Industrial Welders
Switchgear
Relays, etc.

NEWCASTLE ST EAST
Mimico, Ont.

Telephones:
LYndhurst 5488-9
New Toronto 3866

November 3, 1950.

Canadian Johns-Manville Company,
199 Bay Street,
Toronto, Ontario.

Att'n Mr. F.A.H. Gallop

Gentlemen:

For many years we have carefully watched the market for material that would solve our layer insulation problem on class "B" transformers. Quinterra and Quinorgo board, as supplied by the Canadian Johns-Manville Company, is ideal for this service.

We like it because its fine texture and uniform thickness gives high mechanical and dielectric strength. It has a wonderful affinity for absorbing the thermo-setting high temperature varnishes.

We have used this material in transformers from sizes 1 kva up to 1,000 kva and in voltages from 550 volts up to 13,000 volts and find it more than satisfactory.

The Canadian Johns-Manville Company is to be congratulated in making such an advance step in class "B" insulation.

Yours very truly,

SUPREME POWER SUPPLIES LIMITED,

E. J. Mackereth,
President.

EJM/ES

ONE AFTER ANOTHER, companies like Supreme Power Supplies are "discovering" Quinterra — the revolutionary, new Johns-Manville purified asbestos, high-temperature, electrical insulation.

. . . And, like Supreme Power Supplies, they're discovering that Quinterra in a transformer gives them important selling advantages . . . as well as providing many savings in transformer design and production.

Quinterra is a paper-thin flexible, continuous sheet insulation. It is being widely used for interlayer and wrapper insulation in transformers and coils.

Its lasting dielectric strength, due to its resistance to pyrolysis, assures a greater safety factor and longer operating life. Quinterra withstands substantially higher temperatures than the hot-spot limit of 130C for Class B insulation.

QUINTERRA

- ✔ **cuts factory rejects**
- ✔ **reduces complaints**
- ✔ **improves production rate**
- ✔ **produces more uniform product**
- ✔ **cuts costs of operations**

Johns-Manville
ELECTRICAL INSULATIONS

Canadian Johns-Manville
199 Bay Street, Toronto, Ont.
Kindly send me a copy of
Johns-Manville Quinterra Electrical Insulation EL-34A.

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Company .... Position ....

Address ....

City .... Prov. ....

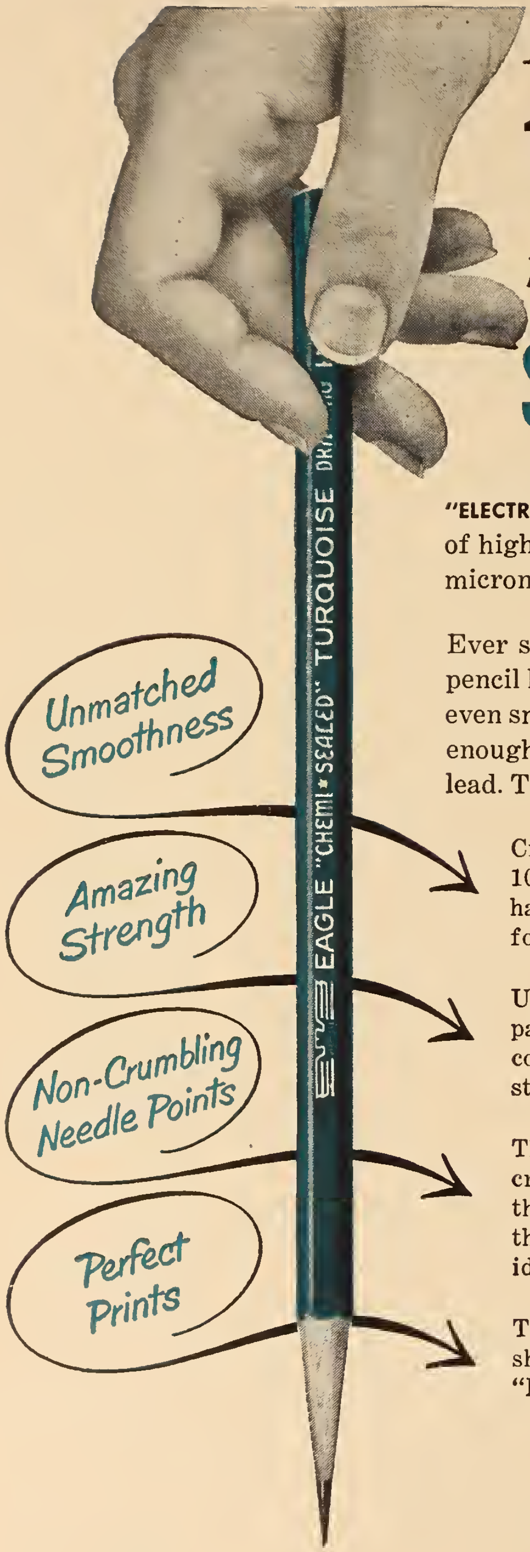
I-335

Here's why

100% "Electronic" Graphite

makes the new Turquoise

Serve You Still Better



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Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Plaster Fireproofing.—F. Hyde & Company Limited, 2315 Cote de Liesse Road, Montreal 9, P.Q., offers a booklet recently issued by the Vermiculite Institute entitled "Vermiculite Plaster Fireproofing".

•

Fan Publications.—Vokes (Canada) Limited, 3801 Dundas Street West, Toronto, are Canadian agents for Keith Blackman Limited, of London, England. The Vokes organization offers the following Keith Blackman publications: "Tornado Axial Fans, Electric and Belt Driven" (Ask for Publication Can/1); "Tornado Paddle Wheel Type Fans" (Ask for Publication Can/5); "Axial Fans, Electric and Belt Driven (Type AF)" (Ask for Publication No. Can/1A); "Tornado Extravent Window Fans" (Ask for Publication No. Can/3B). All inquiries should be addressed to Vokes in Toronto.

•

Vibrating Screens.—Link-Belt Limited, 731 Eastern Avenue, Toronto 8, offers Book No. 2377 which describes Link-Belt Vibrating Screens. The publication is concise, attractive, and highly informative. Copies may be obtained by applying to the manufacturer.

•

Incinerators.—Plibrico Jointless Fibrebrick Co., 1800 Kingsbury Street, Chicago 14, Ill. offers a publication "Plibrico Incinerators". This catalogue fully describes industrial and institutional incinerators. The material is well presented and sketches and photographs supplement the copy.

•

Taylor Instrument Centennial Booklet.—Taylor Instrument Companies of Canada Limited are now in their thirty-seventh year. The parent company, which is located at Rochester, New York, is celebrating its hundredth anniversary. A special centennial issue of "Taylor Technology" has been produced. This publication contains interesting articles describing the history of the Company, its growth, research and manufacturing facilities, and inspection processes. The publication is well illustrated and generally of a very attractive nature. Copies may be obtained from the Taylor Instrument Companies of Canada, Limited, 110 Church St., Toronto.

•

Humidity Measurement. — Minneapolis-Honeywell Regulator Co. Ltd., Leaside, Toronto 17, offers a technical bulletin "Humidities for Industrial Air Conditioning Recorded and Controlled Electronically". This instrumentation data sheet, number 10.5-4, describes the new concept of humidity measurement that makes possible direct humidity readings from remote locations.

Honeywell instrumentation data sheet 10.0-7 describes the new high speed Electronik recorder which features a one-second pen speed specially designed to measure the rapid change variables encountered in many laboratory and test applications. The data sheet describes the applicability, operating characteristics, and methods of operation of the instrument and contains four illustrations.

Copies of these publications may be obtained from the manufacturer.

•

Surface Combustion Bulletin.—Surface Combustion Corporation, Toledo 1, Ohio, offers Bulletin SC-153 in which is described fuel-fired batch and continuous furnaces used in the production of small caliber ammunition.

The heat-treat furnace equipment required at each consecutive step in the production of a finished round of ammunition is included. Write to the Company for copies.

•

Extinguishing Magnesium Flares.—The engineering department of the fire extinguisher division of the Ansul Chemical Company has just published technical bulletin No. 27 explaining how magnesium flares can be extinguished quickly and safely with the new Met-L-X dry powder.

Commenting on the publication the Company states: "At the request of representatives from several lines, tests were conducted to determine the effectiveness of Ansul Met-L-X dry powder as an extinguishing agent for these fires. The flares used in these tests were candles, type Wiley SA-8 (without parachutes), procured from the Kilgore Mfg. Co., of Westerville, Ohio. To simulate severe conditions as nearly as possible, tests were conducted on a damp concrete slab. The flare was laid on its side, the fuse ignited, and the fire allowed to burn for approximately one minute before extinguishment was attempted." For a copy of the bulletin apply to Ansul Chemical Comany, Marinette, Wisconsin.

•

New Liquid Air Periodical.—Canadian Liquid Air Company Ltd., 1111 Beaver Hall Hill, Montreal, Que., has just released a new publication "Arc and Flame".

This publication is produced primarily in the interest of welding superintendents, foremen, and operators. To be placed on the mailing list, communicate with the Company.

•

Inductrol Equipment.—A new bulletin on G.E. Single-Phase inductrols (low-voltage, dry-type induction voltage regulators), is available from General Electric Company, Limited.

Designated as publication GEC-795, e bulletin describes the features of the designed inductrol equipment, its apication and operation. It also contains etches, line drawings, and charts showg operating connections.

For copies apply to Canadian General lectric Co. Ltd., 212 King Street West, oronto.

•

arbon Black for Rubber.—Godfrey . Cabot, Inc., 77 Franklin St., Boston ', Mass., offers a publication and speciation sheet on "Carbon Black for ubber". Write to the Company for pies.

•

.C. Woods Books.—B.C. Coast Woods rade Extension Bureau, 837 West astings Street, Vancouver, B.C., offers series of publications designed to proote the use of B.C. lumber. One of the test of these describes the use of acific Coast Hemlock and Western ed Cedar for building construction. rite to the Bureau for a copy of this iblication and for a list of other inrmative bulletins available.

•

ruck-Mixers.—Chain Belt Company, 00 W. Bruce Street, Milwaukee 4, is., has announced a new 24 page uck-mixer bulletin.

The bulletin describes the features id improvements in the new models the Rex Horizontal Moto-Mixer and ex Adjusta-Hite Moto-Mixer. Write the Company, ask for bulletin 51-29, id mark the envelope attention Dept. R.

•

"The Humidity Engineer".—The third issue of "The Humidity Engineer" has just been published by Surface Combustion Corporation, Toledo, Ohio.

Feature item in the issue describes how Kathabar humidity-conditioning equipment is used for defence production. To be placed on the mailing list write to the Editor, The Humidity Engineer, Surface Combustion Corporation, Toledo 1, Ohio.

•

Tachometer Indicators.—Metron Instrument Company, 432 Lincoln Street, Denver 9, Colorado, has released a new data sheet No. 42 R, pages 1 and 2. It describes the Company's new multiple-head, single-range, fixed-installation tachometer indicators for monitoring speeds of remotely located machines from one convenient location. Apply to the Company for copies.

•

Ferranti Electric Bulletins.—Ferranti Electric Limited, Mount Dennis, Toronto 15, Ont., offers two highly interesting bulletins.

Bulletin No. 502 contains a description of the Ferranti Astatic Voltage Relay. It is a four page publication, supplied punched ready for binding, and it contains the information which would be necessary if the purchase of such equipment was contemplated. Bulletin No. 503 contains 27 pages. It is devoted to Ferranti Automatic Step-Voltage Regulators. This publication, too, is highly informative and well produced. For copies apply to the Company.

•

"The Dominion Engineer".—No. 8 of the 1951 volume of the Dominion Engineer is devoted to a description of poppet valve gear written by H. Norton, engineer of the company's Diesel division. To be placed on the mailing list for regular receipt of this publication write to Dominion Engineering Co. Ltd., P.O. Box 220, Montreal.

"Business & Industrial Briefs"

This section of the *Journal* is intended to keep readers informed on developments and changes in those business and industrial enterprises, and on new products, which affect the engineer.

If you write with respect to any of the items in this, or other sections, please mention

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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."

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CONTENTS

15,100 copies of this issue printed

ERECTION OF THE ANLAW BRIDGE

by

R. C. Harris, S.E.I.C.

Erection Engineer, Pacific Division, Dominion Bridge Company, Vancouver.

In this paper the solution of a difficult bridge erection problem is described. The 250-ft. span was built on the riverbank, and launched over the gap on two Bailey bridges, then lowered into position on sandboxes after the load was taken off the Bailey spans.

The northern trans-provincial highway in British Columbia follows the Skeena valley through the coast range to the sea at Prince Rupert, crossing the Skeena River at Terrace. The only other highway bridge over the Skeena is in the Anlaw Reservation, 4 miles north of Hazelton on a side road, formerly the Yukon Telegraph and Trail. At present, this road is passable only 20 miles north, but a route towards Telegraph Creek is quite feasible. Such a route would give highway access to the promising north-west corner of British Columbia, and could provide a link with the Alaska Highway.

The Anlaw bridge site is a short canyon, with walls rising 60 to 80 ft. above low water. (Fig. 1.) Above and below the canyon the river wanders over a narrow flood plain, "turning on its side" to traverse the canyon. Soundings at low water showed 40 to 50 ft. of rapid water above a gravelly bottom. Depths are almost doubled at high water; in 1946 the rise was 41 ft.

In 1911, a 190-ft. framed timber suspension bridge over the canyon replaced an earlier ford 2 miles upstream. This bridge was downgraded to 5 tons gross capacity a few years ago, when age made the stiffening truss ineffective, permitting the deck to sag as vehicles crossed.

New Span Chosen

Late in 1947 the Department of Public Works selected an alignment for a new span, just upstream of this old bridge. By excavating 3100 cu. yds. of rock on the south bank, and filling 11,500 cu. yds. on the north bank, a level 250-ft. span could be founded entirely on good rock, with clearance of 22 ft. above extreme high water. Economy of design, fabrication and maintenance led the Department to a 2-lane 250-ft. curved chord Pratt truss, of a type already erected in the Province.

Several Erection Methods Considered

Early in 1948 the Dominion Bridge Company was approached by the Department of Public Works of British Columbia to consider the erection problem. The bottom chord of the new span would be about 120 ft. above river bottom, while the river's depth could vary between 50 and 90 ft. The usual piled timber falsework for erecting the span was clearly impractical. Four other schemes were studied.

First considered were heavy inclined timber bents, founded at water line and framed to project over the river. This would allow erection of half the bridge from each bank, with a short cantilever to midspan. Two difficulties condemned this proposal. The falsework would have to be built at low water to minimize the midspan cantilever. This entailed flood risks. Further, delivery of north bank steel required a skyline.

The second erection proposal envisaged building the 250-ft. span on the south bank and launching it over the gap on two Bailey bridges. The north bank fill could give a level Bailey building site. Hauling the small Bailey sections over the old suspension bridge was feasible. Such falsework would be 100 per cent salvageable, and could later form an emergency bridging reserve in the Province. The new span could be launched without men working over water. The ample width of 36 ft. would provide a useful working platform for riveting the bottom chords and floor system. Bailey spans could be launched clear of high water, and lowered to working position after the flood. However, cost and poor delivery dates quoted in the United Kingdom led to this scheme being shelved.

The next method was worked out in detail, as $1\frac{3}{8}$-in. wire rope and most of the special equipment remained from the erection of the Lions Gate Suspension Bridge at Vancouver, B.C. As in the Bailey scheme, it involved erecting the permanent span on the south bank and launching it one chord length at a time. The northern end of the span would cross the gap on a beam hung by adjustable suspenders from two carriages, each of which ran on 4 parts of the $1\frac{3}{8}$-in. wire rope. The maximum rope tension would be about a third of the ultimate strength of 125 tons.

Temporary towers about 390 f[t.] apart, built of modified deck strin[]gers, would support the ropes, wit[h] the backstays passing round 60-i[n.] diameter sheaves at the anchorage[s.] The anchorages would be concrete[d] in solid rock to minimize their si[ze]

Unfortunately, test pits dug for the south bank anchorage disclosed only silt and gravel, to an uneconomical depth. The resultant gravity anchors would be expensive, and valueless after erection.

The fourth plan studied was suggested by the Montreal office of Dominion Bridge Company. It involved counterweighted cantilevering from both banks, with the harness secured at the top hip joint. Supply and erection of north bank steel would be by skyline.

Bailey Method Adopted

During consideration of this plan in late 1949, Bailey bridging material became available in Canada. The chief engineer, Department of Public Works, influenced by the recent Capilano River floods, when an important bridge was swept away, instructed the Dominion Bridge Company to proceed with the Bailey scheme. Enough material was to be purchased to give four complete Class 40 emergency bridges of 120-ft. span, double-double construction.

Direct from Eastern Canada 314 tons of Bailey material were shipped to railhead at New Hazelton, 7.8 miles from the site. All steel arrived at the site by late March 1950, where it was stacked on the south bank. At this time abutments were poured to the base of ballast wall, and the south abutment was accessible from the existing road. The fill on the north approach was only partially placed, to give the Bailey building and launching area.

Falsework for the Bailey Bridges

The longest permissible span for a simple Bailey bridge is 210 ft. The permanent abutments were at 250-ft. centres, necessitating double timber bents at 205-ft. centres to carry the Bailey launching or landing roller reactions (Fig. 1). The Bailey spans had to be lowered almost their full truss depth after launching, to present their top chords to the permanent span. The spans were launched level, but after lowering sloped down 3 per cent to the north, owing to the higher rock on the south approach, where the main span would be built. This grade assisted launching the permanent span. Lowering was by sandboxes, built 15 ft. and 9 ft. high on the north and south banks respectively. The sandboxes were founded on triple bent trestles, which would later carry both Bailey and main span end reactions

Erection of Bailey Bridges

The principal section of the Bailey bridge is the panel, a rectangular welded high tensile steel frame 10 ft. by 4 ft. 9 inches, weighing 570 lb. At the corners are male or female jaws with 1⅞-in. diameter holes for alloy steel pins, which link panels together to form trusses 4 ft. 9 inches high. These trusses are flush beneath, presenting a smooth face to the erection rollers. A bridge girder may contain from 1 to 3 trusses. Similarly, more trusses may be bolted above the first storey to give up to three storeys high. The trusses for the Anlaw falsework were three storeys wide and three high (triple-triple).

Erection of the Bailey spans used standard military cantilevering practice; the main bridge was led over the gap by a cantilever nose 180 ft. long. The section of the nose increased with the bending moment, from the tip (Fig. 3). Launching links were pinned in the lower chord at 2 and 4 panels back from the tip of the launching nose, to counteract the 60-inch sag expected in the long cantilever. Pinhole clearances and elastic deformation cause this sag.

Bailey steel was erected by a 5-ton 'Bull Moose' Cranemobile, which crossed the old bridge with boom and counterweight removed. Rock on the south bank limited each launching pull by the Dominion

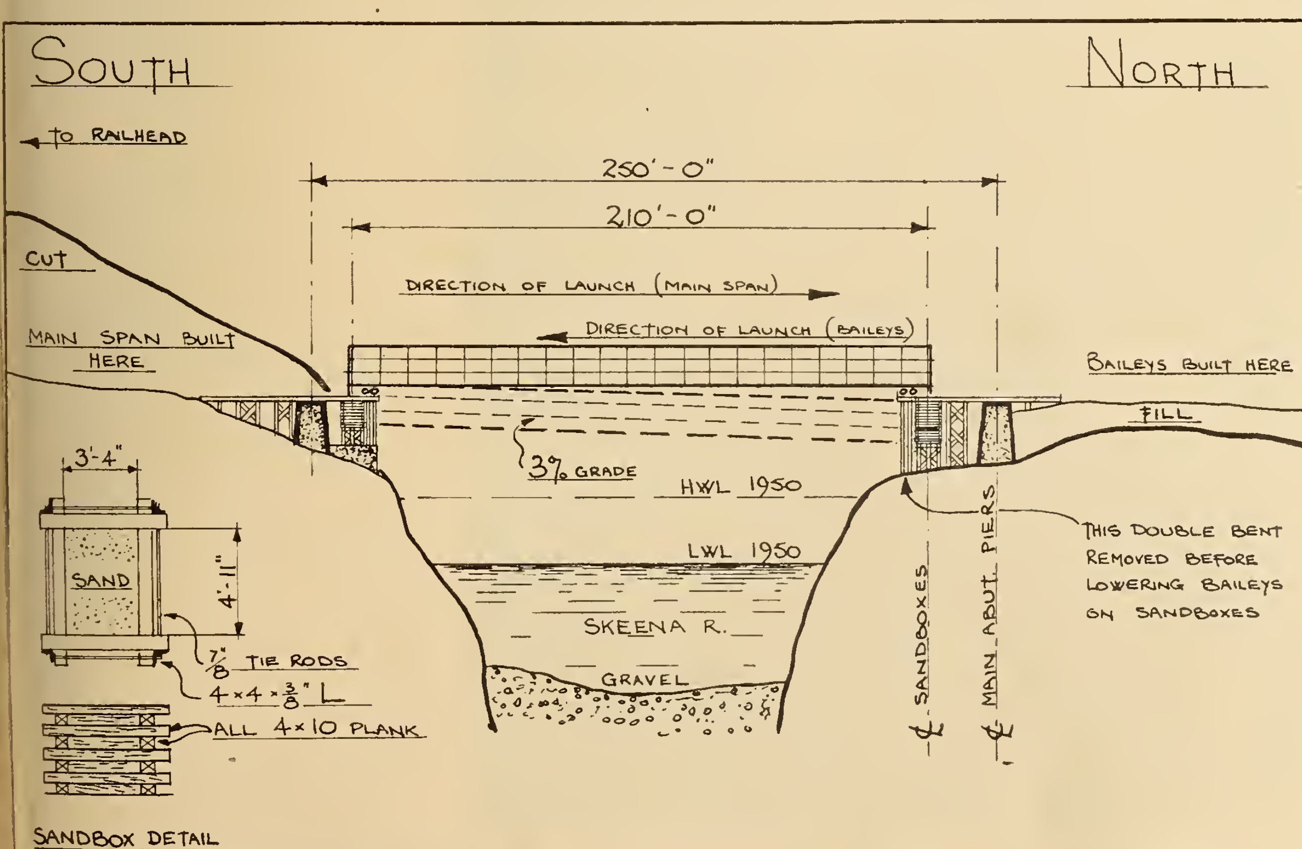

Fig. 1. An elevation, looking downstream, showing Bailey falsework in launched and lowered position.

400 Crawler Crane to 30 ft. (three panels) after the nose touched down on the south bank. Thirty feet was added to the tail as 30 ft. was stripped from the nose, then launched and repeated until the bridge was complete.

Testloading

The first Bailey was launched on the 23rd of May and was left at this elevation during the Spring run-off, which was officially forecast as abnormally heavy for 1950. The waiting period was spent testloading the span, and completing the sandboxes. High water came on the 14th of June, 1950 with a rise of 25 ft. 5 in. Work resumed on the second Bailey bridge on the 26th of June. It was launched and testloaded soon after.

A 110 per cent testload before use of each Bailey span was deemed wise, as the Bailey parts had endured considerable handling in their history. This handling could have affected some welded joints. Fifty-five tons of river water was pumped into two canvas tanks 7 ft. by 10 ft. by 12 ft. set up in a timber frame at midspan of the first Bailey bridge. Both spans were testloaded without incident. The existing sag of 8½ inches (due mainly to pinhole clearances) suffered an elastic increase of 2¼ inches during the testload. The Bailey spans were then lashed together for lowering.

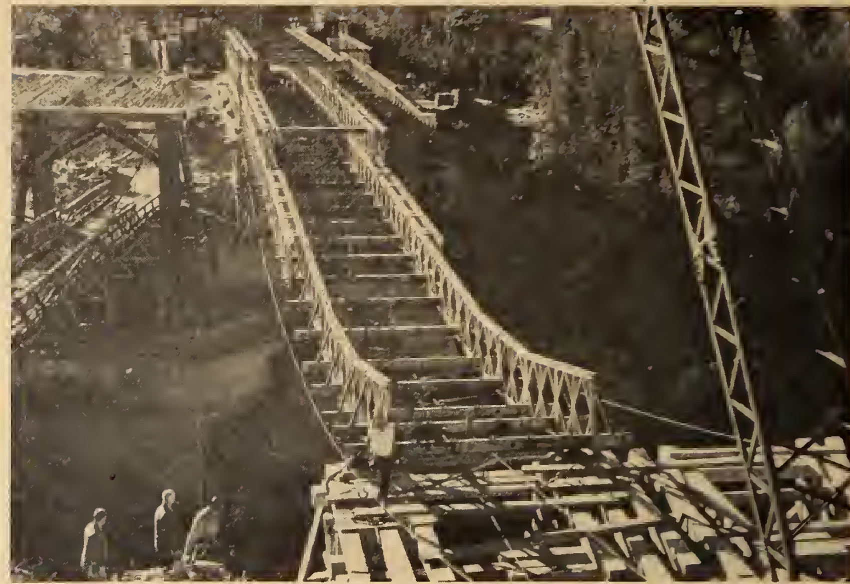

Fig. 3. The cantilevered launching nose of the downstream Bailey bridge touches down on the south bank.

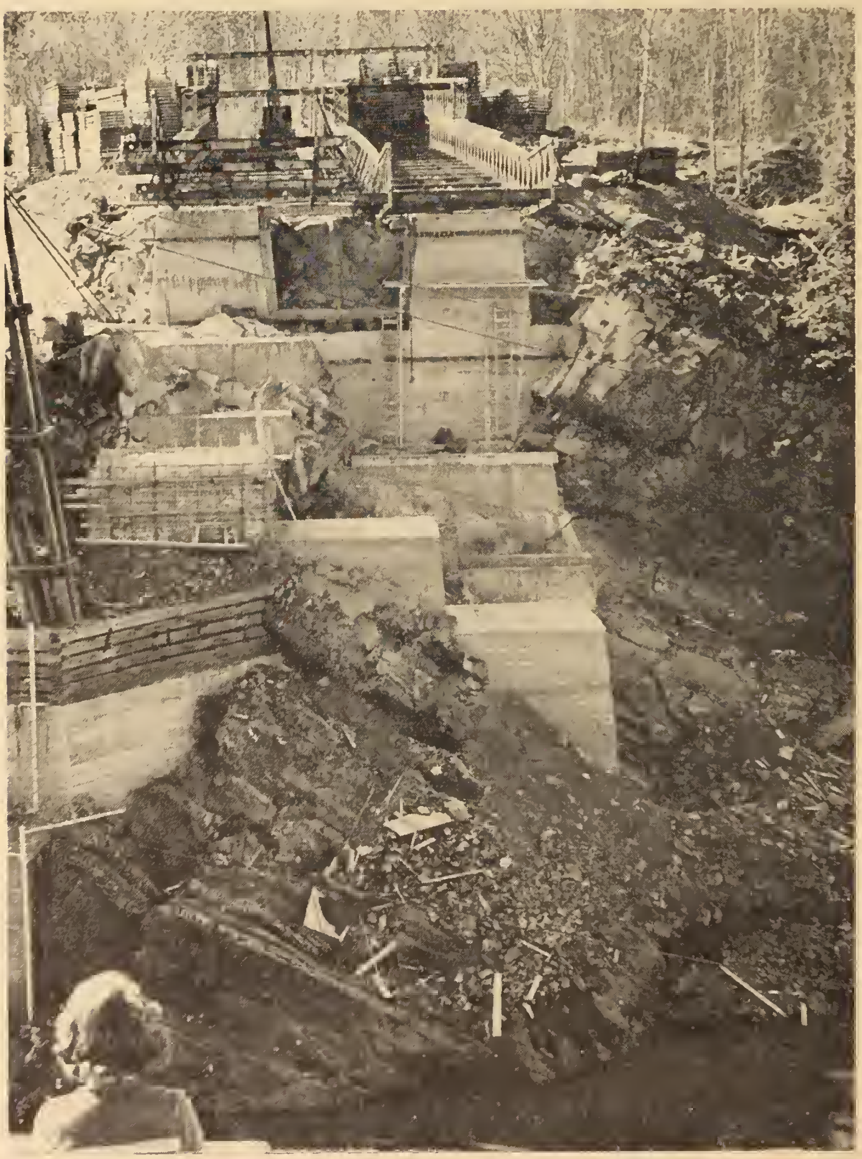

Fig. 2. View of abutment showing construction of Bailey structure just after commencement.

Sand Boxes

Each sandbox was a hollow crib of flat 4 by 10 plank retained by external 4-inch steel angles and ⅞-inch diameter tie rods. No nails were required. Standard Bailey baseplates set under the span bearings formed sandbox plungers. The Department of Public Works filled the boxes with dry river sand. A 20-ft. jacking cantilever was added to the top storey of the Baileys, to carry the end reaction while the offshore bents were cut away. With these bents away the Bailey end reactions were transferred from the cantilevers to the baseplates and the sand. The sand compacted some 18 inches under the Bailey reaction.

Lowering both ends of the Bailey spans through a total of 24 ft. took 8½ hours. A variety of handtools withdrew sand from under the baseplates. Planks and tie rods were peeled from the top of the box to avoid fouling the Bailey bottom chord as it descended. The fina

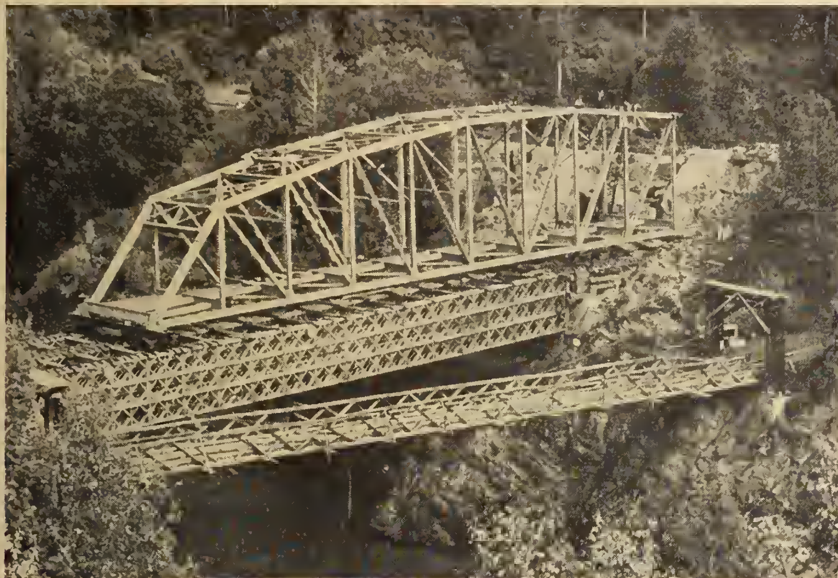

Fig. 4. The three bridges. Assembly and launching of the permanent span has passed midspan. Note the stiffening truss of the old bridge.

2 inches of sand was blown from under the baseplates with air. Although side guys to hand winches were fixed to the Bailey endposts they were not required, as the Baileys descended in the sandboxes on alignment. At this stage the Cranemobile returned to the south bank over the Baileys, to yard the permanent steel.

Completion of Falsework

Ties 4 by 12, two deep, bolted to the Bailey, and four 80-lb. rails, carried the four 6-wheel trucks under the north end of the permanent span. Every fourth tie was made 38 ft. long to help tie the falsework together. Sandbox tie rods were used as further ties between Baileys. Vertical wire rope swaybracing was added to each span in three places.

On the constricted south approach two level double tracks were laid for the two four-wheel carriages. These carriages were moved back one main span chord length (42 ft.) before each launching. Over the permanent abutment, under the offshore end of this track, provision was made for a pair of sandboxes to lower the south end of the main span, which would be 12 ft. high after launching.

Erection of Permanent Span

The crawler crane began erecting the main span on the 28th of July. Assembly progressed well, in spite of the localized building area. A launch was necessary after two bays of bridge were completed (Fig. 4). The adequate carriages and downgrade needed little power to launch the main span. The crawler crane hauled via a snatch block on the Bailey, with the Bullmoose as direct preventer.

After every launch, the distributing beam under the north end of the span was tied down to the Bailey top chords, to take care of wind loads. When the north end of bridge reached its abutment, pairs of 100-ton hydraulic jacks freed the distributing beam, and lowered the north end of the bridge onto its fixed shoes. The south end was lowered by sandbox as far as the Bailey allowed, then blocked. When rivetting of the main span was complete the Bailey bridge was dismantled.

Removal of Baileys and Completion of Bridge

Top chord Bailey transoms were arranged in pairs under or near the

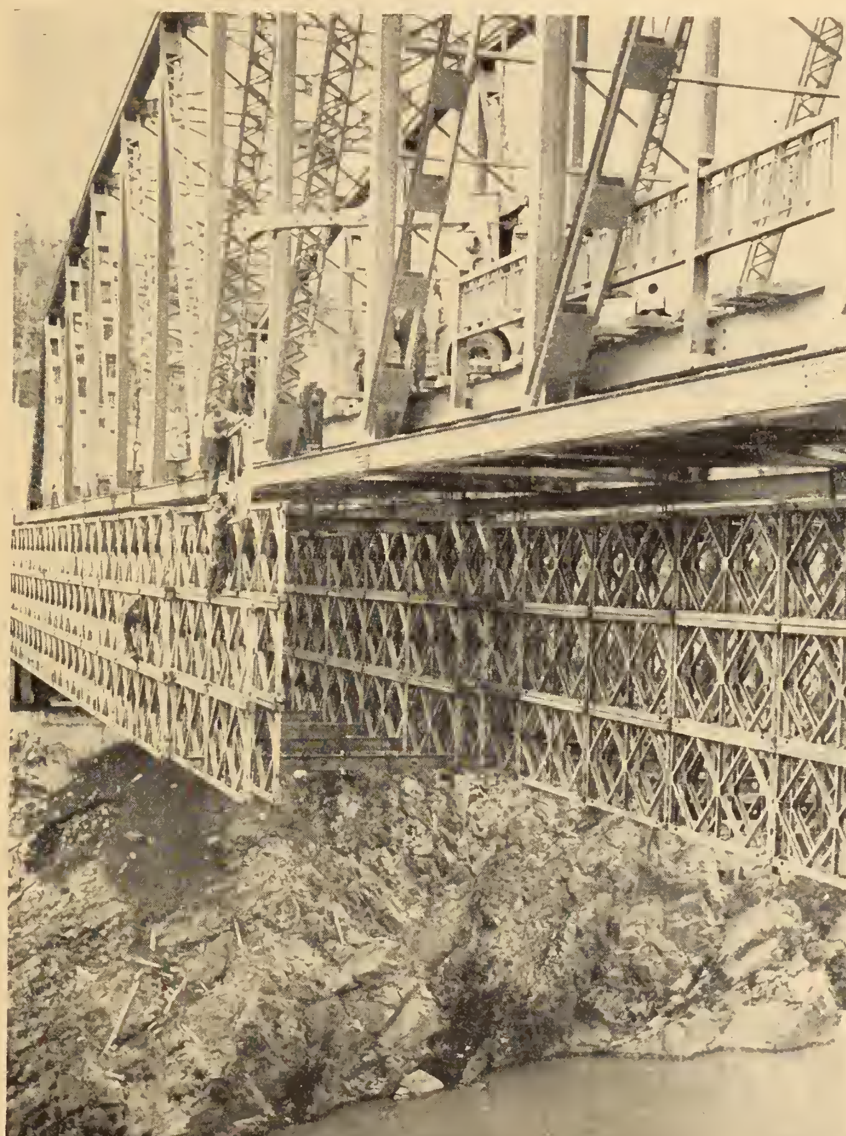

Fig. 5. Removing used Bailey falsework, which was suspended from panel points of the main span, using sand box tie rods.

Fig. 6. The completed structure, with the Bailey still in position, and with the original highway bridge in the foreground.

panel points of the main span. The Bailey was then hung from the panel points by groups of five ⅞-inch diameter sandbox tie rods which proved capable of raising the Bailey when the nuts were tightened in succession. Thus all sag was removed from the Bailey spans, easing dismantling and ensuring uniform load distribution between groups of tie rods.

The Bullmoose, working on a temporary plank deck, picked out the Bailey, starting at the north end. (Fig. 5). It loaded direct on flat deck trucks, which returned from the yarding area with permanent roadway fence panels, erected as the Bailey came out. Practice improved the daily "take" of Bailey panels from an initial 26 to a peak of 150. All Bailey was out in twelve days.

The south end was jacked down by the 26th of September, 1950, or six months from the starting date. An expert Public Works crew formed and poured the concrete deck and ballast walls in good time. Approaches were completed and the bridge opened to traffic by the 11th of November, 1950.

Conclusions

Bailey bridge falsework proved to be satisfactory, both structurally and economically, at this site. Man hours handling Bailey material to the north bank proved 30 per cent less than estimated, while the useful working platform and fixed erection area cut 12 per cent from the usual steel erection man hours. The practice of testloading with canvas water tanks is recommended as cheap insurance on such unusual falsework. Sandboxes showed their worth as devices for lowering heavy weights through large distances.

The erection crew averaged only twelve men, due to limited accommodation. This limited speed of erection at times. Costs analysed as follows:—

Moving tools, equipment and all steel to site	10%
Building timber falsework	15%
Erecting Bailey bridges	30%
Erecting and rivetting permanent span	30%
Dismantling Bailey bridges	10%
Loading out tools, equipment and Bailey	5%
	100%

The erection scheme was conceived by Mr. H. H. Minshall, M.E.I.C., field superintendent of Pacific Division, Dominion Bridge Company, Limited.

Meetings - 1952

E.I.C. ANNUAL MEETING

May 5-7, Hotel Vancouver, Vancouver

MARITIME PROFESSIONAL MEETING

September 1-5, St. Andrews, N.B.

The Saint Lawrence Waterway

Discussion of the paper

"THE SAINT LAWRENCE WATERWAY— An All-Canadian and Very Deep Route"

by

J. G. G. Kerry, M.E.I.C.

Port Hope, Ontario.

A paper presented at the 65th Annual General and Professional Meeting of The Engineering Institute, May, 1951, and printed in the June, 1951, issue of The Engineering Journal.

R. E. Jamieson, M.E.I.C.[1]

I would like to call on Dr. H. B. Hachey, chief oceanographer of the Canadian Joint Committee on Oceanography, who has kindly consented to take part in the discussion of this subject.

Dr. H. B. Hachey[2]

Mr. Chairman and gentlemen, I am certainly not going to point out any mistakes Mr. Kerry has made, if there are any, but the real facts of the situation are that we really have not enough data to deal fully with the problem of ice in the Gulf of St. Lawrence.

The Canadian Joint Committee on Oceanography came into being immediately after the war, as the result of co-operative efforts made between different government departments during the war, dealing with matters of defence. The work was found to be of sufficient importance to attempt to carry it on in peacetime. The result was that the contributing organizations, the Royal Canadian Navy, the Fisheries Research Board of Canada, the National Hydrographic Society and the National Research Council have set up a committee known as the Canadian Joint Committee on Oceanography.

This committee has representatives from each of the Departments mentioned. It is an administrative committee, and directs the work of two oceanographic groups, one on the Pacific Coast and one on the Atlantic Coast. Those particular groups are responsible for this type of activity in their respective territories, and also in our northern waters. You will find them doing oceanographic work as far north as the Arctic.

I mention these details simply to point out that the Gulf of St. Lawrence is really only a small item in our wider attempts to cover what are known as Canadian waters, and the particular reason why there is not sufficient data available for the tackling of the problem which Mr. Kerry has outlined is that actually the St. Lawrence has not to date, been considered of sufficient importance from the point of view of the Fisheries, the Navy, and the general Canadian research programme, to give it any more attention than it has had up to the present time.

Mr. Kerry referred to a paper that has come out recently on the Gulf waters and their movements through Belle Isle Strait. Much of the data quoted in this paper was collected 24 years ago. It has taken 24 years before sufficient interest has been indicated to consider bringing out a report, that is, a full-fledged report, on the data collected at that time.

Mr. Kerry's paper "The St. Lawrence Waterway—National or International?" is one of several papers in which he puts forward the general thesis that an open and ice-free ship channel can be maintained from the Great Lakes to the open ocean. In this particular paper the author deals with certain engineering aspects of the Seaway from the deeps of Lake Ontario to Lake St. Francis. My comments are necessarily confined to the hydrographic features of the main thesis, at the point where that Seaway is considered to begin or to end, between Newfoundland and Cape Breton.

It is quite evident from work that has been done and calculations made by Dr. Barnes and Mr. Kerry, that the immense heat reserve in Lake Ontario, as well as in others of the Great Lakes, is sufficient, if carried through a channel of sufficient depth and at a sufficient rate of speed, to keep the Seaway open, even as far down as Quebec. From there to the Gulf, such a scheme would be aided by what is known as the Gaspé Current. This current is a mixture of ocean and river waters, and contains a considerable amount of reserve heat. These sea waters which

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1 Professor of civil engineering, McGill University, Montreal.

2 Chief oceanographer (Eastern Coasts), Joint Committee on Oceanography, Fisheries Research Board of Canada, St. Andrews, N.B.

go into the mixture forming the Gaspé Current are generally brought up from a considerable depth.

A deep channel exists from the opening at the mouth of the St. Lawrence between Newfoundland and Cape Breton, sometimes of a depth of 400 or 500 meters or 200 fathoms. The result is that deep ocean water, which is comparatively high in temperature, seeps well into the Gulf, and this is a source of heat which is the prime mover in the mechanism that goes to form the Gaspé Current.

As Mr. Kerry has pointed out in various publications in the "Shipping Register and Shipbuilder" and the "Dock and Harbour Authority", general conditions are very different in the Gulf from those obtaining either in the St. Lawrence River or in the Great Lakes. While present day knowledge of ice conditions in the Gulf is still imperfect, you could almost say that the ice in the Gulf is like the weather—everybody talks about it but nobody does anything about it. Until the last few years we have simply decided to let the ice in the Gulf be as it may. Nobody seemed interested except those concerned with ships engaged in sealing, and ice breakers responsible for keeping the channel open between Montreal and Quebec.

Dr. Huntsman, also referred to here by Mr. Kerry, has also stated that although ice conditions in the Gulf are due to ice from the rivers, ice formed locally in the Gulf, and field ice from the Arctic, without the latter the Gulf of St. Lawrence would be probably open to navigation throughout the winter months. This ice from the Arctic is brought down chiefly through the Belle Isle Strait.

Ice conditions in the Gulf vary greatly from year to year. This year the absence of ice is very marked, so marked that the sealing expeditions which generally work off the shore of Newfoundland have had to go up to the Labrador coast in order to get the seals on the ice. It might be of interest to note that the Geographical Branch of the Department of Mines and Technical Surveys have now set up a project known as the Canadian Ice Distribution Survey, and that we have been assured that particular attention will be given to ice conditions in the Gulf.

The general oceanographic problems and conditions in the Gulf are presently being given intensive study. Several reports have already been issued and several more will be issued before the close of the year.

I would like to point out that Mr. Kerry's activities and writings have been responsible for focussing attention on ice problems of national import. Those of us in the field of oceanography have been greatly stimulated in our attempts to deal with these problems in the open sea. There has been throughout this paper a certain amount of discussion as to the heat coming from the waters of the Great Lakes. Mr. Kerry has also given consideration to the heat coming from the waters of the Gulf. We are dealing, of course, with two different problems, fresh water from the Great Lakes and salt water from the open ocean.

The phenomenon of the heat in the Great Lakes is a simple elementary physical phenomenon which is well known to students of elementary physics. Maximum density of fresh water is found to occur at a heat of 4 deg. C. The cooling of lake waters will progress to the point where the water may be all, from top to bottom, at a temperature of 4 deg. C. Any further cooling of the surface water will therefore be of sufficiently low density to stay on the surface, giving you a sort of insulation which would keep the temperature of 4 deg. C. at the deepest levels. The only physical phenomenon that does upset that condition is the effect of wind or storms on the surface. The result is a fresh water lake, if it is deep enough, will always have water of 4 deg. C. at its lowest part, and this usually keeps the water in the middle of the lake open.

In connection with the open ocean there are two factors as far as the freezing of the water is concerned, factors of salinity and factors of temperature. The freezing point of sea water is generally in the neighbourhood of minus 1.8 deg. C. while the maximum density of sea water is generally at a temperature of minus 2 deg. C., so then when we come to the freezing phenomenon, this formation of salt and water is a further factor. It must have a temperature of minus 1.8 deg. C. before ice forms, but as it cools, the water is lighter at lower levels than at the surface, and ice will form on the surface only after the up-welling or bringing up of warmer water from below has been completed.

W. F. Campbell[3] and D. C. MacPhail[3]

(By correspondence)

The proposals set out by Mr. Kerry should serve as a great stimulus to anyone interested in transportation or in fluid mechanics. There are many interesting scientific aspects of the problem, but it is still too early to say whether any such auxiliary developments would lead to a significant reduction in cost.

One of the difficulties of Mr. Kerry's proposals for using the heat store of Lake Ontario lies in the impossibility of doing the job by degrees. It tends to be all or nothing; and, if the "Summer Seaway" is to proceed in the near future, now or never. Although there is enormous advantage in using the heat reserve of Lake Ontario water, which at the winter flow amounts to 13,000,000 kw. per Fahrenheit degree above freezing, we, at the National Research Council, have been looking about for ways to conserve the heat or to make good losses after they occur. It may be that these questions will affect the economic choice of channel depth, and also the excellence of warm water intake arrangements at Lake Ontario.

If a thin film of non-fouling, non-volatile oil could be used to reduce the evaporation heat loss, a large saving of heat would be possible; or alternatively, a less ambitious channel would suffice. In the main, however, we have been looking at the practicability of using atomic energy to keep clear of ice a channel insufficiently supplied with warm water. The preliminary indication is that, though the problems are enormous, the probable costs of the installations for keeping clear a channel of 35 feet depth by 500 feet width (i.e. of approximately the same dimensions as the Suez Canal) are such as to warrant more detailed consideration. Such an arrangement requires as careful stream control as Mr. Kerry's, though on a smaller scale.

F. S. Small, M.E.I.C.[4]

It is a great privilege to have Mr. Kerry's thought provoking articles on the ultimate development of the St. Lawrence. Both he and the Institute are to be congratulated on their public spirited and opportune action in bringing

3 National Research Council, Ottawa.
4 Apohaqui, N.B.

the vitally important problems of the St. Lawrence to public attention at this time.

The existing water surface of the upper St. Lawrence has an average width of about 9,000 feet, while the width of the lower river averages 12,500 feet, or more than 2 1/3 miles. Mr. Kerry proposes to concentrate the flow in a single, deep and narrow channel that would be ice free the year round. It would have a low water depth sufficient for any seagoing surface vessel, present or future. The Panama Canal is 45 feet deep and Mr. Kerry's waterway will be 50 feet or more. Since Lake Ontario is deep and ice free the year round, this means we would have a permanently open channel all the way from Ile aux Coudres to Hamilton, a distance of 600 miles.

Power

Mr. Kerry's plan will reduce the available head at the future Montreal power plants. If he will consent to a small fluctuation of water level above the Ile aux Coudres dam, an important block of power can be developed there. This will compensate for a large part of the cost of his proposals for that place. The water area between Quebec City and the Ile aux Coudres dam is nearly 500 square miles, and the ordinary range of spring tides near the eastern end of Orleans Island is between 17.5 and 20.75 feet, with the neaps averaging 14.25. The highest tide recorded at Quebec in 46 years was 23.4 ft.

A power plant at Ile aux Coudres would have a worthwhile head about half of the time, and a volume of water double the discharge of the St. Lawrence at its mouth. The power would have the same intermittent character and the same daily change in the time of availability as tidal power. It could, however, be used to the full at all times by operating in conjunction with plants on the upper Saguenay. Water not needed in the Saguenay plants while Ile aux Coudres was taking part of the load could be stored in Lake St. John and used when Ile aux Coudres was shut down. Arvida has in the main a 100 per cent load factor load, and could absorb Ile aux Coudres power whenever it is available. Incidentally it seems that a large block of tidal power could also be developed at the mouth of the Saguenay River and used in a similar way.

The River Between Quebec and Montreal

The Canadian Hydrographic Service charts of the St. Lawrence from Longue Pointe to Quebec show for this 155-mile stretch a water area of 366 sq. miles, with average width of 12,500 feet and with local widths varying between 11,000 and 45,000 feet. This gives some idea of the magnitude and the nature of the work involved in Mr. Kerry's proposal for this part of the river.

Floods

Provision must be made for passing floods on the main river and its tributaries. Spring floods on the Ottawa generally occur earlier than on the upper St. Lawrence. But they have sometimes coincided as on May 17, 1876, when the Ottawa carried 350,000 c.f.s. and the St. Lawrence 317,000 c.f.s., the greatest flood ever recorded as passing Montreal. 512,000 of this flowed through Lake St. Louis and the remaining 155,000 passed down the two back rivers.

Ample flood discharge capacity must be provided in the regimented river. The control gates at Lachine should have a discharge capacity of at least 900,000 c.f.s. and the flood capacity of the channel below Montreal should gradually increase. This means a much more capacious channel than would otherwise be required.

The River Above Montreal

The upper St. Lawrence is in effect a gigantic cooling tower with a drop of 225 feet, an average width of about 9,000 feet, and an average flow of over 240,000 c.f.s. The upper part of the section is shallow and the currents are slow and turbulent. In winter all the heat above 32 deg. F. is removed from the water by the time it reaches the head of the rapids. In most winters sufficient ice is formed at Galop to back the water up into Lake Ontario. This is a noticeable feature of the hydrograph of the river.

When this section is narrowed, straightened and streamlined in accordance with Mr. Kerry's suggestion, there will be a great reduction in heat loss at this place. Dr. Barnes was most enthusiastic over the prospects for heat conservation in this part of the St. Lawrence.

Turbulence

At the close of the Ice Age the site now occupied by the upper St. Lawrence river was covered with boulder clay. When the river washed away the "clay" it left the boulders, and these now form a more or less continuous pavement over the river bed. Water flowing over such a surface is very turbulent and the rate of heat loss in cold weather correspondingly high. In the improved channel turbulence should be reduced to a minimum. Where necessary the bottom can be covered with gravel and a layer of sand. After the rapids are drowned out these materials can be dumped from scows and spread by the current. Turbulence is also caused by winds, and shelter belts of trees will help in reducing heat loss from this cause.

After the water temperature falls to 39 deg. F. with streamlined flow the coldest water will remain on the surface, and the colder the surface the slower the rate of heat loss. It is during this stage that it is especially important to avoid turbulence. The ideal condition will exist with the surface temperature down to nearly 32 deg. F. with the warmer water safely stored below and just enough turbulence to bring it to the surface as needed to prevent ice formation. Ordinarily the passage of shipping will probably provide all the turbulence necessary.

On sunny days a great deal of heat is received from the sun, even in winter. Solar radiation is nearly seven per cent stronger in midwinter than in midsummer but unfortunately the percentage loss by reflection is greater in winter. Possibly nothing can be done to reduce the loss of heat from water surfaces by reflection, radiation, evaporation and conduction but the matter is important and should be carefully investigated.

Channels Diversions

Frankly I do not like either of Mr. Kerry's schemes for dividing the flow of the river at the head of Galop rapids, and diverting the Canadian half either into Lake St. Francis near Cornwall or into the Ottawa somewhere above Carillon. Since heat is lost from water almost wholly at the surface, the surface area must be held to a minimum. If we divide the flow into two equal channels we automatically double the surface. If one half is allowed to spread out and flow down over nearly all the existing river bed in the International Rapids enough heat can be wasted to effectually ruin any chance of keeping the river open in winter.

It is true that Mr. Kerry is proposing only what has already been done on a smaller scale at Beauharnois. But Beauharnois is a bad precedent. The primary mistake was made when Cedars was built half way down the Soulanges Rapids. The Cedars plant develops nearly half the total head between Lakes St. Francis and St. Louis, but it leaves two nearly worthless bits of fall, one above and the other below Cedars. Neither of these is worth developing by itself and Cedars prevents full utilization of the available head.

When it was decided to get more power from the Soulanges section a new channel had to be formed, thus allowing the power plant to be built on the shore of Lake St. Louis, where it should have been in the first place. Instead of building Beauharnois where it is, the mistake should have been acknowledged at that time and the new plant built at Cascades, Cedars being dismantled and drowned out. We now have a double channel between the two lakes and eventually the old one will have to be abandoned. It can, if desired, be used to pass surplus water in summer, but on account of the excessive wastage of heat it should not be used in winter, unless the rapids are drowned out by building dams to divide the old channel into pools on which an ice and snow cover will form.

However, this whole discussion of future diversions at Galop is, I think, largely academic. Both the Province of Ontario and the State of New York are ready and waiting for their respective shares of this power. So we may assume that the dam and power houses at Barnhart Island together with the other works needed will have a high priority on the construction programme. With Lake Ontario water level brought eastward to Cornwall there will be no question about where the rest of the improved waterway should be located.

The plan for the Barnhart Island layout as proposed by the Joint Board in 1926 apparently allowed for several feet of drop in water level between the power houses and the upper end of Lake St. Francis. By raising the proposed dykes through Lake St. Francis and the existing Beauharnois Canal dykes, this head, if it exists on the revised plans, can be transferred to Beauharnois, thus saving excavation and compensating Beauharnois for the loss of head if Lake St. Louis is raised a couple of feet as proposed in the writer's plan X. (See the *Engineering Journal*, August, 1950.)

Test Section

There is a considerable stretch of river between Lanoraie and Lake St. Peter that probably approximates quite closely Mr. Kerry's proposed section for the improved St. Lawrence. Above Sorel it is from 3,500 to 4,000 feet wide with high banks and a narrow shoal strip along the shores. It could perhaps be used as a full scale model to get some check on what to expect when the whole river is improved. Velocities and slopes, loss or gain of heat under varying atmospheric conditions and rates of discharge, the effect of turbulence, ice cover and other things could be studied.

Ice Breakers

Another matter seems worth considering. Present practice is to hold the ice breakers until February when the ice is at, or near, its maximum thickness and strength and the water at its coldest, then to start out from Trois Rivières to break open a channel to Montreal, where they arrive in late March or early April. Alternatively ice breaking could start when the ice-bridge begins to form in Lake St. Peter, to keep the ice moving all winter as is now done below Trois Rivières. Apparently the river would keep itself open above the lake, if large fields of bordage ice did not occasionally block the channel as sometimes happens below Trois Rivières. The most serious obstacle to this plan may be the difficulty of keeping the broken ice moving in Lake St. Peter at times of slack tide or upstream winds. Heavy cribs could be built to anchor the Lake St. Peter ice and the bordage ice elsewhere as necessary. The danger of winter and early spring floods would be eliminated or greatly reduced.

Conclusion

Mr. Kerry's plan provides for the development of the ultimate navigational resources of the river but this is only the central one of the three parts which make up the St. Lawrence system. Eastward there is the Gulf and westward are the Great Lakes. Neither of these is wholly ice-free and open to winter navigation. If we are to reap the full benefit of a deep and ice-free river we must also have an ice-free Gulf and ice-free Lakes. The channels connecting the latter must be improved to the same standards as the main river.

Little or nothing has been published to date, so far as I know, on the subject of winter navigation of the Gulf and Lakes. Such studies as have been made were largely confined to the essential business of fact finding. We need more facts, especially those relating to winter conditions in all these waters.

Gen. The Hon. A. G. L. McNaughton, M.E.I.C.[5]

(By correspondence)

I have read Mr. Kerry's paper with very great interest indeed, particularly those sections in which he deals with the possibilities of maintaining an open channel for navigation throughout the winter by concentrating the flow of the river in a restricted deep channel which will retain the natural heat of the water which is present in Lake Ontario. I have followed the studies which have been made on ice formation in the St. Lawrence down the years since Dr. Barnes' experiments and I fully share Mr. Kerry's thought that these studies might now be resumed and pressed with advantage. I believe that the proper authority to undertake this work on the comprehensive basis which is required would be the National Research Council and I believe that a recommendation to this effect from The Engineering Institute of Canada would be helpful.

I would hope that such a recommendation might lead to the establishment by the Council of an associate committee on which all those in Canada, including those specially qualified from the departments of the Government of Canada and of the Provinces of Ontario and Quebec, who are in a position to contribute information or to help in other ways would be appropriately represented.

The President of the National Research Council with whom I have had a number of discussions on the subject of initiating a comprehensive study of the management of the St. Lawrence to re

5 Chairman, Canadian Section, International Joint Commission

duce the formation of ice is entirely in sympathy with the setting up of an associate committee of the Council for this purpose as I have proposed.

Mr. Kerry suggests that consideration be given to a diversion of the Canadian share of the flow of the St. Lawrence into the Ottawa. As he mentions, these plans, which were proposed by the late Mr. Cauchon in the early 1920's, were very carefully reviewed by the late Mr. Coutlee and I recall that they were also comprehensively reviewed in the St. Lawrence Interdepartmental Committee in 1926 when it was shown that the great advantages lay in following the route of the St. Lawrence River itself. Since then Beauharnois has been built which adds to the advantage of adherence to this route.

Author's Reply to Discussion By General MacNaughton

It is gratifying to note from General McNaughton's remarks that there is a good possibility that a study of the St. Lawrence River problems will be taken up by the highly competent scientific and engineering bureaus in Ottawa. The record of the Joint Committee on Oceanography is a good precedent. The writer has much pleasure in endorsing General McNaughton's recommendation that The Engineering Institute should interest itself actively in bringing about the formation of a similar joint committee to study the fresh water section of the great valley and especially its ice problem.

With regard to the suggested Ottawa-St. Lawrence cut-off the writer has never seen the Interdepartmental Report referred to, and would question its value today. We have much more knowledge of the St. Lawrence and its waters than was available in 1926. Two things are fairly certain:— first, that no plan for a diversion of the boldness in design advocated in the paper we are discussing came up for consideration at that time; and second, that the Committee were as ignorant then as we are now of the dominant factor in the design of the cut-off, viz.. contours of the rock surfaces underlying the triangle between Chesterville, Morrisburg, and Prescott.

Today, with our knowledge of the art of geo-physical surveying, these contours can be quickly and cheaply determined. If the Governments of Canada and/or of Ontario decide on the location of an all-Canadian waterway without first ascertaining all the facts concerning the possible cut-off, they will stand convicted of the blunder of reaching a great decision without first studying all pertinent facts and considering all reasonable alternatives and in sound engineering practice there could be no more inexcusable mistake.

The great merit of the cut-off lies in its opening up to most modern development the broad Ottawa - St. Lawrence Lowland and the adjoining valleys of the Ottawa, Gatineau and Lievre Rivers, areas of great but low grade mineral wealth. The division of the waters will not prejudice our good American neighbours. The Beauharnois Plant, when completed, will be well suited to develop beneficially the waters that will reach it from the present and future American developments near Massena.

It would be of little consequence to Quebec if the Canadian waters that were prevented from reaching Beauharnois were to be delivered to it at Point Fortune instead. The writer has yet to learn any strong reason for the rejection of the cut-off as a most suitable location for an all-Canadian deep waterway. There is no question that the cut-off location would be of inestimable advantage to the future of Eastern Ontario and to the City of Ottawa. This plan also calls for no American co-operation, except in the building of the control works at the head of the Galop. All other plans that the writer has seen involve heavy construction in American waters, and much flooding on both the American and Canadian shores. The latter at least can be completely avoided by accepting the cut-off location.

Author's Reply to Discussion By Dr. Hachey

One statement in Dr. Hachey's address calls for particular comment. Our present ignorance concerning water and ice conditions in the Gulf is due simply to the fact that no influential section of the Canadian people has demanded such information. As the freezing-up of the Waterway has been for generations past a major obstacle to the growth of Canadian trade, Dr. Hachey in effect accuses commercial Canada of apathy, and an almost eastern fatalism in accepting existing conditions. There is no evidence of a willingness to fight against these conditions or to make use of present day scientific knowledge to overcome them.

There are of course special sectional interests, notably around Halifax and Saint John, who do not desire that the ice problem should be solved. This writer does not believe that the prosperity of the Maritime Provinces depends on any earnings they may secure from what is, to them, a purely foreign traffic which is passing through their ports. Prosperity is to be found in freeing the trade routes between the Maritime Provinces and Central Canada. The Maritimes do not lack in energy, enterprise and raw materials. Only the lack of a fully efficient transportation system checks their commercial growth. If the Gulf ice can be brought under control, such ports as Corner Brook, Sydney, and Louisbourg automatically become year-round open ports, and a new era will have dawned upon commercial enterprise in the Maritimes.

There is also opposition to the idea of a free river from the Hydro-Electric Power systems both in Ontario and in Quebec, which fear that a free river will cause trouble from frazil ice in their power plants. There can be no frazil in the waters as long as those waters retain a temperature above freezing point, and this condition can reasonably be created in the river. The great cities of this continent did not grow great because of hydro-electric power supply, but because they were placed where traffic could most easily flow through them to world markets. Free communication with the traffic lanes of the world for twelve months in the year will be of infinitely greater importance to the future of Ontario than all the power that can ever be obtained by the Province from the St. Lawrence River between Kingston and Lake St. Francis.

Author's Reply to Discussion By Mr. Small

Mr. Small's suggestion that a hydro-electric power plant should be built onto the proposed barrage at Ile aux Coudres is an excellent one. This writer does not believe, however, that any intentional variation in the water level above the barrage should be made. This barrage is expected to control the water levels of the river as far up as Montreal Harbour, and these water levels should not be permitted to vary. If the basin of Lake Ontario is used as a balance wheel to control the combined discharge of the St. Lawrence and Ottawa Rivers this discharge can be held to an almost uniform total and water levels should not vary. One advantage to be gained from the proposed power plant at the barrage has escaped notice; the operators at the plant will be, within limits, in a position to control the velocity of the waters discharging through the barrage into the estuary. This power may prove to be of value in any future battle with the tides.

With regard to the cross-section of the regulated river, this writer would suggest an area of about 75,000 sq. ft. near the Lake Ontario outlet and one of perhaps 90,000 sq. ft. near Ile aux Coudres, or an average width approaching 1,250 ft. at the upper and 1,500 ft. at the lower end. Skill and foresight in controlling the main river discharge can be a dominating factor in the design and operation of the main channel. Levees or equivalent shore lines will be necessary to the successful exclusion of ice from the Waterway from Lake Ontario to the Estuary. Such levees will protect a waterway, without many of the aids to navigation now considered as essential. Most of the material required for the levees can be secured from the widening and deepening of the main channel.

Mr. Small's statement that much of the present channel between Lake Ontario and the Galop Rapid is shallow is hardly correct. Most of it is deep, but in places it is much obstructed by islets, shoals, and rock reefs. The writer is under the impression that the waters in any channel where the average velocity reaches 4 feet per second are in a condition of turbulent flow, and the water temperatures in such channels will be found to approach an isothermal.

Mr. Small's objection to dividing the river into two streams at Galop rests upon the assumption that our American neighbours will do nothing to utilize their half of the waters to the utmost advantage, both from the standpoint of power and navigation. The writer feels that this view is erroneous. In the long run it is certain that the American section will be improved to an extent at least fully comparable to anything Canada may do. To build a wholly American canal from Rockway Point to Robinson Bay is a task of about equal magnitude to the works already undertaken at Beauharnois. The possibilities of such a wholly American canal are favourably commented upon in the report of the Joint Board of Engineers.

Between the two national canals there would be a placid St. Lawrence Lake extending from the head of the present Cornwall canal to Iroquois, and affording a satisfactory route for traffic using the present Canadian canal system, provided an additional lock is built at Iroquois.

Mr. Small's statement that two canals would have twice the surface area of one is incorrect. The increase of area would be measured by the area occupied by two additional canal banks, and would amount roughly to one sixth.

Author's Summary

In closing the discussion on this paper the author would first like to make some additions to the printed text.

Fig. 10[6] is a more or less hypothetical profile of the proposed cut-off canal to the Ottawa River, prepared from topographical maps and from records of well borings by the Geological Survey and by the Ontario Department of Mines. The location used is not recommended, but the sketch profile will help to give a better picture

6 For convenience, illustrations referred to in this discussion have been reproduced from the original paper in the June, 1951, *Journal*, under the original figure numbers.

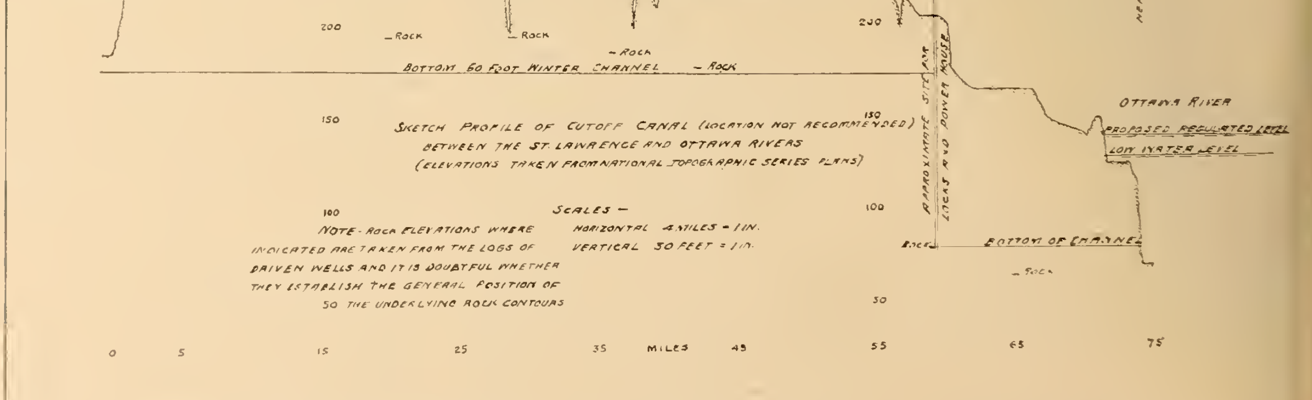

Fig. 10. Profile of suggested cut-off canal between St. Lawrence and Ottawa rivers.

of the proposal to engineer-readers. A much shorter location may be possible, but this will depend upon the depths, now unknown, of the underlying rock.

Whether these works should be built at all is properly a question for government cabinets, with the aid and advice of business organizations such as Chambers of Commerce, and of professional economists.

The comments on Fig. 3 in the paper should read as follows: "Fig. 3 shows the results of a series of depth - temperature observations taken in summer, mainly in Lake Ontario. The form of the curves is typical for the Great Lakes in summer—always a warm shallow and nearly isothermal surface layer, a so-called thermocline, in which the temperatures fall off rapidly with increase of depth, and a deep mass of waters with a temperature approaching 39 deg. F. The isothermal surface layer may be broken up at any time by wind action. Winds blow almost continuously across Lake Ontario."

"Fig. 6 shows the broad shallows between the reef across Lake Ontario along the line of the Duck Islands and the actual mouth of the river. It is difficult to estimate how much time the waters of the river need to cross over these shallows. There are undoubtedly variations in velocity across the vast cross-section of waters overlying the shallows. The waters as a whole may take from 15 to 16 days to cross over them. The time of water transit from river mouth to the Galop Canal is known from the observations taken by the Joint Board of Engineers to be about 11 days making the total time of transit and also of cooling-off between the deep lake and the Galop Rapids some 25 or 26 days.

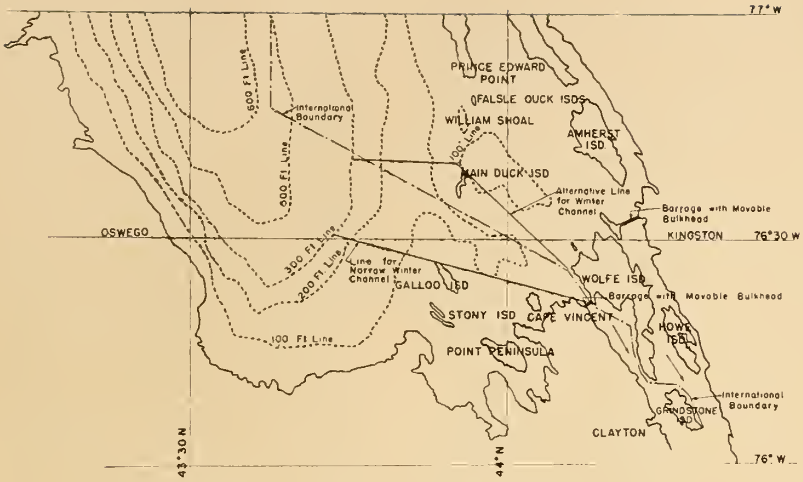

Fig. 6. Plan of the St. Lawrence river headwaters.

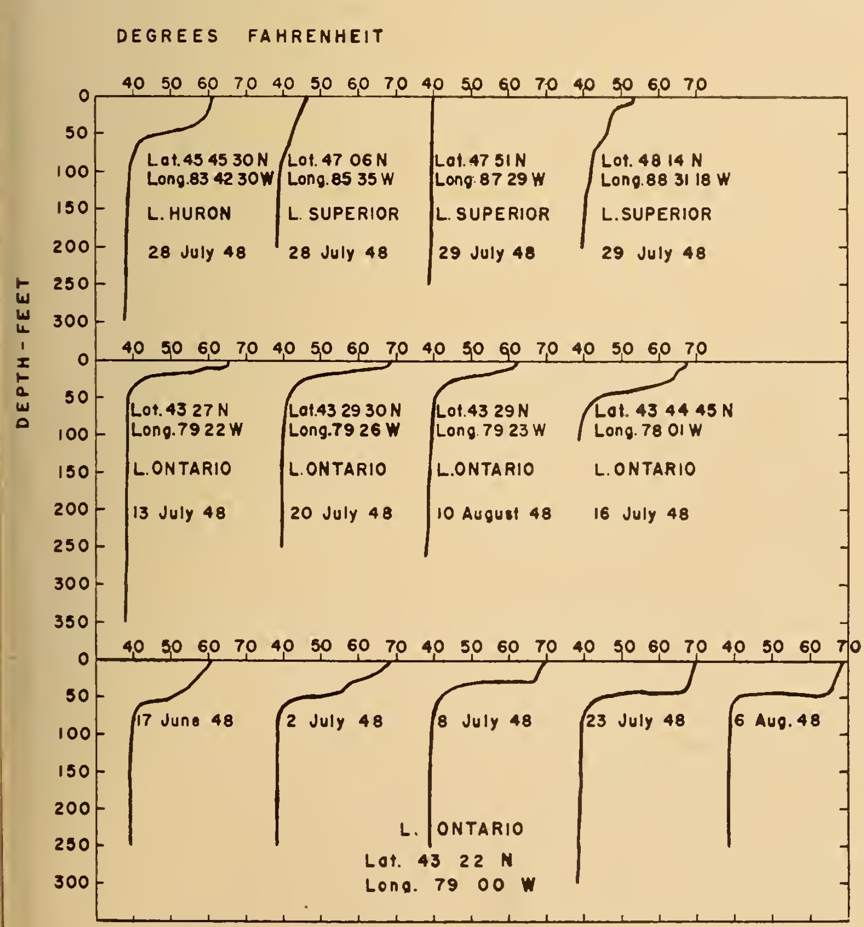

Fig. 3. Depth temperatures of Lake Ontario.

In view of the attendance at the Annual Meeting of Dr. H. B. Hachey, it seemed proper to extend the survey of the Waterway to include certain navigation problems found in the Gulf and in adjoining waters. These are Dr. Hachey's particular fields of investigation.

Special reports on the Waterway between Beauharnois and Longue Pointe have been issued by the Department of Transport and by the Quebec Hydro. It has also been discussed by Mr. Small in *The Engineering Journal* in August, 1950. If open channels are to be maintained on the main river, Mr. Small's channels must be deepened and narrowed, and the ruling velocity in the river must be changed. If so, any developments on the bypass channels of the Ottawa River behind Montreal will not be required.

The best regulation of the St. Lawrence between Lake St. Louis and the Estuary can only be obtained by using Lake Ontario as a balancing basin, with which to level off the effects of the somewhat rapid fluctuations in the Ottawa River. This regulation the writer finds by preliminary enquiry to promise to be quite effective, provided that the level of Lake Ontario is always drawn down to a set minimum before the end of each winter. Thus the St. Lawrence at the Galop would be reduced whenever the Ottawa rose at Carillon, and the flow of the main river below Lake St. Louis would vary but little. Such a system of regulation is impossible until the outlet of Lake Ontario at Galop Rapids has been much enlarged, and until the Department officials are placed in position to adjust the levels of Lake Ontario at any time to the best advantage of Canada and of the United States, considered together.

A maximum output of power can be obtained from the St. Lawrence and the Ottawa, considered as a single source of supply, with the aid of Lake Ontario as a storage basin. To gain this result the use of flood water over short periods must be provided for.

The discussion which follows covering conditions between Montreal and the open ocean is based on a paper written by the author, and published by the "Dock and Harbour Authority" of London, England. Taken together with the original paper, these remarks outline a waterway project from Newfoundland to Lake Ontario, entirely on Canadian soil, which could be kept free from seriously obstructing ice. It would call for co-operation from the United States and from New York State only in the regulation of the levels of Lake Ontario, and in the division of the flow into equal parts at Galop Rapids.

Canada Gains Most From Waterway

The "All-Canadian Deep Waterway", referred to in the paper, means a waterway built entirely on Canadian soil, entirely with Canadian money and with a minimum of co-operation from our neighbours to the south. If we consider building the Waterway alone, we should ask ourselves in advance whether we as a country are sufficiently strong financially to undertake the job.

I think that question hardly requires an answer. Ottawa and Toronto have given the project full approval. They doubtless did not do so without considering all the after-effects. It is about 100 years since the merchants of Montreal created the Montreal Harbour Commission, and the Montreal Harbour Commission promptly started to build the first section of the waterway, namely, the channel from Montreal to Quebec.

I would like to recall for a moment the conditions under which they started that undertaking. The country was absolutely tied up in a political deadlock. The Harbour at Montreal had lost most of its trade because the Corn Laws had been repealed in England. The financial condition of the country was chaotic and three different currencies were being widely circulated; a knowledge of exchange was very necessary in those days; and, finally, about one-half of the leading merchants in Montreal had recently signed an annexation manifesto. It was under those conditions and with absolutely no financial backing except the meagre revenues of the Harbour of Montreal that the Hon. John Young and his associates started to build the Montreal Ship Channel. As you know, they carried out the work with complete success and it took them from about 1850 to 1887 to do it. They had deepened the channel from 10½ feet to 27½ feet before the Government of Canada decided that the work would be to the general advantage of Canada, and proceeded to take it over as a national undertaking.

If they could overcome all those difficulties and make a triumphant success, surely this great and prosperous country of ours can easily undertake what is relatively a smaller job.

The second question is whether the United States is actively interested in our ambitions to create a real waterway. To that I think the reasonable reply is no. They have built up a magnificent overland transportation system from the Great Lakes and from the Ohio River to the Atlantic. They have also built up a magnificent system of electric power supply. Naturally they are apprehensive of the appearance of a publicly-owned power plant and a publicly-owned deep waterway, both under the control of political nominees. It is their right and privilege to oppose it.

If you consider the whole Waterway from Lake Ontario to the shore of Newfoundland, you will find that American interest in it is comparatively small, not more than 10 or 15 per cent. It is not desirable to form a partnership with people who have entirely different ideas of the ultimate objective and very different interests in the undertaking to those which Canada holds. For that reason, speaking personally, I hope the negotiations now in progress at Washington will fail.

The Waterway is not a short route between the main industrial centres of the United States but it is the ideal short route between the industrial centres of Eastern Canada. They all will benefit from it. For that reason I hope that we build it ourselves, to best suit our own conditions and requirements.

Our Objective

How far should we go in improving the Waterway? My own view is that our objective should be the creation of a channel from Lake Ontario down to the ocean, that will always be open to navigation. Any channel in the St. Lawrence that will keep itself ice-free will also be sufficiently deep for navigation interests for a long period.

Prevention of the formation of ice depends on the depth and volume of the waters. A channel about 60 feet deep would be about right for the Waterway. What difficulties would we have to overcome to reach that objective?

The Ice Packs

At the entrance from the ocean there are usually two great ice packs which every ship must avoid. One of those, known as the Labrador ice pack, covers particularly the Grand Banks; this ice is brought south by the Labrador Current.

The second pack lies south east of Cape Breton, and is known as the St. Lawrence ice pack. This ice is carried out from the Gulf. Both are formidable masses of ice, but both are under close observation throughout the early weeks of the navigation season. The Labrador pack is watched by the International Ice Patrol. Its aircraft are constantly observing the pack's movements, and all shipping is warned how to keep out of trouble.

The St. Lawrence pack is watched by the Canadian Ice Information Service. This service has never permitted a ship heading for the south-west corner of Newfoundland to get into ice trouble. Between the two ice packs is a wide open channel. The two observation services keep track of this shifting ice, and keep all the vessels informed as to where the ice is.

In the Gulf itself is the Middle

Pack, an enormous pack of drifting ice, of probably some 15,000 square miles in area, filling all the passage between Anticosti and Gaspé. It also fills all the block of water defined by Cape Ray, the Magdalen Islands, Gaspé, Heath Point on Anticosti, and Corner Brook. One arm extends up into the Jacques Cartier Passage. This is not solid ice; an ice breaker can work through it, sealing ships work in and out of it, and it is said that a powerful merchant ship could work its way through. During this winter of 1950-51 this pack has been about half its normal size, and remained all winter between Anticosti and the Gaspé Peninsula. No ice passed outward through the Cabot Straits. The weather conditions existing were almost without precedent.

Sources of Pack Ice

More information is needed. Two important things are definitely not known; the temperatures of the waters that the pack rides on, and where the ice comes from. Only recently the Joint Oceanographic Committee issued a pamphlet dealing with the surface temperatures of the waters of the Gulf. It is a valuable document, but relates only to the summer months; for the six months of winter there is no information available.

The Laurentian Current comes in from the ocean along the line of the deep soundings shown in Fig. 9, and passes along the south shore of Newfoundland and into the Gulf. It is a tremendously strong current. Norwegian scientists, brought here to study the Gulf fisheries, claimed it was roughly a hundred times as great as the discharge of the St. Lawrence. It could cover the whole area on which the middle pack floats, with new water, to a depth of five feet every day. This current of "warm" water is constantly pouring into the Gulf, and doubtless has helped to keep the Lower Gulf completely clear of ice this year.

The other current, which comes down from the St. Lawrence River and is known as the Gaspé Current, can be first noticed near the mouth of the Saguenay. It has a measured volume about equal to that of the Laurentian Current. What one current brings into the Gulf, the other current must almost of necessity take out. Fortunately in the upper sections of the Gulf all the ice drifts over to the south shore, and is picked up by the Gaspé Current, much of it being lodged in the midle pack. The Gaspé Current at the end of November has a temperature of about 35 deg. F. It may or may not go much lower in winter. The importance of these facts is simply that we have no means of judging how fast ice will form in the Gulf itself, especially over the deeper waters that the middle pack floats on.

The question of where the middle pack ice comes from can be answered generally, but not with precision. No ice inward bound ever passes along the south-western shore of Newfoundland. At times a great deal enters the Gulf from the Strait of Belle Isle. Some ice must be formed in the Gulf, and it is also known that the Gaspé Current brings immense masses of ice with it. This current will bring down far more than enough ice to fill the midle pack in the course of a month.

As long as it is not known what the relative quantities of ice are that come into the pack from different sources, it is difficult to suggest a way of fighting it. A most interesting study of this question is contained in a paper published by the Department of Marine and Fisheries twenty years ago, and prepared by Dr. Huntsman, entitled "Arctic Ice on our Eastern Coast." In it he advocated the complete closing of the Strait of Belle Isle. This, he claimed, would completely change the climate along the northern shore of the Gulf, making the whole Gulf navigable in winter.

The writer hesitates to endorse that opinion. The Strait of Belle Isle ice, from the point of view of navigation, is much the most dangerous ice that gets into the Gulf. Brought down by the Labrador Current, it is generally seven or eight feet thick, as compared with St. Lawrence River ice this year, that did not grow to more than 18 inches.

In addition, icebergs from the Strait of Belle Isle break up and leave behind them miniature icebergs, called "growlers". These are dangerous obstacles for a ship. A special pamphlet, published by the Canadian Joint Committee on Oceanography on the flow of water through the Strait of Belle Isle, shows that there is always a double current, one coming in and one going out. When the measurements were being taken in mid-August,

Fig. 9. Plan of the Gulf of St. Lawrence.

nearly the whole north shore of the Strait was lined with icebergs.

Barrage at Isle of Orleans?

The next mass of ice encountered is that brought down by the Gaspé Current. This ice flow can be almost entirely prevented. There is now nothing to prevent the ice from below Trois Rivières breaking loose and drifting down the river past the shoals between the Isle of Orleans and the South Shore, and so down into the Gulf. These shoals are crossed by two or three passages called "Traverses", but no attempt is made to use them in winter, due to drifting ice and changing currents. The shoal area is somewhere in the neighbourhood of 600 square miles, swept twice daily by tremendous tides. Conditions are almost ideal for ice formation, with quite shallow fresh water, unprotected from the naturally cold air.

A barrage could be built across the Estuary below these shoals, to stop the drift ice. This will be a job comparable to the cutting off of the Zuider Zee from the German Ocean. If the ice from the main supply area to the Gaspé Current were cut off, together with the Belle Isle ice, the conditions in the lower Gulf would be similar to the conditions today in winter between Murray Bay and Seven Islands. That section is regularly navigated through the winter; the ships that navigate it have some trouble with ice at odd times, but it is not regarded as serious.

If the drifting ice from the river above Quebec was cut off, conditions in the lower section of the Gulf would definitely be more favourable than are now found between Murray Bay and Seven Islands. The reason for this is that the winter climate in the area around Sydney, Port aux Basques, and the Magdalen Islands is considerably milder than around Seven Islands, Matane, Tadoussac, Quebec or Father Point. In addition there is the enormous Laurentian Current sweeping in constantly with water of milder temperature. Because of these facts, it may be reasonable to draw the conclusion that there would afterwards be no pack of ice to cut off navigation between Cape Ray and the barrage, and winter navigation would become quite safe.

Would Control Tides and River Levels

If the barrage below Quebec is ever built, it should be high enough to hold back all tides. If it is built high enough to prevent this, it will also be high enough to govern the levels of the river up to Montreal, and to hold those levels at approximately spring elevation. There is a valuable report, now almost forgotten, published by the Department of Public Works about 1892 and prepared by R. Steckel, M. Can. Soc. C.E. It deals with the levels of the river between Montreal and Quebec, particularly the variations between Trois Rivières and Quebec with the stages of the tides and of the seasons. Mr. Steckel's figures agree well with more recent observations by the Dominion Hydrographer.

As is well known, the Government is working to create a safe channel 35 feet deep at extreme low water, up to Montreal. If the levels can be held up to spring elevations the new channel will have nearly 50 feet of water all the way up to Montreal. To make this channel safe for navigation in winter it will probably need to be protected by levees on each side.

The most serious difficulty encountered nowadays in trying to reach Montreal in the early spring is the sideways movement of the ice, particularly in Lake St. Peter. The ice breakers come up through the channel, which, is narrow compared to the entire river width. The side ice naturally tends to flow into open channel and the ice breakers have to do their work all over again. Also, some means of making the water at Montreal a little warmer than it is now in midwinter should be sought, a problem which is dealt with in some detail in the first part of this paper itself.

Conclusion

It may be said in conclusion that the facts so far as we know them today indicate that an open waterway can be maintained between Lake Ontario and the ocean. The cost of such a channel can be readily estimated as soon as the necessary authorizations are given by proper authority—the question of undertaking the necessary works then becomes a public question for the solution of which the engineering profession will have furnished some necessary data.

Aluminum for Aircraft Hangars

A new design for an aluminum alloy hangar enables the entire framework to be erected without any scaffolding, or even ladders, in a very short space of time.

The traditional method of construction of such buildings is to put columns up first and then build an arched roof across them. In the new method each "half portal" (i.e. each side column, together with the arch that springs from it) is put together on the ground. Its base is hinged at the floor and it is then slowly hauled up to meet the half portal opposite. As they meet in the centre of the roof, the two halves are bolted together to form a complete span. Hoisting them into position can be done by a small winch or by manual labour.

Each set of four half-portal frames can be constructed and put up by six men in five days, with the help of two men on the winches during the lifting operation. When the arches have been lifted up, the builders can climb them and begin work on the cross-members, roofs, walls and so on. Girders and other components can be lifted up to them with rope and tackle.

To speed construction, the hangars are partly prefabricated: all the main skeleton-structure is built in medium lengths and assembled on the site. In fact ninety per cent of the assembly work can be done on the ground.

The first of these hangars has been built at London Airport. Its total weight, with three bays each capable of housing one four-engined airliner, is 312 tons, of which 102 tons is structure and sheeting weight, the rest insulation, doors, glazing, and decking.

Engineering Achievements in Alberta

by

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A paper presented at the 30th annual meeting of the Association of Professional Engineers of Alberta, at Calgary, Alta.

We are, tonight, celebrating the Thirtieth Anniversary of the Association and it is, therefore, pertinent to review the general background of Engineering Achievements in the Province, and to deal in greater detail with the achievements during the last thirty years. Let us first define an engineer. An engineer is one who develops the natural resources of a country and/or uses the natural forces of nature, and converts them to the uses of man. To do this efficiently requires years of study, wide experience, and great vision.

Natural resources may be considered as wealth given to us by Providence to develop and use for the benefit of man. It has taken Nature millions of years to produce these resources, some of them can never be replenished. Therefore, we, as a people, are left with a sacred trust to develop them judiciously and not wastefully, and wherever possible to leave them to posterity in a better condition than we received them. Natural resources are of no value if left in the ground.

Unfortunately, engineers are not prone to take an active part in public affairs by voicing their opinions. Yet no one is more capable of guiding the destiny of our country than they are. Too often commissions and other public bodies dealing with natural resources and economics have little or no engineering representation in their personnel, yet better results would be secured if the worth of the engineer was more fully recognized:

It has frequently been said, and truly, that Alberta is the richest in variety and extent of natural resources of all our provinces. Let us enumerate some of these resources: 50 per cent of Canada's coal reserves; practically 100 per cent of Canada's known oil and natural gas reserves; possibly the world's largest known reserves of oil locked up in our tar sands; enormous deposits of salt and gypsum; rich agricultural land; large deposits of limestone, shales and clay suitable for the manufacture of lime, cement, rock wool, bricks, pottery, etc.

Tracing the geological development of Alberta, and showing how the resulting physiography has made power and irrigation possible, this paper discusses in turn, railroading, coal mining, power development, irrigation, petroleum discoveries and development, structures and highways, fertilizer production, and the achievements of the engineering profession in each of these fields. Tribute is paid to the conservation measures set up to protect the public. The author, in conclusion, shows how the Province is wisely using its resources to retire its debt.

Geological Periods

This is truly a great heritage, but these resources did not just happen. They are due to first causes based on the geology of the Province, and the forces of nature acting on the surface, including and since the glacial period some hundred thousand years ago. During the pre-Cambrian times the Gulf of Mexico was joined up with the Arctic Ocean forming a large ocean whose eastern shore line was bounded by the Appalachians and the so-called pre-Cambrian shield in Canada extending from a point some 70 miles east of Winnipeg to the mouth of the MacKenzie River. The western shore line was the Columbia River trench just west of the present Alberta boundary.

During later geological periods there was a gradual rising of this area and a gradual curtailment of the sea. In the meantime limestone was being formed under deep water conditions and sandstones and shales laid down in the shallower water. It is important to note that in general the climate was warm, as evidenced by the formation of coral reefs and salt deposits as well as hot water fossils found in the area extending from the United States border in Alberta to the Arctic Ocean.

As this ocean bed became shallower, with consequent increase in landed areas, there were oscillating conditions between the laying down of marine and fresh water deposits. Vegetation grew and flourished in the low-lying and marginal areas, and their decay and deposition formed enormous peat bogs. These bogs were subsequently covered by sands and clays washed in from the high land and through the process of time and pressure the peat was converted into coal. The coal occurs in three different horizons in Alberta.

After this great sea had disappeared the Rocky Mountains and foothill areas were elevated by folding and faulting by a thrust from the west, which revealed the underlying rocks which had been deposited in the old sea. This was followed by the laying down of younger sediments until the Glacial Period, when the whole area was heavily eroded by the movement of successive ice sheets, and the area to the east of the mountains was covered by a mantle of glacial drift. Finally on the recession of the ice sheet (some 100,000 years ago) the topography of what is now Alberta, Saskatchewan and Manitoba appeared very much as it is today.

At this time, one may ask what this has to do with engineering achievements in Alberta. The answer is, *everything!* Because this is how God left it, and the manner in which they were left constitute the problems facing the engineer today.

The geology of the country gave us deposits of oil, natural gas, coal, salt, tarsands, limestone, gypsum, sands and clay. In the case of the first four, these largely occur at various depths, amounting up to some 15,000 feet in the case of natural gas and at pressures exceeding 5,000 p.s.i. The problem of winning these resources without undue waste is the work of the engineer. The mantle of glacial drift presents two very serious problems, one related to agriculture, and the second in regard to foundations for engineering structures and road building.

Physiography

Providence was good to Alberta in giving these resources. But had it not been for the uplift of the Rocky Mountains and foothill areas, it is doubtful if agriculture would have been possible on the Prairies. One thing is certain, that owing to low rainfall and low gradient we would have had no waterpower development, and the watertable would have been too low to support a population on the Prairies.

The uplift of the Rocky Mountains and foothill area act as a storage for rain, ice and snow and establish a gradient, due to elevation, by which the streams and rivers that rise in the mountains flow, in general, across the Prairie Provinces in an easterly or northeasterly direction to empty into Hudson's Bay, or northward to empty into the Arctic Ocean by way of the Mackenzie River. It is these factors that make possible irrigation and water power in the south and central portion of the Province, and water power and navigation in the north, including the Northwest Territories.

Railways

No single industry employs more engineers in its many branches of endeavour than our railways, nor can any country be developed unless adequate transportation is provided. The first major undertaking by the engineer was the construction of the Canadian Pacific Railway. In 1883 this company laid its steel across what is now Alberta, and Medicine Hat and Calgary came into existence.

Coal discovered on the Oldman River led to the founding of Lethbridge, and a railway was built from Dunmore to that point. In 1891 a railway was built from Calgary to Edmonton which opened up many new towns as centres of excellent farming areas. Alberta is now served by a network of railways, and the mileage has grown from 1,060 miles in 1905 to some 6,000 miles at the present time. Two outstanding steel bridges were constructed, namely the bridge across the Belly River west of Lethbridge, and the High Level Bridge across the North Saskatchewan at Edmonton.

Engineering skill in operation has kept pace with railway construction. Larger and faster trains with increased motive power, burning coal as a fuel, were developed. Now, due to supplies of Alberta oil being available, the railways are turning to oil-fire locomotives and diesel operated equipment. The standard of operation of our railways is as high as that found anywhere on the Continent.

Coal

Coal mining was first commenced in what is now Alberta in 1886.

Fig. 1. New bridge at Lethbridge, Alta.

but it was not until 1906 that a substantial production was secured. The total value of the production since its inception amounts to some $850 millions. In early years hand-mining was widespread, but more recently a high degree of technical skill and machinery has been applied to the industry.

Coal mining in the high-grade bituminous coal areas in the foothills belt is extremely hazardous, due to coal gas and the high dip of the coal seams, as well as other factors that require high engineering skill to promote safety and successful operations. Most of these mines are highly mechanized and some are served by hydro-power. On account of the friability of the coals, briquetting plants have been installed at some of the mines to produce coal briquettes for domestic and power purposes.

Large coal cleaning plants have been installed at all these mines to remove impurities from the coal, and in this way improve the quality of the saleable product. Mechanical stripping and mining operations are now being carried on where conditions are favourable. The coal mines of the Plains area are almost completely mechanized, both in respect to underground and stripping operations. In general it might be said that coal mining operations in Alberta have kept pace with the development of the country and are, today, considerably in advance of other provinces so here, again, a tribute can be paid to the engineers.

In respect to steam operated coal-fired central power plants, a high degree of efficiency has been secured. One of these, the Edmonton Municipal Plant, is worthy of special mention. Owing however to competition of oil and natural gas, the use of coal is being displaced to a considerable extent in western markets, and this offers a challenge to the engineer if we are to hold our place in these markets.

Fig. 2. Glenmore dam, Calgary, Alta.

Water-Power

The Great Plains area, in general, is devoid of natural water powers, as the rivers traversing the area have low gradients. Furthermore, an essential to economic development of water power is that the flow should be fairly constant the year around. The climatic conditions in Alberta are such that the winter flow of our rivers is extremely small, as compared with the heavy spring and summer run-off caused by the melting of snow and ice in the mountains, and rain in the spring and summer seasons. On the other hand, the maximum demand for power and light comes in the winter months.

The best sites for water power development are located in the foothill areas. It is, therefore, apparent that economic development is only possible by the creation of huge water storage works in these areas, to equalize the daily flow of the rivers in so far as possible. Few Alberta rivers lend themselves to this. The Bow and its tributaries have been highly developed under most difficult conditions, so that today we have a well regimented water storage and power development on this river system. This could only be done as part of a well conceived engineering plan.

Engineering development of the Bow has not been confined to water power alone, but this power has been distributed over a network to practically all cities and towns within an area extending in a northerly direction from the United States boundary to a point fifty miles north of Edmonton, and easterly as far as Saskatchewan. This system is unique in that there are few places where power in quantity is used, and the average length of transmission lines to serve small users is greater than almost anywhere else. Notwithstanding this condition, more and more services are being extended even to individual farms.

Engineering applied to water power development, to suit conditions existing in the Province has been of a very high order, and proper credit is due. From the above it must not be assumed that Alberta is devoid of water powers, as further developments will occur as irrigation works progress in the north. The North Saskatchewan and Athabaska have large potential, but dams and storage facilities will be somewhat costly and difficult.

Irrigation

There are large areas in the Prairie Provinces where conditions are such that successful farming is only possible under irrigation. On account of the increased yield per acre and the work needed to be done under irrigated farms, the amount of land required to form a farm unit is small. Therefore, irrigation supports a larger and more closely knit population. The immense advantage to farmers and the country as a whole is well exemplified by the City of Lethbridge, where irrigation has been practised for half a century. Without irrigation, Lethbridge would still be a small town. Today it has a population of approximately 23,000, and retail trade, per capita, is higher than for Edmonton or Calgary, as well as above the Canadian averages.

Some of the larger early projects were undertaken by private enterprise for colonization purposes, and no doubt were of value in this re-

Fig. 3. Aerial view of the St. Mary's dam on the official opening day shows an abundance of water, backed up for miles.

spect. However it was found that the total cost of irrigation was more than could be charged to the land, and on account of its great value to the country as a whole it became a proper function of the Federal and Provincial Governments to provide financial assistance and direction. There are now 13 irrigation projects in operation in Alberta, comprising an area of some 812,000 acres of irrigable land. This area extends from Drumheller to the United States boundary, and from the mountains to the Saskatchewan boundary.

As part of the post-war planning it was proposed to utilize to the fullest extent the water resources of Alberta for industrial, municipal and agricultural purposes. Eight projects were listed and the work commenced on some of them. The first to be undertaken was the St. Mary-Milk River project.

This project was first conceived some thirty-seven years ago, and has just reached fruition. Four international streams, the St. Mary, Milk, Belly and Waterton Rivers, were all involved. Under an agreement between Canada and the United States in 1909, each country was allotted half the combined flow of the St. Mary and Milk Rivers. Distribution of the flow from Waterton and Belly Rivers has not been negotiated yet. If Alberta (Canada) does not get all the water from these rivers the project will be somewhat curtailed. This stresses how important it is to have engineering representation on commissions and other bodies dealing with natural resources.

This development will cost some $30 millions, which works out at a cost of $75 per irrigated acre. The capital cost is being borne by the Federal and Provincial Governments. The Province will charge $10 per irrigated acre for the water right and a refund of the capital cost. This can be cash or spread over crop payments of 10 years. The balance of the capital cost will not be refunded. Some 450,000 acres will be irrigated, stretching from southwest of Lethbridge to a district a few miles from Medicine Hat. The key structure to the project is the St. Mary dam, which is the largest earthen dam built in Canada.

Crops "Under the Ditch"

Industrial developments resulting from irrigation are contributing substantially to the general welfare of southern Alberta and to the Province as a whole. The Sugar industry is growing rapidly, with plants at Taber, Raymond and Picture Butte. The estimated value of the 1950 sugar beet crop alone was some $7 millions, while the total value of crops on irrigated land in Alberta the same year was close to $27 millions. In its natural state this dry land was unsuited to stable agriculture. Now, through the services of the engineer, it is a prosperous area. The rainfall has been brought from the mountains and deposited in an area of low precipitation, thereby creating some $27 millions annually of farm products for the uses of mankind.

Alberta will always be a great agricultural country, and the value of its farm products is still far in excess of the value of all our mineral production. Some fifty per cent of our population is directly associated with agriculture, and many more are indirectly associated.

Petroleum and Natural Gas

Oil development in the Province has passed through three phases. The first phase was the development of Turner Valley as a wet gas field when, after the extraction of gasoline, the gas was flared and wasted. The total gas wasted would have been sufficient to supply the present needs of Alberta for some twenty years.

The second phase began in 1936 with the discovery of crude oil on the flanks of Turner Valley. It is to the credit of the Alberta Government that The Petroleum and Natural Gas Conservation Board was established, and the field operated according to good conservation practice. This board was and still is an Engineering Board. The peak of production was reached in 1942 when the production amounted to 10 million barrels. There has since been a decline in production, and some 3,775,000 barrels were produced in 1950.

The third phase was entered by the discovery of crude oil at Leduc in 1947, followed by the discoveries at Redwater, Golden Spike, Excelsior, Campbell, Joseph Lake, Stettler, Big Valley and in the vicinity of Camrose. Production amounted to some 27 million barrels in 1950, which supplied practically the whole of the Prairie Provinces.

We are now entering on a fourth phase, namely, the reaching out for further markets based on our expanding reserves. The present recoverable reserves have been estimated at some one and one-half billion barrels of oil.

Interprovincial Pipe Line

Apart from the great development programme carried on by the oil companies in Alberta, amounting to some $150 millions in 1950, the greatest single engineering achievement was the construction of the Inter-Provincial Pipe Line from Edmonton to the Head of the Lakes, by which oil refineries at Regina and Moose Jaw will be served en route, and Winnipeg and Brandon by branch lines. However the significant function of this line is to serve southwestern Ontario by tanker service from Superior, Wisconsin.

The capacity of this line is some 93,000 barrels daily, but already it is inadequate to take care of market requirements, and is being boosted some fifty per cent by increasing the number of pumping stations. The development in Alberta is making such rapid progress that it appears possible that in the not too distant future Canada may produce and market the equivalent of her total requirements. When this point is reached, national safety as well as the safety of North America will be considerably enhanced.

Natural Gas

Natural gas development has not kept pace with oil development on account of lack of markets. Nevertheless, the reserves of gas discovered, incidental to oil production, are enormous and are well beyond Alberta's needs. Should the export of natural gas be permitted, our gas reserves would be greatly increased by drilling. The treatment of natural gas in volume, to remove oil and other ingredients before putting it into pipe lines, makes available many products suitable for use in chemical industries.

Natural gas pipe lines are being extended, year by year, thus making gas available to a number of cities and towns in the Province. The great development of oil and natural gas, as outlined above, has only been possible through vision and the application of high engineering skill in its many branches of application.

Foundations and Road Construction

An engineer has continually to deal with the origin and character of our soils in respect to foundations for dams, bridges, buildings, etc., also in irrigation work and particularly in respect to highway and road construction. Our soils being of glacial origin, clay, silt, sand and gravel are mixed and vary from point to point, and may or may not be water borne. One of the greatest specialized engineering achievements in the last two decades in Alberta has been an understanding of this problem and improvements in its solution by Alberta engineers. Engineers of the Public Works Department have made important contributions to the better understanding of the engineering properties of our native soils. Others in the Province have made similar contributions in respect to earth works in general and in particular earth dams. The University of Alberta has pioneered soil studies in Canada, and their contributions to the solution of our peculiar soil problems have received international recognition.

Road building in this Province has also gone through three stages. First, construction of country roads, with few arterial highways, when roads were just made from the natural surface materials whatever they may have been. Second, a slight improvement by grading and drainage with a top course of gravel. The third stage has been brought about by the increase in the financial position of the Province, due largely to revenues secured from oil developments. A time will come when the source of such revenues will fall. Money obtained in this manner is thus considered as capital, and is now being used to reduce the provincial debt, and a portion of the balance is being used for capital improve-

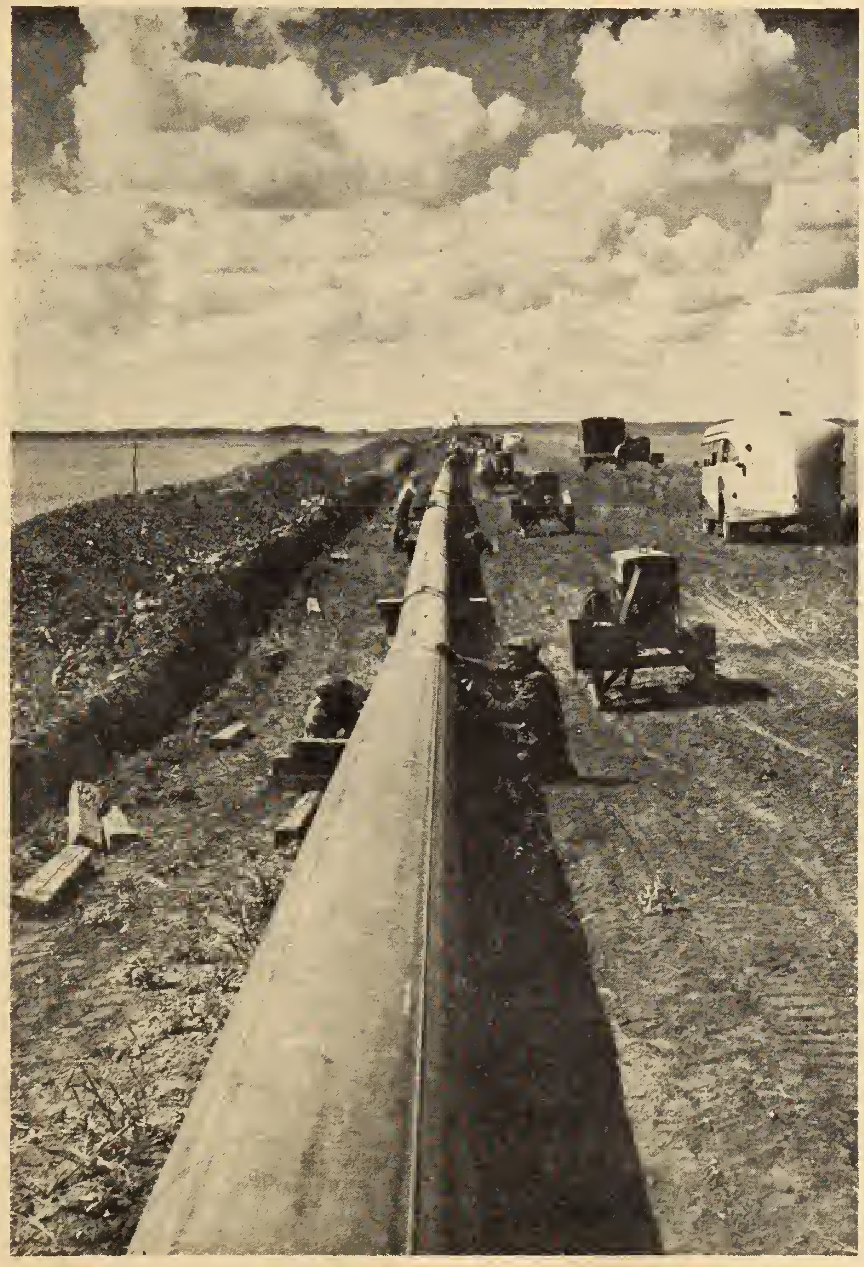

Fig. 4. Interprovincial Pipe Line.

ments, of which permanent highways secure a fair share. It is for this reason that a high degree of engineering skill is needed, so as to construct more or less permanent highways.

The major problem confronting the road builder in these first two stages has been an economic one, resulting from our low density of population. He has been faced with the problem of building an exceptionally large mileage of roads per capita of population. It is only in the third stage that increased financial resources have partially eliminated this problem, so that high quality roads are now economically feasible. Due to the development of the oil industry, heavy oils and asphalt are readily available. These materials are being used to a large extent in permanent and semi-permanent highways.

Alberta Nitrogen Plant

The first stages of World War II created an enormous demand for ammonium nitrate, which formed the basis of manufacture of high explosives. In the manufacture of ammonium nitrate, ammonia is first made; to do this it is necessary to have supplies of nitrogen and hydrogen. The usual practice is to secure nitrogen from the air by first making liquid air; hydrogen is secured by the breaking up of water into its constituents hydrogen and oxygen by means of direct current electricity. This process requires large quantities of electric power.

This process was in use at Trail prior to World War II, but the hydrogen plant could not be expanded at that time on account of the shortage of electric power. As a defence measure, a plant was installed by the Munitions Board at Calgary, when the source of hydrogen was secured from methane gas from Turner Valley. This was the first plant to be constructed in Canada using this process.

After the war, the plant was taken over by the Consolidated Mining and Smelting Co. and used for the production of ammonia for commercial purposes, principally as fertilizer. The cost of production is low enough to permit of its sale in world markets. Its importance as a source of fertilizer for the Prairie Provinces is becoming more apparent every year.

The three essential chemicals for successful agriculture are potash, phosphate and nitrogen, and these are extracted from the soil. If the soil is naturally deficient in any one of these substances, it is only a matter of time when the soil becomes impoverished, and lower crop yield is the result. The origin and nature of Prairie soils has been briefly outlined. The potash and phosphate are present from the erosion by the ice of the Laurentian granites to the north and distributed by the ice sheet over the whole country.

Nitrogen is secured from the air by the growth of vegetation. Since the Glacial Period, plants have lived and died and formed a shallow fertile layer (top soil) suitable for agriculture. It is for this reason that the top layer of production soil should be conserved in every way and not be allowed to blow away. There are deposits of phosphate rock in Alberta and large deposits in Montana and Utah, so that with ammonia as a source of nitrogen, all the elements except potash are readily available for the manufacture of fertilizers.

The potash in our soils is secured from the breaking down of potash feldspars in the granites, and there is no great deficiency. Another advantage of commercial fertilizers is to assist in the natural weathering of the soil, and being in a soluble state plant life responds immediately. This Alberta nitrogen plant, therefore, qualifies as one of our great engineering achievements.

Conservation

In order that the people may be protected in all matters of policy affecting natural resources, engineering boards have been set up in this Province and elsewhere in Canada. Under legislation to develop and protect the "rights of the people", among these might be mentioned: The Petroleum and Natural Gas Conservation Board; The Eastern Rockies' Forest Conservation Board; The Prairie Provinces Power Board, and The International Joint Waterways Commission. Time does not permit dealing with the functions of these boards in detail, but two of them in Alberta are worthy of special mention.

The Petroleum and Natural Gas Conservation Board deals with all matters respecting drilling and production of petroleum and natural gas, with the object of conserving the resources of the Province, preventing waste, and giving each owner the opportunity of obtaining his just and equitable share of the production of any pool. In this connection it can be said that we have gained by the experience of others, and today have an excellent set-up to deal with this important matter.

The Eastern Rockies' Forest Conservation Board deals with forest and water resources. The physiography of the Prairie area has been previously outlined. The water resources of the Prairie Provinces are dependent upon maintaining and preserving the forest cover. This work is being done by engineers jointly by the Province and the Dominion Governments. This work is of the utmost importance, as not only are the water resources of the Prairie Provinces dependent upon its success, but also the fertility of the whole area. An important step in the conservation of the water supply of the northern rivers was made by the Alberta Government some years ago, when it withdrew from farm use most of the northwest area of the Province.

What these Achievements have meant to Alberta

The engineering achievements have only been made possible through the great resources given to us by nature. Some fifteen years ago Alberta was on the verge of bankruptcy. The public debt stood at over $160 millions, and it took more than half the revenue to pay the interest on the debt. Now Provincial revenue is $75 millions yearly, and the public debt has been reduced by $56 millions. To eliminate this debt in twenty-three years would require only 7½ per cent of the present revenue.

In the past three years the Province has received more than $80 millions from Crown reserve sales and royalties from oil. This development has had a tremendous impact on the economy of the Province. All of this has been made possible under our system of democracy and free enterprise, which brings to mind our greatest natural resource, namely our people. Unless we take an active part in the training of our youth in citizenship and in pointing out the advantages of our democratic system, then we may expect the reverse and lose all those freedoms that we now enjoy. Unless we as engineers accept this challenge and warning, we cannot look forward with hope for the future.

ENGINEERING TRAINING in BRITAIN

by

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An address presented at the Annual Banquet of the 65th Annual General and Professional Meeting of The Engineering Institute of Canada, at Montreal, May 11, 1951.

Mr. President, ladies and gentlemen, it has been an inspiration to come here again and see what immense progress is being made in all fields in Canada, and I couldn't help thinking, what an inspiration it was to young engineers to hear the experiences of those who have made good. Nearly all of them had not only qualified technically but practically, and what few words I want to address to you tonight are in connection with the training of engineers as, we realize, new conditions demand in our country.

When I started, in January, 1892, conditions for the training of engineers were very different to what they are at the present time. We started in a shop and everything had to be done as individual pieces, and they had to be made by the skill of the craftsman. Now, sometimes I feel that skill of craftsmanship is getting lost, due to modern methods of production. It is causing us in England a considerable amount of concern. We hear a great deal, and have done since the war, of the importance of scientific training and research. In fact, research has become a little like Mesopotamia, that old lady that had so much to do, and was so comforting. I am not belittling research in any way because more than ever it is necessary, but if all our graduates become interested in research and work on scientific engineering, who is going to do the ordinary work?

One of the things causing us a considerable amount of anxiety is the sort of training the boys who enter the trades and professions associated with engineering will get. Big undertakings can arrange apprentice training, which gives them the fundamentals of this craft. Apprenticeship enables them to get their grounding in technical work, if necessary for them to be able to interpret the work that is done in the laboratories and research organizations.

Now we have various schemes of training the engineer. A boy can start as an ordinary trade apprentice. By attending technical schools one day a week, and also in the evenings, he can attain the ordinary national certificate and the higher national certificate if he works. Those certificates have been approved by the major institutions in association with the Board of Education. They are largely administered through the professional institutions. The higher national certificate qualifies a man up to degree standard at the university in the particular subject he takes. That means that it is possible, and frequently happens, that an ordinary trade apprentice can reach the highest executive position. That, for a conservative country like England, is no mean achievement.

Then we have the sort of training given to a boy from what we call our public schools, who probably matriculates and gets a higher school training before he leaves school. We start him as an engineering apprentice, and while he is taking his practical training he goes to technical school. He may go through to the higher national certificate or he may get a fellowship or scholarship to one of the universities.

Then you get a graduate of the university who works with a firm of engineers as a pupil for three years. If he has the brains he may become a good engineer, provided he has the technical qualifications. He has to obtain practical experience. We place a great deal of importance on practical training.

I noticed in the citation on Mr. Anson that it was mentioned he had extraordinary ability in handling men in connection with the work in which he is engaged. To my mind, from my experience, that ability for handling men not only depends on the temperament of the individual but depends also on his knowledge of the men's attitude to life and their work. He can only get that, to my mind, by actually being in the work and being engaged with them and learning their difficulties and the sort of work they have to carry out.

In Scotland we have a scheme which is called a "sandwich system", which enables the boys to work six months in a works and six months in a technical college, and that has turned out many fine engineers. The "sandwich system" enables industry to release a number of boys for six months in the year. Then they come back into the works while another set goes to the college, which has advantages in the organized shop organization.

Now present conditions require a much larger number of skilled engineers to arrange the work and to plan the work. It also requires a certain number of skilled craftsmen to interpret what these skilled engineers have planned, as well as to set up the machines and see that they get out the work according to the designs. They are a much larger element who operate the machines. In our experience it requires a much larger staff of skilled engineers and designers to plan the work and organize it to produce it economically. It is one of the advantages and also one of the disadvantages of mass production work.

In addition to training, we have made considerable strides in the standardization of parts, in a reduction of a number of sizes used for various articles. In 1945 I came over here in connection with the delegation to the American-British-Canadian Engineering Standards Unification Conference at Ottawa, to consider a standard screw thread and we made a certain amount of progress.

That was in 1945, and we are still waiting for the standard to be issued. As chairman of the Engineers' Divisional Council, twelve months ago I inquired how it was that they had made such slow progress. The main trouble seems to have been to determine the size of the bolt-heads and nuts. I immediately said: "It's no good quibbling about this. Why not agree on the American size?" And somebody in the back of the room said: "WHICH American size?" That rather flattened me. I found there are three sizes of nuts for each size of bolts.

One can readily understand in a big country like the United States, where the industries are enormous, that it would be difficult to settle on a certain size of bolt and nut. But it did occur to me that perhaps that accounted for the large amount of business done by the Stillson Wrench Company, especially in the sale of monkey wrenches.

The problem of standardization of screws has been before us for thirty years, and we still have not come to any final solution. A conference had started in London when I left there and there were some representatives from the United States to discuss this subject. I am hoping when I get back there will have been some advance made which will enable us to issue standard specifications.

One of the most important proposals at the present time is the Athlone Fellowship Scheme, which has been promoted by the Board of Education in London. It provides for 28 fellowships for university graduates in Canada to come to England and have the opportunity of working at universities or research associations. This will enable them to see something of what is being done in those organizations in the Old Country. You in Canada live close to the United States, and you have great privileges in being able to see what they are doing. I have gathered that you lose a lot of trained men to the United States. Well, the Old Country has still something to show you, and we have still something to learn from you. The Athlone Scheme, I think, is going to provide a stimulus to the young engineers from this side, if they can see something of the way things are done in the Old Country.

In addition to those 28 fellowships for university graduates there are ten fellowships for young engineers from industry. That invitation, though, I gather, has not been so enthusiastically received as the fellowships for the university graduates. We are not able to show Canada how to mass produce things in the same way as they can in United States. We do not have their markets, and we are organized for a different sort of production. When it comes to heavy engineering, however, such as power station plants and equipment and heavy machine tools, I am quite sure there is something of benefit to young engineers who are interested in that side of the work in England. I hope that in the course of years young Canadian engineers will take the fullest opportunity to avail themselves of this fellowship scheme.

I have a list here of the men who are coming over later on in this year, civil, mechanical, metallurgical, to various organizations. I can assure The Engineering Institute of Canada and the industrial representatives that are here, that anyone who comes over in connection with these schemes will have the fullest opportunity of seeing everything we have got and will be helped in every way. I hope this scheme will be encouraged and supported in every way possible.

I want to assure you that I shall take back to England very happy memories and recollections of your kindness, and of the interesting things I have learned. You have the greatest opportunity in the world in Canada. Your resources are immense. You are training people. The only disadvantage you have got is this: There is such a demand for your young engineers that you have taken them into industry before they are properly trained, and I leave that thought with you.

Electronic Device to Smooth Air Travel

A new Gust Alleviator for airliners has been flight-tested in England. It is an electronic feeler, a kind of rigid antenna, pointing straight ahead from the aeroplane nose, to detect bumps before the aeroplane itself actually reaches them. Although there is only a tiny fraction of a second's warning, this is enough for a signal to be transmitted automatically through an electronic mechanism which instantly adjusts the ailerons into the best possible position to soften the bump at the precise moment of impact.

To get this timing right the alleviator automatically delays its signal for about one tenth of a second so that the relation between the distance of wing from the gust alleviator and the speed of the aircraft can be taken into account.

Besides improving passenger-comfort, the automatic gust alleviator may help designers to improve wing structures. At present these are designed with a large reserve of strength to meet an occasional heavy load placed on the wing when an aircraft flies into a gust without warning. The loads (and hence the reserve-structure) would be far less heavy in a plane fitted with an Alleviator.

Fig. 1. Navy-Douglas skyrocket research plane.

Rocket Propelled Aircraft

by

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The first attempts to apply rocket propulsion to aircraft were made in Europe a few years after the first world war. Most of the efforts were rather half-hearted, and not very successful. Goddard in the United States obtained several patents on a proposed multi-rocket engine air-liner; several gliders were built in Europe, powered by gunpowder filled tubes, which were fired successively. However, the fields of reaction motor design and application and high speed and supersonic air-flow behaviour were not sufficiently explored at that time (pre 1940) to permit the building of a successful rocket aeroplane. Furthermore, since conventional aircraft were considered adequate for military and civil applications, little or no research and development in these fields was carried on.

The evolution of a successful rocket aircraft had to await the perfection of a reliable liquid propellant rocket motor system. Gun powder or other slow burning explosives had been used almost exclusively for most applications of rocket propulsion. However, their severe limitations in energy content, and lack of reliability, led pioneers during the late "twenties" and early "thirties" to investigate means of utilizing new propellant combinations, such as alcohol and liquid oxygen. It was soon found these liquid fuels were far superior to conventional explosive powders in several respects: They had a higher thermal energy content; their rate and method of burning could be closely controlled; performance could be predicted fairly accurately and combustion chambers or rocket "motors" could be designed for the most efficient burning and expansion of the propellants. These inherent qualities of the liquid fuel rocket systems initiated a new and fruitful period of research and development in rocket science.

The late war accelerated progress in the field to the point where several types of rocket vehicles were in production by 1945. Much of this advance was achieved by the Germans, who were desperately trying to develop "unorthodox" weapons, such as the V-1, the 14 ton V-2 rocket and rocket fighter planes. Although the Allies did not develop a liquid fuel rocket missile or plane for military purposes, they did produce various excellent types of powder-filled ordnance rockets.

By 1941 the Germans began to realize that Allied bombers could penetrate into the Reich despite heavy opposition. A feverish interceptor development programme began. Since the need for a fast-climbing, high altitude, high speed interceptor was apparent, rocket powered aircraft were immediately con-

In this paper the author recalls early efforts to apply rocket propulsion to aircraft, down to 1944 when the U.S. Army Air Force discussed with Bell Aircraft Corporation the design of a supersonic research plane, the Bell X-I.

Discussing the design of the various components of the Bell X-I, its performance is compared with conventional planes and with other rocket aircraft, particularly the German Me 163C. Conclusions are drawn as to the scope and possible future uses of supersonic rocket planes.

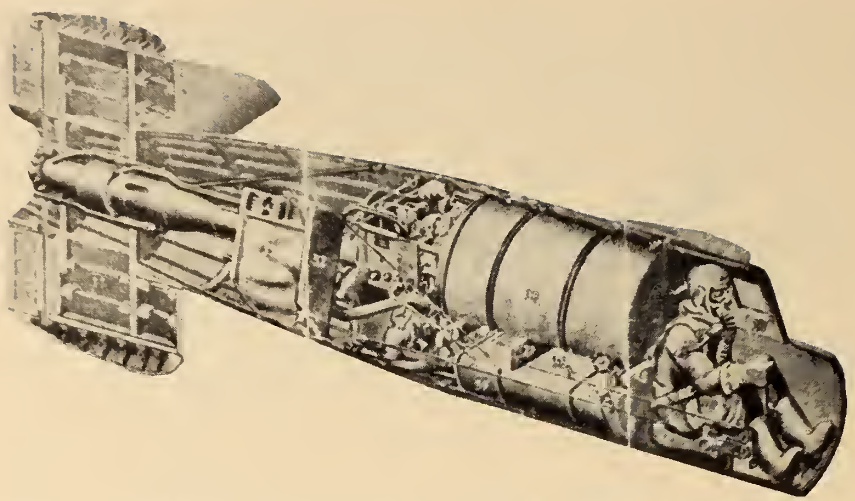

Fig. 2. The "Natter" Rocket Interceptor. The aircraft was launched vertically, from a tower, and was expendable. The pilot bailed out after his mission.

sidered. After three years of intensive practical research a successful rocket propelled interceptor, the Me 163, was built and flown. Although it was superior in several respects to existing interceptor fighters, and could have seriously impeded the Allied bombing programme, it was not produced in sufficient quantities until early 1945, too late to have any decisive influence. The Nazis produced another smaller rocket fighter, the "Natter", but again not in quantity until too late. The Japanese also built a few small crude rocket planes similar to the Natter, called the "Baka". However, these machines were really used as flying bombs guided by Kamikaze suicide pilots.

First American Rocket Plane

In 1944 the United States Army Air Force discussed with the Bell Aircraft Corporation in Buffalo the possibility of designing a man-carrying supersonic research aeroplane. Tentative specifications included a minimum speed of 800 m.p.h. with a duration of two to five minutes at 35,000 feet or over, and capable of carrying 500 pounds of recording instruments. The aircraft was to be constructed and arranged as conventionally as possible. It was to be constructed with conventional tolerances, in order to permit duplication on a production basis. The experimental supersonic X-1 aeroplane, an entirely American endeavour was the result.

The design and operation of a rocket plane entails many problems and new concepts not met with in classical aircraft practice. Some typical problems which are being continually encountered and solved, are, very briefly:

1. Structure and fuselage design

If the plane is to be operated at sonic or supersonic speeds, the wing, body, and control surface configurations must be designed and tested to withstand the severe conditions likely to be encountered, especially upon transition through the "sonic barrier"—the turbulent boundary region between subsonic and supersonic velocities. All structural members, supporting surfaces and skin must be of unusual strength. Most rocket planes are designed for and may operate at supersonic speeds. Heat resistant surfaces are required to withstand the high temperature resulting from air friction. Stainless steel skins have been proposed.

2. Airfoil design

Conventional wings and other lifting or controlling surfaces lose their effectiveness at transonic velocities. Furthermore, if rocket planes are to be operated at high altitudes, above sixty thousand feet, where they are more efficient than air-burning type craft, airfoils must be designed to provide lift in the tenuous atmosphere. Swept-back and V-wings, delta wings and expanding wings have been tried with varying success. The trend seems to be towards thin, tapering, swept-back wings and tail planes for supersonic aircraft.

3. Motor design

Rocket power plant operation and design differs markedly from that of reciprocating or turbo jet engines. A rocket engine (or thrust chamber) is essentially a burning chamber, wherein the inherent thermodynamic energy of some fuel in the presence of an oxidizer may be transferred into kinetic energy or "thrust". The fuel and added oxidizer are injected through a multi-holed atomizing injector head, inserted at one end of the chamber. The two liquids are thoroughly mixed and then ignited, either by an external ignition device or spontaneously upon contact. The thrust chamber pressure may be as high as 500 p.s.i.

The hot gases resulting from the combustion exert a net forward thrust, are exhausted through a constricting throat, and are then expanded by a conical nozzle into the atmosphere. During this expansion the gases achieve supersonic velocities, and also impart further thrust to the rocket chamber. This thrust must be initially strong enough to overcome the starting inertia of the vehicle and later, the air (or parasitic) drag encountered by the vehicle. The initial inertia is often overcome by the use of two associated rocket motors: a powerful "boost" motor which is fired during take off and a smaller "cruise" motor which is operated during normal flight.

Rocket motors cannot easily be throttled. If the rate of propellant flow is varied, injector head characteristics such as the rate of atomization and the propellant distribution, degenerate, with an accompanying drop in chamber pressure with a resultant decrease in efficiency. On the other hand, if segmented multi-injector heads are used, the spray characteristics remain good; due to the smaller mass flow of propellant, however, the chamber pressure is still decreased with a similar loss in efficiency. An effect similar to throttling is obtained by the use of multi-motors (such as the four-chamber X-1 motor) which can be fired successively or simultaneously, each at maximum efficiency.

Terms used in Rocket Design

Rocket power plants are not usually described in conventional terms, such as hp., cubic displacement, etc. Instead, a new nomenclature is employed. A few of the technical expressions which define a reaction motor system are as follows:

(1) Thrust: F (lb.)—The net forward force, due to the reaction caused by the ejection of matter at a high velocity, or, $F = \frac{w}{g} c$, where

c = velocity of exhaust gas and w = weight flow rate of propellants.

(2) Effective Exhaust Velocity: c (ft./sec)—The velocity of the exhaust gases ejected from the nozzle, or $c = \frac{Fg}{w}$.

(3) L^*: (inches)—Characteristic chamber length, a criterion of the chamber geometry, or, $L^* = \frac{V_c}{A_t}$, where V_c = chamber volume in in^3 and A_t = area in in^2 at the throat.

(4) Specific Impulse: I (seconds)—This is an important parameter of rocket performance indication, or $I = \frac{F}{w}$, where F = thrust in lb. and w = weight flow of propellants in lb/sec.

(5) Density Impulse—The size of a rocket power plant is very small in comparison to the weight or volume of propellants it consumes. Therefore, the ultimate size of a rocket plane is not governed by the *thrust* or *power* required, but rather by the *impulse* or *work* required. Or, it is governed by the size of the propellant tanks rather than the size of the motor.

The weight of a rocket-powered winged aircraft is of minor importance compared with the volume, in contrast with conventional aircraft in which weight is more important. As a result, the specific propellant consumption on a volume basis is far more significant than on a weight basis. This "specific propellant consumption on a volume basis" is called the "density impulse"—Id. This factor can be incorporated in an equation relating time of flight t, volume of propellant V_p, and drag D_o, as follows:

$$t = Id\frac{V_p}{D_o}$$

The dimensions of Id are impulse/unit volume, or lb.-sec./ft.^{3}. It follows that for an aircraft with drag essentially independent of weight, the time of powered flight (and consequently the range) varies directly with the density impulse. An example of the above relationships is indicated in Table I.

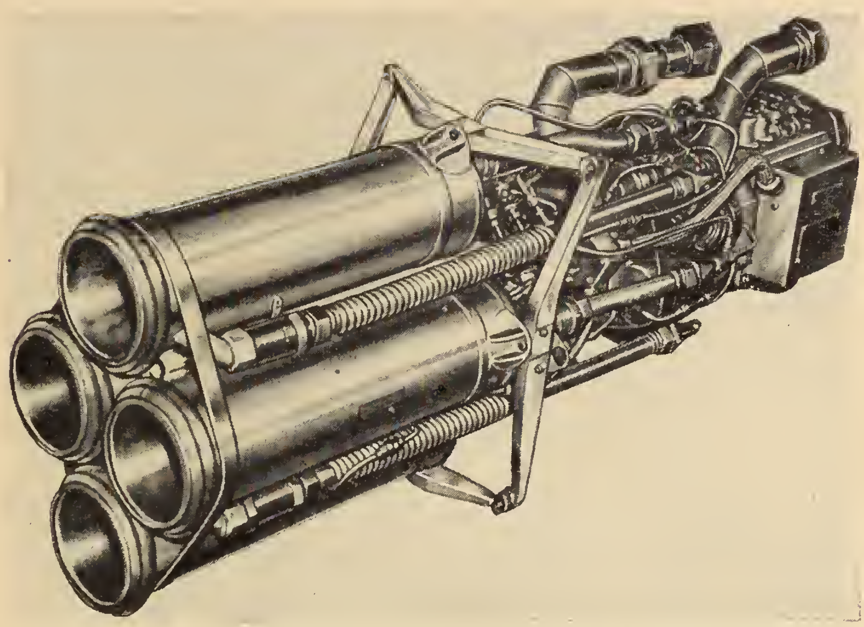

Fig. 3. The rocket motor assembly of the X-1, built by Reaction Motors, Inc., N.J. Each of the four chambers may be fired separately, or together.

Valving, Piping and Associated Equipment

While the motor is intrinsically a simple device, the attendant auxiliary equipment is much more complicated. In fact the quality and design of the auxiliary mechanism, rather than the actual motor, often determine the success of a reaction system. The fluids which the system must handle are usually corrosive and volatile, such as white fuming nitric acid and gasoline; or spontaneously ignitable (hypergolic), such as red fuming nitric acid and aniline or hydrazine; or detonable, such as nitromethane, or cold, such as liquid oxygen. Also, pressures as high as six hundred pounds prevail, since the propellants must be injected at high speeds into the chamber which may be at 500 p.s.i.

There are two main methods for achieving these pressures. One is to pressurize the fuel and oxidizer tanks and force the liquids into the motor. This requires rugged and heavy tanks and piping, and some means of achieving a steady gas pressure supply. Gas generating devices which can create a large volume of gas such as CO_2 or steam are often used. The other method consists of pumping the fluids into the motor. This radically decreases the tank weight, but creates a new set of problems involving the design of light, high-speed reliable, powerful, compact centrifugal pumps, operated by some type of gas generator. These problems are some of the knottiest facing American designers at this time. The Bell X-1, Model 1, used pressurized tanks; subsequent X-1's will use pumps.

Rocket plane designers, then, are faced with a number of unique and onerous problems, some of which may be briefly summed up as follows:

TABLE I

Effect of Propellant Parameters on Range

Propellant Vol. (cu. ft.)	77.8	93.4*	77.8	77.8
Specific Impulse (lb-sec/lb.)	200	200	200	240*
Density Impulse (lb-sec/cu. ft.)	18000	18000	21600*	18000
Propellant Weight (lbs.)	7000	8400	8400	5835
Fixed Weight (lbs.)	4000	4400	4000	4000
Take-off Gross Weight (lbs.)	11000	12800	12400	9835
Weight ratio, W_p/W_o	0.636	0.656	0.678	0.625
Take-off Thrust (lbs.)	8800	10250	9920	7935
Propellant Consumption for Take-off and Climb (lbs.)	4000	4550	4410	3133
Propellant Remaining for Cruise (lbs.)	3000	3850	3990	2702
Cruise Thrust (lbs.)	2000	2200	2000	2000
Cruise Duration (seconds)	300	350	399	325
Range (miles)	77	88	99	82.5
Percent Increase in Range	0	14.3	28.5	7.1

*Parameter increased 20%; others held constant.

(T. F. Reinhardt—"Factors Affecting the Range of Rocket-powered Aircraft", Aer. Eng. Rev.—Volume 8, No. 10, 1949).

Fig. 1. The X-1 at high altitude cruising under power. Note shock-wave patter in the exhaust jet.

1. The designing and mounting of reliable rocket motor units of sufficient power.

2. The design of an ignition system which can re-ignite the motor as often as required.

3. The provision for accurate metering and instrumentation for the monitoring of the motor or motors during operation.

4. A considerable mass of piping and valving and other equipment including huge fuel and oxidizer tanks must be fitted into the small volume of a fuselage, which in turn must be designed for sonic or supersonic speeds.

The above list, of course, barely touches upon the many and varied problems with which designers are continually confronted.

Performance and Comparisons

The rocket plane is the only known manned aircraft capable of reaching great altitudes and flying at extremely high speeds. As such, it is distinguished from I.C. engine-driven propeller, turbojet, pulsejet or ramjet vehicles, which are very much dependent upon the ambient atmosphere, not only for buoyant lift but also the oxygen required to support combustion. While the rocket plane also requires the atmosphere for lift (unless it were to operate as a projectile), it carries its own oxygen and hence is independent of the air in this respect. Since the atmosphere becomes extremely tenuous above 60,000 feet, air-breathing engines are limited to altitudes not much in excess of this figure unless enormous intake ducts and serious efficiency losses can be tolerated.

The conventional planes are in a similarly disadvantageous position with regard to very high velocities. The ultimate attainable economical speed for propeller and turbojet craft may be about 8-900 m.p.h. Huge ramjets may be limited to speeds not greater than 1,600 m.p.h. As the vehicle speed increases the ram air stagnation temperature approaches the allowable metal temperature, thus allowing less heat to be added in the combustion chamber. This, in turn, limits the ramjet exit velocity and since the thrust depends on the difference between the existing velocity and the missile speed, the thrust finally drops to zero with increasing speed.

Rocket aircraft have an upper speed limit determined only by: (a) the ability to withstand air-friction heat and (b) the fuel capacity. Actually the propulsive efficiency increases with speed up to the point where the flight speed equals the exhaust velocity—the latter in the region of 5,000 ft. per sec., or almost 3,600 m.p.h., for present common propellants such as liquid oxygen and gasoline or alcohol. Furthermore, a very high rate of acceleration and rate of climb is an inherent feature of reaction propulsion—an essential asset for interceptor fighters. The thrust of a rocket motor increases somewhat with increasing altitude and is independent of the flight velocity.

The chief disadvantage of the rocket power plant is its high propellant consumption, with a consequent short flight duration and range. This drawback may be alleviated to a small extent by the design of efficient motors and the use of more powerful propellants. Rocket plane pilots have extended the range of their planes by successively gliding and then cruising under power.

Performance

Some performance data relating to successful rocket planes is given as follows:

Me-163C—German Combat Interceptor

Length—22 Feet.
Gross weight—11,300 lb.
Empty weight—5,730 lb.
Fuel weight—5,570 lb.
Thrust—4,400 lb.—cruise motor, 660 lb. boost motor, 3,740 lb.
Fuel consumption—1150 lb. hr.
Take-off speed—150 m.p.h.—Due to the large change in weight of a rocket powered plane during flight extremely high wing loadings are desirable (and necessary). This would cause take-off difficulties in conventional planes. However, rocket power plants have a very high take-off thrust available and high-take-off speeds become feasible.
Landing speed—110 m.p.h.
Climbing speed—500 m.p.h.
Range—62 miles—under full power.
Duration: full throttle—4.5 min.
Maximum altitude (end of fuel)—55,000 feet.
Rate of climb (best)—40,000 feet in 3 minutes.
"Critical Mach. No.—0.85—i.e. $\frac{\text{speed of plane}}{\text{speed of sound in plane's environment}}$ Beyond this speed the plane tended to become uncontrollable.
Motor—"Walter" Rocket—Double jet, cruise and boost (earlier models had only one thrust chamber (Fig. 3)).
Fuel—Hydrogen peroxide (plus catalyst) and gasoline or Hydrazine Hydrate.
Miscellaneous—Take-off assisted by a disposable powder "Jato" unit. Earlier models had a skid landing gear. Propellants were fed to motors by a turbo-pump.

Bell X-1—Supersonic Research Aeroplane

Length—31 feet.
Gross weight—13,034 lb.
Empty weight—4,818 lb.
Fuel weight—8,216 lb.
Thrust—6,000 lb.—four 1,500 lb. motor units.
Speed—Above Mach. No. 1. First U.S. plane to fly "Faster than Sound"—about 1,000 m.p.h.
Maximum attainable altitude—much higher than 50,000 feet.
Wing area—130 Ft^2.
Wing loading—100 lb./sq. ft. at beginning of flight.
Propellants—Liquid oxygen and ethyl alcohol—water.
Miscellaneous—Sealed, pressurized pilot cabin. X-1, No. 1, had nitrogen pressurized propellant tanks. Subsequent models will have turbo-pump feed.

The X-1 is launched from a B-29 at present. Tricycle landing gear is provided to permit take-off from ground. Over 100 successful flights have been made.

Another supersonic research rocket plane, the Bell X-2, is now being built. This craft is a successor to the X-1 type and will also be a flying research and development laboratory. The X-2 has a stainless steel body and swept-back wings; it is designed to attain higher speeds than the X-I. Great Britain has also begun to experiment with small experimental rocket aircraft. However, details are not available.

Conclusions

In these critical times the performance characteristics of supersonic rocket planes are of special interest to defense extablishments. With existing technical knowledge, interceptors can be designed to operate at 2,000 miles-per-hour at an altitude of 200,000 feet and with a rate of climb of 50,000 feet per minute. A fleet of such interceptors would be a formidable defense weapon.

Aside from its military uses, the rocket plane can function as a convenient practical high-altitude test laboratory for the study of upper atmosphere phenomena and supersonic flight behaviour. It does not seem too unrealistic to speculate upon such future applications as 5,000 m.p.h. rocket passenger planes, perhaps powered by nuclear propellants, spanning entire continents in a few minutes—under power only at the beginning of the flight and gliding to the destination. In the meantime, rocket propulsion will surely find wider applications in the civilian aeronautical field—especially with regard to rocket assisted launchings of large planes.

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CANADA'S NEW LEGAL YARD AND POUND

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By Act of Parliament, assented to on 20 June, 1951, it is ordained that the Canadian yard shall be 0.9144 of the International metre and the Canadian pound shall be 0.45359243 of the International kilogramme.

Before explaining the implication of the new act in detail, definitions of the words "unit" and "standard" are required.

A "unit" is an abstract magnitude, which can be used in calculations or definitions, but which has no objective reality, and therefore is quite unaffected by ambient physical conditions. A "standard" is a real or tangible embodiment of the unit required for purposes of measurement, e.g., a metal bar to represent a unit of length, which is necessarily subject to ambient effects, — temperature, pressure, time, etc.,—and represents the unit only within a greater or less degree of error under strictly defined physical conditions. As the degree of precision required of a standard increases, so do the physical conditions affecting it become increasingly important.

Thus, a straight line or a point used in mathematical discussions is analogous to a unit; it can be discussed, but has no objective existence. In the application of mathematical reasoning to everyday life pencil streaks or dots are used, taken as analogous to standards representing the ideal lines and points. As greater precision of these embodiments of mathematical units is required, increased refinement and care are needed in drawing the lines or dots. One has only to view a carefully plotted fine line under a microscope to realize how far it departs from the mathematical ideal.

The origin of the yard and of the pound is lost in antiquity, but they are very old units. Standards for them are mentioned in early English records; the oldest existing official standard for the yard dates from 1587. The present (1951) British standards were constructed after fire had destroyed the previous ones in 1834. Difficulty was experienced in finding authentic copies of the standards; however, using the best available technical skill, guided by prominent British scientists of the time, bronze bars, engraved with reference lines, were constructed as length standards and some platinum weights as standards of mass. One bar and one weight, declared to be exact copies of the lost standards, became the legal embodiments of the yard and pound units under the British Weights and Measures Act of 1878. These standards continue to represent the fundamental units of the Imperial system. They are in the custody of the British government and are not recognized by certain other countries using the British system, e.g. the United States.

The metric system dates from about 1790, in French revolutionary days. This system was offered to mankind with the slogan, "A tous les temps, à tous les peuples". To some extent this slogan was justified when, in 1869, the French Government issued invitations for an international meeting to consider the question of an international system of weights and measures. Eventually, in 1875, the Metric Convention was signed on behalf of 16 states. Others have since adhered and there are now 33 in the Convention, including Canada, which joined in 1906.

Among other activities, the Convention sanctioned the establishment of standards for metric units and of the International Bureau of Weights and Measures at Sèvres, where the primary standards are preserved and where staff and equipment are maintained for the necessary work in distributing copies of the standards and for research in scientific metrology.

The administration of the Bureau and other allied matters are under the control of the International Committee of Weights and Measures, composed of 18 members, who must all represent different countries and one of whom now represents Canada. This Committee meets in Paris at least once in every two years; its decisions are subject to the approval of an International Conference of Weights and Measures, held once every six years, at which each state adhering to the Convention has one vote. There is no similar centralized control for the British system of weights and measures.

The Imperial standard yard is not an accurate standard judged by present-day requirements, due to the relative coarseness of its defining lines and to other factors. Moreover, there is fairly conclusive evidence that its length has changed appreciably since its construction. The British authorities are well aware of these defects, and consideration is now being given to the establishment of a new standard. In Canada the yard was hitherto represented by a bar similar to the Imperial standard and open to the same objections.

In the United States the legal yard is defined as 3600/3937 parts of the International metre, which makes it about 1 part in 300,000 longer than the accepted length of the British yard. The fact that English measures, as distinct from metric, are under national control thus makes possible the existence of different values for the standards.

As regards the pound, the variation is not quite so great, but again there is evidence that the Imperial pound (of pure platinum) has become lighter. Canada had as its legal standard a platinum-iridium pound, which was originally made in London in 1874 and certified by the British Standards Department. A recent (1948) direct comparison between the Imperial pound and the Canadian pound indicates that the latter has gained mass, interpreted as further evidence of loss in the softer Imperial standard.

It was originally (in 1790) intended that the metre should represent a definite fraction of a meridian of the earth, and so be independent of material standards. Unfortunately, it is possible to compare two standards of length one with another, to a much higher relative precision than that to which either standard can be stated to reproduce this unit. Hence, while the metre represents very closely its ideal value, it is actually defined as the length between two lines on a specified platinum-iridium bar preserved at the International Bureau of Weight and Measures. Countries subscribing to the Convention possess copies of the metre, verified from time to time by the International Bureau.

The pioneers of the metric system proposed to make the kilogramme the mass of a decimetric cube of water under specified conditions. Practical considerations made it necessary instead to define the kilogramme as the mass of a specified cylinder of platinum-iridium also preserved at Sèvres. It is interesting to note that those who constructed the old French "kilogramme des archives" came very close to realizing the desired value, for tests made with the aid of modern facilities have shown that the volume of a kilogramme of water under the defined conditions is actually 1.000027 cubic decimetres.

At the moment the metric and Imperial units depend on arbitrary standards. It follows that the ratio between, say, the Imperial yard and the metre is based on experiment, and may have a different accepted value if one of the standards changes or if the errors inevitable in making the necessary experiments should vary. Hence there would appear to be strong arguments against making, say, a new Imperial or a new Canadian standard yard, as opposed merely to legalizing an accepted ratio and basing all length measurement on a single standard of proven stability, such as the International metre. This was done in the United States many years ago, but unfortunately the ratio legalized does not agree with the accepted British value, resulting in the discrepancy now existing in the United States and British units, becoming appreciable in the precision now attained in mechanical engineering, geodesy, etc.

Many standards associations and other bodies have adopted the relation of 1 inch=25.4 millimetres as official, to avoid long strings of decimals in calculations. This relation has the additional advantage of falling between the present accepted values of the British and American inches, and hence is ideal for a compromise. It was recommended for adoption throughout the British Commonwealth by the Commonwealth Science Congress of 1947 and has recently been endorsed by a widely representative official committee in England, which has made an exhaustive survey of all phases of weights and measures legislation. Many authorities in the United States favour its adoption and it has few, if any, opponents.

Consequently, when the question of re-establishing the obsolete Canadian standards recently came to the fore, it was officially decided to base them on the International metric standards, and in the case of the yard to make one yard=0.9144 metre, which corresponds to 1 inch=25.4 millimetres. In the case of mass, the new value one pound=0.45359243 kilogrammes, fortunately, is in close agreement with both British and American values.

There is very good evidence that the International metre and the International kilogramme are extremely stable in representing their units. No sign of measurable change has been found in periodic comparisons between various copies of the standards. In so far as the metre is concerned, additional evidence as to its stability is given by various direct comparisons of the number of wave-lengths of light in its length corresponding to unique spectrum lines. Hence, it may be stated confidently that the standards on which scientific and practical measurements now made in Canada are based, are as stable as it is humanly possible to make or to measure at this time.

This necessarily summarized information may well be concluded with the remark that it is quite possible in the not too distant future, that the long-sought natural standard of length may be realized as a light-wave length in the spectrum of certain isotopes. The International Committee of Weights and Measures may soon be faced with making a decision whether or not the material standard metre should be deposed and replaced by mere reference to the properties of an atom, much as the Canadian yard has recently been defined by reference to the International metre.

The First All-Canadian Diesel Locomotive

Many distinguished guests attended an elaborate celebration in Kingston on August 1st, marking the introduction of the first consolidation road diesel locomotive built by the Canadian Locomotive Company in their Kingston plant. Known as "Kingston Diesel Day", the event also commemorated completion in 1928 by this company of the first road diesel built on the continent, C.N.R. Number 9000. Among some 400 guests present were the Rt. Hon. C. D. Howe who dedicated and christened the locomotive; the Hon. Leslie Frost; Mayor Clifford Curtis of Kingston; W. A. Mather, president of the C.P.R.; Donald Gordon, president of the C.N.R., and many senior officials of both railroad systems and many leading industries. Robert H. Morse, Jr., president of the Canadian Locomotive Company, was the host.

This first Canadian-built consolidation, "City of Kingston", which comprises two complete diesel electric units of 1,600-hp. each, bore the maroon, grey, and gold colours of the Canadian Pacific Railway. Claimed as able to haul a fully loaded freight train at 65 miles per hour or a passenger train at 110 miles an hour, it is a prototype of a fleet of 78 different locomotives that will be built at the C.L.C.'s Kingston works.

Canadian Westinghouse engineers claim this new locomotive has the smoothest acceleration of any diesel-electric put on Canadian railway tracks. "Acceleration through full speed range without transition" is its exclusive feature. "Shifting gears" to gain speed has been eliminated, permitting a very "smooth start".

This consolidation diesel locomotive has the railroad world's most compact power plant, with 40 per cent fewer moving parts than in conventional diesels. Its opposed-piston engine delivers more horsepower per square foot of floor space, a factor of prime importance. It has 15 per cent more pull than its nearest diesel competitor. Though total weight and in most cases overall length is less, it features higher percentage of weight on drivers; working weight that moves tonnage.

This consolidation line of locomotives are built in packaged units, all interchangeable, and units can be combined to make hauling units with ratings all the way from 3200 to 9600-hp. Each locomotive can be equipped with any one of six gear ratios. A total of 78 different locomotives can be built from only one basic unit. Under all kinds of conditions this engine has proven itself outstanding for fuel economy, reliability and ease of maintenance.

The Canadian Locomotive Company's history spans a 101-year period, involving many changes of ownership and a succession of names. A great and continuous tradition of locomotive building has been maintained since the company's first railway engine, Grand Trunk No. 88, was delivered in 1856. During the late "twenties" the Company began to diversify its output by making heavy equipment for Canada's expanding mining industry. Its industrial equipment began to find markets in food packing and processing, chemical and metallurgical industries as well. Now underway is an expanding programme for the manufacture of Fairbanks Morse pumps. During World War II it became an arsenal, producing gun mounts, depth charge throwers, tank armour and tank bogie wheels.

Last year controlling interest was acquired by Fairbanks Morse and Co. Under the guidance of its president, Robert H. Morse, Jr., a new programme of expansion is dawning for the Company. It has spent over a million dollars in industrial expansion for diesel locomotive and diesel engine production. The total expansion programme will cost upwards of $2 millions. √

The "City of Kingston", first of the Consolidation line of diesel-electric road locomotives to be produced in Canada by the Canadian Locomotive Company, Kingston. Prototype of a line of Consolidation Locomotives, this first model is a road freight locomotive, capable of hauling heavy freight trains at 65 m.p.h. The passenger version of this locomotive will haul a full train at 110 miles an hour.

The Brabazon Assembly Plant

During the Second World War a committee was set up in Britain to explore post war possibilities for the British aviation industry. One of the projects recommended by the committee was the gigantic Brabazon Airliner for inter-continental service.


Fig. 1. View of the Brabazon hangar from the south-east.

This aircraft, named for Lord Brabazon of Tara, chairman of the committee, was designed by the Bristol Aeroplane Company, one of Britain's largest aviation organizations. Since the aircraft has a wing span of 230 feet, and is 177 feet long and 50 feet high to the tip of the rudder, the assembly hangar built for it at Filton near Bristol, was in itself an engineering project of formidable proportions.

General Description

The hangar consists of three bays of equal span (358 ft. between main steel supports), but with the centre bay 420 ft. deep and side bays 270 ft. deep. The whole of the front wall is occupied by sliding aluminum folding doors arranged in three pairs, one to each bay, so that they can open and close either to the sides or to the centre. In this way, three openings each 330 ft. wide or six openings 143 ft. 6 in. wide can be obtained. The overall opening is 1,045 ft. long and 65 ft. 9 in. high. Each of the six doors is powered by two 5-hp. electric motors, by means of which the whole front of the hangar can be opened in two minutes.

The back of the hangar is largely taken up by a window which extends to the full width of each bay and in total is 1,000 ft. long and 50 ft. high and provides the principal source of light for the interior. Supplemented by a small amount of roof and clerestory lighting, it provides well-diffused day lighting good enough for technical operations in all parts of the bays. For night work, a complete artificial lighting system has been installed. Four hundred and fifty groups of mercury-vapour and tungsten-filament lamps each with a loading of 2,300 watts, are mounted on the overhead catwalk, 75 ft. above the floor.

Structural steel is used to span the hall in the form of two-pin arch latticed ribs, tied at the haunches and set at 50-ft. centres. These main frames vary in width, those for the outer bays being 7 ft. wide and for the centre bay 5 ft. wide. To allow for movement and expansion of each bay, the outer bay arch ribs are in no way attached to those carrying the centre bay. To save floor space, the vertical legs of the centre bay trusses are nested within those of the flanking bags, where they come together. Movement is allowed for at foundation level by resting the main ribs on 10-in. diameter steel pins set in open arch pits 2 ft. 6 ins. below floor level.

The roof consists of steel decking covered with half-inch insulating board and mineral-faced felt.

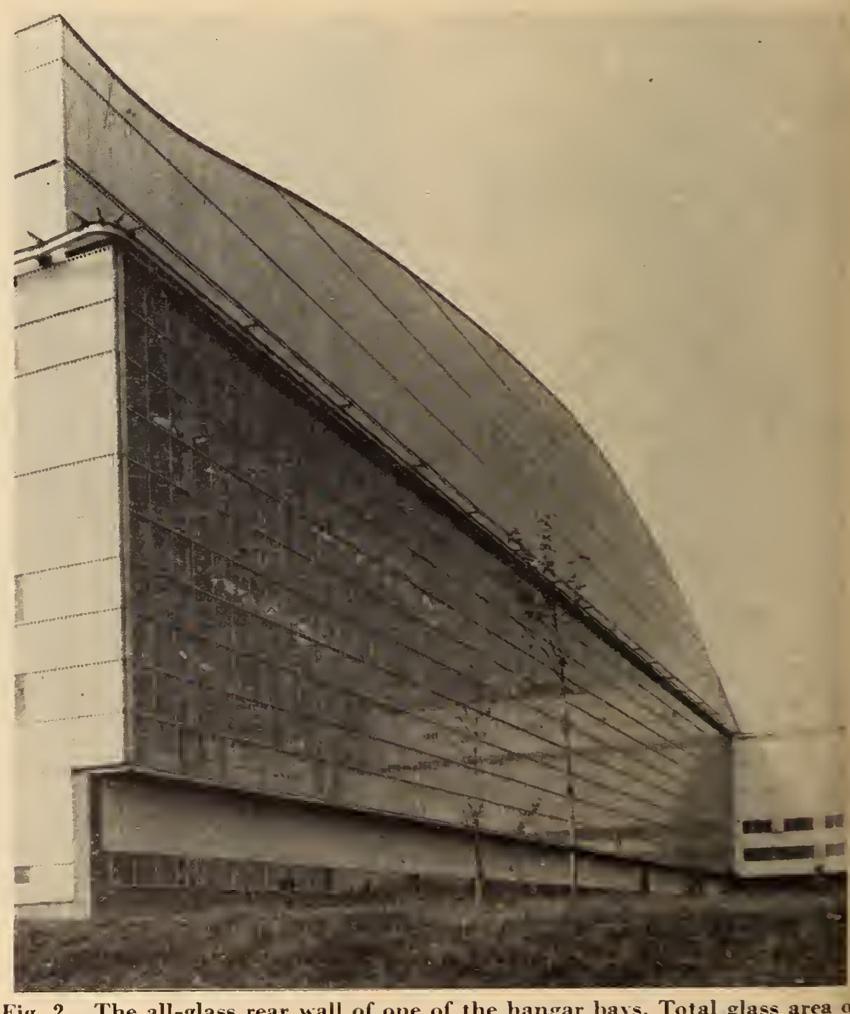
Fig. 2. The all-glass rear wall of one of the hangar bays. Total glass area of rear walls is some 50,000 sq. ft.

The north window is of quarter-inch polished plate glass, each pane being 5 ft. high by 3 ft. 6 in. wide, set in aluminum glazing bars. The floor consists of a sub-base of six inches of concrete, on which a nine-inch reinforced concrete base is laid.

Main Structure Details

Among the requirements for the hangar were a minimum clearance width of 300 ft. in each bay, a minimum height of 60 ft. to the underside of crane hooks suspended from the roof, and the ability to serve the whole floor area with overhead cranes capable of lifting a 10-ton load anywhere in each bay. The final shape of the hall was, in effect, finally determined by the demands of the crane system, which also necessitated the complicated pattern of steelwork filling the roof-spaces of the hall.

The possibility of using reinforced concrete as the main structural medium was carefully considered, in view of the prevailing shortage of steel, but was finally ruled out owing to the difficulty of providing formwork and travelling staging. It became apparent that some kind of lattice construction incorporating metal sections should be used and consideration was given to the use of aluminum alloy. The limited knowledge of its use in structures of such size, combined with supply difficulties, led to its rejection.

The final decision was to use structural steel members in lattice formation, and considerable economies were achieved by using high tensile steel for certain components.

Once the general form and materials had been settled, it was necessary to decide how the adjacent frames of the bays should be arranged. At a fairly early date, it was recognized that a high level structural grid independent of the roof framing would be required for the crane system, as well as for lighting and heating units, and it was decided that a tie would be necessary. This virtually converted the upper part of the frame to a bow-string arch. Apart from its advantages as a basis for the grid, the tie was found to reduce materially the stresses in the whole arch system, as it eliminated the tendency of each frame to splay out at the haunches under load. Stresses arising from temperature changes ruled out a fully continuous arrangement and other designs were rejected because they would not allow a wing bay to be completed before the centre bay.

Fig. 4. The Brabazon I on the apron on the south side of the assembly hangar.

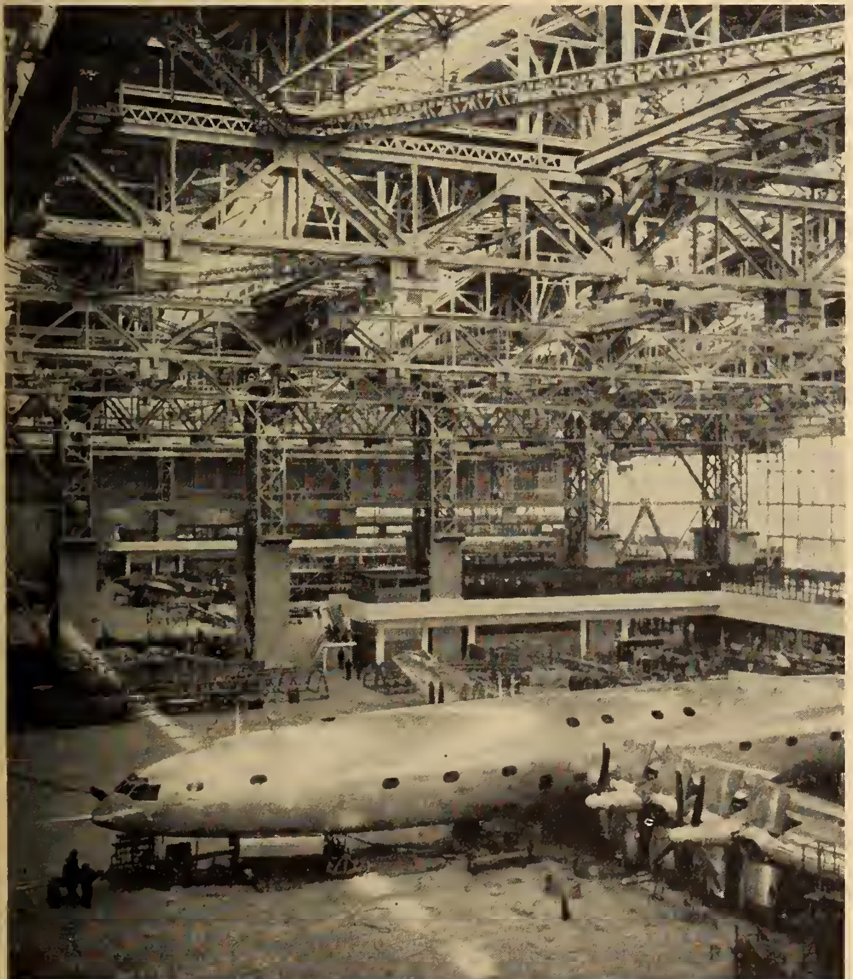

Fig. 3. The Brabazon I in the east bay. The complicated pattern of steelwork was demanded by the crane system.

The arrangement finally adopted consisted of a series of entirely independent frames with ties at haunch level, adjacent members being nested within one another to save floor space. This scheme, it was found, best met aesthetic requirements, gave flexibility to the construction programme, allowed speed of erection, and was fully consonant with economy.

The final structural arrangements had main frames at 50-ft. centres supporting a series of longitudinal lattice frames, which in turn supported subsidiary frames. Purlins and sheeting rails running from subsidiary frames to main frames supported the roof sheeting, cladding, and insulating board lining.

Wind Loads

The difficulties of carrying fragile cladding materials like glass and asbestos cement on such a massive structural framework created a number of problems which may never have been met before. Under extreme gale conditions, for example, it was calculated that frames carrying exposed parts of the hangar would sway up to five inches each side of their normal position. This meant that a range of movement up to ten inches must be allowed at eaves level. The problem was aggravated by the fact that, while a lateral wind force would cause sway in the outer bay, it would not affect the sheltered part of the adjacent centre bay. It was, therefore, necessary to allow for movement at the Valley gutter between the centre and outer bays and to make special provision for drainage.

Another problem caused by wind sway arose from the fact that the steel framework carrying the back glazed walls had to remain fixed in position while the adjacent return walls and roof remained subject to sway under gale conditions.

At the front and back sides, the size of the main foundation bases was governed by anchorage requirements against uplift rather than safe foundation pressure. The overturning effect of the wind was so great that the joint foundations at the front side between the centre and outer bays called for a reinforced concrete block 48 ft. by 30 ft. by 9 ft. deep in each case, in order to hold the building down.

Building Services

The large capacity of the Assembly Hall, which approaches 33,000,000 cu. ft. in volume, necessitated the installation of heating and ventilating systems of vast proportions. Space heating requirements are met by 80 steam-fed unit-heater cubicles, 42 of which are mounted on main stanchion faces and 26 overhead on main ties. Each operates under individual thermostatic control and projects warmed air through groups of high-velocity projection nozzles. The remaining 12 unit-heaters are automatically brought into action in groups of four when the main doors are opened during the heating season; they are arranged to create a vertical "blanket" of hot air in the door openings. These supplementary heaters continue to operate after the doors are closed until equable temperature conditions are restored.

In planning the overhead crane system, it was found that, owing to changes in temperature and loading conditions, the distance between the ends of the rails for the travelling hoist forming part of the mobile bridges was subject to variation by just over one inch. The problem of hoist transference was made more difficult by the difference in level up to ¾ in. arising from non-uniform loads setting up torque in the supporting box girders. The problem was only overcome by providing at each end of the hoist two axles mounted at different levels, with scarfing arrangements to the rails of the travelling bridges.

The concertina-type aluminum doors at the front of the assembly hangar are believed to be the largest ever built. They are operated automatically by push buttons on the power mullions, which house powerful electric motors. The method of operation is for the power mullions to wind themselves backwards and forwards along fixed cables running one above the top guides, and the other in a groove in the floor.

Floor

Since the prototype Brabazon 1 was designed so that the greater part of its 130-ton weight was carried on the main pair of two-wheel undercarriage units, the load applied to the floor over the contact area of each wheel was approximately 30 tons. Scientific design was, therefore, necessary for the floor itself.

The construction finally chosen consisted of consolidated layers of hard-core on an ash-blinded formation overlaid by a 6-in. concrete sealing slab, which was in turn surmounted by a 9-in. top slab of high grade concrete.

The required thickness of hardcore and the use of reinforcement were determined as a result of shear tests made on undisturbed samples of the sub-soil together with micrometer deflection tests on loaded plates applied to the prepared surface before casting of the concrete slabs.

FROM MONTH TO MONTH

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

New Assistant General Secretary

At the September meeting of Council held in Halifax approval was given to the appointment of Colonel H. G. Thompson, D.F.C., E.D., M.E.I.C., to the post of assistant general secretary to replace W. D. Laird, M.E.I.C., who had resigned. (A note on Mr. Laird's new work appears in the *Personals* of this issue.)

Colonel Thompson is widely known in Canada through his activities in military, professional and industrial circles. His broad experience forms an excellent background for his new work with the Institute. His wide acquaintanceship within the profession will enable him quickly to be at home with his new duties and new surroundings particularly when it is noted that he was on the staff of the Institute some years ago associated with the work of the Engineering Catalogue.

Colonel Thompson was born near London, Ontario, and in 1922 was graduated from the University of Toronto with the degree of B.A.Sc. in mechanical engineering. For several years following graduation he worked in the heating, ventilating and steam power plant field, as applied to industrial plants, particularly pulp and paper and power. Later he became in succession department head, branch manager and manager of various companies dealing with the design and operation of steam power plants. From 1932 to 1934, Colonel Thompson served on the staff of the Engineering Institute in Montreal as Editor of Indices of the Engineering Catalogue.

In 1937 he was selected to organize and command the first Canadian Reserve Army Field Workshop, with the rank of Major and Ordnance Mechanical Engineer. On the outbreak of war in 1939 this unit was mobilized to full strength, Major Thompson being promoted to the rank of Lieutenant-Colonel, and proceeded overseas with the First Canadian Division under General McNaughton. At the end of 1940 Colonel Thompson was invalided home and early in 1941 was appointed Chief Ordnance Mechanical Engineer at Defence Headquarters in Ottawa with the rank of Colonel.

In January 1942 he went to the Middle East as technical observer for the Canadian Army. In June he returned to England where he served successively as Deputy Director of Ordnance Engineering Services and of Mechanical Engineering at Headquarters, First Canadian Army. After having supervised the formation of the Royal Canadian Electrical and Mechanical Engineers Corps (R.C.E.M.E.) in the Canadian Army overseas, Colonel Thompson was returned to Canada in August 1944 to become Director of Mechanical Engineering at Army Headquarters, Ottawa, where he remained until the end of the war.

In 1945 Colonel Thompson was awarded the Medal of the Engineering Alumni of the University of Toronto, for outstanding achievement in the field of engineering. Following his retirement from the active army at the end of the war he rejoined the active reserve in command of the work-

Col. H. G. Thompson, M.E.I.C.

Cover Picture

That the gas turbine is now accepted for industrial, as well as aviation, and other applications, is exemplified by the illustration on this month's cover, of the rotor of a 5,000-kw. gas turbine for power generation. *Photo by courtesy Brown Boveri* shops in the Toronto area and during this period assisted in organizing the R.C.E.M.E. Corps Association, of which he served as president for the first three years.

Colonel Thompson joined the Engineering Institute of Canada as a Student in 1920 and has been a corporate member since 1928. He has also been a Member of the Association of Professional Engineers of Ontario, the Canadian Institute of Mining and Metallurgy, the Institution of Mechanical Engineers and the American Society of Mechanical Engineers for many years. Last year he served as chairman of the Ontario section of the latter organization. He has as well been a vice-president of the Engineering Alumni Association of the University of Toronto since his return to civil life at the end of the war.

The Institute is indeed fortunate to secure the services of one who is so well qualified for the work.

Institute to Co-operate in Civil Defence

Civil Defence memorandum No. 38/51 issued in July last by the Civil Defence Co-ordinator for Canada, Major-General F. F. Worthington and printed below, outlines the arrangements which at the request of General Worthington have been worked out by the Council of the Institute.

Branches of the Institute, particularly those located in target areas where there is a local civil defence authority, are to be available on request of such authorities to give technical advice and to assist in the interpretation of the technical literature particularly in respect to the design of shelters and the equipping and strengthening of other structures

So far the technical literature that has been distributed consists of the booklet "Structural Defence Against Bombing" by Professor Fred Webster, which is a reprint of the Institute's publication, and "Technical Guidance for Provision of Air Raid Shelters".

Ottawa, 9th July, 1951.

Civil Defence Memorandum No. 38/51

Offer of Assistance — The Engineering Institute of Canada

1. In the Department of Public Works, Ottawa, a committee has been set up for the purpose of studying the many problems connected with the various types of shelter and the strengthening of public buildings. This committee is composed of representatives from the following organizations:

Department of Public Works
National Research Council
Defence Research Board
Canadian Construction Association
Royal Architectural Institute of Canada
Engineering Institute of Canada

together with building inspectors from Winnipeg, Toronto, Montreal and Ottawa.

2. In this connection, Mr. W. E. Fancott, of the Department of Public Works, has already visited the United States and close co-operation is maintained at all times.

3. It is suggested that you might wish to set up a similar committee in your province, composed of representatives from the local branches of the above mentioned and similar organizations.

4. To date, the following material has been issued to you:

"Structural Defence Against Bombing", dated March, 1951, and by permission of the Engineering Institute of Canada.

A manual, entitled "Technical Guidance for Provision of Air Raid Shelter", which has been adapted for Canadian use by the Department of Public Works, is now in the hands of the Printer and is expected to be released in less than 2 months. The preparation of this manual has entailed a comprehensive study of the shelter problem and will serve as an overall guide for those areas requiring such information.

5. Some time ago, a meeting was held with the Secretary of the Engineering Institute of Canada when it was made known that the Institute was willing to offer all possible assistance in the way of technical information and guidance to those target areas which might require some type of shelter.

6. In a letter dated 20th June, the Engineering Institute have generously offered their services and have notified their branches to co-operate with the Civil Defence authorities in the respective municipalities.

7. It has been suggested that the local branch of the Engineering Institute could associate itself with the local Civil Defence authorities and, together, carry out a general study of the requirements with respect to shelters and strengthening of existing and contemplated structures. What is now required is a general dissemination of factual information on protective measures to be taken in the form of shelter. Architects and builders should have this information or know where it can be obtained.

8. In discussion, it was considered that one means of achieving results would be to centre the responsibility in one agent having close affiliation with the other agents likely to be involved. This central agent could instigate a group study or forum on the main principles related to structural strengthening, assessment required, surveys, etc. From this, subgroups could be formed to study, assess and provide guidance for the following:

(a) For the individual dwellings — Contractors and architects working on shelters in new construction or strengthening old construction, could be brought in for discussion.

(b) For apartment houses and office blocks — Contractors who erect such buildings could carry out similar studies on these types of construction.

(c) For industrial construction — Contractors and others concerned with industrial construction could consider not only the shelter of personnel but, also, the best means of sheltering vital machinery.

9. In this way, dissemination of technical knowledge on an authoritative basis would be achieved.

10. It is requested that local authorities in target areas be advised of the readiness of the Engineering Institute of Canada to undertake a service which is of great importance to Civil Defence.

F. F. Worthington,
Civil Defence Co-ordinator
Department of National Health and Welfare

President's Visits

President Ira P. Macnab has established his itinerary of branch visits for the months of September, October, and November, and while the programme will be well underway by the time this appears in print — we are including the complete programme as a matter of record. It is expected that the president will visit the Western Branches en route to the annual meeting at Vancouver in May, 1952.

Halifax, Friday, Sept. 14; St. John's, Nfld., Wednesday, Sept. 19; Corner Brook, Saturday, Sept. 22; Sydney, Monday, Sept. 24; Moncton, Wednesday, Sept. 26; Charlottetown, Friday, Sept. 28; Saint John, N.B., Monday, Oct. 1; Rimouski, Friday, Oct. 12; Quebec, Monday, Oct. 15; Arvida, Tuesday, Oct. 16; Montreal, Thursday, Oct. 18; London, Monday, Oct. 22; Sarnia, Tuesday, Oct. 23; Windsor, Wednesday, Oct. 24; Niagara Falls, Ont., Monday, Oct. 29; Kitchener, Tuesday, Oct. 30; Lakehead, Thursday, Nov. 1; Sault Ste. Marie, Friday, Nov. 2; Sudbury, Saturday, Nov. 3; Toronto, Tuesday, Nov. 6; Peterborough, Wednesday, Nov. 7 (joint meeting with Belleville); Ottawa, Thursday, Nov. 8; Sherbrooke, Friday, Nov. 9.

Two New Branches to be Inaugurated

Council has approved the formation of two new branches of the Institute and the inaugural meetings will be conducted by the president during his tour of the eastern branches.

The first will be at Rimouski on Friday, October 12, and the second at Sherbrooke on Friday, November 9. Formal presentation of charters will be made to each of the new branches and special programmes are being arranged by the local members to mark the occasions. On the Saturday following each of these inaugural meetings a regional meeting of Council will be held at these places.

Nominees for Office

The report of the Nominating Committee, as accepted by Council at the meeting held on September 14th, 1951, is published herewith for the information of all corporate members as required by Sections 19 and 40 of the by-laws:

President:		
Vice-Presidents:		
*Zone "B" (Prov. of Ontario)	A. E. Berry	Toronto
*Zone "C" (Prov. of Quebec)	G. T. Malby	Isle Maligne
*Zone "D" (Maritime Provinces)	D. J. MacNeil	Antigonish, N.S.
Councillors:		
†Cape Breton	C. N. Murray	Sydney
†Halifax	W. H. Chisholm	Halifax
†Moncton	N. B. Eagles	Moncton
†Quebec	Hector Cimon	Quebec
§Montreal	E. R. Smallhorn	Montreal
	A. D. Ross	Montreal
†Cornwall	D. Ross-Ross	Cornwall
†Ottawa	B. G. Ballard	Ottawa
†Peterborough	A. R. T. Hailey	Peterborough
†Hamilton	Neil Metcalf	Hamilton
†Kitchener	M. A. Montgomery	Kitchener
†Niagara Peninsula	Paul E. Buss	Thorold
†Sarnia	E. W. Dill	Sarnia
†Sault Ste. Marie	D. C Holgate	Sault Ste. Marie
‡Toronto	C. D. Carruthers	Toronto
†Winnipeg	T. E. Storey	Winnipeg
†Calgary	J. J. Hanna	Calgary
†Lethbridge	P. E. Kirkpatrick	Calgary
†Vancouver	S. Hogg	Vancouver

* One vice-president to be elected for two years.
† One councillor to be elected for two years.
‡ One councillor to be elected for three years.
§ Two councillors to be elected for three years each.

Design Competition

The National Industrial Design Committee has announced a $7,000 competition, with the purpose of stimulating the greater use of trained Canadian talent in the designing of manufactured products.

Sponsored by the National Industrial Design Committee, and financed by the Aluminum Company of Canada, the Canadian Lumberman's Association, and the National Gallery of Canada, the competition will receive entries until January 15, 1952.

Emphasis is laid on economy of production, mechanical efficiency, suitability of form to the function of the object, and simplicity of design. Awards will be given for four clearly specified items of Canadian design, which designs must be suitable for mass production by available manufacturing processes in Canada. In each category there will be first, second and third prizes, of $1,000.00, $500.00, and $250.00.

Detailed rules of the competition may be received from D. W. Buchanan, secretary, National Industrial Design Committee, Ottawa.

Correspondence

Atmospheric Pollution Control

July 31, 1951.

Mr. Editor:

I perused the committee report on "Atmospheric Pollution in Canada" in May 1951 issue of the *Journal* and thought that I would like to draw to your attention the great strides which have been made by the Air Pollution Control District of Los Angeles County.

I had the privilege of assisting Colonel Gordon P. Larson, Director Los Angeles County Air Pollution Control District on some of their projects. It may interest you to know that the first pilot course in Air Pollution Control was recently completed at Loyola University. I have organized this course in collaboration with Colonel Larson.

If I can be of any assistance to the *Journal* or to any of your subscribers in connection with same, please write. I am resigning from the Engineering Faculty of Loyola University to devote all my time to private practice.

October 31, 1951

Mr. Editor:

I have your letter of July 31st from Mr. I. Raidel.

It should be noted that the Los Angeles scheme was described in considerable detail in my subsequent paper on "Air Sanitation". (See July 1951, *Engineering Journal* — Ed.)

E. A. ALLCUT, M.E.I.C.,
Professor of Mechanical Engineering,
University of Toronto

News of Other Societies

Canada's 1951 Power Show, sponsored and held in conjunction with the annual convention of the **Institute of Power Engineers** (496 Church St., Toronto) will be held in the Royal York Hotel, next November 26, 27, 28 and 29.

The Montreal Section of the **American Institute of Electrical Engineers** has elected the Executive Committee for the year 1951-1952, as follows:

Past chairman, A. Malkin; chairman, J. M. Sharpe, M.E.I.C.; secretary-treasurer, L. Roy, M.E.I.C.; programme chairman, H. Bush, M.E.I.C.; membership chairman, G. H. Gillett, M.E.I.C.; executive, E. D. Bent, M. C. Archibald, M.E.I.C., R. C. Short, JR.E.I.C., L. K. Hart.

The committee of the St. Maurice Valley Sub-section is as follows: chairman, M. T. Ferguson; vice-chairman, H. Westman; secretary-treasurer, J. B. Simpson; assistant secretary-treasurer, R. F. Brooks.

The American Institute of Electrical Engineers (33 West 39th Street, N.Y.) announces the winter general meeting to take place at the Hotel Statler, New York, N.Y., January 21 to 25, 1952.

The American Society of Mechanical Engineers (29 West 39th Street, New York) will hold the 1951 annual meeting at the Chalfonte-Haddon Hall Hotel, Atlantic City, N.J., November 25 to 30.

The annual meeting of the **American Institute of Chemical Engineers** 120 East 41st Street. New York 17, N.Y.) is scheduled for December 2 to 5, 1951, at the Chalfonte-Haddon Hall Hotel, Atlantic City, N.J.

Elections and Transfers

At the meeting of Council held at the Lord Nelson Hotel, on Friday, September 14th, 1951, a number of applications were presented for consideration and on the recommendation of the Admissions Committee the following elections and transfers were effected:

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F. E. Turner, *Halifax.*
W. Watson, *St. John's, N'fld.*
F. Wolf, *Montreal.*
G. M. Young, *Sherbrooke.*

Juniors:

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D. W. Durst, *Peterborough.*
H. G. Dutz, *Vauxhall, Alta.*
J. W. Francis, *Montreal.*
D. M. Gunn, *London, Ont.*
D. Jamieson, *Sydney, N.S.*
H. O. Kohlmeier, *Flin Flon.*
R. J. Kostick, *Kenora.*
A. F. Morrison, *Montreal.*
R. L. Schleihauf, *Arvida.*
C. E. Scott, *Shawinigan Falls.*
D. H. Simpson, *Sarnia.*
R. A. Tothe, *Caledonia, Ont.*

Transferred from the class of Junior to that of Member:

H. G. Burbidge, *Montreal.*
A. K. Butt, *St. John's, N'fld.*
W. A. Chadwick, *Montreal.*
H. T. Hart, *Jamaica, B.W.I.*
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H. P. Klassen, *Rivers, Man.*
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L. G. McDiarmaid, *Hollyburn, B.C.*
B. M. Monaghan, *Seven Islands.*
E. A. Robertson, *Vancouver.*
W. G. Secline, *Cap de la Mad.*

Transferred from the class of Student to that of Member:

G. Gravel, *Jonquiere, Que.*

Transferred from the class of Student to that of Junior:

G. J. Goldsworthy, *Winnipeg.*
H. T. Work, *Winnipeg, Man.*

The following Students were admitted:

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G. W. Bowers
A. D. Burford
E. A. Clawson
R. T. McLaughlin
W. B. McTavish
J. Ortega-Martinez
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J. V. Selby
J. M. Squire
A. E. Sulavella
J. R. M. C. Szogyen
F. J. H. Tasker
A. C. Testart
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Applications Through Associations

By virtue of the co-operative agreements between the Institute and the Associations of Professional Engineers, the following elections and transfers have become effective:

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Student to Junior:

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c/o Canadian Westinghouse Co. Ltd., Hamilton, Ont.

Personals

News of the Personal Activities of Members of the Institute

Honoured by McGill

Among six distinguished leaders in science and industry who received honorary degrees at McGill's recent convocation there were three members of the Institute, Dr. J. R. Donald, M.E.I.C., of Montreal; Dr. A. O. Dufresne, M.E.I.C., of Quebec; and Dr. O. M. Solandt, Affil.E.I.C., of Ottawa.

Dr. J. R. Donald, M.E.I.C., president of J. T. Donald and Co. Ltd., Montreal, was, this year, named director of chemicals and explosives, Department of Defence Production.

Dr. Donald graduated from McGill University as a chemical engineer in 1913. He joined Nichols Chemical Company, and during the first World War

Dr. J. R. Donald, M.E.I.C.

was assigned to the post of chief inspector of explosives for the Imperial Munitions Board. This was followed by extensive experience in his field, notably with J. T. Donald and Co. Ltd., of which he later became president, as well as a partner in the firm, Donald Ross and Company. During World War II he was named director-general of the chemicals and explosives branch, Department of Munitions and Supply, was appointed one of the original members of the Joint War Production Board, and, in 1943, was awarded an O.B.E. in recognition of his service. He continued in the post of director-general until the end of the war. In 1948 he was appointed one of the original members of the Industrial Defence Board of Canada.

Dr. O. M. Solandt, Affil. E.I.C., as chairman of the Defence Research Board, has the task of correlating the defence effort of Canada on the scientific front.

After an outstanding record of academic achievement at University of Toronto, and Cambridge, England, possessing degrees in arts, science, and med-

Dr. O. M. Solandt, Affil.E.I.C.

icine, he has worked in military operational research since shortly after the outbreak of World War II.

He was appointed director of the South-West London Blood Supply Depot, and in 1941 became director of the Medical Research Council Laboratories Experimental Station at Lulworth. In the summer of 1942 he was appointed deputy director of the British War Office Operational Research Group, and in May, 1944, became director. In the spring of 1945 he was selected to join Lord Mountbatten's S.E.A.C. staff as special scientific adviser. Honours granted to him have included the O.B.E., in 1946, and the United States Medal of Freedom in 1947.

Dr. A. O. Dufresne, M.E.I.C., Deputy Minister of Mines for the Province of Quebec, is the immediate past-president of the Canadian Institute of Mining and Metallurgy.

Dr. Dufresne studied civil engineering at Ecole Polytechnique, Montreal. From McGill University he received the degree of master of science in geology in 1913.

He has been associated with the Provincial Bureau of Mines, since 1914, when he was named to the post of inspector of mines. When a separate department was formed in 1941, he became the first deputy minister.

For many years Dr. Dufresne was a professor of mineralogy and geology, and mineral economics, at Laval University, Quebec. The University of Montreal, in 1946, conferred upon him the honorary degree of doctor of applied sciences.

Dr. A. O. Dufresne, M.E.I.C.

H. H. German, M.E.I.C., has returned recently from a journey including visits to Norway, Sweden, England and Scotland.

Mr. German was the delegate of The Engineering Institute of Canada to the international meeting of naval architects and marine engineers of England and Scotland, whose meetings were held in London, Glasgow and Newcastle. Mr. German was also the Engineering Institute's delegate for the joint meetings of the Institutions of Electrical, Mechanical and Civil Engineers, held in London last June.

On his return trip, Mr. German visited the Montreal firm of Milne, Gilmore and German, with which he was associated for many years.

B. L. Davis, M.E.I.C., of the Aluminum Co. of Canada Ltd., at Arvida, Que., has been elected chairman of the Saguenay Branch of the Institute.

Mr. Davis is a graduate of the University of Toronto where he received a B.A.Sc. degree in mining in 1941. After graduation he joined the Aluminum Co. of Canada, Arvida Works, as assistant engineer in charge of mechanical maintenance of Ore Plant No. 1. Later appointments were those of supervisor of the ore plant operating department, mechanical supervisor and assistant superintendent of Ore Plant No. 1. He was made superintendent of the caustic plant in 1947, and of the carbon department in 1948.

Dr. G. R. Langley, M.E.I.C., works engineer of Canadian General Electric Company's Peterborough Works retired recently after forty years of service with the Company.

Well known in the electrical industry, Dr. Langley has made an outstanding contribution to two fields — the design engineering of electrical apparatus and the training of young engineers.

Born in Toronto, he received his secondary education at Upper Canada College in 1903. He graduated in 1907 from Union College in Schenectady, N.Y., where he was later to receive also the honorary degree of doctor of science for "his outstanding contribution to engineering".

Following a period in the house lab of the famous scientist Steinmetz and further training in the G.E. research laboratory, Mr. Langley took the Company's "Test" course. In 1911, he returned to Canada and joined C.G.E.'s Peterborough Works in switchgear engineering, a division he was to head for 25 years. In 1938, he was appointed works engineer and since that time has been in charge of all engineering, draughting, laboratories and testing in the huge Peterborough Works. He was, for some time previous to his retirement, chairman of the engineering committee which co-ordinated engineering activities in the Company's eleven works.

In addition to being a registered professional engineer, he is a Chartered Engineer of Great Britain.

Dr. Langley has played a prominent part in the training of young engineers for C.G.E. He is chairman of the Company's Students Committee, past-chairman of E.I.C.'s "Committee for Guidance of the Young Engineer", and chairman of the Canadian Committee for Student Guidance in Science and Engineering. This last committee co-ordinates the guidance work of The Engineering Institute of Canada, the Canadian Chemical Institute and Canadian Institute of Mining and Metallurgy.

The photo at right shows Dr. Langley, left, and H. M. Turner, president of C.G.E., at presentation ceremony.

Saskatchewan River Commission

A commission to study the proposed South Saskatchewan River irrigation project has been appointed by the Dominion Government.

The commission will report to the government on whether the economic and social returns of the long-standing project would be commensurate with the cost involved. It will also determine whether the project represents the most profitable and desirable use of the South Saskatchewan waters.

Chairman of the Commission is **Dr. T. H. Hogg,** M.E.I.C., consulting engineer, of Toronto, former chairman of the Ontario Hydro-Electric Power Commission. Other members are **G. A. Gaherty,** M.E.I.C., of Montreal and Calgary, president of Calgary Power Limited, and **Dr. John A. Widtsoe** of Salt Lake City, Utah, who has been engaged for a number of years on Canadian and American irrigation problems **B. T. Richardson** of Ottawa is secretary.

John E. Armstrong, M.E.I.C., chief engineer of the Canadian Pacific Railway, Montreal, and past-president of The Engineering Institute of Canada, has retired under the pension plan of the company.

Mr. Armstrong was born in Peoria, Ill. He graduated from Bradley Polytechnic Institute in 1905 and from Cornell University in 1908 with the degree of civil engineer.

From the beginning he has been associated with railways, starting as a high school student in summer work, in 1900, with the Toledo, Peoria and Western Railway. In 1912 he came to Canada to the Canadian Pacific Railway at Montreal working as assistant engineer until 1928. He was then appointed assistant chief engineer and in 1939 became the chief engineer.

Mr. Armstrong was the Engineering

J. E. Armstrong, M.E.I.C.

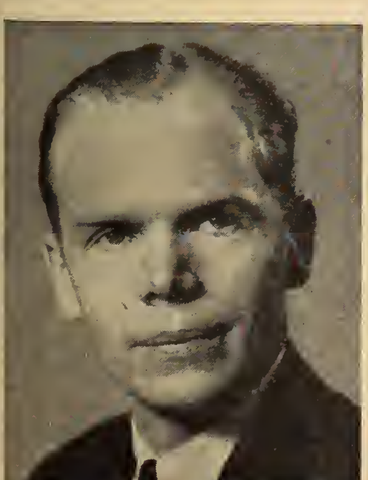
Institute president in 1949. He has been active also in the American Railway Engineering Association, of which he is a past president and an honorary member. For the Canadian Standards Association he has served on the main committee and on the executive committee.

R. A. Emerson, M.E.I.C., of Montreal, has been appointed chief engineer of the Canadian Pacific Railway, succeeding John E. Armstrong, M.E.I.C., of Montreal, who has retired.

For the past 22 years he has been associated with the C.P.R.'s engineering department which he entered in 1928, on a summer basis, to finance the winning of a degree from the University of Manitoba. He attended post graduate studies at Yale University, New Haven, through 1933 and 1934, with a Strathcona scholarship for studies in transportation.

His permanent career with the Canadian Pacific engineering department started in 1935, as transitman at Revelstoke, B.C. Later he was roadmaster on the Portage Division, Winnipeg, and was promoted to division engineer, holding that post first at Brandon and later at Moose Jaw. This led to his selection as assistant district engineer and subsequently district engineer of the British Columbia district, at Vancouver, which post he left in March, 1948, to become engineer of track. He was appointed assistant chief engineer in 1950.

Mr. Emerson is a member of the American Railway Engineering Association, and of the Corporation of Professional Engineers of Quebec.



R. A. Emerson, M.E.I.C.

Hugh Crombie, M.E.I.C., has been appointed secretary-treasurer of the Dominion Hoist & Shovel Company Limited, Montreal.

Mr. Crombie is vice-president and treasurer of Dominion Engineering Works, Montreal, and president of the Canadian Manufacturers Association.

H. Miller, M.E.I.C., of Northern Electric Company Limited, has been appointed associate director of the electronics division, Department of Defence Production, Ottawa, Ont. Mr. Miller is one of two government-selected representatives of industry currently completing a special course at the National Defence

College, Kingston. He was works manager of Northern Electric's wire and cable division at the time of his selection for the special course.

R. K. Thoman, M.E.I.C., has been appointed vice-president of Canadian Vickers Limited at Montreal, Que. He has been associated with the Company since 1939, and in recent years has served the organization as assistant general manager in the engineering division, and most recently as works manager.

He graduated from Queen's University with a B.Sc. in mechanical engineering in 1936. He worked for Remington Rand Limited in Hamilton, Ont,, before going to Canadian Vickers.

L. C. Jacobs, M.E.I.C., is working for the Department of National Defence at Ottawa, Ont., in the office of the deputy minister.

Mr. Jacobs graduated from the University of Manitoba in 1905. He worked for a number of years for the Algoma Central Railway and for The Foundation Company Limited. He went to the Power Corporation of Canada Limited, in Montreal in 1926, as construction manager, and returned to the Power Corporation after service during World War II with the department of Munitions & Supply in Ottawa.

Mr. Jacobs served the Engineering Institute in 1947 as treasurer.

W. D. Laird, M.E.I.C., who has served as assistant general secretary of the Institute for the past four and one half years has accepted a new position and left early in September to assume his new duties.

The resignation of Mr. Laird has been accepted with regret. Mr. Laird came to the Institute shortly after the end of the war and has done outstanding service for the organization in the performance of his duties as assistant secretary.

Mr. Laird graduated from the University of Manitoba in 1940, after a scholastic career of considerable distinction. Following a short term of employment with The Shawinigan Engineering Company, he was commissioned in the Aero

W. D. Laird, M.E.I.C.

Engineering Branch of R.C.A.F. in December 1940.

Mr. Laird acquired considerable experience in the field of internal combustion engines with the R.C.A.F. during the war and is leaving his work with the Institute to become sales manager of the diesel engine division of Consolidated Engines & Machinery Co. Limited, in Montreal.

Needless to say Mr. Laird takes with him to his new work the best wishes of his many friends in The Engineering Institute.

Dr. Joseph Krol, M.E.I.C., has been appointed an assistant professor of mechanical engineering at the University of Manitoba. Dr. Krol received his Ph.D. degree at the University of London and has been until recently in the Research Department of Howard Smith Paper Mills Limited.

Air Vice Marshal C. R. Dunlap, M.E.I.C., was transferred in July to Kingston, Ont., as the commandant of the National Defence College.

E. V. Caton, M.E.I.C., vice-president of the Winnipeg Electric Company spoke recently to the Kiwanis Club luncheon in Winnipeg on the subject of "The Power Situation, Present and Future".

W. D. Hurst, M.E.I.C., Winnipeg city engineer and commissioner of buildings, **H. Lee Briggs,** M.E.I.C., assistant general manager of the Winnipeg Hydro, and **N. S. Bubbis,** M.E.I.C., manager of the Greater Winnipeg Water District, were sent by the City of Winnipeg to the assistance of Kansas City, during the recent flood of the Kansas River. At a recent meeting of the Rotary Club of

Winnipeg, Mr. Briggs compared the problem with that of Winnipeg during last year's Red River flood. He estimated the flow of the Kansas River as five times that of the Red, and the loss of property as 40 to 50 times as great as Winnipeg's.

G. H. Krupski, M.E.I.C., was recently appointed chief engineer of T. M. Estabrooks Co. Limited, Montreal. Previously he was assistant chief engineer for Canada & Dominion Sugar Refinery Ltd., in Montreal.

He studied engineering at the Technical University of Vienna graduating in 1934. Mr. Krupski worked for the Barrett Company in Montreal as a project engineer, after his arrival in Canada from England. Prior to coming to Canada he worked in Vienna, and Poland. He was in the R.A.F. during World War II.

G. H. Loane, M.E.I.C., formerly assistant engineer for Canadian National Telegraphs at Toronto, Ont., is now assistant professor of electrical engineering for the University of New Brunswick.

Mr. Loane graduated from the University of New Brunswick with a B.Sc. degree in electrical engineering in 1943. After graduation he worked for the Bell Telephone Company of Canada, in Montreal. In 1946 he was junior engineer for Robert A. Rankin and Company, consulting engineers in Montreal. He joined the Canadian National Telegraphs in Toronto in 1946.

H. R. Fee, M.E.I.C., general superintendent of the Saguenay Power Company, Ltd., Isle Maligne, Que., has been transferred to the Aluminum Company of Canada Limited at Shipshaw, Que., where he will be assistant manager of power generation.

A graduate in electrical engineering from the University of Alberta, in the class of 1934, Mr. Fee has been with Aluminum Company and Saguenay Power Company since 1941. He was chairman of the Saguenay Branch of the Institute in 1947-48.

T. C. Powell, M.E.I.C., is a sales engineer for Canadian Johns-Manville Co. Ltd., at Toronto, Ont. He joined the Company in 1947, to do technical sales and service work. Mr. Powell graduated from the University of Toronto with a B.A.Sc. in 1938.

Malcolm J. Oldershaw, M.E.I.C., is a consulting engineer in industrial electronics with the Canadian Marconi Co. Ltd., of Montreal. For the past six years Mr. Oldershaw has been in the employ of the Northern Electric Co. of Montreal.

Mr. Oldershaw received his electrical engineering degree at the University of Toronto.

R. C. Robson, M.E.I.C., has been appointed chief draughtsman of the central engineering department of Alaska Pine & Cellulose Limited at Vancouver, B.C. Previously he was designing engineer for H. A. Simons, consulting engineer in Vancouver, B.C.

A. A. Swiderski, M.E.I.C., is senior mechanical engineer for Computing Devices of Canada Limited, in Ottawa, Ontario. Previously he was senior designer for Canadian Johns-Manville Company Limited, at Asbestos, Que.

Mr. Swiderski was educated in Poland at the Technical University of Danzig. After graduating in 1930 he worked in engineering design in Poland. In Canada he has worked for Vector Engineering Co., as a tool designer; Canadian Wooden Aircraft Ltd., as chief tool designer; and for the Farand & Delorme division of United Steel Corporation, as chief engineer.

K. G. Cook, M.E.I.C., is in Greenville, Pa., working as an engineer for R. D. Warner Co. Inc.

He graduated from McGill University with a B.Eng. degree in mechanical engineering in 1938. During World War II he served with the R.C.A. Upon his discharge as a captain he joined the engineering department of Cresswell Rollforming Co. Ltd., in Montreal. He became the chief designer of the Company, and the chief engineer of Cresswell Pomeroy Ltd. In 1950 he went to Kaiser Aluminum & Chemical Corporation in Spokane, Wash.

Major H. Goodfellow, M.E.I.C., is in Korea, attached to the 25th Canadian Infantry Brigade as a scientific adviser to Brigadier Rockingham. Previously he was stationed at the Canadian Army Operational Research Establishment at the Royal Military College at Kingston, Ont.

Major Goodfellow graduated from the University of Saskatchewan in 1940 where he received a B.Sc. degree in mechanical engineering. He joined the Royal Canadian Engineers, going overseas and returning in 1946. In Canada he was appointed district electrical and mechanical engineer for District No. 10, Winnipeg. He served in the R.C.E.M.E. Prairie Command, and later in the directorate of Army Personnel at Ottawa as deputy assistant adjutant general. He was appointed to Kingston in 1950.

Irving M. Keyfitz, M.E.I.C., is a mechanical engineer for C. D. Howe Co. Ltd., at Montreal, Que.

He graduated from McGill University in 1941 with a B.Eng. degree in mechanical engineering. He worked for a time as assistant to the chief engineer and sales manager of Canadian Propellers Ltd. in Montreal. In 1946 he joined A. V. Roe Canada Limited in Toronto where he worked as a stress analyst group leader until his recent change.

Lt.-Cmdr. C. L. Mofford, M.E.I.C., R.C.N., has been appointed staff officer of works and development for the west coast area. He is stationed at the Esquimalt naval base in British Columbia. He was previously at the Halifax naval base.

H. D. Ayers, M.E.I.C., is professor of soil and water conservation engineering at the Ontario Agricultural College in Guelph, Ontario. He was previously at Swift Current, Sask., working as an agricultural engineer for the Dominion Experimental Station. He is a graduate of the University of Saskatchewan, where he received a B.Sc. in agricultural engineering in 1942.

Glen H. Mitchel, JR.E.I.C., has been transferred to Los Angeles, Calif., by the Western Precipitation Corporation.

Mr. Mitchel graduated as an electrical engineer from California Institute of Technology in 1948. He was associated with the Western Precipitation Corporation for two years, before coming to Montreal as a sales engineer for the Precipitation Company of Canada, Ltd.

L. B. Davies, JR.E.I.C., is an engineer with B.C. International Engineering at Vancouver, B.C. Previously he was an assistant field engineer for the Shawinigan Engineering Company at the Trenche development. He joined Shawinigan in 1948.

He graduated from the University of British Columbia with a B.A.Sc. degree in electrical engineering in 1947. After graduation he worked for the Bell Telephone Company of Canada in Montreal, Que.

J. M. Carrol, JR.E.I.C., has been transferred from the Detroit office to the New York office of the Applied Research Laboratories, Glendale, California, where he has charge of installation and service for the eastern States.

Mr. Carrol studied at Queen's University and received a B.Sc. degree in engineering physics in 1948.

Roy J. Blezard, JR.E.I.C., is plant engineer for Fiberglas Canada Limited at Guelph, Ontario. Previously he was plant engineer for Canadian Gypsum Company at Hagersville, Ontario. He received a B.Sc. from the University of Saskatchewan in mechanical engineering in 1945. After graduation he worked as junior engineer for Link Belt Limited, Toronto, Ontario.

E. Lundman, JR.E.I.C., who was with the Department of Resources and Development at Yellowknife, N.W.T., is now a town engineer of Dauphin, Man. He graduated in civil engineering from the University of Manitoba in 1947.

Michael Price, JR.E.I.C., is with The Foundation Company of Canada Limited, Toronto, Ontario.

Mr. Price is a graduate of the University of Birmingham, where he received a degree in civil engineering in 1948. He worked as a design engineer for the waterworks department of the city of Toronto prior to his recent appointment.

Robert E. Yule, JR.E.I.C., has been appointed sales representative in eastern Ontario for the Norton Company of Canada Limited.

Mr. Yule is a mechanical engineering graduate of Queen's University. He joined the Norton Company after graduation.

Harvie D. Walford, JR.E.I.C., has left for Switzerland where he is to attend the Centre d'Etudes Industrielles in Geneva, Switzerland, which was founded in 1947 by Aluminium Limited, to meet the increasing demand for a post graduate school which would treat of industrial aspects of international business administration.

To fulfil its objectives the school deals with industrial problems, with emphasis on international aspects; with training made effective by intimate contact with students, informal discussion and personal assistance.

The Centre d'Etudes Industrielles comprises four departments: Industrial Organization; Business Administration and Economics; International Relations and Economic Geography; Languages. Visiting lecturers contribute to the curriculum, industrial visits, and summer field training are arranged.

Graduates of recognized universities are accepted after oral interview with one or more of the Trustees, located in the United States, Switzerland, England and Canada. The school's assistant director, Holbrook R. Davis, Montreal, is the North American representative.

Mr. Walford is a graduate of McGill University, where he received a B.Eng. degree in civil engineering with honours in 1949. He has done post graduate work at Cambridge University, England.

John Henry Scovil, JR.E.I.C., is with The Aluminum Company of Canada Limited, at Isle Maligne, Que.

Mr. Scovil graduated from the University of New Brunswick in civil engineering in 1947. He has worked for the Department of Public Works in New Brunswick and the Shawinigan Engineering Company in Montreal, Que.

A. W. Samson, JR.E.I.C., is now with McColl Frontenac Oil Company in Montreal, Que. Formerly he was in the engineering department of the Canadian International Paper Company at Gatineau, Que. A graduate of McGill University, he received a B.Eng. in mechanical engineering in 1949.

D. B. Kilpatrick, JR.E.I.C., is employed in the financial department of Brown Company, at Berlin, N.H. He graduated recently from the Harvard Graduate School of Business Administration, and was the only Canadian to receive the M.B.A. degree "with high distinction". He graduated in engineering from McGill University in 1949.

Michael D. Arnaud, JR.E.I.C., of Canadian Brazilian Services, has been transferred from Toronto, Ont., to Sao Paulo, Brazil, where he is working for the Sao Paulo Tramway Light & Power Company, in the Hydro-Electric Construction Department.

W. M. Balke, JR.E.I.C., is at Shawinigan Falls, Que., working for the Canadian Industries Limited, cellophane plant in the technical department.

Mr. Balke graduated from University of Alberta in electrical engineering in 1949. From University of Toronto, in 1951, he received a master of commerce degree, after graduate work in business administration.

T. E. Chalmer, JR.E.I.C., is a field engineer for the Dominion Textile Company, Limited, at Magog, Que. He joined the Montreal office of the Company in 1947. Previously he was draughtsman for Canada Cement Company Limited in Montreal.

Mr. Chalmer graduated from the University of Saskatchewan, receiving a B.Sc. degree in mechanical engineering in 1946.

R. G. Wilson, S.E.I.C., (McGill University, B.Eng., mechanical, 1951), has left for the United Kingdom for a two-year course of advanced study and specialized experience, under the provisions of an Athlone Fellowship.

R. A. E. Stenberg, S.E.I.C., (University of British Columbia, B.A.Sc., mechanical, 1951) is employed by The Shawinigan Engineering Company, at Trenche, Que.

W. C. Sinkins, S.E.I.C., (Queen's University, B.Sc., mechanical, 1951) is draughtsman for E. Leonard & Sons Ltd., at London, Ontario.

Michael Kissel, S.E.I.C., (University of Manitoba, B.A.Sc., mechanical, 1951) is at present undergoing graduate training with Imperial Oil Limted at Regina, Sask.

W. W. Kennedy, S.E.I.C., is in the telephone equipment engineering department of The Northern Electric Company Limited at Montreal.

He graduated in electrical engineering from McGill University with a B.Eng. degree in 1949.

J. Hawthorne, S.E.I.C., is employed as a junior engineer with Interprovincial Pipe Lines Company on structural draughting and design.

Mr. Hawthorne graduated in civil engineering from the University of Alberta in 1950.

E. W. Rosen, S.E.I.C., (University of British Columbia, B.A.Sc., 1951) is second computor for Geophysical Service Inc., in Calgary, Alberta.

Malcolm Grant, S.E.I.C., who was in the control department of the Bathurst Power and Paper Company Limited, at Bathurst, N.B., is now in Dartmouth, N.S., with the Imperial Oil Limited.

D. D. Graham, S.E.I.C., (University of Toronto, B.A.Sc., civil, 1951) is working as an instrumentman on maintenance for the Canadian National Railways, at Stratford, Ontario.

Gerard J. Gagnon, S.E.I.C., joined the engineering services department of Canadian Pratt & Whitney Aircraft Company, Limited, at Longueuil, Que., last April. He had been with the Montreal Tramways Company, autobus maintenance division, since his graduation from McGill University in mechanical engineering in 1950.

Jean-Paul Dionne, S.E.I.C., who was with the Quebec North Shore & Labrador Railway Company at Seven Islands, Que., after graduating from Ecole Polytechnique this year, is now working for Boucher, Cartier, Leclerc, consulting engineers, at Montreal.

Mr. Dionne received The Engineering Institute of Canada Student Prize for 1950.

Visitors To Headquarters

Thos. P. Mann, Edmonton, Alta., August 20, 1951.

Wm. A. Arsenault, M.E.I.C., Margaree, N.S., August 21.

H. A. Spencer, M.E.I.C., Saskatoon, Sask., August 21.

A. F. Myers, London, England, August 23.

M. W. Jennings, M.E.I.C., Calgary, Alta., August 24.

H. B. Strachan, Lunenburg, N.S., August 24.

Martin MacDonald, Montreal, Que., August 28.

A. Mikkelsen, Denmark. August 29.

G. J. Currie, M.E.I.C., Halifax. N.S., August 29.

Luis R. Alfonso, Havana, Cuba, September 1.

Vernon L. Dutton, M.E.I.C., Birtha, Man., September 4.

Frank Binns, M.E.I.C., Sackville, N.B., September 3.

Adolph J. Ackerman, Sao Paulo, Brazil, September 7.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

C. H. N. Connell, M.E.I.C., resident engineer for Swan, Rhodes, Wooster, consulting engineers in Vancouver, B.C., died on March 14, 1951.

Mr. Connell was born at Woodstock, N.B., in 1876. From 1897 to 1900 he was rodman and topographer on survey and construction for Canadian Pacific Railway at Crows Nest Pass, and for Canadian Northern Railway at Rainy River. He served various railway lines within the next fifteen years, among them the Algoma Central & Hudson Bay Railway; the Halifax and Southwestern Railway; the Alberta Railway and Irrigation Company at Lethbridge; the Canadian Northern Railway at Quebec. He joined Canadian Natonal Railways in 1914, working at Quebec City and Montreal as district engineer on maintenance, and at Toronto and North Bay as district engineer of the central region. After his retirement from C.N.R. in 1944 he was city engineer for North Bay for a time.

He joined the Institute as an Associate Member in 1915, becoming a Member in 1931, and attaining Life Membership in 1947.

J. J. O'Sullivan, M.E.I.C., construction engineer in Halifax, died at his home on July 29, 1951.

Mr. O'Sullivan was born and educated at Cork, Ireland. He served an apprenticeship in civil engineering and architecture, and studied at the Cork Technical Institute. He did railway work in Ireland, and was on the Royal Engineers Civil Staff in 1910. He worked in Newfoundland for a time, after which he joined the Laurentide Power and Paper Company. He served overseas from 1916 to 1920, with the Royal Canadian Engineers. He was associated after the war with various enterprises throughout Canada, working for the St. Lawrence Paper Mills at Three Rivers, Que.; and for the Bathurst Power & Paper Co., Bathurst, N.B. During 1940 and 1941 he was the resident supervising engineer for construction of Welland Chemical Works at Niagara Falls, Ont.

He went to Halifax in 1941 as chief supervising engineer for the Wartime Housing Limited. He was in Montreal for several years, as Central Mortgage regional engineer for Quebec and the Maritimes. He returned to Halifax in 1949, to take charge of the National Defence project at Tufts Cove, N.S.

He joined the Institute as a Member in 1925 attaining his Life Membership in 1951. He was a member also of the Corporation of Professional Engineers of Quebec.

D. D. MacCrimmon, M.E.I.C., well-known railway construction engineer died on July 13, 1951, en route to his home in Williamstown, Ontario.

Mr. MacCrimmon was born at Lancaster, Ontario, in 1879. He spent most of his life working on railway surveys and construction in eastern and western Canada, the greater part of his service having been with the Canadian Pacific Railway Co. Recently he had been with the Shawinigan Water and Power Company.

During World War I he served with distinction and in the course of his service was awarded the Military Cross and promotion to the rank of captain with the 5th C.R.T.

He joined the Institute in 1926 as an Associate Member becoming a Member in 1940. He was also a member of the Corporation of Professional Engineers of Quebec.

Robert Clifford Bell, M.E.I.C., who was resident engineer at Lethbridge, for the Department of Transport, died at Edmonton, Alta., on May 31, 1951.

Mr Bell was born at Fort Macleod in June, 1892. He took elementary and intermediate schooling at Macleod and graduated from the University of Alberta in 1916 with a B.Sc. degree in civil engineering. That year he joined the army and served with the Canadian Machine Gun Corps in Canada, England, France and Belgium until 1919. Returning to Canada he was employed by the Department of Interior's irrigation branch and later by the Alberta government highways during construction of the Jasper highway. He served with the Department of Resources, and for the past ten years had been engaged in making airport surveys throughout Alberta and Yukon Territories for the Dominion Department of Transport.

He joined the Institute as a Member in 1941. He was also a member of the Association of Professional Engineers of Alberta.

Prof. J. H. Moore, M.E.I.C., of the University of New Brunswick, Fredericton, N.B., passed away in hospital in England in August, 1951.

Prof. Moore was born at Moncton, N.B., in 1910. He studied at the Moncton Public Schools and entered the University of New Brunswick, in 1929. A gold medallist, he received a B.Sc. degree in civil engineering in 1933. The following year he received a M.Sc. degree in civil engineering from Massachusetts Institute of Technology.

After graduation he worked for a year as engineer and assistant superintendent for the Acme Construction Company, Ltd., at Saint John, N.B. There followed two years of research work in structural engineering design at Cambridge University. He was associated for a year, as a structural designer with Dominion Bridge Co. at Montreal, before joining the staff of University of New Brunswick in 1938 as associate professor of civil engineering.

At University of New Brunswick, Professor Moore designed and supervised the construction of the Bonar Law-Bennett Library; the Sinclair Rink, and several school and commercial buildings throughout the Province For several years he headed the engineering firm, J. Harry Moore and Associates.

He joined the Institute as an Associate Member in 1939 becoming a Member in 1940. He was elected president of the Association of Professional Engineers of New Brunswick this year.

News of the Branches

Activities of the Thirty-five Branches of the Institute and abstracts of papers presented at their meetings

Kootenay

T. W. Lazenby, m.e.i.c.,
Secretary-Treasurer

Luncheon meeting, with Vancouver guests

It was a memorable occasion for the Kootenay Branch when on September 12th, 1951, seven members of Vancouver Branch E.I.C., and 6 members of Vancouver Branch American Society of Metals flew C.P.A. to Castlegar Airport where they were met by Kootenay Chairman, H. P. Hamilton and the following members of the executive, S. L. Baird, G. R. McMeekin, W. V. Nicholson and A. H. W. Busby.

On the drive from the Airport a brief stop was made at "Brilliant Dam", before arrival at Trail where The Consolidated Mining and Smelting Company of Canada Limited was host at a luncheon in the Cafeteria for the visitors and members of the Kootenay Branch, together with some senior officers of Cominco, about 50 people being present.

E. M. Stiles, m.e.i.c., chief engineer, welcomed the visitors on behalf of Mr. Diamond, general manager of Cominco, and told of his pleasure at receiving his guests, also giving a brief outline of Cominco's production and expressing the hope that the plant tours to follow would be educational and enjoyable.

Mr. S. H. deJong, vice-chairman of Vancouver Branch, replied, for the visitors, that it was a pleasure to take part in such a trip.

After lunch the visitors were taken on a special tour of the metallurgical plants at Trail from 2 p.m. to 4 p.m., after which the executive members drove them to the Hotel, and on to a dinner meeting in the Palm Room, of the Crown Point Hotel, at 6.30 p.m.

About 44 visitors, members and guests enjoyed a very pleasant evening under the guidance of H. P. Hamilton, who introduced the visitors and guests. He called on Mr. W. O. Scott to speak on behalf of the American Society of Metals, and Mr. Scott explained briefly the organization which he represented and expressed his appreciation at being present.

Mr. deJong spoke of the Branches' close relationship to each other. It was an enjoyable experience, he said, to take part in this co-operative meeting.

Mr. H. N. MacPherson of Vancouver Branch E.I.C. spoke on E.I.C. business, stressing the great changes which had taken place since his last visit to Trail in 1942. He urged the Branch to continue sending a Councillor to the annual meetings. Dr. L. M. Pidgeon, Department of Metallurgy, University of Toronto, also gave a short address.

A hearty vote of thanks on behalf of the Kootenay Branch, to all who attended and contributed to this outstanding meeting, was expressed by E. B. Broadhurst.

On Thursday morning the Vancouver visitors were taken on a tour of the chemical and fertilizer plants at Warfield, and at noon all expressed deep appreciation for the way the special guides had conducted their tours.

In the afternoon the visitors made a special tour of the Research Division, or a short trip around the district, after which they were motored to the Airport for the return flight to Vancouver.

Montreal

R. B. Wotherspoon, m.e.i.c.,
Secretary-Treasurer

Junior Section

J. P. Dagenais, jr.e.i.c.,
Secretary-Treasurer

Junior Section Programme

The fall programme of the Montreal Junior Section has been organized in order to interest each and every one of the members. The executive had two purposes in mind in selecting the various events composing this programme. "General interest" topics were chosen as subjects of conferences, non-technical matters of interest to the young engineer, but only indirectly touching on his engineering career. Social gatherings will give members occasions to meet each other.

The following meetings have been organized:

Sept. 30—Golf Tournament: 9.30 a.m., St. Eustache Golf Course.

Oct. 1—Opening night: Dr. A. Bois, "Development of Executive Personnel".

Oct. 15—Forum on Insurance—Bureau of Insurance.

Oct. 19—Oyster Party at Le Cercle Universitaire.

Oct. 29—The Better Business Bureau: Mr. Claude Root, Manager.

Nov. 12—Ladies films night.

Nov. 26—"Northern Quebec Development".

Dec. 7—Annual Dance at the Windsor Hotel.

Dec. 10—Study Groups Report.

That each of these events should attract a large group of young engineers, is the hope of the executive members.

Saskatchewan

D. W. Houston, m.e.i.c.,
Secretary-Treasurer

W. M. Berry, m.e.i.c.
Branch News Editor

Moose Jaw Meeting

For the first time in years the Saskatchewan Branch of the Engineering Institute of Canada (Regina section), in conjunction with the Association of Professional Engineers of Saskatchewan, held their regular meeting in the city of Moose Jaw. This took the form of a dinner meeting at the Grant Hall Hotel on Friday, September 14, 1951. Approximately forty Regina engineers attended this meeting as well as representatives of the Saskatchewan Rivers Development Association who attended as guests.

The speaker was Dr. L. B. Thomson, director, P.F.R.A. He spoke on **The Economics of Irrigation** and dealt with the three phases of soil and water conservation on the prairies, the small individual project, the community project and the large irrigation works. He told his audience that the individual farm projects had been proven economically sound and already had a definite far-reaching effect on the economy of the west. The community projects also had demonstrated their great value and Dr. Thomson emphasized that these projects could not be judged solely on the basis of the land irrigated and the benefits to the owner or operator, but on the stabilizing effect on agriculture in the community and the bringing about of a better balanced unit of production.

The speaker declared that in his opinion there was no better invested $5 million than that which the government had expended on small soil and water conservation projects on the prairies.

Another phase of the conservation work undertaken is represented by the projects in the Frenchman River, Cypress Hills, Wood River and Qu'Appelle River basins. Irrigation projects in these areas insure winter feeding for livestock and prevent the disastrous forced selling of livestock herds or the costly importation of feed that took place in the dry thirties. He recalled the occasion in 1937 when he had assisted in shipping a whole trainload of cattle out of an area in Saskatchewan under forced sale conditions which brought a return of ½ cent a pound: while ten years later, after irrigation had been established, he had observed a trainload of sheep and cattle go out of the same area bringing a return of many times the 1937 price. Again, in 1947 there had been no need to bring in hay and fodder as there had been in 1937.

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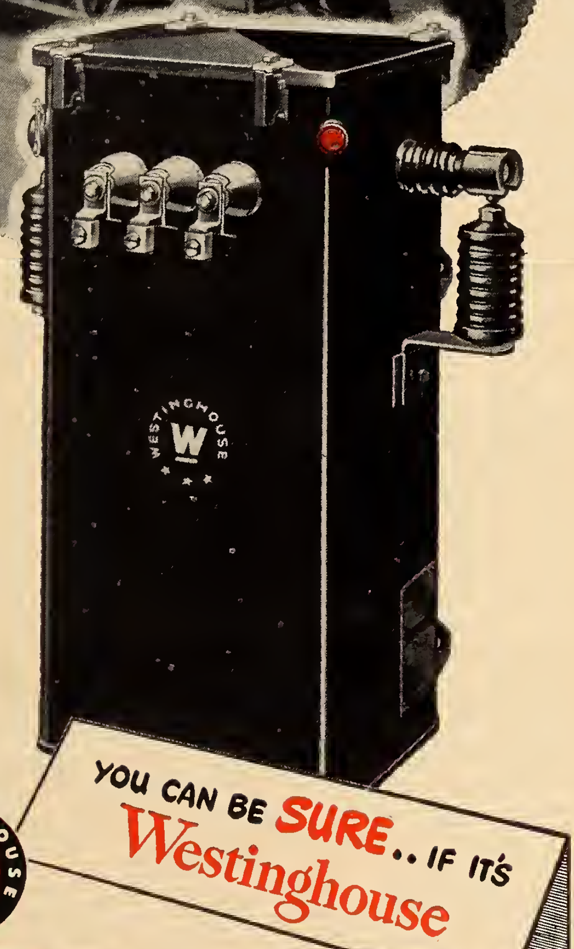

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Vancouver

Stuart S. Lefeaux, m.e.i.c.,
Secretary-Treasurer

H. T. Libby, m.e.i.c.,
Branch News Editor

Approximately twenty-five members of the Institute were the guests of the Shell Oil Co. of Canada at the Shellburn plant on the afternoon of August 15th for a plant inspection tour.

The plant is ideally situated on Burrard Inlet with access by road, rail and boat. The contour of the ground is such as to permit much of the liquid handling to be accomplished by gravity.

Besides being an extremely suitable location from the engineering point of view, it is also most picturesque, commanding an excellent view of Indian Arm and the North Shore mountains.

The plant is a fully modern oil refinery which converts crude oil into naphtha, gasoline, kerosene, stove oil, diesel oil and the heavier fuel oils, asphalts, etc.

The crude oil is received by tankers which pump the oil up the hill to the crude storage tanks. The crude is pumped from the tanks to a boiler where it is heated under pressure to an optimum temperature. From there it is allowed to flash into the bottom of a fractionating column where the vapours bubble through bubble trays. Each layer of bubble trays is kept at a different temperature so that the heaviest crudes condense out at the bottom while the more volatile fractions continue up the tower, each cut being removed by successive trays, with the gasoline and naphtha being taken off at the top level. As the distilled liquids leave the tower they impart much of their sensible heat to the incoming crude through heat exchangers thereby reducing the fuel consumption for heating purposes by approximately 60 per cent. The various fractions are then piped to the run-off tanks.

It would be a happy situation if the demand for the various products, such as bunker oils, stove oils, gasoline, etc., exactly matched the output of the plant, but of course, such is not the case. However, by the use of a cracking plant the molecules of one type of fuel can be "cracked" to yield a new "crude like" group of products.

The cracking plant consists of a large boiler where the ingoing fraction is exposed to a high temperature at a high pressure. It is then flashed at a slightly reduced pressure to a soaking tower. From there it passes to a rectifying tower similar to the one used in the first run. The products from the straight run tower and the cracking unit tower are then blended and processed to render them ready for the market. This entails the removal or modification of certain injurious and odoriferous sulphur compounds, clarifying, and, in the case of gasoline, the adding of tetraethyl lead.

In order that all the phases of such involved cycles can be carried out simultaneously with perfect control complete instrumentation is necessary. In the Shellburn Plant all the critical pressures, temperatures, etc., are recorded in fully modern, centrally located instrument rooms. Suitable alarm systems are included which actuate whenever certain tolerances are exceeded.

Upon completion of the plant tour the groups were transported to the new storage and packaging plant which is under construction down near the waterfront and railway. An excavation involving forty or fifty thousand cubic yards of soil had to be made in order to prepare the ground for the new warehouse. A large settling tank is also under construction. It will be used to store for future use the batches of partially refined oil, etc., which accumulate around a refinery when units have to be taken out of service.

The groups then left Shellburn and reconvened at the Horseshoe Cafe where refreshments were served, after which the film "Fuel for Power" was shown. The film explained in some detail the technological development leading up to the modern oil refinery.

Mr. Stan Williamson, acting plant manager, wound up the meeting with a few well chosen words, and Jack McDonald, chairman of the Vancouver Branch, thanked the management of the Shell Oil Co. for an extremely interesting and entertaining afternoon. Mr. McDonald's remarks were heartily endorsed by the membership.

E.I.C. Student and Junior Prizes

Prizes to Students and Juniors

(1) Five prizes may be awarded annually for the best papers presented by Students or Juniors of the Institute in the vice-presidential zones of the Institute, as follows:—

The H. N. Ruttan Prize—in Zone A—the four western provinces.
The John Galbraith Prize—in Zone B—the Province of Ontario.
The Phelps Johnson Prize—for an English Student or Junior in Zone C—the Province of Quebec.
The Ernest Marceau Prize—for a French Student or Junior in Zone C—the Province of Quebec.
The Martin Murphy Prize—in Zone D—the Maritime Provinces.

(2) Awards shall only be made if, in the opinion of the examiners for a zone, a paper of sufficient merit has been presented to a branch in that particular zone.

(3) The winner of a prize shall be required to specify such technical books or instruments as he may desire to the total value of approximately twenty-five dollars when suitably bound and printed or engraved, as the case may be.

(4) The award of prizes shall be for the year ending June thirtieth. On that date, each branch secretary shall forward to the examiners for his particular zone all papers presented to his branch by Students and Juniors during the prize year, regardless of whether they have been read before the branch or not.

(5) The prizes shall be awarded only to those who are in good standing as Students or Juniors of the Institute on June thirtieth following the presentation of the paper.

(6) The papers must be the bona fide production of those contributing them and must not have been previously made public or contributed to any other society in whole or in part. It is to be understood, however, that a paper which has won or been considered for a branch prize is nevertheless eligible for the Institute Prize. No paper shall be considered for more than one of the five prizes.

(7) The examiners for each zone shall consist of the vice-president of that zone and two councillors resident in the zone, appointed by council. In the case of Zone C, two groups of examiners shall be appointed under the two vice-presidents, one for the English award and one for the French award. The awards shall be reported to the annual meeting of the Institute next following the prize year, and the prizes presented as soon thereafter as is reasonably possible.

Prizes to University Students

In 1930 Council established eleven cash prizes of twenty-five dollars each for competition among students of Canadian engineering schools, in the year prior to the graduating year. Awards are now made annually to the following institutions:—

University of Alberta
University of British Columbia
Ecole Polytechnique, Montreal
Laval University, Quebec
University of Manitoba
McGill University
University of New Brunswick
Nova Scotia Technical College
Queen's University
University of Saskatchewan
University of Toronto

It is the desire of council that the method of their award shall be determined by the appropriate authority in each school or university, so that a prize may be given to the student in any department of engineering who has proved himself most deserving, not only in connection with his college work, but also as judged by his activities in the student engineering organization, if any, or in the local branch of a recognized engineering society.

It is not necessary for the recipient to belong to the Institute, and in this respect the prizes are quite distinct from those offered to Students and Juniors of the Institute, or from the prizes which are offered by a number of our branches to the Students attached to them.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment*.

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER to act as project or development engineer. It is essential that candidate have experienc in this field or in general engineering minimum of 5 years. The work will involve engineering, estimating, investigation and special studies. The applicant should have a good command of English and preferably some experience in contacting the public. The location is Montreal with some travelling as the occasion requires. Salary is commensurate with experience. Apply to File No. 4047-V.

FIVE CHEMICAL ENGINEERS required by large chemical organization in Ontario to act as Sales Engineers. Chemical Engineer or Chemist from any Canadian University. Selling experience is preferred but not necessary. Preferably young men with a definite aptitude for selling. Apply to File No. 4060-V.

CIVIL

CIVIL ENGINEER required to act as junior office engineer in Western Canada. Duties to include draughting, plotting, topography design, development of minor concrete and timber structures, computation of quantities for earthwork, rock excavation and concrete, and similar work required in the office of such a project. Apply to File No. 4041-V.

CIVIL ENGINEER required for the permanent staff of city engineers' department in Ontario. Work includes the design, layout and supervision of roads, sewers, sidewalks etc. The salary is dependent on qualifications and full employee benefits are available. Apply to File No. 4046-V.

CIVIL ENGINEER required by the department of highways in Ontario. Applicant should have some experience in highway engineering and be preferably bilingual. Salary is $4500.00 per year with car allowance. Apply to File No. 4049-V.

A CIVIL ENGINEER required by firm of consulting engineers in Toronto with practical experience covering the design and installation of sewerage and sewage disposal systems. Salary according to qualifications. Apply to File No. 4050-V.

CIVIL ENGINEER required with extensive experience in Canada or United States in water main, water pumping plant, sewer and sewage treatment plant layouts. Duties will include preliminary survey, design, draughting, and supervision. Permanent position with large organization in Toronto with generous pension, sick leave, and vacation privileges. Salary can be arranged to suit qualifications of successful applicant. Apply to File No. 4052-V.

THREE GRADUATE CIVIL engineers with at least four years experience in design of reinforced concrete structures for work in Montreal. Apply to File No. 4056-V.

ELECTRICAL

ELECTRICAL ENGINEER to take charge of switchgear estimating department. Qualifications required are that the applicant should have a sound general knowledge of electrical engineering fundamentals and should have a specialized knowledge of medium and high voltage switchgear. He should have experience in the preparation of specifications, tenders and cost-estimates. Salary would depend on qualifications. Cost of living bonus and pension scheme. Location Montreal. Apply to File No. 4051-V.

APPLICATIONS ARE INVITED for the post of professor and head of the department of power engineering in the India Institute of Science, Bangalore, India. The candidates should possess a degree in electrical engineering and should possess very high academic qualifications and experience. Associations with engineering and technical institutions and teaching experience are necessary qualifications. For full information apply to File No. 4053-V.

ELECTRICAL ENGINEER required, young university graduate with research outlook, to join a team working on aircraft de-icing. The work is mainly in the electrical field, with some observational flying. Some experience with aircraft electrical power systems is desirable. Initial salary up to $3900.00 depending on age qualifications and experience. Apply to File No. 4054-V.

MECHANICAL

THREE MECHANICAL engineers required by firm in Newfoundland, for process and general engineering duties. Single men are preferred who have experience in the pulp and paper industry. Salaries open. Apply to File No. 4055-V.

MECHANICAL DESIGN Engineer required by locomotive works in Montreal. Apply to File No. 4062-V.

METALLURGICAL

METALLURGIST, RECENT GRADUATE required by large transport company in Montreal. Duties include microscopic and physical study of various metallurgical problems. Apply to File No. 4063-V.

MISCELLANEOUS

ENGINEER REQUIRED by organization in Ontario with good knowledge of Marine radar with training and ability to handle service and installation crews. Considerable travelling involved. Apply to File No. 4042-V.

ENGINEER TO ACT AS assistant, to deal with technical and administrative work and to do some outside sales work for organization in Ontario, manufacturing radar and navigation equipment. Travelling involved. Apply to File No. 4042-V.

SENIOR DRAUGHTSMAN required by firm located in Ontario. Must have several years all-round experience in plant layout and special machinery and equipment. Salary commensurate with experience. Application with sample of work to File No. 4043-V.

PLANT ENGINEER for textile mill in Province of Quebec. Applicant should be about 35 years of age with three to five years' experience in plant maintenance, preferably a textile mill. Salary open. Apply to File No. 4044-V.

INDUSTRIAL ENGINEER to act as leader and instructor of industrial engineering teams in applied field work. Will be required to instruct various teams of engineers in methods for increased productivity and plan the activities of these groups of engineers. This will be mainly practical work and will require much travel. Responsible to the industrial consultant of the Ministry of Labour. Travel throughout Israel. Length of service one year. Experience: should possess experience in the field of industrial engineering in general, and particularly practical experience in serving as consultant to industrial projects. Hebrew desirable but not essential. Age 35 to 55 years. Apply to File No. 4045-V.

PROFESSOR OF INDUSTRIAL engineering to teach both undergraduates and graduates in the field of industrial engineering. Responsible to Ministry of Labour, Hebrew Technion, Haifa. Length of service indefinite. Previous experience as professor in the field of industrial engineering at an accredited university. Knowledge of Hebrew is desirable but not essential. Age 25 years and over. Apply to File No. 4045-V.

RESEARCH DIRECTOR of Israel Rubber Research Association. Research in improving production methods as well as quality of products. Instruction in the plants. Length of service 2 years. Degree preferably in field of chemistry of rubber. Age 35 to 50 years. Hebrew is desirable but not essential. Reading knowledge of English, German and French is desirable. Apply to File No. 4045-V.

RESEARCH DIRECTOR of the Israel Ceramics Research Association for research in improving production methods, as well as quality of products. Research in the conservation of imported raw materials and the utilization of local raw materials. Length of service 2 to 3 years. College degree preferably in the field of ceramics. Candidate should have some practical experience in the manufacture of ceramics and be familiar with the semi-automatic equipment used, especially dishes, electrical ceramics, building and sanitary ceramics, and should be familiar with tunnell kiln process. Knowledge of Hebrew is desirable but not essential also knowledge of English, French and German. Age between 30 and 45 years. Apply to File No. 4045-V.

TWO PROFESSORSHIPS TO THE faculty of mechanical engineering at Hebrew Institute of Technology, Haifa. Duties to commence in October 1952 or earlier. One of the above two positions requires special knowledge of applied thermodynamics. In due course instruction to be conducted in Hebrew. Salaries will be fixed in relation to the highest grade of the Israel Civil Service. There will be a pension scheme. The Haifa Institute of Technology will pay transportation expenses and will also undertake to provide housing. Apply to File No. 4045-V.

TWO FULL PROFESSORSHIPS and two associate professorships to the faculty of electrical engineering, Hebrew Institute of Technology, Haifa. Duties to commence about October 1952. Instruction in the fields of telecommunications and power engineernig, in due course instruction to be conducted in Hebrew. Applicants must have specialized professional and academic qualifications in telecommunications and power engineering. Salaries fixed in relation to the highest grade of the Israel Civil Service. There will be a pension scheme. The Haifa Institute will pay transportation expenses and will also undertake to provide housing. Apply to File No. 4045-V.

INDUSTRIAL ENGINEER instructor for field engineers and advanced industrial engineering methods. Will instruct groups of field engineers in methods for increased productivity. Time and motion studies etc. Work of industrial engineer would be both theoretical and practical and would require direct contact with projects in the field. Will supervise approximately ten engineers. Responsible to industrial consultant of Ministry of Labour. Travel throughout Israel. Length of service one year. Knowledge of Hebrew is desirable but not essential. Age 40 and over. Apply to File No. 4045-V.

SUPERINTENDENT REQUIRED by gold mining Co. in Western Canada. Salary range $500.00 and a new house may be rented at a very nominal price. Apply to File No. 4048-V.

RECENT GRADUATE required by Hamilton organization for training as sales engineer on sheet metal building and industrial products. Qualifications: graduate civil engineer or architect, age 20-25 years preferred, knowledge of industrial building construction an asset, to locate in Toronto or Hamilton area. Excellent opportunity for career in sales. Apply to File No. 4053-V.

ENGINEER REQUIRED in B.C. for research work on hydraulic model laboratory, to examine the nature of water currents in the vicinity, and to determine what alterations will be necessary to accomplish certain industrial requirements. Besides these possibilities of industrial and research experience, there is the privilege of using the research as a thesis material for advanced degrees. The position offers a full-time salary at a level in keeping with the qualifications of the candidate. Apply to File No. 4057-V.

ENGINEER, MANAGER required by public utility in Newfoundland. Applicants must be licensed to practice engineering in some Canadian province and should have not less than ten years of practical experience of which five years should have been in the water supply and sewerage field. Duties include supervising the detailed design and construction of water supply and sewerage systems to serve an estimated present population of 20,000: to take entire charge of the technical and business operation of these systems upon completion, under the general direction of the corporation. Applications must include details of experience, salary expected, recent photo, names and addresses of 3 references and be received not later than October 20, 1951. Apply to File No. 4058-V.

THE MANUFACTURING and assembly department of the overseas operations division of a large automotive industry in Canada is offering to the engineering graduate extremely valuable experience in all lines of automotive engineering endeavour. The work is essentially one of liaison in Australia, India, New Zealand and South Africa. Men for this department should have a broad inquisitive interest in everything automotive (as opposed to those with specialized interests). As they will deal with both directors and labourers alike, a personality neither forceful or reluctant is desirable. Should the need arise they should also be willing to serve in India and Malaya. Apply to File No. 4059-V.

RECENT GRADUATE ENGINEERS required by manufacturer in Ontario of steel chains, conveying and power transmission equipment for the expansion of their engineering and sales department. Applicants will be given thorough training and then be placed in key positions where they are most suitable. Apply to File No. 4061-V.

SUPERINTENDENT OF PRODUCTION control required by large locomotive industry in Montreal. Apply to File No. 4062-V.

UNIVERSITY GRADUATE DESIGN Engineer required in Toronto, Ontario, capable of designing hydro-electric equipment and in particular hydraulic turbines and auxiliaries. Apply to File No. 4064-W.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMICAL ENGINEER required for research department of organization in Quebec. Recent graduate or experienced engineer for work on existing processes and original development. Apply to File No. 4006-V.

CHEMICAL ENGINEER required by Montreal organization with knowledge of plant layout, material specifications A. S. M. E. code design and job scheduling. Experience of three to four years in the foregoing is desirable. Some knowledge of control instrumentation also beneficial. Salary according to qualifications. Apply to File No. 4023-V.

A PROMINENT CHEMICAL INDUSTRY has an opening in a plant in southern Ontario, for a Ph.D. with about ten years experience in research and development work. Some experience in administration is required in addition to that in the direction of research and development activities. Chances of advancement are excellent. Apply to File No. 4036-V.

CHEMICAL ENGINEERS preferably with post graduate training to act as process development group leaders for an expanding technical division in a large chemical plant in Southern Ontario. Applicants should have about five years experience in development and for operations in a chemical industry. The work will involve direction of a group of chemical engineers working on laboratory and pilot plant investigations, plant tests, and will include the evaluation of proposed new processes or process improvements. Apply to File No. 4036-V.

CIVIL

YOUNG CIVIL ENGINEERS required by organization in Province of Quebec, duties include design and field work on construction. Apply to File No. 4024-V.

MUNICIPAL ENGINEER for town in Niagara Peninsula, population 7,000. Requirements are for civil engineer who has had experience in maintenance of pavements, side walks, sewers and surveying for new subdivisions. Salary open, middle-aged man preferred. Apply to File No. 4025-V.

EXPERIENCED GRADUATE CIVIL ENGINEER for standard design and supervision of wood, steel and concrete buildings in architect's office located at the Lakehead, Ontario. Pension, P.S.I., Blue Cross and other benefits. State experience and salary desired in application. Permanent position for the right person. Apply to File No. 4035-V.

ELECTRICAL

ELECTRICAL ENGINEERS with experience in electronics and radar for positions in Ottawa. Salaries open. Apply to File No. 1588-V.

WELL QUALIFIED ELECTRICAL engineer to act as supervisor of underground distribution by a Canadian utility in Brazil for planning underground distribution systems and allied substations; standardizing present practices, special studies. Prefer 7 to 10 years experience. Quote File 13771. Apply to File No. 4014-V.

ELECTRICAL ENGINEERS with test-course experience are required for specification writing, comparison of tenders, supervision of acceptance tests, liaison with manufacturers and checking drawings. Possibility of going to Brazil in six months to two years. Quote File No. 14110. Apply to File No. 4014-V.

CHIEF OF SYSTEM PLANNING well qualified electrical engineer is required by a Canadian utility in Brazil for long range plannnig of generating, transmission and receiver facilities; supervision of distribution, relay protection, carrier current, research and standards department, forecasting capital expenditures. Prefer 7 to 15 years' experience. Quote File No. 13737. Apply to File No. 4014-V.

THREE ELECTRICAL ENGINEERS required by large organization in Montreal for specialized sales work in power apparatus. Applicants should have about 5 years experience partly or completely in test room or power house work. Salary commensurate with experience. Apply to File No. 4015-V.

MECHANICAL

MECHANICAL ENGINEER required by organization in Montreal. Applicant should have had experience in production planning and the design and application of mechanical equipment to production operations. Duties will include research and the development of mechanical equipment for one of the primary industries. Preferably single and free to travel. Apply to File No. 3020-V.

TWENTY MECHANICAL Engineers, senior and junior, are required to work in Montreal office on, design of special machines, design of heating and air conditioning systems. Must have college degree or equivalent background. Some practical experience in either field is desirable. Apply to File No. 4008-V.

MECHANICAL ENGINEER required for Toronto sales office of large manufacturing firm in Montreal. Training period in Montreal. Good opportunity offered. Apply to File No. 4020-V.

McGILL UNIVERSITY requires graduate mechanical engineers in the department of mechanical engineering; qualified in the design field for full time appointment, instructors and demonstrators for seven months, from 1st of October, 1951. Apply to File No. 4022-V.

MECHANICAL SALES ENGINEER with three or more years experience on hydraulic presses or rolling mills, design layout, application, servicing and sales. Salary commensurate with ability. Responsible position in Montreal office of firm with international reputation. Apply to File No. 4032-V.

MINING

MINING ENGINEER, recent graduate required by organization in Province of Quebec. Apply to File No. 3097-V.

MISCELLANEOUS

THE PUBLIC SERVICE OF CANADA REQUIRES electrical engineers (electronics and communications) appointments at Ottawa, Toronto and Montreal. Salaries up to $4,740.00 per annum. Details and application forms may be obtained by writing C.S. Comm., Ottawa, Competition No. 50-158-B. Apply to File No. 2016-V.

MECHANICAL OR AUTOMOTIVE ENGINEER with complete technical and practical training on modern automotive equipment, prefer drawing office experience and a background in body design engine testing and tuning, repair testing and calibration of electrical units, diesel engine maintenance and modern automatic transmissions, such as dynaflow, vacuomatic and hydromatic. The position would be with a large Canadian Company in Rio de Janeiro, Brazil, and the applicant would be dealing with 900 assorted vehicles, principally of American origin. Apply to File No. 3032-V.

ASSISTANT RESIDENT engineer required in Vancouver, B.C., for Granville Bridge. Qualifications required are preferably university graduate in civil engineering or structural with a minimum of 3 to 4 years field experience in construction work, or equivalent. Interviews would be conducted with persons now in vicinity or those willing to go to location. Apply to File No. 3062-V.

CHIEF OF FOREIGN WIRE RELATIONS required by Canadian Telephone Company in Brazil. Prefer about 10 years experience with a manufacturer or utility; experience in design, operation and maintenance of telephone plants including carrier systems as well as a knowledge of the fundamentals of power generation and distribution would be valuable. Practical and theoretical experience in inductive coordination, electrical protection and electrolysis problems as applied to telephone plants with emphasis on the methods of protecting them from lightning and low frequency induction would be desirable. Apply to File No. 3099-V.

GENERAL MANAGER required to supervise the entire operations of water, light and power commission in Ontario. State qualifications, age, experience, references and when available. Apply to File No. 4000-V.

YOUNG ELECTRICAL OR MECHANICAL engineers required by electrical manufacturer located in Montreal for plant in Ontario. Apply to File No. 4002-V.

THREE MINING OR MECHANICAL engineers required by large mining company in Quebec, also draughtsman for layout and design work. Apply to File No. 4003-V.

A CANADIAN UNIVERSITY wishes to receive applications from engineering graduates, preferably Civil, Mechanical or Electrical, under 30 years of age to teach engineering problems and drawing. Applications should state age, university and experience. The salary offered is $1,800.00 and up for the session depending on qualifications. Apply to File No. 4009-V.

RADIO ENGINEER, senior design engineer with 8 to 10 years experience in low, medium and high frequency communication, transmitter design. Must be capable of heading a section and have the qualities necessary for advancement. Starting salary $6,000.00 per year. Location Montreal. Also Junior Radio Engineer with 3 to 5 years experience in electronics design. Apply to File No. 4010-V.

HEAT TREAT SPECIALIST required in Montreal. Applicant should have knowledge of electric heat treating of precision machined parts. Should be capable of assisting in department layout and selection of equipment. Apply to File No. 4011-V.

ELECTRO PLATING SPECIALIST with knowledge of electro plating high grade machined parts with cadmium, zinc, copper, tin and silver. Should be capable of assisting in department layout and selection of equipment. Location Montreal. Apply to File No. 4011-V.

CANADIAN COMPANY located in Ontario urgently requires engineers to fill key positions (1) works manager, (2) graduate engineer for engineering division, (3) chief inspector, (4) methods engineer (tool design department). Nature of work is aircraft, on jet engine work. Apply to File No. 4012-V.

PROJECT ENGINEERS 1946 to 1949 mechanical or chemical graduates, preferably with experience in chemical or allied industry. Process engineers; recent graduates in chemical engineering. Location Ontario. Apply to File No. 4013-V.

A CANADIAN UTILITY in Brazil requires a well qualified business man with utility experience to direct sales promotion, billing, tariffs, consumer research, statistics, advertising and to correlate economics data. Duties would include correlating the business activities of nine public utilities. The successful applicant will report directly to Vice-President operations. Quote File No. 13740. Apply to File No. 4014-V.

A CANADIAN UTILITY IN BRAZIL requires a rate setting engineer or a retired rate specialist to set up a retail rate department in Rio de Janeiro and Sao Paulo. The position would be permanent for an experienced engineer but would last two or three years for a retired consultant. Quote File 13513. Apply to File No. 4014-V.

TWO SENIOR ENGINEERS with experience in general and detailed layout of mill buildings, equipment and equipment layout, including processing equipment, material handling, conveying, packaging etc. Location Quebec. Apply to File No. 4017-V.

YOUNG ENGINEER preferably mechanical required for Montreal sales office of Toronto manufacturer. Apply to File No. 4018-V.

RESEARCH SCIENTIST to conduct research and development in food packaging and packing. This will involve work independently and in co-operation with manufacturers and other agencies on suitable container materials and methods of container fabrication, and will require a knowledge of such materials as paper and paper products, plastic films, metal foils, metal cans, enamels, adhesives and inks, etc. Applicants should have a Ph.D. or M.Sc. degree in chemical engineering, organic chemistry or physical chemistry and should have some experience with the container materials. Location Ottawa. Salary open. Apply to File No. 4019-V.

REFRIGERATION ENGINEER required in Montreal to do design and development work on ice cream cabinets, refrigerated merchandising equipment. Preferably graduate from Canadian University 1950 or 1951. Practical experience in commercial refrigeration possibly through summer work would be advantageous as a supplement to a theoretical knowledge of refrigeration. Age under 30 years. Applicant should have initiative and perseverance, should be interested in engineering as a profession rather than as an immediate key to an administrative position. Salary open. Apply to File No. 4026-V.

MECHANICAL AND ELECTRICAL ENGINEERS required by newly formed organization in Canada, with some knowledge of heating and ventilating installations. Location Montreal. Apply to File No. 4027-V.

SALES ENGINEER preferably chemical or mechanical as representative in Montreal and vicinity on exclusive commission basis. The man we required must be experienced in industrial applications as he will be required to call on chemical, food and other processing industries. This is a real opportunity as the commission rate is good. equipment is top quality, and the successful applicant will be given the opportunity of acquiring an interest in the company after proving his worth. Apply to File No. 4028-V.

SENIOR INDUSTRIAL ENGINEER required to supervise manufacturing methods and standards. The location is approximately 16 miles east of downtown Toronto. Salary open. Apply to File No. 4029-V.

ENGINEERS REQUIRED with experience in heating and plumbing by consulting engineering firm in Montreal. Apply to File No. 4031-V.

CIVIL MECHANICAL OR CHEMICAL engineer, (2), required by firm located in Toronto, Ontario. Minimum of three years experience in structural, steam and piping design. Some process and equipment design and knowledge of specifications and estimating would be advantageous. Preferably 28-35 years. Apply to File No. 4033-V.

PATENT ANALYST to organize patent records, investigate violation of patents also investigate possibility of manufacturing new products. Carry out and assist in market research studies. Preliminary work on new patent applications. Applicant should have Bachelor's degree in chemical engineering or honors chemistry. Age minimum 27 years. Experience in sales, development or production of organic chemical dyestuff. Experience in patent work desirable but not essential. Location Ontario. Apply to File No. 4033-V.

MECHANICAL OR CHEMICAL ENGINEER to act as junior project engineer in chemical organization in Ontario. Applicant would work with plant engineer on piping layouts and design plant and equipment layouts, some process and machine development maintenance problems etc. Preferably graduate with one or two years' experience or 1951. Apply to File No. 4034-V.

ENGINEER REQUIRED to act as assistant purchasing agent for manufacturer of engineering supplies, located in Province of Quebec. General duties consisting of preparation of engineering quotations, sales correspondence and purchasing of equipment. Preferably bilingual but not essential. Apply to File No. 4038-V.

Situations Wanted

CIVIL ENGINEER, 1949 graduate, age 27. Experience in highway construction and concrete construction. Desires responsible position with construction company or consulting firm in Ontario or Western Canada. Apply to File No. 203-W.

CIVIL ENGINEER, B.Sc. Queen's 1948, M.A.Sc., Toronto, 1949. Prof. Engineer (Ont.), Jr.E.I.C. Age 26, single. Presently employed as assistant town engineer. Have 2 years practical experience in every phase of municipal engineering. Prior to present position have been on highway surveying and construction; precise surveying and mapping, hydrographic surveying. Also experienced in reinforced concrete design, sewerage work and waterworks design. Desires position where opportunity exists for acquiring of further experience in sanitary engineering designs preferably with a consulting engineer specializing in municipal and sanitary engineering. Apply to File No. 250-W.

MECHANICAL ENGINEER, 1950 graduate in industrial option, with 14 months varied experience in large manufacturing industry desires position in production organization. Apply to File No. 1216-W.

ELECTRICAL ENGINEER, M.E.I.C., P.Eng. (Que.), Universiy of Alberta, 1936, age 38, small family. Desires position in Western Canada, preferably Alberta or B.C. Fourteen years varied experience in the electric wire and cable manufacturing field, with emphasis on Power Cable. Experience includes considerable application engineering involving extensive studies of cable rating and impedance calculations, considerable overhead conductor design calculations; laboratory experience covering a wide range of electrical measurements, general and high tension cable testing techniques, laboratory apparatus design; knowledge of manufacturing methods; some plant layout. Considerable practical experience with electronic apparatus in the measurement and audio fields. Available on reasonable notice. Apply to File No. 1460-W.

GRADUATE ENGINEER, 8 years draughting and design, including 3 years tool design; is available on short notice for group leader; chief draughtsman of small or medium size staff; tool designer; or tool engineer. Location is not a deciding factor. Salary desired $425.00 per month. Personal interview by appointment. Experience also includes structural steel reinforced concrete, steam plant, piping, oil refiner and chemical plant. Apply to File No. 1935-W.

TOWNSITE ENGINEER, capable of taking complete charge of the administration, design and construction of Townsite developments or extensions, including planning, roads, drainage, sewers, water supply, hydro distribution, buildings. Qualifications include fourteen years experience in Canada and abroad, C.E. (Toronto), P.Eng., M.E.I.C., A.I.E.E., A.S.C.E., A.W.W.A., C.I.S.S. Apply to File No. 2466-W.

ENGINEER, MECHANICAL, interested in position offering opportunity as representative, plant or assistant engineer. Experience includes twelve years design, construction and maintenance with pulp and paper industry. Age 40, married. Apply to File No. 2642-W.

POSITION AS SALES PROMOTION MANAGER sought. Age 34. Competent to handle all phases of advertising; produce sales literature; write and edit; promote general publicity. Experience with firm of consultants; journalism; assistant sales development manager; manager sales office handling heavy and light equipment. Will consider position as assistant if scope not too limited and permits initiative. Also consider allied work. Apply to File No. 2670-W.

B.A.Sc., Jr.E.I.C. Honours, Toronto, 1947, desires permanent position preferably with small but expanding firm. Experienced in production and technique of rubber and thermoplastic molding and extrusion. Apply to File No. 2888-W.

CIVIL ENGINEER, Jr.E.I.C., bilingual, with 1½ years experience with consulting engineer firm and three years with steel fabrication company. Work consisting mostly on design of reinforced concrete structure. Desires position in Montreal area in architect's office or with consulting engineering firm as structural engineer. Apply to File No. 2947-W.

CIVIL ENGINEER, B.Sc., '47, Jr.E.I.C., P.Eng. (Que.), age 26, married, with car, 3½ years varied structural experience with architects, fabricators and contractors, convering design, detailing and estimating of structural steel and concrete as well as liaison work, desires position with responsibility. Must include outside work in design and supervision, and/or liaison work, or sales promotion. Available on one month's notice to present employer. Ontario or Alberta preferred. Apply to File No. 3340-W.

MECHANICAL ENGINEER M.E.I.C., A.M.I., Mechanical Engineer, Chartered Engineer, 1st class B.O.T. (Steam and Motor), stationary engineer A.B. Certificate. Management administration, construction, power plant operation. Desires more progressive position at senior executive level. Apply to File No. 3420-W.

EXPERIENCED ENGINEER, A.M.I.C.E., M.E.I.C. Age 31. 14 years combined Civil Mechanical background. Design and construction in road works water supply, sewage system and large factory construction in U.K. Hydro-electric construction and investigation in U.K. and Canada. Geophysical investigation and deep well drilling and operation for water supply in N. Africa. Aircraft component design and machine shop practice in U.K. Require progressive position where experience may be utilized combined with aptitude for administration organization and production. Apply to File No. 3435-W.

EX R.E.M.E. OFFICER, A.M.I., Mech.E. Age 35. Arriving in Canada in November. Experience of design of mechanisms, maintenance of vehicles, contractor's plant, etc., and wide knowledge of management of engineering workshops dealing with machining, assembly, forging and heat treatment. Prepared to accept offers of employment now. Apply to File No. 3534-W.

MECHANICAL ENGINEER, S.E.I.C., University of Saskatchewan, 1950. Age 25, Naval Veteran. Experience includes, automotive mechanics, pipefitting, heating system design and installation, design and draughting office since graduation. Interested in all mechanical fields, especially automotive and implement manufacture, pulp and paper industry, diesel and gas turbine design and steam generating plants. Willing to undertake training program. Available on short notice. Apply to File No. 3536-W.

MECHANICAL ENGINEER, Queen's 1950, S.E.I.C., Member C.P.P.A. Desires employment in British Columbia preferably in pulp and paper industry. Veteran, age 33, married, 1½ years experience in general engineering office of pulp and paper company, 3 years on highway surveys. Presently employed, available September 30th. Apply to File No. 3537-W.

CIVIL ENGINEER Jr.E.I.C. Toronto, 1949. Presently employed in Ontario at good salary in responsible position. Desire association with responsible engineering firm operating in Br. Columbia or British Isles. Experience one summer U.K., one year Canada on heavy construction (steam power plants); one year present position in charge of initiating, designing, and manufacturing new reinforced concrete structural units. 3 years underground mining prior to war; ex pilot R.C.A.F. Married, one child. Age 31. Apply to File No. 3538-W.

PRODUCTION MANAGER (A.M.I.P.E.) of a medium sized engineering company in England is contemplating immigrating to Canada and wishes to offer his services to a progressive company who require a works or production manager in light, medium or heavy engineering. Industrial career: apprenticeship, tool room foreman aero and motor works, machine shop superintendent aero and motor works, production manager of light engineering works (1,250 employees). Age 38 years, married, Scot. Apply to File No. 3539-W.

GRADUATE ENGINEER, Jr.E.I.C., N.S. T.C., 1949. Married. Age 27, with qualifications and experience to handle position as workshops superintendent. Experience in production control, employing and interviewing personnel. Presently employed as workshops supervisor and as production engineer for a small assembly plant. Desires position where experience may be beneficial for administration and production duties. Apply to File No. 3547-W.

GRADUATE STRUCTURAL ENGINEER, M.E.I.C., A.M.I., Struct.E., with 10 years experience (about a year in Canada) in design and erection of reinforced concrete, steel and timber structures, well experienced in prestressed concrete design and construction, capable of supervising a team work. Would accept a position of senior designer. Apply to File No. 3552-W.

PART-TIME WORK: Graduate Civil Engineer, B.A.Sc., S.E.I.C. desires to obtain part-time work (evgs. and Sat.) drafting and detailing in Toronto. Some experience in reinforced concrete and steel design. Apply to File No. 3553-W.

ELECTRICAL ENGINEER, Jr.E.I.C., P.Eng., experienced at draughting, designing and estimating power and lighting layouts, substations, control schemes, etc., now fully employed, desires part-time work in Montreal area for evenings and week-ends. Apply to File No. 3554-W.

CIVIL ENGINEER, B.Sc., V of S, 1950, Jr. E.I.C. Age 32. Married, veteran, presently employed as resident engineer on highway construction work. 12 years experience in all phases of survey work and 5 years as resident engineer. The latter position entails full charge of surveying, designing and construction of the 2 or more highway projects placed under my control. The position also demands considerable administrative ability. Desires permanent position with organization in which hard, good work and initiative leads to advancement. Wishes to get away from position which entails too much travelling. Would like to settle in one locality. Apply to File No. 3555-W.

CHEMICAL ENGINEER, British subject, 25 years old, B.Sc. (Chemical Engineer), A.C.G.I., 2 years experience chemical and petroleum refinery development. Capable, and hard-working. Has served in Armed Forces. Apply to File No. 3560-W.

MECHANICAL ENGINEER, McGill, aged 31, Canadian, with capital, is interested in representing or becoming dealer for Canadian or English company to work in either Canada or Mexico. Has full working rights in Mexico, many business contacts and speaks and writes Spanish fluently. Apply to File No. 3561-W.

ELECTRICAL ENGINEER, S.E.I.C. Age 31, single. Graduate of the University of Manitoba, 1951. Experience in house service wiring, and topographical survey. Done some line tracing and mapping. Presently employed in hydro plant. Will be prepared to leave any time after October 1st. Would prefer work as designer or maintenance engineer in an electrical firm. Apply to File No. 3562-W.

CIVIL ENGINEER, University of Toronto, 1949, Jr.E.I.C., P.Eng. Experience has been mainly on heavy construction, three years as resident engineer on diversified hydro-electric work, also 2 years of office design and administration. Desire position in construction or work closely allied thereto. Apply to File No. 3604-W.

GRADUATE ELECTRICAL ENGINEER, S.E.I.C., Manitoba, 1951. Married, one child, R.C.A.F. veteran, presently employed. Desires to gain experience in Electronic design. Willing to work for moderate salary during training period. Montreal or Toronto area preferred. Available on two weeks notice. Apply to File No. 3651-W.

CHEMICAL ENGINEER, McGill, 1951 graduate, 24 years old, single. Worked two summers for large pulp and paper industry in Ontario. Desires position in production organization. Would prefer working in the Province of Quebec, but would accept work at any other location. Apply to File No. 3679-W.

ELECTRICAL ENGINEER, Jr.E.I.C., 1949 graduate. Age 26, married, bilingual, desires employment in Montreal. Test course experience with large electrical firm; design and sales training. Would like position preferably with consulting engineers firm or electrical sales firm. Any interesting position with opportunity for advancement will be considered. Available in two weeks notice. Apply to File No. 3699-W.

ELECTRICAL ENGINEER specializing in permanent magnet applications, open for engagement. Apply to File No. 3700-W.

U.K. ENGINEERING EXECUTIVE, M., I.E.E. contemplates immigration to Canada. University Engineering Degree and 25 years industrial experience in mechanical, electrical and electronic engineering. Wide knowledge of commercial and government research and development including aircraft accessories, guided missiles, naval equipment, electronic and television work. Knows Canada well and speaks French. Apply to File No. 3701-W.

EXPERIENCED STRUCTURAL ENGINEER, M.E.I.C., A.S.C.E. seeks employer wishing to delegate responsibility for design (and erection) of structures and foundations for buildings and industrial plants. Trained in England (Field and Office); 15 years experience on mill buildings, warehouses, chemical plants, etc. Sound theoretical approach, employed for past three years in Canada as senior design engineer with hydro-electric utility. Interested only in position of responsibility. Apply to File No. 3702-W.

Attention, Members

Please telephone in advance and make an appointment if you propose using the Institute's Employment Department.

This will result in a better service to everyone concerned.

TELEPHONE PLATEAU 5078

Except in special cases all interviews will be arranged between the hours of 9 and 12.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

Quakers in science and industry: being an account of the Quaker contributions to science and industry during the 17th and 18th centuries. Arthur Raistrick. New York, Philosophical library, c1950. 361 pp., illus., $6.00.

As one can consider the Wesleys purely as social reformers in their time, quite apart from their religious significance, so also one finds, after reading Dr. Raistrick's book, that the 17th and 18th century Quakers can be considered in the same light, but in the world of industrial reform and development.

The first 35 pages of QUAKERS IN SCIENCE AND INDUSTRY, are concerned with the rise, origin, and persecution of the Quakers, and their life in the civic and business world.

Quakers in trade and industry are then considered in detail, and traders and merchants, ironmasters, mining companies, and miscellaneous industries such as brass wire making; porcelain and pottery manufacture and relations with Swedenborg; the Griffiths and the Bevans, and copper smelting in South Wales; the Frys and chocolate manufacturing; and the Friends in roads, canals, and railways.

The number of Quakers engaged in clock and precision instrument manufacturing makes very interesting reading, as does also the section on botanists and naturalists. The discovery of injection of a germ to produce a mild form of a more virulent disease, and thereby producing immunity, the forerunner of our modern vaccination is also described here.

In short, this volume is packed full of interesting information, but, for the general public, the great drawback is its manner of presentation, which becomes, at times, almost documentary.

To my mind, this almost ponderous style will definitely limit the readers of QUAKERS IN INDUSTRY. At the same time, however, I would suggest that hours of enjoyment and information may be had from dipping into and reading sections in which one has a particular interest or curiosity.

The volume is well indexed and also carries footnote references. E.K.

BOOK NOTES

Prepared by the Library
The Engineering Institute of Canada

The Art of Administration. Ordway Tead. Toronto, McGraw-Hill, 1951. 223p., $5.25.

The successful administrator should combine tact, understanding, and a sincere desire for the well-being of those under him, with a good philosophy of management and executive ability.

The great problem of if, or how, big organizations and growing personalities can exist together, is considered in this volume with all its ramifications. It will make interesting and informative reading for all executives and those aspiring to an executive position. Although general treatment of the subject under consideration is good, the sentence structure is at times long and involved, which definitely detracts from easy reading.

The index is general, rather than specific, although it seems to serve the purpose for general reference. Footnotes refer the reader to references at the end of the text.

Building construction and drawing. G. A. Mitchell. London, Batsford: Toronto, Clarke Irwin, 1950. 648 pp., illus. $2.25.

Sub-titled "a textbook on the principles and details of modern construction for the use of students and practical men", a thorough revision, in the form of the 20th edition of this already familiar title will be welcome news for a large number of our members.

Treating all types of building construction, and opening with a chapter on "Instructions for beginners", the book is profusely illustrated with all types of chart, diagram and photograph, and the appendices are, General tables and Memoranda, Exercises, and sixty pages of examination questions. It is also indexed.

Ordnance Production Methods. C. O. Herb ed. New York, Industrial Press, c1951. 534 pp., illus., $10.70.

This work is a collection of articles published in the American magazine "Machinery" during World War II. It describes manufacturing operations on rifles and small arms, machine guns, bullets, shells, cartridge cases, guns, bombs, tanks and other weapons of war. In it, United States production experts explain hundreds of procedures and tooling set-ups that proved successful. It is the editor's claim that the World War II methods explained in this book are still applicable to today's problems.

This volume was erroneously reported in our July Book Notes as being a collection of articles from the British magazine of the same name.

The origin of the earth. W. M. Smart. Cambridge, University Press. Toronto, Macmillan, 1951. 239 pp., illus. $2.75.

One does not need to be an amateur astronomer to read and enjoy THE ORIGIN OF THE EARTH. Simply a normal curiosity about the things around us, is rapidly changed to an absorbing interest as one peruses Dr. Smart's book. A logical sequence of where the universe came from, when, according to man's reckoning, its various parts first made their appearance, and the nature of their origin, form the three parts of the volume.

The author's easy, non-technical, and at the same time informative treatment of a highly scientific subject, along with the excellent photographic illustrations, should prove of interest to a large number of our readers.

Selected writings of Bolivar. 2 volumes. Banco de Venezuela. New York, the Colonial Press. 1951. V. 1, 355 pp., V. 2, 467 pp., illus.

Conceived and compiled by Vicente Lecuna, and sponsored by the bank of Venezuela, these selected writings have been published to make known in the English-speaking countries the role played by Bolivar in the war of independence in the Spanish colonies, and his ideas on the best form of government for the Indo-Spaniards.

For those of you who enjoy something a little different in reading material, this will have a rather unique appeal.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

Aircraft Jet Powerplants. F. P. Durham. New York, 1951. 326 pp., illus., $6.65.

This book deals with aircraft jet powerplants with special emphasis on the gas turbine. The first six chapters are devoted to jet propulsion and gas turbine principles. The next five chapters each deal with a component of the jet engine. The remaining two chapters present the fundamentals of ramjets and rockets. The compressible gas flow theory is developed throughout the book wherever its application is necessary. A knowledge of elementary thermodynamics and fluid mechanics is essential, and a knowledge of elementary aerodynamics is desirable although not essential.

Architectural Graphic Standards. C. G. Ramsey and H. R. Sleeper. 4th ed. New York, Wiley; London, Chapman, 1951. 614 pp., illus., $12.50.

Designed to give architects, builders, draftsmen, civil engineers, and others interested in building the standards, facts and data needed to deal with every type and phase of building. The fourth edition

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Short subject bibliographies are compiled on request.

Extensive searches will be made at a charge of $3.00 per hour to members, and $5.00 per hour to non-members.

Please give as much detail as possible when requesting information of either type.

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A library deposit of $5.00 at par in Montreal is required for which two items may be borrowed at one time. Books, periodicals, etc. may be ordered by members through the library. All carrying charges are payable by the individual concerned. Except in the case of library deposits, please make **no payments in advance.**

Non-members may consult the library, but may not borrow material.

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is 80% larger, contains 368 new plates, 151 revised plates, and an extensive index with over 11,000 references. Data is included on all materials, fixtures, fittings, devices, equipment, accessories, utensils, furnishings, apparatus, machinery, supplies, and structural material.

Communication Networks and Lines. W. J. Creamer. New York, Harper, 1951. 353 pp., illus., $6.00.

Intended as a text for junior and senior electrical engineering students, the book provides a mathematical treatment of communication networks and lines. The first part deals with network analysis and problems in the design of attenuators, filters, and equalizers. The second part contains the theory of communication lines with extensive applications to cables and open-wire circuits at audio and carrier frequencies. The final chapter presents the essential theory of the high-frequency lossless line. A knowledge of telephone apparatus and systems and of elementary hyperbolic function theory is assumed.

Elements of Television Systems. G. E. Anner. New York, Prentice, 1951. 804 pp., illus., $10.35.

This book is concerned with the basic principles and equipment. Part I is devoted to a study of closed systems, those that rely upon cable connections between sending and receiving apparatus. Part II considers the commercial telecasting system which uses a radio link in place of interconnecting cables. The third and last Part deals with color television systems. Dot systems of television transmission are covered in an Appendix. Sets of problems are included at the end of the book.

Engineering Thermodynamics. H. J. Stoever. New York, Wiley; London, Chapman, 1951. 458 pp., illus., $5.75.

Intended as an undergraduate text, this book presents the principles and some of the more important applications. Parts I and II cover the First and Second Law of Thermodynamics respectively and treat them not according to the kinds of systems considered, but according to the thermodynamic principles involved. Part III deals with applications in steam power plants, internal-combustion engines, refrigeration, compressors, nozzles and turbines, fluid flow, and air conditioning. Numerous problems are included throughout Parts I and II.

Gas Turbine Manual. R. J. Welsh and G. Waller. London, Temple Press, 1951. 243 pp., illus., 25s.

Intended as a text for students and a reference for power-plant engineers, this British book deals with various forms of gas turbines other than those used for aircraft. It covers fundamental theory and operational features and turbines used in locomotive, power station, and marine applications. A glossary of gas turbine terms, useful tables, and a bibliography are included. Design information on some 50 British and foreign gas-turbine plants is also given.

Introductory Soil Mechanics and Foundations. G. B. Sowers and G. F. Sowers. Toronto, Macmillan, 1951. 284 pp., illus., $4.75.

Written for undergraduate civil and architectural engineering students who are not soil specialists and for practicing engineers who encounter soil problems in their everyday work, this book stresses the rational scientific approach to soil and foundation problems and explains how the theories are applicable in usual engineering situations. Prerequisites are a knowledge of basic geological principles, applied mechanics, some understanding of structural design, and an appreciation of constructional procedures.

Source Book on Atomic Energy. S. Glasstone. Toronto, D. Van Nostrand, 1950. 546 pp., illus., $3.50.

This book surveys the important facts about the history, present status, and possible future of atomic science. It considers peace-time and war-time applications. Beginning with the earliest theories of the atom and its structure, the growth of thought and knowledge, the development of theories, and the discovery of the phenomenon of radioactivity are described. Atomic particles, modern instruments, and the release of atomic energy are treated. Radiation protection and health physics are also considered.

Thermodynamics of Fluid Flow. N. A. Hall. New York, Prentice, 1951. 278 pp., illus., $7.35.

This book is concerned with the combined application of the principles of fluid mechanics and thermodynamics in the analysis of fluid flow. Major emphasis is on theory with examples to demonstrate its applications. In handling fluid flow problems, the author assumes that the flow is both steady and one-dimensional. Although organized as a text, the book provides reference material for those engaged in research and development in jet propulsion, process industry, and other fields dependent on flow systems.

Ultrasonics. P. Vigoureux. New York, Wiley, 1951. 163 pp., illus., $4.00.

This book serves as an introduction to the technique and to the simpler aspects of the theory of propagation of ultrasonics in fluids. The general principles of apparatus and of experimental procedures are stressed rather than details. The theoretical treatment is kept as simple as possible. References to the literature published since January 1, 1939 are given in the thirteen-page bibliography.

Underpinning, Its Practice and Applications. E. A. Prentis and L. White. 2nd ed. rev. & enl. New York, Columbia University Press; Toronto, Oxford, 1950. 374 pp., illus., $12.00.

This book is devoted to technical descriptions of underpinning methods and applications for foundation construction. It also contains an introductory treatise on soil mechanics and appendices covering specifications, legal aspects, and rates of pay. This second edition is revised and contains new chapters on the raising and moving of heavy structures and on the recent renovation work done on the White House. A glossary of terms is included.

STANDARDS

British Standards. British Standards Institution, 24/28 Victoria Street, Westminster, London, S.W.1. British Standards are available from the Canadian Standards Association, National Research Building, Ottawa, Canada.

B.S. 93:1951 — Screw threads. 3/–.

This revision of the 1919 edition provides a "normal" series having increased bolt and nut tolerances for sizes 0 B.A. to 16 B.A., and affords an allowance for ease of assembly or for plating, between the maximum bolt and minimum nut sizes. Complete tables are given of basic sizes for sizes from 0 B.A. to 25 B.A.

B.S. 156:1951 — Enamelled round copper wire (oleo-resinous enamel). 3/–.

This differs from the 1943 edition in that it has been extended to include the full range of wire sizes from 0.001 in. to 0.160 in. inclusive. It gives details of diameters, resistances, and thickness of enamel (including tolerances), together with tests on the enamel insulation.

B.S. 327, part 1:1951 — Power-driven derrick cranes. 6/–.

The standard deals with Scotch derrick, Guy derrick and Tower derrick types of cranes, and lays down requirements relating to the crane as a whole, including electrical equipment and provisions for testing. It is intended to secure the general observance of such fundamental principles as appear desirable to secure reliability and safety without hampering the designer-maker.

B.S. 778:1951 — Steel pipes and flanged joints for hydraulic purposes. 4/–.

The scope of the present standard embraces complete specifications for both flanges and pipes for working pressures up to 4500 lb/sq. in., and the type of flanges standardized are suitable not only for pipe lines but also for use on valves and hydraulic machinery.

B.S. 1740:1951—Wrought pipe fittings, iron and steel (screwed B.S.P. thread). 5/–.

This provides for an extensive range of fittings, screwed British Standard pipe thread, for use with wrought steel and wrought iron pipes and includes, for the convenience of users, particulars of equal sockets, hexagonal backnuts and barrel nipples as specified in B.S. 788 and B.S. 1387. Light and heavy weight fittings are provided.

B.S. 1745:1951 — Alternating-current relays for railway signalling; track relays (double-element, 2-position), line relays (single-element, 2-position). 2/–.

The new standard applies to alternating-current line and track relays of the induction type intended for use in railway signalling circuits not exceeding 250 volts, and is applicable to relays with or without a local element.

B.S. 1757:1951 — Power-driven mobile cranes. 6/–.

The present publication has been prepared to deal with road wheel mounted and tracked power-driven mobile cranes. It covers the full slewing, part slewing, part slewing and non-slewing types which may be either fully mobile on their own wheels or tracks, or fully mobile and mounted on lorries. It also covers semi-mobile types and portable cranes.

Canadian Standards. Canadian Standards Association, National Research Building, Ottawa.

C.S.A. A5:1951 — Portland cements, 4th ed. 75 cents.

This specification covers material, manufacture, chemical properties, physical requirements, storage, packing and marking, inspection and rejection. The following methods of sampling are given in appendices: sampling methods for testing Portland cement, methods for chemical analysis of same, methods for physical tests of same.

CSA A82. 20:1950 — Standard methods of testing of gypsum and gypsum products. 50 cents.

CSA A82.21:1950 — Gypsum. 50 cents.

CSA A82.22:1950 — Gypsum plasters. 50 cents.

CSA A82.23:1950 — Gypsum moulding plasters. 50 cents.

CSA A82.24:1950 — Gypsum lath. 50 cents.

CSA A82.25:1950 — Gypsum partition tile or block. 50 cents.

CSA A82.26:1950 — Keene's cement. 50 cents.

CSA A82.27:1950 — Gypsum wall boards. 50 cents.

CSA A82.28:1950 — Gypsum sheathing board. 50 cents.

CSA A82.29:1950—Definitions of terms relating to gypsum. 50 cents.

Whenever possible, the following information is given: composition, flexural strength, sampling, dimensions, weights, and permissible variations, finish, packing and marking, inspection and rejection.

CSA A82.40:1950 — Methods of chemical analysis of limestone, quicklime and hydrated lime. 50 cents.

CSA A82.41:1950 — Methods of physical testing of quicklime and hydrated lime. 50 cents.

CSA A82.42:1950 — Quicklime for structural purposes. 50 cents.

CSA A82.43:1950 — Hydrated lime for masonry purposes. 50 cents.

CSA A82.44:1950 — Normal finishing hydrated lime. 50 cents.

CSA A82.45:1950 — Method of sampling, inspection, packing and marking of quicklime and lime products. 50 cents.

For chemical analysis, information on the following is given: special solution required, silicon dioxide content, iron and aluminum oxide content, total iron, calcium content, etc. The standard on physical testing deals with the standard consistency of lime putty, plasticity of lime putty, soundness of hydrated lime, popping and pitting of hydrated lime, and water retention of same. The other standards give, whenever possible: chemical composition, residue, popping and pitting, water retention, methods of testing, sampling, inspection, etc.

CSA A82.55:1950 — Test for unit weight of aggregate. 50 cents.

CSA A82.56:1950 — Aggregate for masonry mortar. 50 cents.

CSA A82.57:1950 — Sand for use in plaster. 50 cents.

The test for weight covers apparatus, calibration of measure, compact weight determination and loose weight determination. The other standards give grading, deleterious substances, compressive strength, etc.

BOOKS RECEIVED

A code for dwelling construction for buildings housing one or two families: minimum standards to regulate the erection and provide for the safety of buildings. Associate committee on the national building code. Ottawa, National research council, 1950. 77 pp., illus., 25 cents.

Compulsory arbitration of utility disputes in New Jersey and Pennsylvania. R. R. France and R. A. Lester. Princeton University, 1951. 91 pp., $2.00.

Consciousness and behaviour: a neural analysis of behaviour and of consciousness. J. T. Culnertson. Dubuque, Iowa, Wm. C. Brown, c1950. 210 pp., illus., $4.25.

Diesel engine catalog: transportation, stationary, marine. V. 16, 1951. R. W. Wadman, pub. Los Angeles, Diesel Engines Inc., 1951. 408 pp., illus., $10.00.

Festival of Britain 1951: selected designs. Association of consulting engineers. Toronto, International Trade Press, 1951. 411 pp., illus., $16.50.

The law of grading for concrete aggregates: investigations upon discontinuous aggregate gradings and the development of laboratory techniques for vibratory compaction, accelerated curing, and permeability. Melbourne, the author, 1951. 113 pp., illus. (Melbourne Technical College, Technical Paper No. 1).

Proceedings of the Seventh annual forum of the American Helicopter Society in co-operation with the Institute of the Aeronautical Sciences, April 26-28, 1951. New York, Institute of the Aeronautical Sciences, 1951. 159 pp., illus., $5.50.

Report of the general committee for the sixty-fifth annual general and professional meeting of The Engineering Institute of Canada, held in Montreal, May 9th, 10th and 11th 1951. Montreal, the Institute, 1951. 36 pp.

Report of the Royal Commission on National Development in the Arts, Letters and Sciences 1949-1951. Ottawa, Department of Public Printing and Stationery, Division of Documents, 1951. 517 pp., $3.50. (Massey report).

Royal Commission studies: a selection of essays prepared for the Royal Commission on National Development in the Arts, Letters, and Sciences. Ottawa, Department of Public Printing and Stationery, Division of Documents, 1951. 430 pp., $3.00. (Studies on Massey Report).

Science French course. C. W. P. Moffatt. New York, Chemical Publishing Co., 1951. 332 pp., $4.75.

Statistical Yearbook, Quebec, 1950. Quebec, Dept. of Trade and Commerce, 1950. 615 pp., illus.

Television tube location guide: enables preliminary diagnosis without chassis removal. H. W. Sams. Indianapolis, H. W. Sams & Co., 1951. illus.

Thermodynamics of irreversible processes. S. R. De Groot. New York, Interscience Publishers, 1951. 242 pp., $4.00.

Work study and incentives: an introduction. A. J. Speakman. Manchester, Emmott, 1951. 90 pp., illus., $1.00. (Mechanical World Monograph No. 63).

TECHNICAL BULLETINS RECEIVED

Association of short-circuit testing authorities. Publications:

No. 5 — Interpretation of standard rules governing the short-circuit testing and certification of oil circuit-breakers. No. 6 — Interpretation of standard rules governing the short-circuit testing and certification of low and medium voltage electric fuses for use on alternating current circuits. No. 7 — Rules governing the short-circuit testing of circuit-breakers which are not included, or have features not provided for, in British Standard specifications Nos. 116: 1937 and 936: 1940. No. 8 — Rules governing the short-circuit testing of high-voltage electric fuses for alternating current circuits. No. 9 — Rules for the short-circuit testing of circuit-breakers in combination with back-up fuses. No. 12 — Rules for the short-circuit testing of power transformers, current-transformers, reactors and resistors.

Astrophysical Journal. Reprints:

Meteor velocities determined by radio observations, by D. W. R. McKinley.

Bell Telephone System. Monographs:

No. 1837 — A full automatic teletypewriter switching system, by W. M. Bacon and G. A. Locke. No. 1838 — Operational study of a highway mobile telephone system by L. A. Dorf. No. 1839 — Some general properties of magnetic amplifiers, by J. M. Manley. No. 1840 — Energy distribution of secondary electrons, by K. G. McKay. No. 1841 — Single-frequency signalling system for long telephone trunks, by N. A. Newell and A. Weaver. No. 1842 — Aging of black neoprene jackets, by G. N. Vacca and others.

Bituminous Coal Research, Inc. Publications:

Collection and burning of locomotive cinders, by E. J. Boer and others. Factors affecting dust emission from boiler furnaces, by E. R. Kaiser.

British Electrical and Allied Industries Research Association. Technical reports:

No. G/T234, 1951 — Gas-blast circuit-breakers. Aerodynamic conditions in nozzle as affected by arcing and nozzle diameter, by A. M. Cassie and A. A. Hudson. No. G/T239, 1951 — Restriking voltage in British 66-kV Networks, by L. Gosland and J. S. Vosper. No. G/T250, 1951 — The maximum energy dissipated during first current loops of different asymmetry on closing an A.C. series circuit, by H. Goldenberg. No. L/T256, 1951 — The development of a vacuum torsion balance and its use to measure sorption in dielectrics, by A. G. Day. No. W/T21, 1951—Electrode soil sterilizing, A. E. Canham.

British Welding Research Association. Reprints:

No. T. 27 — The industrial use of flash welding, dealing in particular with ferrous materials.

Canada. Canadian Government Specifications Board. Specifications:

No. 1-GP-12a, 1950 — Schedule of standard paint colors. No. 3-GP-55a, 1951 — Oil: lubricating aircraft engine. No. 3-GP-60a, 1951 — Oil; lubricating aircraft engine. No. 3-GP-80a, 1951 — Oil, lubricating aircraft engine. No. 3-GP-100a, 1951 — Oil; lubricating aircraft engine. No. 3-GP-120a, 1951 — Oil, lubricating aircraft engine. No. 3-GP-659a, 1951 — Lubricant; wire-rope. No. 3-GP-673a, 1951 — Grease; fibrous, No. 3. No 5-GP-14, 1951 — Leather, strap, arctic chrome vegetable retanned. No. 5-GP-16, 1951 — Welting; leather. No. 25-GP-1a, 1951 — Schedule of methods of sampling and testing waxes and polishes. No. 25-GP3a,-1951 — Wax; floor, water-emulsion. No. 25-GP-8, 1951 — Cleaner and polish for plastic. No. 25-GP-9, 1951 — Polish; aluminum, paste for aircraft. No. 37-GP-3, 1951 — Schedule of recommended methods for surface application of asphalt emulsions.

Canada. Department of Resources and Development. Forest Products Laboratories Division. Ottawa laboratory and Vancouver laboratory. Programs of work:

Program of work 1951-1952.

Canada. National Research Council Division of Building Research. Progress reports on building research in Canada:

V. 1, No. 1, 30 June 1951.

Canada. National Research Council. Reprints:

No. 2322 — Deceleration and ionizing efficiency of radar meteors, by D. W. R. McKinley. No. 2340 — Photoelectric meteor observations, Barbara McKinley and D. W. R. McKinley.

Manitoba. Dept. of Mines and Natural Resources. Publications:

Notes on Red River floods with particular reference to the flood of 1950, by R. H. Clark.

Society of Naval Architects and Marine Engineers. Advance papers:

No. 1 — On the linearized theory of wave resistance for displacement ships in steady and accelerated motion, by J. K. Lunde. No. 2 — Potential theory of wave resistance of ships with tables for its calculation, by Rene Guilloton. No. 3 — Self-propulsion tests with small models. Part 1, Experiments at the experimental towing tank, Stevens Institute of Technology. Part 2, Scale effect in self-propelled model tests, by A. B. Murray and others. No. 4— Results to date of comparative cavitation tests of propellers, by R. W. L. Gawn. No. 5 — Economic speed trends, by E. V. Telfer. No. 7 — The organization of merchant shipbuilding research in Great Britain, by S. L. Smith. No. 8 — Turbulence stimulation on ship models, G. Hughes and J. F. Allan. No. 9 — Skin friction resistance and the effects of surface roughness, by F. H. Todd.

Union of South Africa. Dept. of Forestry. Bulletin:

No. 35 — The pines of Mexico and British Honduras, by E. E. M. Loock.

U.S. Dept. of Commerce. National Bureau of Standards. Handbooks:

No. 45 — Testing of measuring equipment: a manual for weights and measure officials.

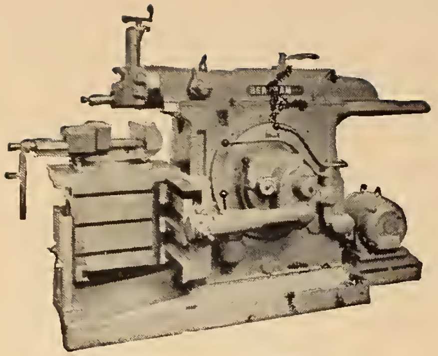
PAMPHLETS RECEIVED

Approved road signs. Westeel products Limited. Winnipeg, the company, 1951.

Oil processes and products. Imperial Oil Limited. Toronto, the company, 1951.

Publications and services of engineering and metallurgical societies in the British Commonwealth countries exclusive of the United Kingdom. M. C. Jones. Kingston, Aluminium Laboratories Limited, 1951.

University research potential; a survey of the resources for scientific and engineering research in American colleges and universities. American Society for Engineering Education. Cambridge, Mass., the Society, 1951.



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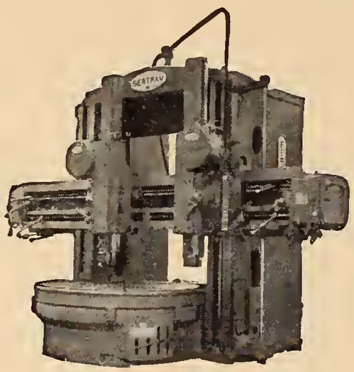
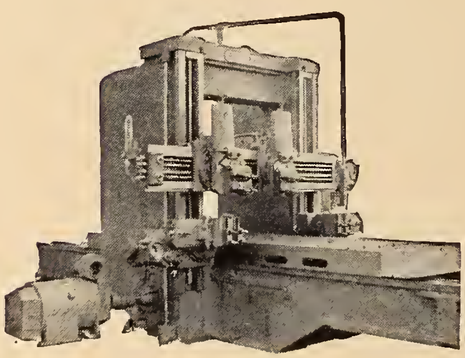
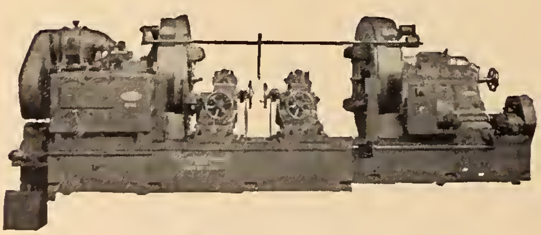


72" VERTICAL MILL


72" D. H. PLANER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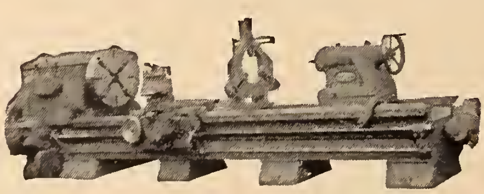
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HORIZONTAL DUPLEX
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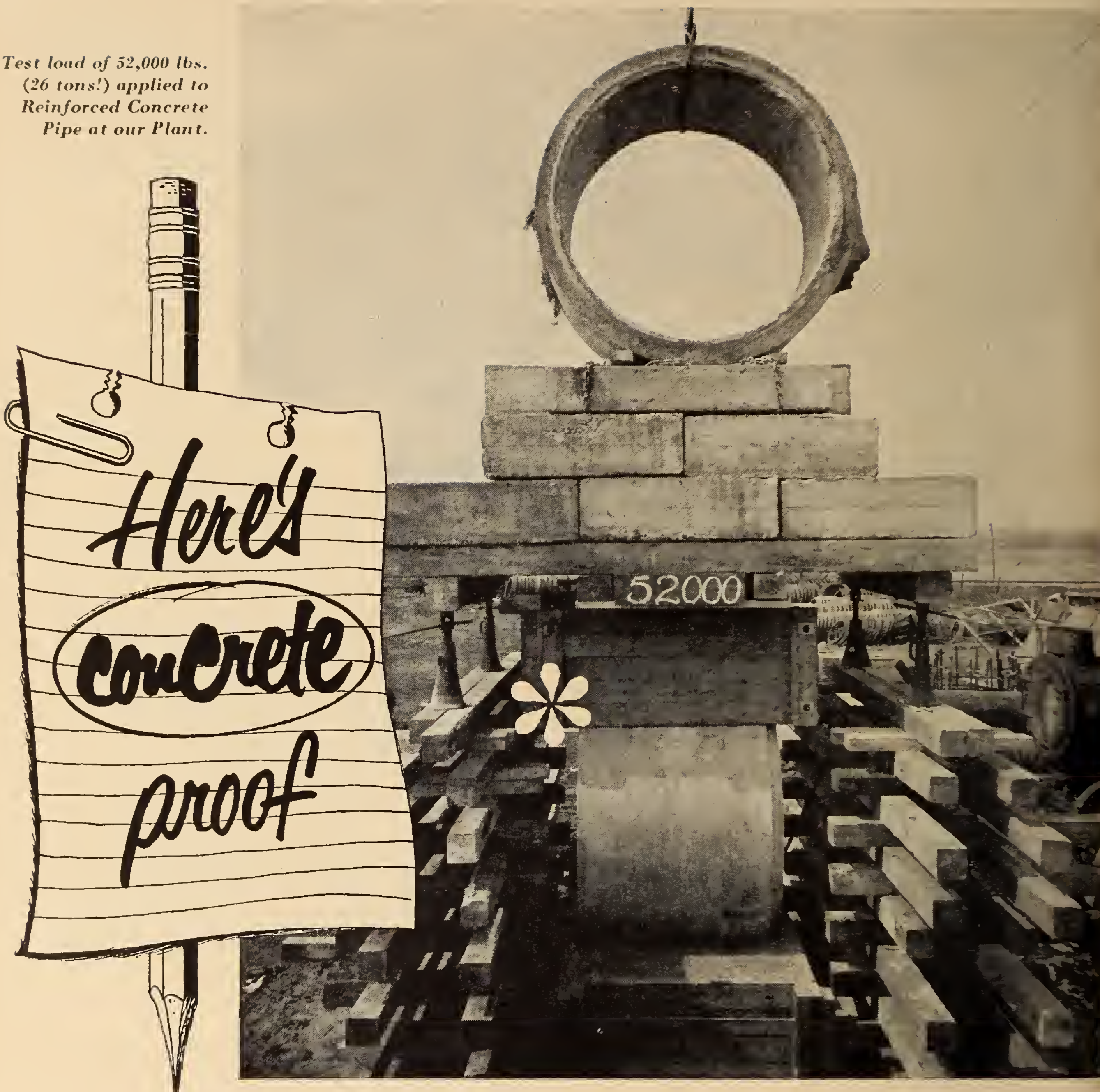
ERICAL ROLLER BEARINGS
NEEDLE ROLLER BEARINGS
BEARINGS AND CRANK DISC MOUNTED BY SKF OIL INJECTION SYSTEM
CANADIAN SKF COMPANY LIMITED

Engineering Journal
Oct., 1951

Test load of 52,000 lbs. (26 tons!) applied to Reinforced Concrete Pipe at our Plant.



That we are prepared to demonstrate the quality of our pipe by tests

Our pipe are manufactured to meet the specifications of the American Society for Testing Materials, and a regular test programme ensures the uniform quality and strength of pipe that is necessary for it to carry the loads imposed on it under the varying conditions of sewer design.

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CLEAN UNIFORM CASTINGS of consistently high quality are secured by the most modern steel making and moulding techniques.

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No Casting too large - None too small

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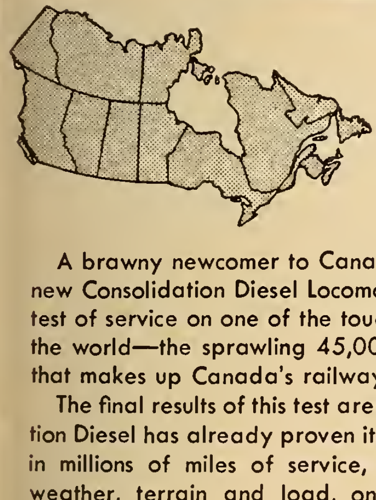


Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

Cutting Machines. — Air Reduction Canada Limited, 110 Duke Street, Toronto, Ontario, has announced the Airco No. 50 Travograph, the latest addition to its complete line of gas cutting machines. This new heavy duty pantograph type cutting machine guided by manual, magnetic or electronic tracer, the Company says, will cut an unlimited variety of shapes from steel plates, slabs, billets and forgings and makes equally practicable and economical the cutting of either one or a few parts or identical parts on a quantity production basis.

•

British Power Transformers.—Power transformers to be installed at Kemano and Kitimat in British Columbia, have been ordered from a Hollinwood, Lancashire, firm for the Aluminum Company of Canada. The transformers total 400,000 k.v.a. and will operate at 300,000 and 275,000 volts. They are believed to be the highest voltage power transformers yet ordered from Britain.

•

Pipe Line in Ontario.—Construction of the 64-mile Sarnia to London section of the Sarnia-Toronto pipe line will begin within two weeks and should be completed by December, Imperial Oil Limited announced recently. The London-Toronto section and spur line to Hamilton will be built next spring.

The contract for the construction has been awarded to Comstock Midwestern Limited of Leaside, Ont. The Sarnia to Waterdown section, 132 miles, will be 12-inch pipe, the 56-mile Waterdown-Toronto section — 10-inch; and the Hamilton spur will consist of two, six-inch lines.

The line will have an initial capacity of 39,000 barrels a day of gasoline, kerosene and heating oils.

While transportation costs by the pipe line will be approximately the same as for tankers, there will be a considerable saving in steel because fewer ships will be required and additional large tankage will not be needed to store supplies for the winter season.

•

George W. Crothers Limited.—A new service has been introduced by George W. Crothers Limited of Leaside for the purpose of assisting contractors to maintain their equipment in operation at a time when new replacement parts may be difficult to obtain. This new service consists in rebuilding wearing parts such as wheels, rollers and idlers and where possible to furnish these to customers on an exchange basis.

•

British Navy Carrier.—The British Navy expects to commission their latest aircraft carrier, H.M.S. Eagle, for the end of 1951. H.M.S. Eagle will be the largest carrier afloat, having a crew of 2,750 officers and men, and will carry 100 aircraft.

•

Column Presses.—A new line of twin column presses is now being manufactured by Wales-Strippit of Canada Ltd., of 344 Sherman Avenue North, Hamilton, Ontario. These presses may be used for all types of blanking, forming, drawing, and bending. Hole punching and notching equipment may be used efficiently with these new Wales presses and in addition a self-contained shearing attachment is available where precision shearing is required.

•

Welding Courses. — The Canadian Welding Bureau of 22 College Street, Toronto, have announced the results of the June welding examinations held in various centres throughout Canada. Out of nearly 250 candidates who wrote the final examination there were very few failures and the average standing was higher than that obtained by last year's candidates.

This course is to be continued for at least one more year but only 100 candidates can be accepted for the next course. All those wishing to enroll should therefore make application without delay to the Bureau at the above address.

•

Pneumatic Sander.—A new pneumatic reciprocating sander is being placed on the market by the Detroit Surfacing Machine Co., of 1333 East Eight Mile Road, Detroit 20, Mich. This new model incorporates the many years of experience which this company has had in making electrically operated finishing machines and is light in weight as well as practically free of vibrations. Further particulars can be obtained from the Company at the above address.

•

Sales Film.—The McGraw-Hill Book Company of 330 West 42nd St., New York, have announced that they have available a 35-mm. silent, color film entitled "Mechanized Selling". This film is intended for use in educational courses on business administration, salesmanship, and advertising in order to demonstrate the practical advantages of the use of advertising in effective sales effort.

•

Blast Hole Drill. — The Canada Crushed and Cut Stone Ltd. have recently placed in operation at their Dundas quarry a new "Champion" blast hole drill which they have purchased from the Joy Manufacturing Co. (Canada) Ltd., of Galt, Ontario. This latest drilling rig incorporates a number of new features which according to reports, permit of higher speed and greater efficiency in blast hole drilling than have been obtainable in the past.

•

C.G.R.A. Meeting. — The convention and annual meeting of the Canadian Good Roads Association will be held in Toronto on November 1, 2 and 3 at the Royal York Hotel. Many important matters will be discussed, amongst which might be mentioned the consideration of the report on a proposal for a Canadian highway research institute.

Another feature item on the programme will be a symposium on road building problems under present day conditions of materials and manpower shortages. The chief engineer of the Canadian Army will give an address dealing with the role of highways and roads in wartime, and a member of the Federal Civil Defence Transportation Committee will outline the procedure laid down for evacuation by road should such be necessary as a result of enemy bombing.

●

Process Control.—For industrial applications, such as oil pipe line inspections and liquid level gauges, Tracerlab Inc., 130 High Street, Boston, have developed a rugged, stainless steel tube especially designed for industrial process control procedures using gamma rays and for cosmic ray counting.

●

Radar Equipment.—The Radio and Electrical Engineering Division of the National Research Council has set up equipment at its Scarboro Field Station near Toronto to investigate the performance of radar equipment under varying atmospheric conditions. It has been found that at an elevation up to 250 feet very wide variations may occur in the effective range, which might prove to be a serious danger if not fully understood and appreciated by those depending on such equipment.

●

New Storage Battery Models.—Announcement is made that three new models have been added to the line of Yardney Silvercel storage batteries. These batteries, which are high rate discharge miniature units, are manufactured by Yardney Electric Corporation, 105 Chambers Street, New York, N.Y.

Their model No. 20 HR-15 is designed for a one to ten hour discharge with discharge rate of 2 to 15 amperes. The models 20 HR-GS and 20 HR-BS are intended for a discharge of approximately six minutes, at a discharge rate of up to 150 amperes. These batteries are reported to be spillproof and substantially leakproof, giving off no corrosive or poisonous fumes and to be highly resistant to shock, vibration and acceleration. Furthermore they will perform at extreme temperatures and will not boil at high altitudes.

●

Thermometer for Metals.—W. C. Dillon and Company, Inc., 1421 South Circle Avenue, Forest Park, Illinois, now have available a new vial type thermometer specially designed for checking the exact temperature of molten babbit metal, solder, lead, hot oils, waxes, etc.

Many new features have been incorporated through the design of this unit, we are advised, in order to insure longer life and easier reading. Full particulars can be obtained by communicating with the Dillon Company at the above address.

●

Nylon-lined Bearing. — Announcement is made of the introduction of a new Nylon-lined bearing by Thomson Industries, Inc., of Manhasset, Long Island, New York. A number of advantages are claimed for this new type of bearing over the plain injection-molded or machined Nylon bearings for many applications. Nylon is coming to be recognized as an excellent bearing material, having better performance than most known bearing materials under adverse lubricating conditions or where no lubricant at all can be used. These new bearings designed by Thomson Industries can be furnished in plain sleeve or flange type and can be economically made up to special dimensions on a custom basis.

●

Snow Melting Systems.—An interesting question-and-answer letter has recently been circulated by A. M. Byers Company, manufacturers of wrought iron pipe at Pittsburgh, Pa., dealing with the proper methods of installing and operating snowmelting systems. The information provided deals with the best methods of installing piping, types of coating, slab thickness, type and amount of fill, use of anti-freeze and approximate temperature for circulating water.

●

Navigational Computers.—Announcement has been made that A. V. Roe Canada Limited has recently placed contracts for the supply of a quantity of navigational computers with P.S.C. Applied Research Limited of Toronto. The latter company is a newly formed associate of the Hunting Aviation Group and its operations were formerly carried on through the Technical Division of the Photographic Survey Corporation.

●

Jet Training Planes.—The Department of Defence Production in Ottawa announces that arrangements have been made for the production of T-33 jet training planes in Canada by Canadair Limited of Montreal under a licensing arrangement with the Lockheed Aircraft Corporation of Burbank, California.

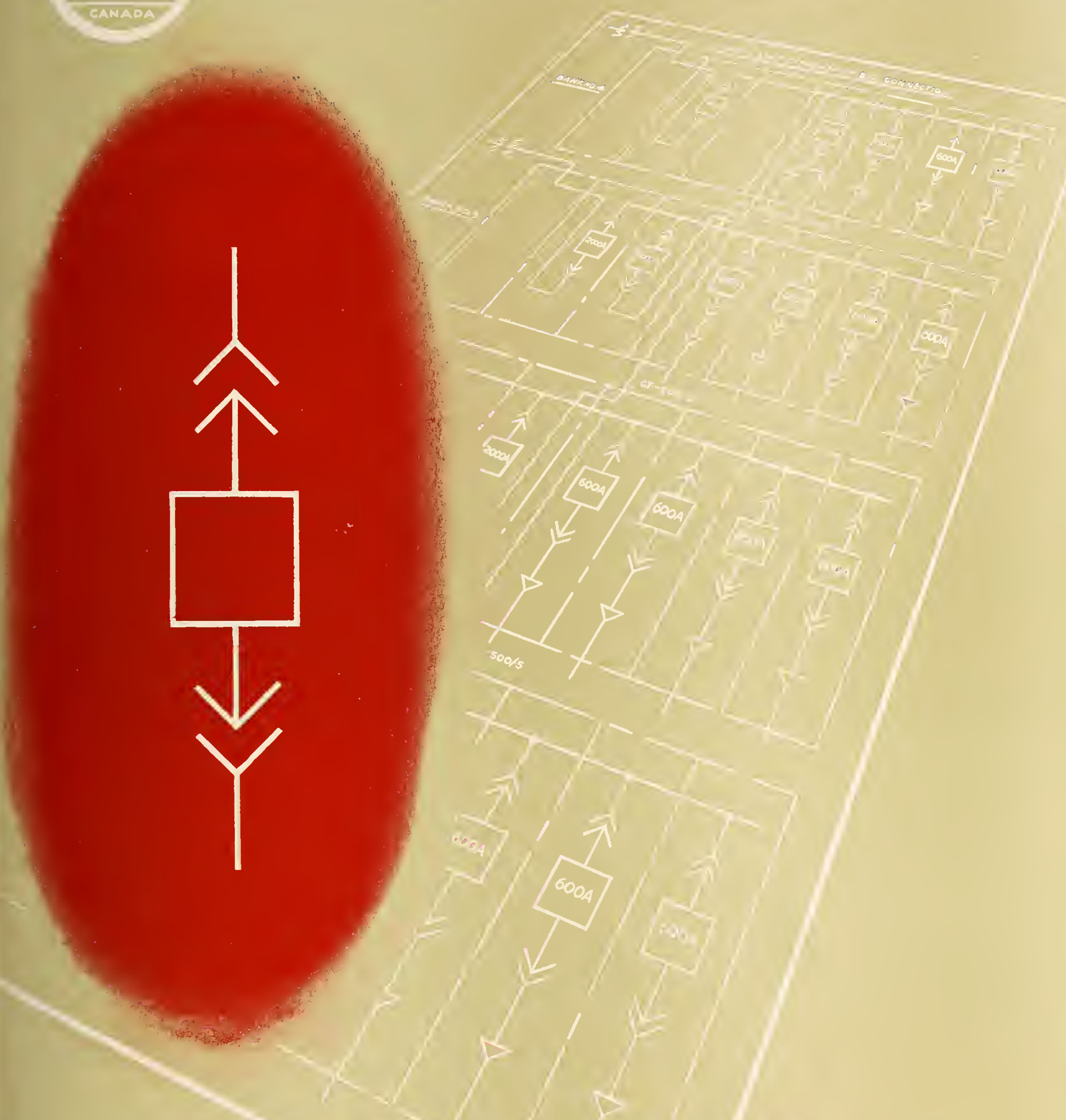
●

Erico Electrode Holder.—A new and improved semi-insulated electrode holder has just been placed on the market by Erico Products, Inc., 2070 East 61st Place, Cleveland, Ohio. Complete details of this new arc welding accessory may

(*Continued on page 1037*)

CANADA

ENGLISH ELECTRIC



INDOOR & OUTDOOR

SWITCHGEAR

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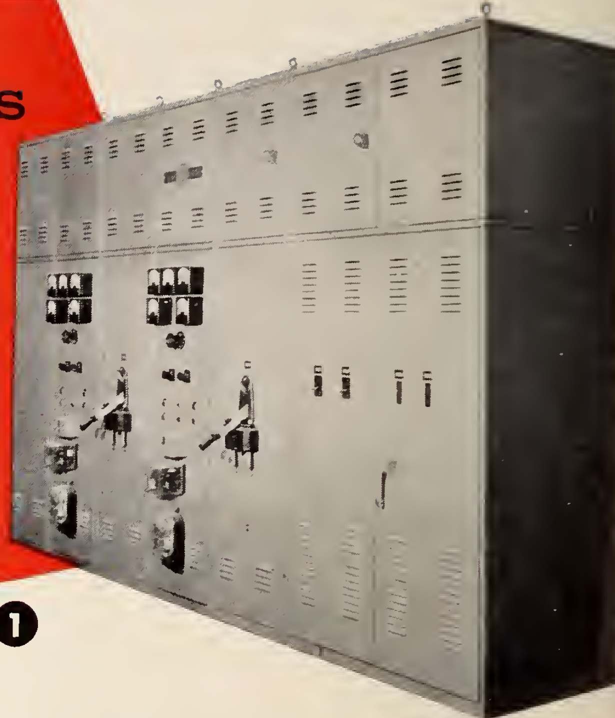
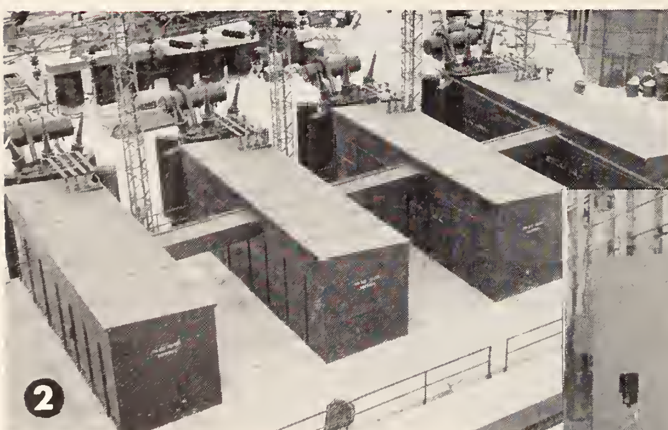
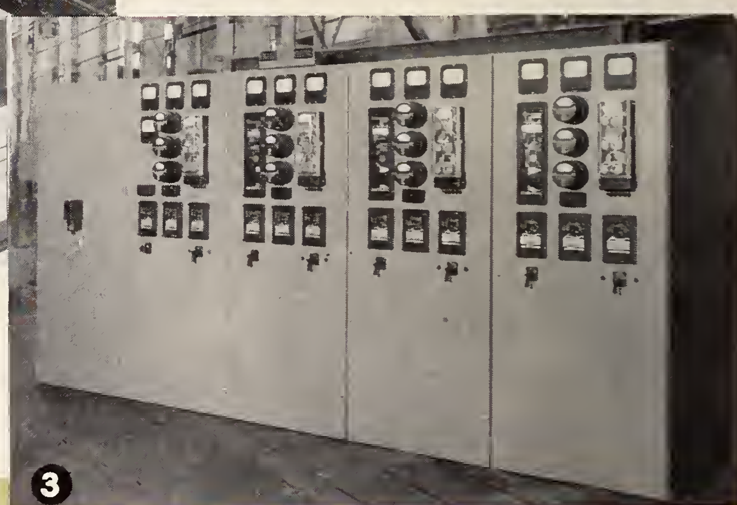


1. A 6 cell metal enclosed cubicle type switchboard incorporating synchronous motor controllers, service transformer and sub feeders.
2. 7.5 KV outdoor metalclad Switchgear with drawout air blast circuit breakers having an interrupting capacity of 250,000 KVA.
3. Five cell indoor metalclad switchboard with drawout electrically operated oil circuit breakers with interrupting capacity of 100,000 KVA.

For precise, simple and safe control of every part of a complex electrical system, English Electric makes open type, metal-enclosed and metalclad switching equipment both indoor and outdoor, in a range up to 15 KV, using air circuit breakers, oil circuit breakers, and air blast breakers, with interrupting capacities up to one and a half million KVA. Available in both fixed breaker and withdrawable breaker types. Unit Construction makes additions easy. Complete enclosure of all live equipment, with interlocks to prevent improper operation, guard both personnel and apparatus. For more detailed information, ask any English Electric office.





PA5107

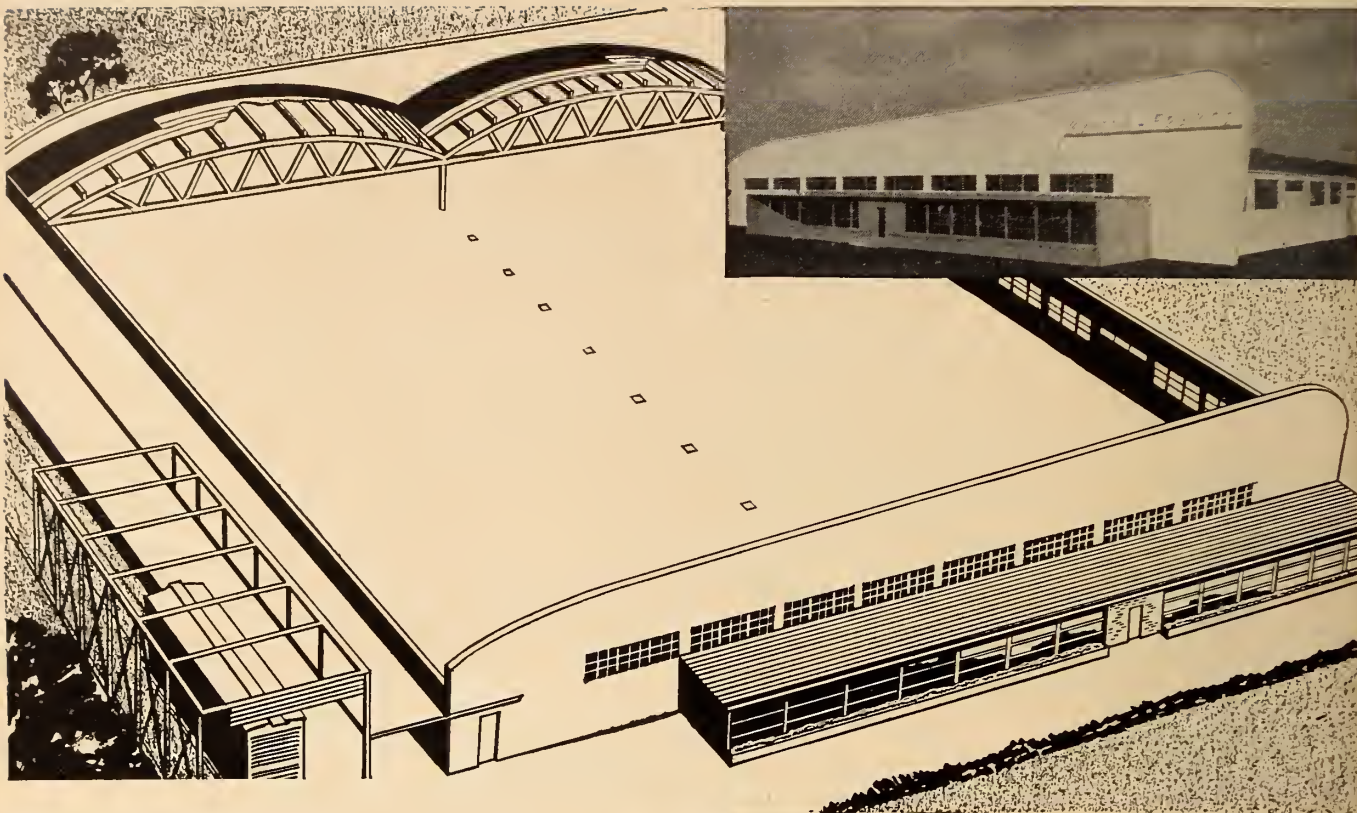
CANADA

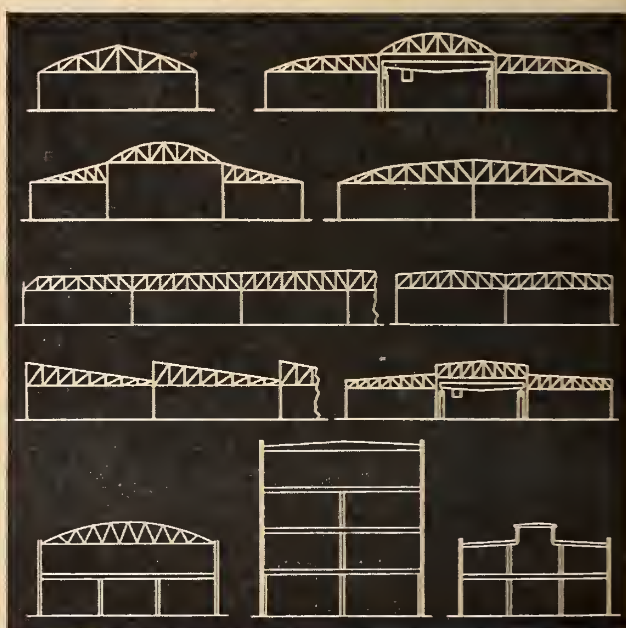
ENGLISH ELECTRIC COMPANY OF CANADA LIMITED

St. Catharines, Ontario

VANCOUVER · CALGARY · WINNIPEG · TORONTO · OTTAWA · MONTREAL

REPRESENTED BY FOULIS & BENNETT ELECTRIC LIMITED IN HALIFAX, SYDNEY AND ST. JOHN'S, NEWFOUNDLAND





(*Continued from page 1032*)

be obtained by writing to the manufacturers at the above address.

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Lignum-Vitae.—Very complete data on the many economical applications of the heavy tropical hardwood Lignum-Vitae are dealt with in the new "Engineering Report on Lignum-Vitae" recently issued by Lignum-Vitae Products Corporation, 10 Boyd Avenue, Jersey City, N.J. While this material has been known and used for such applications over a long period of time, there are, no doubt, many engineers who do not realize its advantages where special problems are involved. It is a self-lubricating and non-contaminating material which is resistant to many acids and other chemicals, as well as to water, and is considered to be ideal for many chemical applications.

•

Lucky Key Contest.—The lucky key contest which has been conducted for many years by the Minneapolis-Honeywell Regulator Co. Ltd., of Toronto at the Canadian National Exhibition is now well known to a great many people connected with the industrial and engineering organizations in that part of Canada. Mr. H. Duff, of Canada Packers Limited, Toronto, was the winner of the grand prize at the 1950-51 contest and received a General Electric 17-inch deluxe console model television set. Daily prizes consisting of a Stetson hat certificate were also awarded.

•

Packaged Powerstat Dimmers.—The Superior Electric Co. of Bristol, Connecticut, has announced a new line of packaged powerstat dimmers. Assemblies of 2000 watt series are now available in packages of 3, 4, 5 and 6 unit dimmers. Each assembly is housed in an attractive smooth grey finished cabinet. Individual dimmers are operated by vertical hand levers with graduated drums. These levers can be interlocked for master control from one lever. When required, a separate master handle can be provided. Each dimmer has its own on-off switch and circuit-breaker, card holder for circuit identification, and pilot light.

•

Heavy Duty Fenders for Tractors.—Announcement is made by the Caterpillar Tractor Co., Peoria, Ill., that heavy-duty fenders are now standard equipment for D8 "Cat" type tractors. These fenders are manufactured from one-half-inch steel plate and will provide a more rigid platform for mounting equipment. They are designed to withstand greater abuse and rough treatment which is sometimes encountered in pioneering and logging operations| These heavy duty fenders are standard equipment on D4 tractors also and it is anticipated that they will be on the D7 and D6 units within the near future.

•

New Motorcycle Features. — The Harley-Davidson Motor Co. of Milwaukee, announces the flexible new features of their 1952 big twin motorcycle model will be a four-speed foot shift, improved muffler, wider tire tread contour and Parco-Lubrized exhaust valves. The new foot shift permits fast, convenient shifting without taking a hand from the handlebars. The improved muffler provides reduced back pressure with consequent greater horsepower and reduced vibrations. It is also announced that the new 1952 light weight model incorporates a number of improvements, chief of which is, a folding footrest which folds upward at a 45 degree angle when a rut or other obstruction is encountered.

•

Garnet Finishing Paper.—Behr-Manning (Canada) Limited, Brantford, Ontario, announce that they have available a double-faced garnet finishing paper for use in the sanding of reeded and fluted posts. This paper is made up in cut sheets 3 2-3 inches by 9 inches with ⅞-inch arbor hole arranged in a staggered fashion to form a loose buff 25-100 sheets in thickness and is available in grits ranging from 80-0 (medium coarse) to 240-7/0 (fine) depending on the finish required. This paper is designed for use on a vertical spindle sander but can be adapted to horizontal spindle operations. The usual spindle speed is approximately 1200 r.p.m.'s. Sheets can be supplied in special sizes as well as to suit arbor diameters other than ⅞ inches.

•

Prefab Wood Shelving.—Hill-Clark-Francis Limited, New Liskeard Ontario, have recently made arrangements with the Lundquist Company of Stockholm, Sweden, for the marketing of Lundia adjustable prefab wood shelving in the eastern United States. The manufacture of this product will continue to be carried on at the Hill-Clark-Francis New Liskeard plant and the product exported to the American market.

•

Steel Bridge Flooring.—Announcement has been made that tests have now been completed by a well-known firm of consulting engineers of the IQ-35 rectangular steel bridge flooring supplied by Kerlow Steel Flooring Company of Jersey City, N.J. IQ-35 flooring is made with grating parellel to traffic and transverse to traffic. In the latter type, the transverse bars that the tires ride on are placed higher than the longitudinal bars, and the transverse bars are serrated to enable tires to maintain or to develop greater traction for emergency stopping. IQ-35 rectangular steel bridge flooring whether laid longitudinally or transversely on a bridge, will carry H20 loading on a 15-in. circle up to a span of 48-in., according to its manufacturer. The Kerlow Company also supplies an open steel flooring for industrial and chemical plants known as their series CB standard rectangular pattern. They advise that this flooring is forged under 500 tons hydraulic pressure with a proven positive dovetail lock construction. It is swaged cold, thus preventing internal strains which might cause warping. Slotting terminates above the neutral axis of bearing bars in order to provide maximum strength. Cross bars extend below the bottom of the slots eliminating the possibility of lateral deflection.

•

Government Orders re Copper Wire and Nickel.—The procedure in the buying and selling of copper wire and certain forms of nickel has been amended by two orders issued recently from the Department of Defence Production which became effective October 1, 1951. One of the new orders, NFM-9, amends a previous order, NFM-3 and requires departmental approval on orders for copper wire and cable placed with wholesale distributors as well as those placed with manufacturers. Stock limitations have been changed and a clause inserted giving authorized purchasers, who have not used such copper products in the past permission to purchase copper wire or cable upon certification. Order NFM-10 supersedes a previous nickel order M-1 and requires official approval of the sale or purchase of nickel anodes as well as primary nickel and electrical resistance alloys mentioned in the former order. Definitions of primary nickel and electrical resistance alloys are given in greater detail in the new order.

•

Ring Seal Data Sheet.—A new technical data sheet has been made available recently by the Arrowhead Rubber Company, Downey, California, in order to assist users of their "O" ring seals in the proper design and application of this equipment. A supply of these data sheets can be obtained by writing to the "O" Ring Technical Service Department of the company at the above address.

•

New Chemical Company.—Announcement was made recently by the principals concerned that a new chemical company will be formed in Canada to be owned jointly by Shawinigan Chemicals Limited of Montreal and Heyden Chemical Corporation of New York. The new company plans to construct a two million dollar plant in the territory served by the Shawinigan Water and Power Company for the manufacture of formaldehyde and pentaerythritol. The latter material is the base for new quick-drying, weather-resistant paints, varnishes, resins and lacquers which are coming into wide use in defence production.

•

Case Institute Research.—Recent researches carried out by the Case Institute of Technology were discussed at a meeting of the Ontario Chapter of the American Society for Metals by J. W. Sands, who is in charge of the engineering steels section of International Nickel's development and research division in New York. It was pointed out that efforts to correlate end quench curves with various quenched section of the same or different steels may result in a faulty estimation of their properties with resulting unsatisfactory service performance.

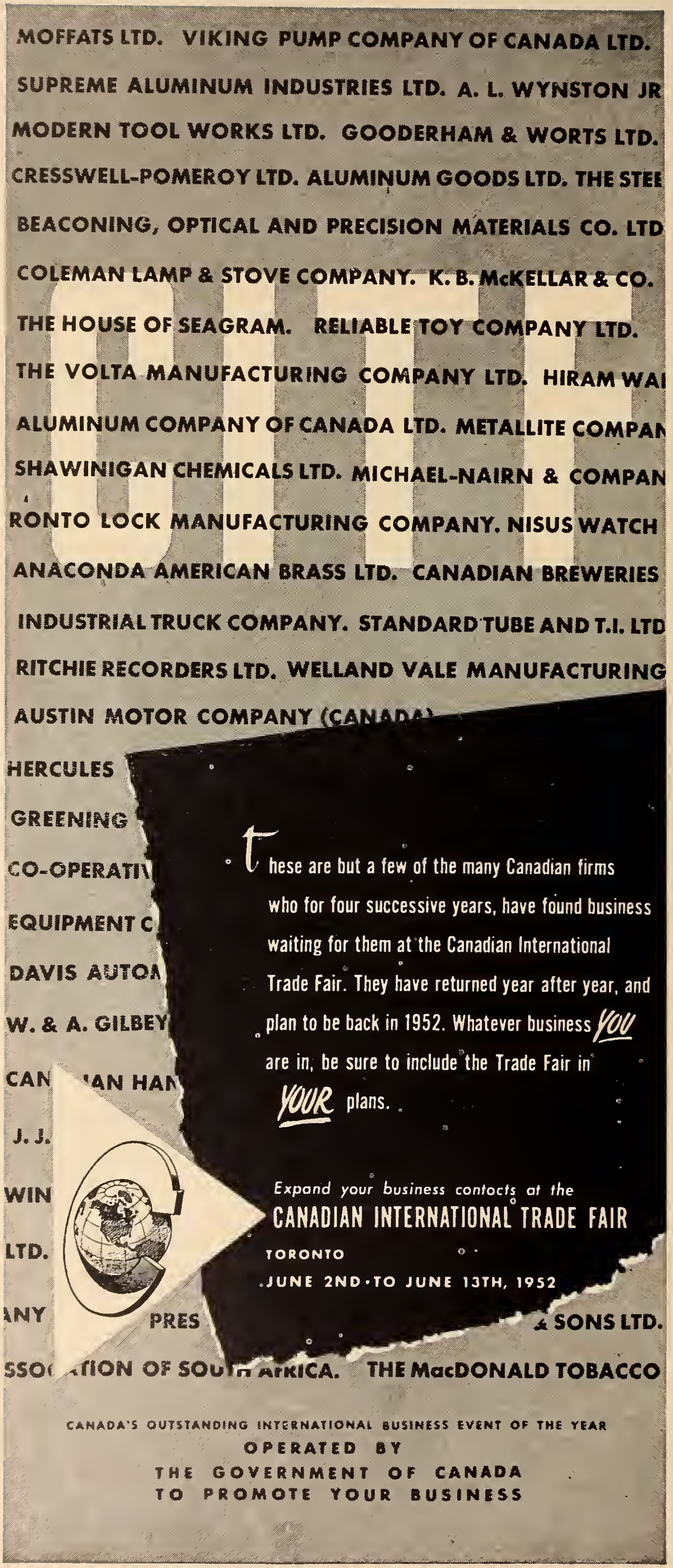
•

Simplified Camera.—The well-known firm Instruments (1951) Limited have announced that as Canadian distributors they now have available a new Fairchild-Polaroid ID camera which provides a simple, fast and efficient means for producing identification photographs of personnel. The principal features of this camera are the rapid one-step development without recourse to dark room facilities and the simplicity of operation which precludes the need for any photographic skill. Double exposures are impossible, focussing is automatic and exact proportional reduction of the image size permits the recording of four identification photos on a single print. It is stated by the distributors that photographs can be produced at as high a rate as 110 photos per hour and that where used in a plant for photographing new employees an identification badge containing the employees picture and number can be made up in a matter of less than three minutes.

•

Mine Shaft and Concentrator Completed.—R. L. Beattie, vice-president and general manager of Canadian operations of the International Nickel Company of Canada has recently announced the simultaneous completion of the new shaft and concentrator at the Creighton Mine of the Nickel Company near Sudbury. The shaft, known as Creighton No. 7, designed for ore-hoisting only, has been sunk to an initial depth of 2,050 feet. It is 8½ feet by 24 feet in cross section and is concrete-lined throughout. The shaft is to be served by a 14-foot by 110-inch parallel double-drum geared hoist with skips having a capacity of 15 tons each and a hoisting rate of 700 tons per hour. The concentrator when originally designed in 1948 was to have a daily capacity of 6,000 tons but plans had to be revised after the outbreak of hostilities in Korea and capacity was increased to 10,000 tons per day.

The concentrator has been built at the site of No. 7 shaft and the headframe and hoist house are integral parts of the mill building. Ore from the mine is hoisted directly into the crushing plant but part of the mill feed consists of non-magnetic ore brought by



conveyor from another Creighton shaft two-thirds of a mile distant. The plant's water supply is obtained through a six-mile pipe line from the Vermilion River and the mill product, which is a bulk concentrate, is pumped through another pipe line seven and half miles to the smelter at Copper Cliff.

•

Constant-support Hangers.—A new design of constant-support pipe hangers to be known as their Model L has been announced by Grinnell Company of Canada Ltd. The function of the model L constant-support hanger is to provide equal lift in all positions of travel of a piping system as it moves from expansion or contraction between its hot and cold positions. A new refinement incorporated in this latest design provides for center support, which places equal dimensions on each side of the centre supporting line, non-resonance in its springing system, and provision to give less horizontal shift of the load line as the load shifts from cold to hot positions.

Maximum travel, the Company advises, with constant-support has been increased from the former four inches to five inches in the medium chassis and from eight to 10 inches in the large chassis. The number of chassis sizes has been reduced from four to three and the total load range which formerly required 28 sizes is now covered by only 16 sizes. Discrepancies between calculated hanger loads and aetual loads can be corrected simply in the field by making an adjustment of a position of one nut on the hanger at the time of installation.

•

Improved Exhaust Muffler.—A new and improved exhaust muffler has recently been developed by the Caterpillar Tractor Company at Peoria, Ill., for their DW20 and DW21 diesel tractors. This new muffler is claimed to reduce engine exhaust noise thus providing greater operator comfort and reduced annoyance for people living near construction sites. Another improvement recently reported on Caterpillar equipment is the lengthening of the pull levers to match the higher seat now furnished for the D4 tractor equipped with HT4 Traxcavator.

•

Diesel Sales Statistics.—The Brush-Aboe Group of engineering companies who hold the controlling interest in the Vivian Engineering Works of Vancouver have recently announced that their 1951 orders for the first six months of the year amounted to nearly 50 million dollars as compared to just over 30 million dollars for the whole of 1950. Brush-Aboe are now the largest manufacturers of industrial diesel engines in the world and the current orders have come from more than 100 different countries.

•

Electronic Tachometer.—An electronic tachometer recently designed by the Parsons and Marine Engineering Turbine Research and Development Association research station at Newcastle-on-Tyne, was shown at the Engineering Exhibition just held in London. This new instrument for testing gas turbines gives the remarkable accuracy of plus/minus 1 r.p.m. within the range 500 to 10,000 r.p.m.

•

Appointments and Transfers

Roy G. Peers.—The Right Honourable C. D. Howe, Hon. M.E.I.C., has announced the appointment of Roy G. Peers, Montreal, as vice-president of Canadian Commercial Corporation. Mr. Peers will be located at the Washington office of the department. From 1941 to 1944 Mr. Peers was general manager of War Supplies Ltd., a former Canadian government agency, and also served as executive director of the Joint War Production Committee (Canada-U.S.A.). Since 1945 he has been the head of the export-import firm of Roy G. Peers Limited of Montreal.

•

H. J. Sissons and J. J. D. Brunke.—Appointed recently as co-ordinator of the Materials Branch of the Department of Defence Production, H. J. Sissons was formerly the director of the Priorities Division of the department.

Mr. Sissons' services were made available to the government by the Ontario Hydro-Electric Power Commission in February last. Until his appointment the deputy minister, M. W. Mackenzie, had been acting as Materials Branch co-ordinator.

J. J. D. Brunke, an executive officer of the Mutual Life Assurance Company of Canada, Waterloo, Ontario, has been appointed director of the Priorities Division. Mr. Brunke, whose services have been loaned to the department by his company is a political science and economics graduate of the University of Toronto.

•

New C.A.E. Division.—A western division of Canadian Aviation Electronics, Ltd., has been formed, under the managership of H. A. Ferris.

Mr. Ferris has been associated with the radio industry since 1929. He was vice-president and chief engineer of Halross Instruments Corp., Ltd., in Winnipeg, before joining C.A.E.

•

Climatologist Appointed. — Morley Keith Thomas has been seconded from his position in the Climatological Section of the Meteorological Division of the Department of Transport to become full time climatologist in the National Research Council's Division of Building Research. Mr. Thomas graduated from the University of Western Ontario in mathematics and physics and took his master's degree in meteorology at the University of Toronto. He has served with the Meteorological Service for ten years and during the war years saw services as a forecaster at various R.C.A.F. training stations. For the last six years he has been with the climatological section of the Canadian Meteorological Service.

•

R. G. "Nik" Cavell. — R. G. "Nik" Cavell, chairman of the executive committee of the Canadian Institute of International Affairs, has been appointed administrator of the International Economic and Technical Co-operation Division, according to a recent announcement by the Rt. Hon. C. D. Howe, Hon. M.E.I.C., Minister of Trade and Commerce.

This new division will be responsible for the supervision of all Canadian commitments under the Colombo Plan for the economic development of south and south-east Asia.

Mr. Cavell has resigned his position as vice-president of the Automatic Electric (Canada) Ltd. and Phillips Electrical Works Ltd., in order to take up this appointment. He brings to his new work a wide knowledge of Asiatic affairs gained through twenty years of practical experience in the Far East.

•

J. E. Armstrong, Jr.—The office of the chief engineer of the Canadian Pacific Railway Company has announced the appointment of Mr. J. E. Armstrong, Jr., as engineer of track with headquarters at Montreal.

•

New Building for U.B.J.—Notice has been received that Upton Bradeen & James Ltd., have now moved to their new building at 890 Yonge Street, Toronto, Canada. This new accommodation will provide nearly three times the floor space previously occupied and will permit of modern show rooms as well as larger office and warehouse facilities.

•

H. A. L. Pattison.—Announcement was made recently by The Hon. Lionel Chevrier, Minister of Transport, of the appointment of H. A. L. Pattison, C.B.E., formerly manager of Gander Airport, as the Canadian representative on the Air Navigation Commission of International Civil Aviation Organization (ICAO) at its Montreal headquarters. Mr. Pattison will replace Stuart Graham who is now in Ethiopia as Civil Aviation Advisor heading the United Nations ICAO technical assistance to that country. Mr. Pattison served with the Royal Air Force during and subsequent to World War I, retiring in 1937 with the rank of squadron leader. At that time he was appointed controller and later director of Civil Aviation in Newfoundland. Mr. Graham also served with the R.A.F. in World War I and was awarded the Air Force Cross for his work in combating submarine activity. Subsequently he joined the Civil Aviation Division of the Canadian government and held a number of responsible posts in this organization up to the time when he was appointed Canadian representative to the Air Navigation Commission at ICAO in 1949.

•

J. W. Truran.—The Bristol Aeroplane Company of Canada Limited recently announced the appointment of Mr. J. W. Truran, A.F.C., A.R.AcS., to be special projects engineer with the company in Canada. Mr. Truran, after considerable early flying experience, joined the Air Ministry in 1938 as a technical officer and served throughout the war with the R.A.F. as test pilot. From 1950 until recently Mr. Truran has been principal scientific officer in the Ministry of Supply.

•

Northern Electric Appointment. — Northern Electric Company Limited announce the appointment of T. C. Clarke, formerly general sales manager, to be vice-president in charge of sales, succeeding the late A. L. Brown. Mr. Clarke, who is a native of Wales, came to Canada in 1910 and served through-

out World War 1 with the British Army, being discharged with the rank of captain in 1918. He joined the Northern Electric Company as sales engineer at Vancouver in 1920 and later was transferred to Winnipeg as district sales manager. Subsequently he served in the same capacity in the other districts of western Canada and in 1933 was made manager for Alberta and British Columbia at Vancouver. In February of this year Mr. Clarke came to Montreal as general sales manager for the company. While in Vancouver Mr. Clarke was active in many organizations having been the past-president of the Vancouver Board of Trade as well as of the Electrical Service League of B.C. He was also active in the Canadian Chamber of Commerce, the Canadian Red Cross Society and the Medical Research Institute of British Columbia

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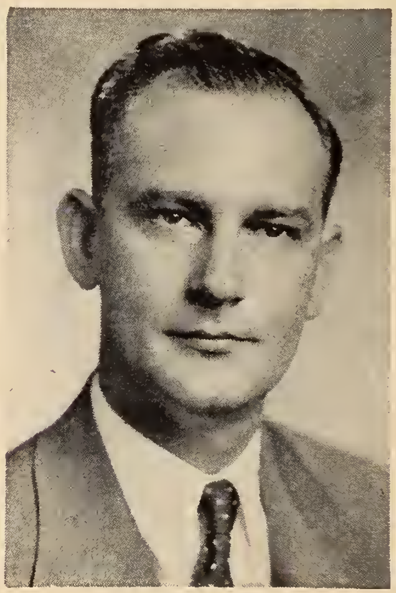
S. S. Schneider.—Canadian Westinghouse Company Limited, Hamilton, Ontario, announce the appointment of



S. S. Schneider

S.S. Schneider as manager of the electronics engineering department, electronics division of the Company.

Mr. Schneider has been with Westinghouse since 1939, after his graduation from Louisiana State University. He has since held positions in the engineering and research laboratories, and the electronics and x-ray division. He was in turn a laboratory research and design engineer; then district engineering and service supervisor; manager of the same department, and finally electronics service manager. He has specialized, also, in the training of young engineers for assignments in the field.

•

John G. Campbell. — Announcement was made recently of the appointment of John G. Campbell, formerly manager of the electronics division of the Canadian Westinghouse Company Limited, to be manager of their appliance-electronics division.

Mr. Campbell joined the company in 1934 and has had a number of responsible positions connected with the manufacturing and marketing of Westinghouse products. During the war Mr. Campbell served as deputy assistant director of Ordnance Service, First Canadian Corps, with the rank of major. He represents his Company on the board of directors of the Radio Manufacturers' Association and has also been active in the Canadian Electrical Manufacturers' Association.

•

J. R. Lamb.—D. F. Bowie, president and general manager of Canadian Overseas Telecommunication Corporation, has announced the appointment of J. R. Lamb of Montreal, as traffic manager. Mr. Lamb received his early training at the London office of the Eastern Telegraph Company and later served in many parts of the world with this organization. He came to Canada nearly twenty years ago and during this period was engaged in traffic production and administration work with Cable and Wireless Limited as well as the Canadian Marconi Company, before the latter was absorbed by the crown owned Canadian Overseas Telecommunication Corporation.

•

Fiberglas Canada Limited.—Notice has been received that Fiberglas Canada Limited have now completed their new modern office building at 50 St. Clair Avenue West, Toronto, Canada, and all future communications should be sent to them at that address.

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Trade Fair Appointments.—The appointment has been announced by the Rt. Hon. C. D. Howe, Hon.M.E.I.C., Minister of Trade and Commerce, of two field supervisors and seven field representatives for the Canadian International Trade Fair. For some time it has been the feeling of the government that the Trade Fair should be more representative of Canadian productivity and to this end the various organizations interested are making a concerted effort in which these new appointees will assist to obtain greater representation of Canadian manufacturers at the Fair. Mr. F. A. Serdongs of Montreal has been appointed field supervisor for Quebec with H. L. Gagnon and M. J. Edwards as his field representatives for the territory.

In Ontario, McCormack Smyth of Oakville is to be field supervisor and he will be assisted by A. A. Love of Lindsay, A. S. Wilkinson of Guelph and D. R. Platt of London. Mr. Campbell Millar of Winnipeg will be field representative for the provinces of Manitoba and Saskatchewan while Professor E. D. Morrow of Vancouver will serve in the same capacity for Alberta and British Columbia.

•

H. G. Acres Company.—The Hydro-Electric Board of the Province of Manitoba have engaged H. G. Acres Company of Niagara Falls, Ont., to investigate and report on the possibility of constructing one or more steam generating plants as well as the possibility of utilizing undeveloped power on the Winnipeg River.

•

Monsanto Directors Appointed.—The appointment of four new members to the board of directors of Monsanto (Canada) Limited was announced recently following a meeting of the board in Vancouver. The new members of the board of the Canadian company are E. M. Queeny, chairman of the board of Monsanto Chemical Company, St. Louis; C. S. Cheston, director of Monsanto Chemical Company; F. N. Williams, St. Louis, director of Monsanto Chemical Company; and Canadian-born I. C. Raymond Atkin, vice-president, director and member of the executive committee of J. P. Morgan and Co. Inc. Other directors of the company are L. G. Ryan, Montreal, chairman of the board; Arnold H. Smith, Montreal, president; and Leo E. Ryan, Montreal, executive vice-president. The company has manufacturing plants in Ville LaSalle, a suburb of Montreal, as well as in Granville Island and Marpole in the Vancouver area.

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Canadian Allis-Chalmers. — Canadian Allis-Chalmers (1951) Ltd., Lachine, Quebec, have announced the purchase of the St. Thomas, Ontario, works of Allis-Chalmers Rumely Ltd. This plant was built in 1948 and known as the Erie Iron Works. It was purchased by Allis-Chalmers Rumely Ltd., in September 1950 and has been engaged in the production of electric controls for diesel locomotives which are being built at the General Motors' London, Ontario plant. In announcing the purchase, Mark C. Lowe, president of Canadian Allis-Chalmers (1951) Ltd., also announced the appointment of the following officials: J. A. McVeigh as works manager, J. P. Lyons to be shop superintendent, and William H. Smallhorn, formerly office manager of the east end branch of the Canadian General Electric Co. Ltd., in Montreal, to be works accountant.

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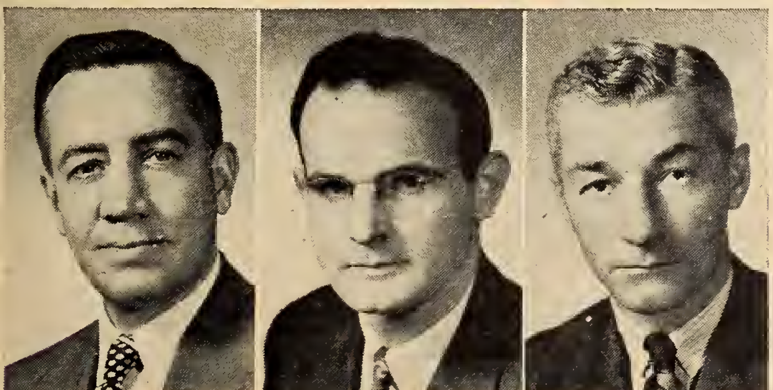


J. A. McVeigh **J. P. Lyons** **W. H. Smallhorn**

Perfex Sales Representative. — The promotion of Earl D. Allen to sales representative for the company in the greater Toronto area has been recently announced by M. K. Bowman, vice-president of Perfex Controls, Ltd. Mr. Allen was with the Syd Webber Sheet Metal Co. of Toronto before joining the Perfex organization in 1950.

•

Stelco Appointment.—The Steel Company of Canada, Limited at Hamilton, Ontario, have announced the appointment of C. P. Short to be general sales manager of the wire, wire products and screw divisions, succeeding C. E. Harrison, who is retiring after fifty-three years of service with the Steel Company and its predecessors. Mr. Short, who was born in Ireland, joined the Steel Company in 1936 as a sales representative in the wire division. He subsequently served as a sales executive in this branch of the company's activities.

•

Distributor Appointed.—Upton Bradeen and James Limited of Toronto have recently been appointed exclusive distributors for the Superior honing machine manufactured by Superior Hone Corporation of Elkhart, Indiana.

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Grinding Wheel Guards. — Morrison Products, Inc., 16816 Waterloo Road, Cleveland, Ohio, has distributed a new parts brochure, available on request, describing a new line of drawn steel wheel guards for portable, flexible shaft and bench grinders. The Company advises the new line was put into production at the request of the Safety Committee of the Grinding Wheel Institute.

•

All Purpose Boiler. — Warden King Limited, 299 Adelaide Street, West, Toronto, in a new four-page folder in colour, describes the new Warden King "20" all-purpose boiler. The boiler is designed for either steam or hot water heating and is suitable for oil, stoker, gas or hand firing; and it is available with either trombone or tankless type water heaters. Copies of the folder are available.

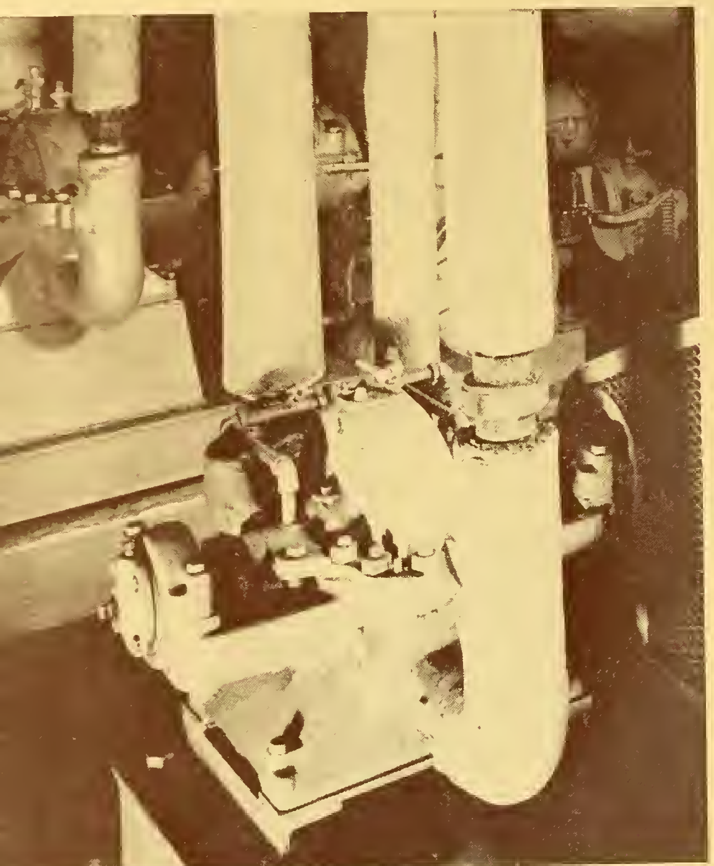
•

"Link-Belt News". — The August-September issue of Link-Belt News, (published by the Link Belt Company, 307 N. Michigan Ave., Chicago, Ill.) features a story of the Hungry Horse Dam under construction. The dam, which is to be completed late in 1953. is located in northwestern Montana.

•

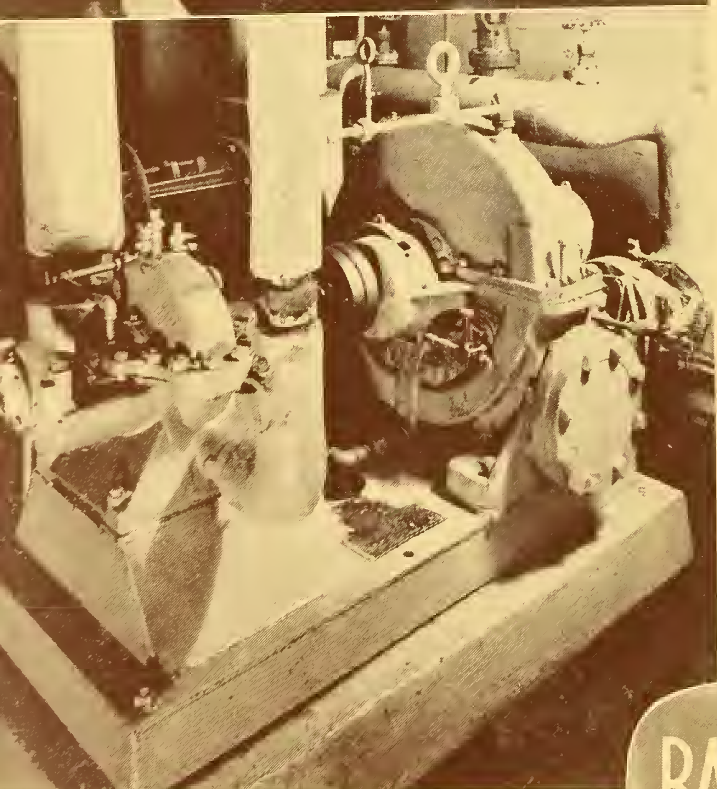
Step-Voltage Regulators. — Ferranti Electric Limited have just issued a new step-voltage regulator bulletin (No. 503), which describes maximum ratings for each type of Ferranti Regulator; advantages of the line drop compensator; regulation for city feeders; regulation along rural lines; effects of harmonics and load unbalance in the various three-phase connections of step-voltage regulators; results with various types of connections; how to determine the regulation of distribution primary lines and many other subjects. The

BABCOCK Turbine and Pum
Assure Feed-Water Supp



Babcock Boiler Feed pumps are dependable "hearts" for your boilers. Precisely made for each installation they fulfill every specification to the letter. Coupled with Babcock Turbines they make a unit that can be relied on for years of efficient operation.

Two stage centrifugal Boiler Feed pump, motor driven through V-belts to deliver 36 Imp. g.p.m. against 600-foot head when running at 3650 r.p.m.



Two stage centrifugal Boiler Feed pump, driven by a Babcock steam turbine to deliver 48 Imp. g.p.m. against 600 ft. head when running at 3475 r.p.m.

BABCOCK-WILCOX & GOLDIE-McCULLOCH
LIMITED
GALT ONTARIO
Montreal Toronto Calgary Vancouver

See other side for further details of this installation.

BABCOCK
BOILER ROOM EQUIPMENTS

bulletin also includes illustrations, connection, diagrams, regulation and voltage-drop charts.

•

Defence Production Organization. — The Department of Defence Production, Ottawa, has prepared an organization chart of the department. For copies apply to the Information Officer, Department of Defence Production, Ottawa, Ont. Ask for a copy of Department of Defence Production "Organization Chart".

•

Portable Steel Bleachers.—Seating, Incorporated, 3565 Wooddale Avenue, St. Louis Park, Minnesota, have issued a descriptive two-colour brochure on SICO Portable Steel Bleachers. The brochure, 8½ by 11 in., outlines outstanding features of the equipment, including the unique "4th Man Feature" design principle, and details various engineering factors of safety, comfort, expandability and portability.

•

Dipper Buckets. — Catalogue No. 189 recently released by Esco Limited, 146 East 1st Avenue, Vancouver, B.C., describes and illustrates all types of Esco dippers.

Together with their catalogue No. 188 on Esco draglines, this latest publication completes a planned programme to condense and simplify Esco dragline and dipper literature and specifications. Detailed specifications and illustrations will be found covering the general purpose cast-welded dipper, all-cast manganese steel dipper, coal-loading dipper and fastback hoe dipper. Job recommendation, pointing out which dipper will perform most economically under certain digging conditions are included.

•

Wenner Potentiometers.—Leeds and Northrup Company, Philadelphia, Pa., have just published a newly revised 16-page catalogue EH22(2) describing their Wenner potentiometers.

The publication discusses both the low range instrument, used primarily for precision measurement of thermocouple voltages, and the high range, or standardizing potentiometer, used for accurate voltage measurement up to 1.9111 volts. It also traces the circuit development of each potentiometer from the basic Wenner principle. External and internal illustrations of the potentiometers are given, annotated to indicate special construction features. Listing and illustration of recommended accessory equipment is also given.

•

Canadian International Trade Fair.— Exhibitors from 28 countries participated in the fourth Canadian International Trade Fair held in Toronto earlier this year.

A number of these exhibitors reported booking substantial orders during the period of the Fair, but the majority were inclined to the opinion that actual business done at the Fair is but a small part of the picture and that the important thing was the establishing of contacts which would lead to continued business over a long period of years.

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Paper Stock Pumps.—The October number of the "Bepco Jurnal" contains an interesting article dealing with the Harland "Fibroglide" pump as applied to the handling of paper stock.

•

"Roldweld" Steel Gear.—An interesting illustrated brochure has been issued recently by Hamilton Gear and Machine Company, Ltd., 950 Dupont Street, Toronto, which illustrates and describes the sequences followed in the manufacture of their "Roldweld" welded steel gears. It is claimed that this type of gear construction was pioneered in Canada by the Hamilton Gear and Machine Company.

•

New Caterpillar Bulldozer.—A bulletin has just been issued by the Caterpillar Tractor Company of Peoria, Ill., describing their No. 10S bulldozer. This bulldozer is cable controlled and it is used with their DW10 tractor model.

•

Refuse Burning.—The Detroit Stoker Company, General Motors Building, Detroit, Mich., have just recently published a new catalogue dealing with the application of the Detroit RotoGrate stoker and RotoStoker to the burning of refuse of all kinds. In addition to all types of wet and dry wood and bark refuse, many other materials have been successfully burned with this equipment, such as grain husks, corn cobs, peanut shells, etc. Many of these refuse fuels are being burned separately while others are used in conjunction with auxiliary fuels such as coals, oils or gas.

•

Riley Springs.—Robert Riley Ltd., have recently put out a comprehensive booklet to illustrate the variety and range of their spring products. This company, located at Rochdale, England, has been manufacturing springs since 1821.

•

Electric Vibrating Feeders and Conveyors.—The Jeffrey Manufacturing Co. Ltd., through their Jeffrey-Traylor Division now have available Catalogue No. 830 a new publication which describes the operation and application of their electric vibrating feeders and conveyors. Jeffrey-Traylor units are entirely electrical with no mechanical wearing parts and are said to have an amazingly low power consumption. Present installations are handling over 300 different types of materials ranging in size from dust products to four foot cubes, bone dry to dripping wet, hot or cold, at capacities from ounces to 2,000 tons per hour.

Many standard units are available that will continuously feed material and flow is controlled by means of a rheostat. To suit individual requirements feeders with dust-proof, water-cooled, spreader and grizzly features can be supplied. Vibrating conveyors operate by the same controlled high frequency vibration and also handle the range of materials mentioned. Conveyors are custom built to solve particular material handling problems and as with the feeders special features are available.

Copies of Catalogue No. 830 will be sent upon request to Jeffrey Manufacturing Co. Ltd., P.O. Box 428, Montreal, or to any of their branch offices or distributors.

•

Automatic Clutches.—Bulletin 6-51, which illustrates and describes the construction and operation of BLM automatic clutches and clutch couplings, has recently been issued by BLM Automatic Clutch Corporation of Canada Limited, 165 Spadina Avenue, Toronto.

•

Worm Gear Speed Reducers.—A new brochure has recently been issued by the Cleveland Worm and Gear Company of Cleveland, Ohio, illustrating and describing their various types of worm gear speed reducers. This company is represented in Canada by Peacock Brothers Limited, LaSalle, P.Q.

•

Water-repellent for Masonry.—Dow Corning Corporation, Midland, Michigan, has just released information on the newest Dow Corning silicone resin for use in the formulation of masonry water-repellent finishes. Finishes incorporating this new resin render new or old masonry resistant to straining and efflorescence and make all above-grade masonry water-repellent. Rain soaked interior walls are eliminated, as also is the spalling which follows the freezing of wet masonry. They are easy to apply with brush or spray and are absolutely invisible in any weather. These finishes, based on Dow Corning silicone resins, are available from various suppliers. A list of suppliers is available from the corporation.

•

"Atlas Steel News"—The "Atlas Steel News" for September contains a most interesting article describing a new 385-ton press recently installed in the plant of Donald Ropes and Wire Cloth Limited at Hamilton, Ontario. Other articles describe the application of stainless steel, the manufacture of cameras and locomotives.

●

Propeller Turbine Aircraft. — The Hawker Siddeley Review under date of September 1951, presents a paper on propeller turbine aircraft presented by Mr. H. R. Watson at the semi-annual meeting of the American Society of Mechanical Engineers at Toronto in June last. Mr. Watson is chief designer for Armstrong Whitworth Aircraft and his paper deals in some detail with the performance of propeller turbine driven machines as compared to other types of propulsion.

●

New Trane Company Factory.—Trane Company of Canada Limited, Toronto, in their August issue of "Weather Magic" describe the new plant recently completed by their company which is located in Etobicoke Township west of Toronto just off Queen Elizabeth Way. Containing some 45,000 square feet of floor space and built at a cost of $400,000, this new Trane plant is expected to form the nucleus of the Trane Company operations for the future.

●

Largest U.S. Liner Launched.—An interesting article in the August issue of the "Alcan Ingot" describes the launching of the *S.S. United States*, recently, at Newport News Virginia. This steamship, which is the largest ever built in the United States, contains over two thousand tons of aluminum. Most of this went into the two stacks, the larger of which measures 60 feet in length and 55 feet in height. In addition many parts of the superstructure, including deck houses, stack enclosures, decks, bulkheads, as well as life boats and davits, feature aluminum in their construction. The *S.S. United States* is 990 feet in length and has a beam of 101 feet, 6 inches. Another interesting feature of her construction is that she is reported to be the most completely welded passenger ship of her size ever constructed.

●

Nordberg Mine Hoists.—Publication of a new 24-page bulletin which illustrates and describes various sizes and types of Nordberg mine hoists is announced by Nordberg Manufacturing Company, Milwaukee, Wisconsin.

Nordberg Mine hoists are built in cylindrical, conical or cylindro-conical, single or double drum designs of the conventional or tandem type to meet specific hoisting requirements.

Bulletin 190 shows with installation photographs the application Nordberg hoists have in coal and ore mining operations both in the United States and throughout the world. Descriptions of these installations give pertinent engineering data on the hoists' operation.

●

Vibrating Screens.—Link-Belt Limited of Toronto announce the publication of a new catalogue Book No. 2377 illustrating and describing the Link-Belt vibrating screens supplied by their Company. This catalogue contains very complete engineering data together with dimension tables and other information useful to engineers in working out the design of installations.

●

Motive Power for Canada.—Montreal Locomotive Works, Limited, Montreal, P.Q., have been responsible for the issue of an illustrated booklet in colour describing their diesel locomotives and telling how Canadian enterprise builds MLW diesel electric locomotives for Canadian railways, using Canadian skilled labour and Canadian materials.

●

Western Oil Reaches Ontario.—Graphic descriptions of the various stages involved in the transportation of western oil to the Sarnia refinery of Imperial Oil Limited are contained in the August issue of "Imperial Oil Review". This culminated with the docking and unloading of the tanker *Imperial Leduc* at Sarnia on April 24th last, of which a very complete report is given.

●

Welding Accessories Catalogue. — Tweco Products Company, P.O. Box 666, Wichita, Kansas, announces the publication of a new 12-page No. 8 Twecolog, which illustrates and describes the complete line of electrode holders, ground clamps, cable connectors, terminal connectors, cable splicers, mechanical and solder type cable lugs, carbon electrode holders and the new "Lug-Set" block and punch for attaching solder type lugs to cables without solder. Copies of this catalogue are available upon application.

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THE ENGINEERING JOURNAL

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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."

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CONTENTS

15,200 copies of this issue printed

The ENGINEER and His COMMUNITY

The Roy V. Wright Lecture, presented before the 1951 semi-annual meeting of the American Society of Mechanical Engineers, at Toronto, June 12, 1951.

by

C. J. Mackenzie, C.M.G., Hon.M.E.I.C.

President,
National Research Council,
Ottawa

I am deeply sensible of the honour you pay me today. It is a compliment for a Canadian to be invited to address your distinguished society on any occasion; and when the meeting is in Canada and the occasion "The Roy Wright Memorial Lecture" the honour is indeed enhanced.

I never had the pleasure of knowing Dr. Roy V. Wright personally, but I do know something of what he accomplished and, of greater importance, what kind of man he was, what he stood for, and with what affection and regard he was held in this society; and I consider it a great privilege this afternoon to commemorate with you, the name of one of your most loved and respected presidents.

One can't help feeling at this time, in a world torn by conflict, confusion, and often by downright malice and bad faith, what a different and pleasant place it could be if the atmosphere of kindliness and devotion to the public good, which characterized Roy Wright, could only pervade all peoples in all countries. I am mindful of the purpose the Council had in setting up this memorial lectureship. As officially stated it was "to impress on engineers and young people the duties, responsibilities and privileges of citizenship in our democracy".

Previous lecturers have dealt with citizenship in the local, state and federal arenas of the United States, and while one who is not a citizen of your country has no right to preach to you of your local and national responsibilities, we Canadians can heartily subscribe to the practices and principles which guided Roy Wright in his writings and in his day-to-day life. For no one can deny that, in attempting to understand how government and social organizations work, no better start can be made than by direct personal service on local councils, boards and social welfare organizations. This is particularly good advice for engineers, whose training, although it makes them potentially effective, is not likely alone to give complete understanding of the subtleties of political and social activities.

Individual Skill Versus Universal Wisdom

It is not uncommon to observe men who, having achieved marked success and reputation in a specialized professional business or industrial field, assume that their opinions are of equal validity in public affairs. This is one of the weaknesses of our present day democracies. As Rebecca West so well puts it "The study of physics or chemistry is no more likely than the study of harmony or counterpoint to develop social omniscience" and she warns against assuming "That the man who possesses a special gift will possess also a universal wisdom".

It is discouraging to hear — as one does occasionally — engineers and scientists with little experience or background in political affairs suggest that a certain baffling social problem could be solved quite simply if it were only left to engineers who, presumably by applying the laws of physical science, would readily find a workable solution.

I agree that when engineers add to their professional competence the knowledge and wisdom gained by active participation in citizenship, then they are likely to contribute more usefully than most. But we, as engineers, should never make the rather stupid error of assuming that human actions follow valid and consistent laws such as we have in our fields of physical science. As Sir Josiah Stamp, a great economist and experienced statesman, so well said "In physical science a force such as gravity will always act in the same way on any piece of matter. But in the field of human relations if a man *thinks* a dog is a wolf he will act as if it *were* a wolf".

Because Roy Wright added to his engineering knowledge serious study of public affairs and actual participation in them, he became the great citizen he was. I venture the guess that he never confused

In this address the author traces Canada's material growth and change in character over four decades, and illustrates some of the constitutional and other differences between the United States and Canada. He pleads for an extension of the understanding that nevertheless exists between them, plus an expansion of our conception of community, interest and responsibility, to all our international relationships.

his engineering skills and his social and political philosophy.

Compromise Needed

As I have suggested, it would not be appropriate for me, a Canadian, to talk as previous lecturers have, of your local institutions and problems. I think, however, it would be appropriate for me to talk today about citizenship in its broadest sense, as today our concept of community and national interest is a rapidly expanding one; and it is becoming realistically obvious to all of us that to the obligation of citizenship in national fields must be added new responsibilities in the field of international affairs, responsibilities which are inherent in our determination to maintain the kind of world we wish to live in.

That Roy Wright also had this conception of a larger community interest is borne out by the words he wrote in 1938. Referring to the vital need for compromise in group activities he observed:

> ". . . This is all the more important in these intense modern days when . . . we are all so dependent one upon another. . . . This is true not only of our people as a nation, but to a very great extent internationally also. Improved communications, rapid transportation and worldwide commercial relationships have drawn us all more closely together, and to a surprising extent have made us internationally mutually interdependent. . . . We cannot escape the fact, whether we will or not, that we are an integral part of the peoples who inhabit this planet and that our fortunes and futures are inseparable from theirs." This fact is now more generally accepted than in 1938 when it was penned by Wright — it does illustrate his wisdom and foresight.

Today I would like to emphasize two associated points — I do not claim they are novel, I only suggest they need emphasis at this time. The first, which I think cannot be questioned, is that all effective human co-operation must be based on understanding and compromise: not necessarily mutual acceptance of each other's views and beliefs, but understanding, based on knowledge of differences, which makes compromise possible.

Friends and Allies

The second, and most supremely important point to realize, is that it is comparatively easy to be friends but exceedingly difficult to operate as effective and contented allies; and it is as partners in an alliance of freedom-loving nations that we must work and fight if we are to survive collectively in the form we have chosen. The truth of this is obvious. The difficulties do not come in the days of friendship and courtship, but when the marriage partnership demands constant adjustments and sacrifice by both parties.

We all know that in business, in associations, in politics, whenever we come together for group action, frictions arise, incompatibilities appear, differences of interest are aggravated. A hundred-and-one adjustments are needed that are not required in ordinary friendly social or business intercourse. As Roy Wright put it "In the last analysis the real objective and problem in a democracy is to live together as a large reasonably contented family, all working together for the common welfare. Human nature being what it is, this is no simple or easy task . . . compromises must be made".

We have learned to work by compromise in local societies, in national groups and political parties, but it would be naiveté indeed to suggest there are no internal difficulties. What is even more naive, I think, is to be surprised when difficulties arise between allies with different national backgrounds.

In 1951 we are in a world in which we must operate as allies, and it is imperative that we all realize fully it is not an easy thing to do (I fancy military and political leaders of all past alliances have been fully aware of this). But if we are to obtain our supreme goal, permanent world peace, it is of vital importance that we learn the techniques of international co-operation, just as Roy Wright and his disciples mastered the realistic techniques of national citizenship.

Probably no other two peoples in the world know more about each other than do we in the United States and Canada, and yet, friendly as we are, and easy as our common language and customs make understanding, we should never assume that our knowledge of each other's circumstances is complete. And because I think such understanding is of paramount importance in the kind of world we now live in I am going to say a few words about my country. I realize of course that much of what I say will be familiar to many of you, but it is normal for the citizen of a small community to know more about a larger community than does the big-town citizen of the smaller place. That is my excuse for the remarks I am about to make.

Canada Yesterday and Today

Canada in 1951 is very different from the Canada that entered World War II, and bears almost no resemblance to the Canada that went into World War I in August 1914. In 1914 our population was under eight millions — 25 years later in 1939 it was eleven millions and today it is over fourteen millions. These figures alone tell very little, although they do indicate that in the last ten years our growth has been about the same in numbers as in the previous quarter century. In percentage it has been double that of the preceding decade, and twice that of the United States between 1940-50.

It is the change in character, however, that is significant. In 1914 this country was essentially a producer of primary products; predominantly rural in character. In World War I we provided and maintained through four years of bloody fighting and terrific casualties a corps of infantry soldiers with its complement of artillery, engineers, and other arms. We were essentially front-line soldiers; we had few special units, although a large proportion of the pilots in British Royal Flying Corps were Canadian boys.

On the civilian side we supplied shells and ammunition in large quantities, but our great contribution was in foodstuffs. Our production capacity in wheat alone doubled in a few years. We went into World War I automatically when Britain declared war, willingly and with great enthusiasm, but virtually as a colony; we came out spiritually an independent nation, bound together by our fierce pride in the battle achievements of the Canadian Corps in which practically every man in Canada of military age and fitness served.

We went into World War II a free and autonomous unit in the British Commonwealth of Nations. We did not become involved automatically with Britain as in 1914. Our Parliament declared war not when Britain did, but several days later, and of our own volition. But I might say with the same conviction that, in a war for justice and freedom, we wanted to be fighting as we always had side by side with our Commonwealth cousins.

World War II changed our economy completely. More than one million men enlisted in our three fighting services. We put an Army group in the field. On a per capita basis Canada provided more flying personnel than any other nation. On the seas Canadian sailors manned a navy of 780 ships. At the same time our industrial output increased phenomenally in size and character. Before the end of hostilities we were producing most of the intricate weapons of war except battleships, proximity fuses and atomic bombs.

When Canada entered the war in 1939 most of its large industries were branch factories of U.S. and U.K. corporations, most of its industrial research was imported, and no military research and development existed. We emerged in 1945 with strong scientific research organizations, the only atomic energy pile outside of the United States, and a strong integrated industry capable of producing almost any kind of intricate industrial goods. As you know, since the end of the war our industrial capacity has further increased, our national income is three times what it was in 1939, and in every way our industrial potential is today far greater than at any time in history.

Neighbours not Fully Aware of our Growth

Such were our circumstances in the post-war years that, instead of receiving financial aid from your nation which gave so generously to others in difficulties, we were in the fortunate position of being able to follow your inspired Marshall plan and like you grant to other countries credits comparable to our size and resources.

Recently our hinterland has disclosed immense iron deposits in Quebec and Labrador, uranium in western Canada and titanium in Quebec. The newly discovered oil formations in Alberta give promise of completely revolutionizing the oil position on this continent, and the end is not in sight.

I am not suggesting that this body of engineers is entirely unaware of what has been happening. I would be surprised if some of the billions of dollars of United States capital that has poured into Canada in recent years has not come with the knowledge and advice of many of your members. I do feel, however, that many people in Canada and the United States are not fully aware of what a remarkable change has been taking place during the past decade in the fundamental economy of Canada.

But these are material facts which present no difficulties in interpretation. All we have to do as responsible world citizens is to learn about physical developments in other parts of the world. There is no problem of misunderstanding such facts.

As understanding is the basis of effective co-operation, we as world citizens must have knowledge of the differences in social and political institutions in neighbouring countries. I am sure that many of the day-by-day manifestations of political action in other countries seem incomprehensible, and even downright perverse, because we do not appreciate the fundamental differences in governmental institutions.

Constitutional Differences

For instance, take our two countries. No two independent countries have more similar institutions and traditions than have we. We speak the same language, sing the same songs, read the same magazines and have more personal and business contacts than any other two countries in the world. Yet I am certain that some of your political methods seem unusual to many Canadians. This is because in our apparently similar democratic governments there are fundamental differences that inevitably make for different public approaches. I am equally sure you find some of our political policies and tactics equally incomprehensible for the same reasons.

The fundamental political difference between our two countries is not that you live in a republic and we in a constitutional monarchy, for we enjoy as much freedom as you. One of the fundamental differences is that our executive is headed by elected representatives who sit in parliament as ministers in charge of departments of government. Such ministers can be retired almost instantly and so can the entire Government, Prime Minister and all his Cabinet, if at any time the Government loses the confidence of the House of Commons.

The minister in charge of a Canadian department is responsible for all acts of his department and is held absolutely to account. He and he only is attacked in Parliament if anything goes wrong. A public servant is rarely if ever, attacked in public, as he has no way of defending himself. By the same token, no non-elected public official is supposed to speak publicly about policy matters; and any breach is looked upon as a most serious offence. This system means that Canadian officials are rarely associated in the public mind with political controversy. They can and do serve a succession of ministers of different political faith with no embarrassment whatsoever.

Your system is different, but let me emphasize again I am not passing judgment as to which is better — that is completely contrary to my thesis, which is that it is understanding not appraisal that is needed. In your system the executive heads of your great departments of government are not elected representatives and cannot explain or defend their actions as members of congress. This leads inevitably to a situation in which non-elected public officials have to talk about, explain and even advocate matters of policy and in turn are naturally criticized and become personally associated with the policies of the head of your Government.

I mention this one difference, which to the casual citizen may not seem important, but which does lead to misunderstandings. Many of your people cannot understand why some of our tactical manoeuvring is necessary to get to certain ends. I am afraid many Canadians in turn don't understand some of the activities of your appointed officials because they don't really comprehend the fundamental differences in our political systems. The pressing need is for understanding, not evaluation of the political institutions of our friends and allies. When we achieve that, we shall be able to co-operate internationally just as national groups do regardless of differences in belief, ceremony and procedures.

Size makes a Difference

Let me mention two other examples of hidden differences in apparently similar systems. In comparing institutions in different countries we must never overlook the size factor. In engineering, industry and business we all realize that the type of organization and the procedures effective in small organizations will be quite inadequate for large units. And so in reverse it would be absurd and wasteful to surround small operations with all the complicated controls necessary in large operations. In the same way it is unwise and misleading to make a direct comparison between the types of organizations found in small countries and those of larger ones.

It is often even more misleading to compare results or activities on a basis of costs or relative numbers of personnel. Let me mention one field with which I am familiar. In our Government scientific organizations I believe we are able to get, speaking in overall terms, more scientific work out of each research scientist than you do in your large Government institutions. The reason is that we, being relatively small, have few large headquarters formations and committee structures, which in a large country seem to absorb an unfortunately large percentage of the time of the most highly skilled personnel.

While we are sure that as a whole the output of our scientists on a per capita basis is greater than yours, we do not jump to the erroneous conclusion that we are better at organizing scientific effort or that our scientists are better. We shall have to wait until we are as large as you are before that question can be answered. So when we compare the scientific effort of different nations in terms of relative population we may deceive ourselves if we use the simple yardsticks of dollars spent or numbers of scientists employed per million of population.

Different Policies for Defence

Another field where direct comparisons are difficult is in defence. Canada could never go to war on its own. We always have and always will be operating with allies of greater size, whose forces are complete and all encompassing. This makes our contribution to a common war assume a distinctive form. For instance we have an area within our borders larger than yours and just as vulnerable to attack, but we only have 1/12 of your population and 1/18 of your national revenue.

If every able-bodied Canadian of military age were in our forces we probably would not have enough to man adequate static defences for our principal cities and ports. In peacetime, therefore, we must concentrate on mobile forces, airborne troops, fighter aircraft and naval vessels. In a general way, in war our contribution must follow a similar pattern and supplement the forces of our allies. In the air we are now concentrating on fighters and troop transports, in our navy we concentrate on escort duty, which has been our traditional role.

On the civilian front our industrial strength and resources far outbalance our military strength. During World War II 70 per cent of our production was in excess of our own needs. Today, in spite of our relatively small population, we are among the first half dozen industrial nations in the world. All of this means that, because of this natural lack of balance, our contributions to any alliance cannot be ascertained by a direct comparison of troops or supplies on any exact basis of population or national wealth.

I could go on giving example after example, and if we extend our study to other countries the areas that need our serious study multiply greatly. But I think I have said enough — perhaps too much. I fear that I have taken your invitation too literally, as I seem to be lecturing to an audience which does not need it; but my excuse is that these lectures are supposed to reach ultimately a larger and younger audience.

Community Spirit in International Relations

In bringing my remarks to a conclusion I repeat that I, as a Canadian, am deeply moved by being asked to give an address in memory of one of your most loved Presidents. I am aware of the personal honour, but I like also to think of my invitation as a measure of the warm friendship and respect that exists not only between our respective professional societies but between our two peoples.

I have taken the liberty of interpreting citizenship and community responsibility in a broader way than former Roy Wright lecturers have done. I do feel sincerely that if we are to win this global struggle for democratic freedom to which we are dedicated, it is absolutely essential that we expand our conception of community interest and responsibility to cover all people of good will wherever they be found.

I have talked a bit about Canada and our international relations, as I think our two countries have given the greatest example of how autonomous people can solve their mutual problems, settle all disputes, and live harmoniously behind borders whose only defences are those of mutual regard and affection. We not only have lived as good neighbours in times of peace but as allies we have fought side by side through two world wars. In Korea today we are again fighting under a unified command. This is as it should be and as it must remain, no matter what challenges we face.

Canada a Link between Britain and America

Our population is relatively small, not more than that of one of your sizable states, but to our alliance we bring, besides numbers, a long and intimate association with British Commonwealth countries, an association which today has few if any binding legal ties but which, nevertheless, permits us to draw spiritual and material strength from the culture of two great races with their traditions and ideals of justice, freedom, and intellectual and practical effectiveness.

We feel strongly that any alliance of nations in which the United States and the United Kingdom are not the principal parties will have no chance of bringing permanent peace to this world. We feel that, understanding the people of Britain perhaps better than you do, we can play a helpful role. By the same reasons we can, and I think, do assist the other members of the Commonwealth in understanding your great country.

After all we are both North

(*Continued on page 1061*)

The Engineer's Part in Fisheries Conservation

by

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Department of Fisheries,
Vancouver, B.C.

The idea of applying engineering principles to the problem of fisheries conservation is not new. More than a hundred years ago fishways were designed by European engineers, as an integral part of dams and other hydraulic structures. The importance of conserving the fisheries' resources by allowing the fish to continue their normal migratory habits was even then recognized. Early in the twentieth century the need for a better understanding of the hydraulics involved in the design of fishways was felt, and outstanding research in this field was done by Denil in France and Nemenyi in England and the United States. Their results were never applied on any large scale, however.

With the industrialization of the West Coast Region of North America in the last few decades, a growing realization of the necessity for conservation of the tremendous resources of salmon and trout indigenous to this area has been apparent. This industrialization of necessity has been accompanied by a vast number of water development projects, many of them small, but a few among the largest in the world. It was inevitable, therefore, that engineers would become more and more involved with the problems of resource conservation created by these projects. The impetus gained from the conservation problems solved and partially solved in connection with some of these larger projects, such as the series of dams on the Columbia River, has made the fishing industry and the general public more and more conservation-minded, and has to a certain extent stimulated research and development in the biological and engineering phases of fisheries conservation.

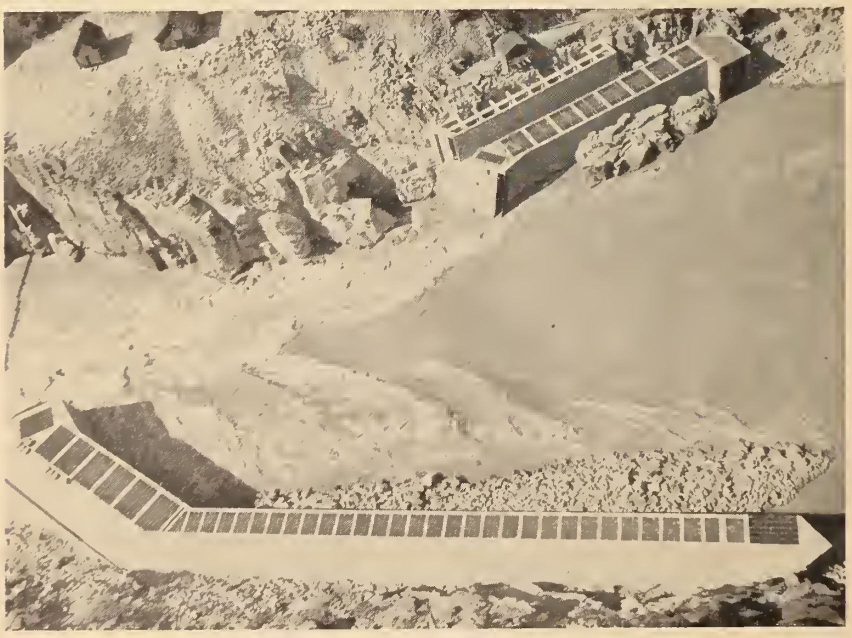

Fig. 1. General view of Hell's Gate Fishways.

Fishway Design

Perhaps the best known fishways now operating in North America are those in Bonneville Dam on the Columbia River. These fishways were built as an integral part of the dam at a cost of some $7 millions, or 8.5 per cent of the total cost of the dam. Each year an average of 700,000 fish pass upstream over the 50 feet minimum height of the dam. New fishways (estimated to cost $17 millions) to be installed in McNary Dam now nearing completion 130 miles upstream on the Columbia River, will become perhaps more famous than those at Bonneville in the future.

The general public and probably many engineers have no realization of the enormous cost of these structures, and the tremendous amount of experimental work which preceded design and construction. Hydraulic model studies of the fishways were conducted in conjunction with studies of the complete dam. The opinion has been advanced that the design of the fishways offered a greater number of more difficult engineering problems than the design of the dam itself. Certain it is that the investigators involved in this work, among whom were M. Litt and H. Preston of the U.S. Army Corps of Engineers, H. Holmes of the U.S. Fish and Wildlife Service, and M. C. Bell of the International Pacific Salmon Fisheries Commission, added a tremendous amount of data to the already growing fund of knowledge on fishways and fish facilities in dams.

Fig. 2. One of the Bonneville Dam Fishways looking downstream.

The chief advance in the design of the fishways in these dams over those in older dams was the introduction of a more successful collection system at the entrances to the fishways. The most frequent cause of fishway failures up to this time was not the inability of fish to ascend them, but the inability of fish to find the entrance. Normal flow in a weir type of fishway does not provide the volume of outflow at the downstream end of the fishway necessary to compete successfully with the discharge from a powerhouse tailrace or dam spillway, in attracting the fish bound upstream. To solve this problem additional water was introduced through diffusion chambers to the fishway near the lower end, giving the required outflow to provide an attractive velocity at the fish entrance. This extra water is either taken by gravity from the dam forebay, or pumped from the tailwater during periods of low flow.

The collection systems are elaborately designed for each particular fishway location, but unfortunately space does not permit of a detailed description of any of the current installations. Suffice it to say that the elaborate design is not wasted, as the Bonneville fishways to date have been very successful in collecting and passing fish over the dam. It is believed that the McNary fishways will prove equally successful.

The Vertical Slotted Baffle

In Canada another outstanding advance in fishway design was accomplished with the completion of the Hell's Gate Fishways[1] on the Fraser River in 1945. Hell's Gate had been an obstruction to upstream migration of salmon ever since a disastrous slide occurred, after construction of the Canadian National Railway through the Canyon in 1913. This slide had restricted the channel to such an extent that a large localized drop in the water surface profile was created, which persisted over a wide range of water levels. High velocities resulting from this drop prevented the ascent of fish. The problem was, therefore, to either restore the channel or design a fishway which would operate with a minimum of adjustment over a wide range of headwater and tailwater levels.

The answer was found in the Hydraulics Laboratory of the University of Washington, where the so-called "vertical-slotted baffle" was developed by M. C. Bell of the International Salmon Commission, in association with C. W. Harris of the University of Washington and E. S. Pretious of the University of British Columbia. This baffle provided a constant head loss through each slot for varying quantities of flow through the fishway. Thus a fishway was evolved which required virtually no manual adjustment for any required range of head and tailwater levels.

The value of this is not at once realized. It is the answer to a problem which for many years has vexed designers of fishways for natural waterfalls. This is the problem of adjusting the intake of a weir-type fishway to suit the prevailing headwater levels. It has often been necessary to have a special attendant at isolated locations for the sole purpose of making these adjustments. Using the vertical-slotted baffle, however, no attendant is necessary.

This baffle has been so satisfactory that the same principles are

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[1]Published material on Hell's Gate Fishways is listed as follows:

Fishways for Fraser River salmon, C. Lake. *Compressed Air Magazine*, v.50, p.122-26, May, 1945. *Roads and Bridges*, v.53, p.63-66, June, 1945.

Fishways on Fraser River, designed for wide head variation. *Engineering News Record*, v.137, p.386-88, September 19, 1946.

Salmon swim Hell's Gate through new fishway, P. W. Harris. *Civil Engineering*, v.16, p.431-33, October, 1946.

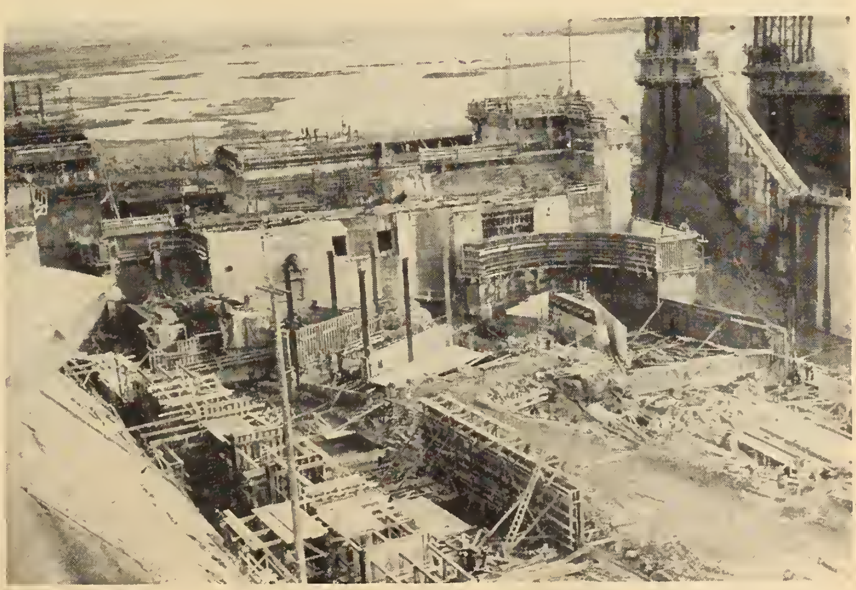

Fig. 3. Washington shore Fishways under construction, McNary Dam.

Fig. 4 (top). Hell's Gate Fishways under construction, Fraser River, B.C.

Fig. 5 (centre). Screens in irrigation ditch, Sunnyside, Wash.

Fig. 6 (bottom). Small irrigation screen near Yakima, Wash.

being used in fishways from British Columbia to California. Temporary fishways of the Hell's Gate type for use during construction have been built into McNary Dam. Smaller installations with the same general type of baffle have been built at Bridge River Rapids on the Fraser River, Farwell Canyon on the Chilcotin River, and Moricetown Falls on the Bulkley River, all in the Province of British Columbia.

Some field experiments have been carried out recently by H. Holmes of the U.S. Fish and Wildlife Service in the State of Washington on Denil type fishways, and it is considered that this type has great possibilities, providing the practical limitations of ease and economy of construction can be met. The reason for the high hopes for this type is that it, too, operates without adjustment over as wide a range of water levels as desired. It has the added advantage that it carries comparatively large flows, resulting in good velocities for attraction of the fish at the entrance.

Improvements in Design of Fish Screens

The problem of screening water supply intakes to prevent the loss of young salmon migrating downstream has been met with much ingenuity by Western engineers in recent years. In many of the Western States and in the Province of British Columbia, salmon-and trout- producing streams flow through arid regions where irrigation is practised extensively. Dams of many types are used to divert the water into canals, but the type most common is the low wing dam, which does not obstruct the river to any large extent. Fry and fingerling migrating downstream, however, often move down the margins of the streams, and thus frequently swim into the irrigation ditches and later die in the fields.

Losses in this manner have been large enough in many streams to seriously impair the productivity of the fishery, and it has come to be a recognized practice to screen all irrigation ditches where fish are likely to be present. Fixed vertical screens which were used at first were entirely unsuccessful, because they soon clogged up with leaves and debris, with a resulting failure of water supply at what were often critical times for the farmer.

A type of moving, self-cleaning screen was then evolved and perfected over the last twenty years. It consisted in general of a cylindrical drum-screen kept in motion by means of a paddle wheel coupled to it by a drive chain and set of gears. The velocity of the water flowing in the canal revolved the paddle wheel, which in turn revolved the screen, keeping it clean at all times. Hundreds of these installations are in operation at the present time, screening quantities of water ranging from one or two c.f.s. up to 1300 c.f.s. A diversion on the Yakima River at Sunnyside, Washington, has the latter capacity, the installation consisting of ten revolving-drum screens each 10 feet in diameter and 10 feet long.

A further improvement has been made in these screens by providing a by-pass, to enable the fry to return to the main river when they are prevented from going any further by the screen. This consists in general of a large pipe, with its flow controlled by a small weir placed conveniently near the face of the screen. The fry, seeking a route past the screen, fall over the weir and are sluiced out of the pipe back to the river, to continue their journey downstream.

One even more recent development in the screening of small irrigation ditches is the invention of a sloping perforated-plate screen by E. W. Murphy in California. A rubber edged blade not unlike an automobile windshield wiper is operated by a paddle wheel through a series of levers, scraping trash and leaves off the surface of the perforated plate. The big advantage of this screen is its economy of construction. So far, however, no installations of this type are in use outside of California.

Water intakes for purposes other than irrigation often have to be screened as well. Intakes operating under a high head, such as for power development, do not readily lend themselves to the above type of screen, so other types have had to be used. The most satisfactory of these are considered to be the the Link Belt and Chain Belt travelling screens which were developed by these Companies for sewage treatment and general water supply screening. These screens consist of endless belts made up of a series of narrow flat-plate screens, which travel over large drive sprockets, passing vertically across the opening to the penstocks. They are usually driven electrically and operate at a very slow speed so that little power is required.

Water jets are usually operated in conjunction with the screen, to remove refuse clinging to it as it emerges from the water. These jets also wash off many small fish which have become lodged against the screen. A by-pass pipe to the river has to be provided with these screens as well, so that migrating fry will not remain indefinitely at the face of the screen seeking an exit. The largest installations of this kind are at Bonneville Dam, while many smaller installations are in operation in Washington and British Columbia.

One further type of screen, the electric screen, has been tried on irrigation diversions. However, after years of testing by various government agencies, it has been found to be defective in many ways, and is not now approved by any responsible conservationists. Experimental work is still continuing, however, and it is hoped that this method can be perfected, as its low initial cost and great economy of operation are very strong arguments in its favour.

More Engineering Research Needed

In addition to the designing of fishways and fish screens, engineers have applied many other useful techniques to fisheries conservation. Aerial surveys have been used extensively in the analysis of river mechanics, where spawning grounds have been menaced by removal of water for industrial purposes, or where flows have been altered for other reasons. Depth recorders have furnished quick methods for determining lake bottom contours and lake volumes for the analysis of rearing areas. Accurate flow records provided by hydraulic engineers have been of inestimable value in the solution of basic problems.

It is quite safe to say, in spite of all the good work already accomplished, that the field of fisheries' conservation by application of engineering principles is only beginning to open up. Much has been said about the necessity for more and more basic research in fisheries biology, but research in the engineering and mechanical phases of fish protection is also needed to an equal degree.

Heretofore, specific problems such as new dams have been met as they materialized and an answer arrived at years later, usually in the form of a compromise. Research into the general solutions for possible problems arising in the future would give those responsible for conservation of the fishery surer ground on which to base their decisions. It would thus afford greater protection to this large but diminishing food resource. In the meantime, engineers are busy evolving new methods of solution, and supplying an ever greater number of answers to the many problems besetting this resource. √

THE ENGINEER AND HIS COMMUNITY

(Continued from page 1057)

American nations, and that means much. I believe we all agree that as North Americans we have great responsibilities today. We have not only inherited high ethical standards and a sense of justice from our common ancestors, but we possess a continent of vast natural resources which is our good fortune. True, we have wrestled with and tamed our resources on the grand scale, but we must be careful not to look with disdain on other peoples who live in lands not so well endowed. I suggest that humility is still a virtue, and when we think of our high standard of life I suggest we do well to give Providence a fair share of the credit.

That nature has favoured us with great material wealth makes our responsibility the greater. This I suggest is in keeping with the philosophy which made Roy Wright the great citizen he was and which gained for him the greatest of all riches, the warm friendship of a host of people from all walks of life. He understood what public responsibility was. "Noblesse oblige" was to him no meaningless cliché. I respectfully submit that when we accept, as we do today, the idea of a still larger community to which we have a responsibility, we do not offend the spirit of that great man whom we honour this afternoon. √

Atomic Attack:

Residual Radiation in Industrial Areas

by

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Outlining the types of radiation resulting from various types of atomic bursts, this paper describes the limits of their effect. Methods of determination of the intensities of each are given. Permissible and hazardous dosages are defined. Measures to be adopted in dealing with casualties at decontamination centres are discussed, as well as methods recommended for decontamination of water, food, clothing, buildings and surfaces. In conclusion, the importance of advance planning is emphasized.

The engineering profession, more than any other, is aware of the extent and nature of the destruction that will follow atomic attack. Much has been published and much said about atom-bomb blast effect on structural design and material. Much evaluated data is available from the careful surveys of Bikini and Eniwetok; much less, however, is generally known of the nature of fission and of its secondary radiological effects.

It is the purpose of this paper to outline briefly the forces involved in atomic fission, to indicate qualitatively their action in terms of induced and residual radioactivity in affected but not wholly destroyed areas, and to discuss appropriate protective procedures. It is important that all engineers and plant superintendents should have some foreknowledge of what must be expected. They must be aware of the techniques of detection and decontamination that have been devised in mitigation. The safety of workers and the continuation of production will depend upon such knowledge.

Reactions of Nuclear Fission

In nuclear physics, equations balance in terms of protons or nuclear charges and of atomic weight or mass. The symbols of chemistry are therefore insufficient for nuclear notation. Thus hydrogen H is written ${}_1H^1$, indicating one proton or positive charge in the nucleus and one unit of mass; lithium is written ${}_3Li^7$, indicating three positive charges and seven units (3 protons, 4 neutrons) of mass. Uranium is written ${}_{92}U^{238}$, indicating 92 positive charges and 238 units (92 protons, 146 neutrons) of mass.

The neutron, since it has unit mass but no charge, is written ${}_0n^1$; the proton with one positive charge and one unit of mass (thus being approximately equal to the H nucleus) is written ${}_1p^1$; the electron with one negative charge but no mass (for equating purposes) is written ${}_{-1}e^0$. The concept of the positron, a kind of positively charged electron, need not be considered here. In any nuclear equation, subscripts and superscripts must balance.

To the extent of present knowledge, no free fissionable material exists in natural form except in trace amounts. Following Meitner's brilliant hypothesis, however, techniques were devised to isolate the theoretically fissionable isotope of uranium. This can be done by the mass difference principle, or, more commonly, by gaseous diffusion as the halide UF_6. Despite chemical disadvantages, fluorine, being mononuclidic, is efficient for the purpose. The amount of ${}_{92}U^{235}$ in "run of the mine" uranium is about 0.7 per cent. A second isotope, ${}_{92}U^{234}$, exists in trace amounts.

The remaining ${}_{92}U^{238}$, about 99.3 per cent, not being fissionable, must be converted into a fissionable element. This is done by controlled transmutation in the atomic pile, the static modifiers being either H_2^2O (deuterium water), or graphite.

Controlled reaction is initiated by injection of a neutron into the uranium nucleus to produce a new isotope—

(a) ${}_{92}U^{238} + {}_0n^1 \rightarrow {}_{92}U^{239}$

This isotope, being radioactive and unstable, ejects an electron—

(b) ${}_{92}U^{239} - {}_{-1}e^0 \rightarrow {}_{93}Np^{239}$

—to become the artificial element neptunium, which, also being unstable, breaks down by similar change—

(c) ${}_{93}Np^{239} - {}_{-1}e^0 \rightarrow {}_{94}Pu^{239}$

This is the fissionable, mildly radioactive and stable element plutonium.

Atomic explosion results from uncontrolled fission which is spontaneous in any supercritical mass of ${}_{92}U^{235}$ or ${}_{94}Pu^{239}$. Uncontrolled fission is the autoprogressive attainment of nuclear instability effected by the injection of neutrons; the following is the generalized equation

(d) ${}_{92}U^{235} + {}_0n^1 \rightarrow {}_{30\text{-}40}\text{"X"}^{85\text{-}100} + {}_{52\text{-}62}\text{"Y"}^{130\text{-}150} + 1\text{-}3\,{}_0n^1 + E.$

A characteristic reaction produces, as the "X" and "Y" intermediates, the two elements strontium and xenon, thus—

(e) ${}_{92}U^{235} + {}_0n^1 \rightarrow {}_{38}Sr^{95} + {}_{54}Xe^{138} + 3\,{}_0n^1 + E.$

—in which the Sr and Xe are extreme isotopes outside the proton/neutron stability range and hence very radioactive.

The fission reaction of $_{94}Pu^{239}$ follows the general equation.

It will be noted that the free neutrons (necessary to continue the reaction), which are produced at any stage, may vary between one and three in number, depending on the proportion of "X" to "Y" which is indeterminate. For a long series the average will be two. The chain reaction may reasonably be called a geometric progression.

The Determination of "E"

In the equation (e) above it would seem that the two sides balanced without the factor *E*. This is not, in fact, the case.

Early in the century, Einstein asserted that at the basic level matter and energy were interchangeable, being manifestations of the same cosmic material, and that this relationship could be expressed by the equation $E=MC^2$ in which E is the energy in ergs, M the mass in grams, and C the velocity of light in cm/secs. Thus, C^2 is a numerical constant, 9×10^{20}.

An illustration of the application of this hypothesis lies in the fact that in any atom—

The sum of the mass, or "atomic weights", of the constituent protons, electrons and neutrons is always greater than the mass of the atom itself.

Considering Sodium, $_{11}Na^{23}$, as an example—

Mass of 11 protons plus 11 electrons[1]	11.08932
Mass of 12 neutrons....	12.10716
Sum............	23.19648
Actual mass of Na atom	22.99618
Difference.......	.20030

This loss of mass of components, when physically associated as a nucleus, is referred to if considered as weight, as the "mass defect" (symbol $\triangle$); if considered as energy, as "binding energy", a term that implies its presumed function in holding the nucleus together. To express mass defect as binding energy, it is multiplied by the factor 931 (the derivation of which need not be considered here) to obtain a value in million electron volts. In the case of Sodium, above, this value is 186.48 MEV[2] or 8.08 MEV per particle.

The mass defect of any of the heavy fissionable elements is greater than the sum of the mass defects of the immediate fission products. The statement, $\triangle$ U235 $>$ Σ $\triangle$ "X", $\triangle$"Y", is valid for any fissionable element. It is this difference, or net mass defect, that represents the convertible energy. In the case of $_{92}U^{235}$, for example, it amounts to about 200 MEV. As in one gram of Uranium there are some 2×10^{21} atoms, the energy release involved is theoretically 4×10^{23} MEV. In practice, because of imperfect obturation (i.e. bomb casings below ideal strength and density) it is less than this. However, the energy equivalent of the fission of one kilogram of $_{92}U^{235}$ is of the order of 8.4×10^{20} ergs, or 23 million kwh. By the equation $E=MC^2$, the actual mass here involved is approximately 0.94 gram. (*Effects of Atomic Weapons*, 1-37).

These are impressive forces. The radiological phenomena accompanying them are equally impressive.

Types of Radiation Present in an Atomic Burst

Not long after the isolation of radium by the Curies, Rutherford, doubtful that the Ra emission was no more than analogue of X-rays, proved in a series of experiments that it was, in fact, composed of three distinct types of radiation, namely—

(1) *Alpha Particles* of double positive charge, negligible penetration and high ionizing power, essentially He nuclei ($_2He^4$).

(2) *Beta Particles* of negative charge, moderate penetration and high ionizing power, essentially electrons, and

(3) *Gamma Rays* unaffected by an electro-magnetic field, of very great penetration and low ionizing power.

These are all emitted in an atomic burst. Their proportion and significance vary, as the type of burst—air, near-ground, ground, or underwater.

Air Burst

In an air burst well above ground most of the alpha and beta particles are captured and dispersed in the upper atmosphere. The gamma rays, on the other hand, by reason of their penetrating power and the enormous quantities in which they are emitted, are an exceedingly

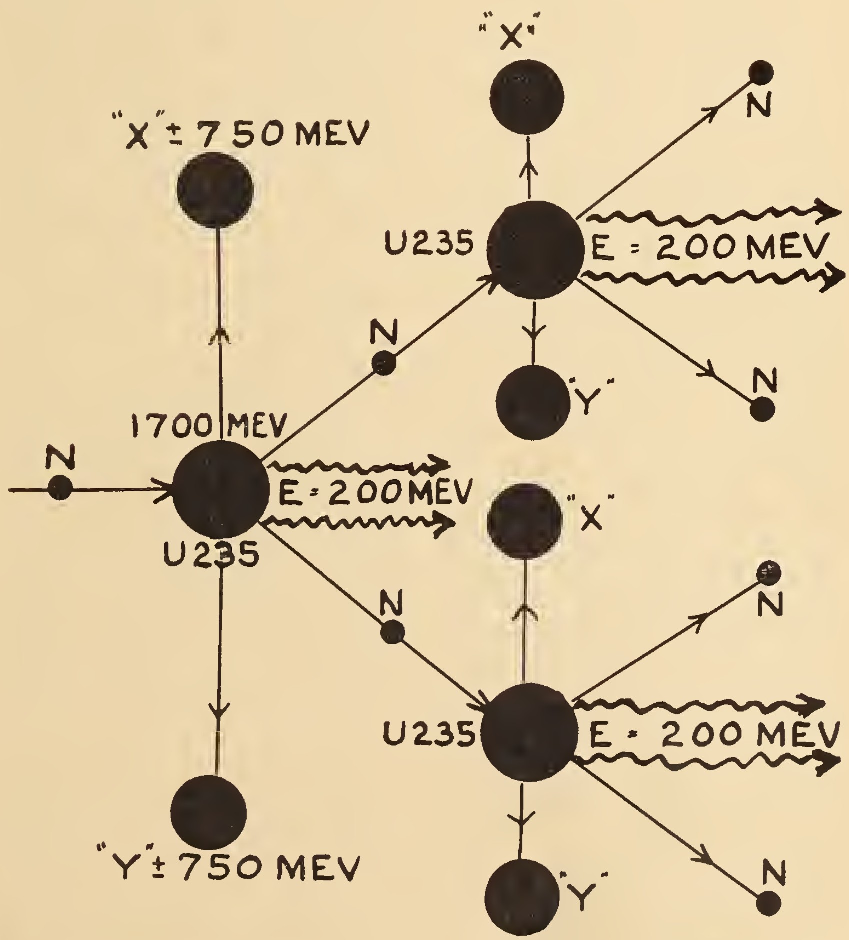

Fig. 1. Diagrammatic representation of energy release in the fission of U-235.
Drawings by A. I. Cook, S.E.I.C.

[1]Mass of the electron in 1/1838 that of the H nucleus, hence it is negligible in equations of mass. It becomes important in energy conversions where it is multiplied by the large constant, 9×10^{20}.

[2]One MEV equals 1.6×10^{-6} erg, or 3.8×10^{-14} calorie. It is the energy acquired by a unit charge of either sign when accelerated by a potential of one million volts.

lethal hazard. About half the total gamma radiation takes place at the instant of explosion, the remainder over a period of one minute to ninety seconds. This delayed radiation is many times more intense than the prompt radiation, much of which is absorbed or attenuated by the bomb material while it is still relatively dense. This is the reason why, even after exposure to the "flash emission," it is important to take whatever cover is at hand.

Within 4000 feet of ground zero practically all persons exposed to gamma radiation will receive a lethal dose; however, within this radius most of those caught unprotected would in any event be dead from traumatic causes or flash burns, so the point is academic. The highest percentage of surviving radiation casualties will be found between 4,000 and 8,000 feet of ground zero.

Gamma-ray intensity varies inversely as the square of the distance from the source. It also falls off in direct ratio to the thickness and density of any homogeneous shielding material. The following table is a calculated estimate of adequate shielding at 3,000 feet:[3]

Lead . . .	4 inches
Steel . . .	8 "
Aluminum	16 "
Concrete .	36 "
Earth . .	42 "
Water . .	60 "

In summary: In a high airburst, incident gamma radiation is a serious, transient, personal hazard. By reason of its low power of ionization, this gamma radiation has very little persistent effect on material. With certain reservations, it may be said that in the case of an airburst the disaster area can be entered in safety within a very few minutes, so far as residual radiation is concerned.

All other types of burst, underwater, ground or near-ground, while less devastating in terms of the blast area involved, raise problems of residual radioactive contamination. The extent and duration of such residual radioactivity may vary greatly, but it should be assumed that in all cases protective and decontamination procedures may be necessary if casualties and the disruption of administration and production are to be avoided or minimized. A marginal industrial area left functionally operative by reason of its position or of some vagary of the Mach effect, may, if unprepared, be neutralized for an indefinite period by residual radiation, with many of its inhabitants hospitalized by avoidable radiation sickness.

Before considering the characteristics of low-level or subsurface bursts, however, it is as well to note that there is still too little empirical knowledge of residual radiation phenomena to permit definitive description of their effect. From the 1951 Eniwetok tests (tower bursts, or the equivalent of very low air bursts) it appears that earlier estimates were exaggerated. No serious contamination was found outside the destroyed area, significant residual radiation being confined to a radius of about 1,000 feet from ground zero or less than the extent of total devastation.

On the other hand, the circumstances of actual attack on the complex of an industrial city may vary greatly from those obtaining on a South Pacific island. The area and character of potential hazard can be increased by several factors, including (a) very dry soil conditions; (b) high surface winds; (c) concentrations of metallic oxides, common in manufacturing areas; (d) the presence of carbon in significant deposits and in airsols; (e) the carrier agency of clouds of drifting smoke and combustion gases from the conflagration area.

Moreover, there is the inescapable danger that the attacker may deliberately "rig" the bomb by encasing it in a metal specifically susceptible to radioactivation. Cobalt, $_{27}Co^{59}$, (which transmutes to radio cobalt 60) has been suggested in this connection as the isotope is a radical beta- and gamma-emitter with a half-life of about five years. While, then, the experience of the last Eniwetok tests is to some extent reassuring, it does not invalidate precautionary measures.

Ground Burst

Only in exceptional circumstances would a ground burst be strategically desirable, since the involved area is reduced and the increase in blast effect is unnecessary. It may result from a fault in fusing, either mechanical or human.

In varying degree, radioactivity will be present in the dust cloud above and surrounding the crater. Within a few minutes the cloud may spread and give rise to fall-out. The extent of such spread is determined by the factors of wind direction and velocity, and the rate of descent of the particles, which varies as their size and the density of the atmosphere. The mean is about 1000 feet per hour. Ordinary meteorological methods can accurately foretell fall-out after any observed burst.

Primary radiation, in the case of a ground burst, is reduced. At ground level, the prompt gamma radiation would be absorbed by buildings (as the shock wave travels slowly)[4] and the delayed gamma radiation would be attenuated by debris, the dust storm and any low topographical features. There remains, however, definite hazard from other radiological phenomena. These are:

(a) *Fissioned and Unfissioned Products.* In any atomic explosion, a wide range of fission products is produced, comprising the radioactive isotopes of thirty or more elements. The half-life of these may be a few micro-seconds[5], or several million years, the intensity of emission varying directly as the rate of radioactive decay. Many of these isotopes undergo several transmutations in the course of a few days or weeks. In sum they form a complex and indeterminate mixture. A significant amount of unfissioned radioactive material, Plutonium for example, is also encountered.

(b) *Induced Activity.* The neutron flux is a phenomenon accompanying fission. In part, it is the end product of the chain reaction. To complete the fission of one kilogram of Plutonium, about 80 stages in the geometrical progression[6] are required. In the last stage 2.5×10^{24} nuclei are fissioned, each releasing two neutrons which then have no target. From this source alone some 5×10^{24} neutrons are freed. In a high burst few of them reach the earth's surface, but in the case of a

[3]Table of the R.C.A.M.C. School of Atomic Warfare. These thicknesses are calculated to reduce dosage to about 50r. In *The Effects of Atomic Weapons* (7.45) the following thicknesses are given as effective, at distances greater than 3000 feet, in decreasing dosage to less than LD50 or 400r; lead 2 inches, iron 4, concrete 12, earth 20. The two tables correspond except in the case of concrete, where the Canadian figure is 50 per cent greater than the U.S. figure. The Canadian table is the more recent calculation.

[4]At 8000 feet from ground zero, the primary shock wave travels at about the speed of sound.

[5]For example: Polonium's half-life is 3×10^{-7} second. Plutonium has a half-life of about 2.4×10^{4} years. As it is an alpha-emitter, it transmutes spontaneously to isotopic Uranium and Thorium, thus: $_{94}Pu^{239} - _{2}He^{4} \rightarrow _{92}U^{235} - _{2}He^{4} \rightarrow _{90}Th^{231}$ and so on through the natural series to Pb.

[6]Time required to fission one kilogram of Plutonium, assuming perfect obturation, is 8×10^{-7} sec.

low or ground burst, neutron reaction with accessible elements on the ground or in the dust cloud will produce radioactive isotopes.

Such isotopes decay at varying rates with the emission of beta particles and gamma radiation. The Sodium atom, found in appreciable quantities in ordinary soil, can become beta- and gamma-emitting radiosodium 24, the half-life of which is about 15 hours. Structural metals, including copper, zinc and the oxides of iron, may acquire radioactivity.

In summary: In the case of a ground burst, primary gamma radiation is reduced and the principal hazard becomes the dispersal of radioactive fissioned or unfissioned bomb material and of radiation which is neutron-induced in surface material. Exposed persons may be heavily contaminated by a radioactive agglomerate; most of this will be beta-emitting, but a proportion, enough to create serious concentrations, will be gamma-emitting; alpha emitters will be a hazard from any U^{235} or plutonium that is unfissioned and dispersed[7].

Low Burst

A low burst may be defined as an airburst, in which the ball of fire touches the ground, i.e., detonation at an altitude of 250 feet or less; it has no characteristics of its own, but shares those of the high air and ground bursts. The point of importance is that the ground surface turbulence will create a residual radiation hazard differing only in degree from that described above. In certain strategical circumstances the low burst might be a highly effective form of attack.

Underwater Burst

In a subsurface explosion at 250 feet or more of depth there is no characteristic "ball of fire", no thermal radiation and negligible danger from gamma or neutron radiation, most of which is absorbed in a few yards of water. The blast impact is enormous but falls off quickly, as demonstrated by the relatively slight damage to some of the periphery ships at Bikini.

The column of water, which rises to about 8,000 feet and involves not less than one million tons, contains a heavy concentration of radioactive residuals, radioactive minerals and the fission products of the explosion. The "base surge", so called, begins as a high wall of mist or water droplets superficially resembling a tidal wave. In a few moments, however, if the Bikini test is characteristic, the surge may leave the surface and assume the appearance of a swirling cumulus cloud; this also is heavily impregnated with a wide range of radioactive substances.

The extent to which the base surge washes or rolls over the land, or the column (in later stages the "plume") of water is deposited on shipping and harbour installations, will determine the area of *primary* contamination. Some minutes later the *secondary* "fall-out" from both plume and surge may considerably extend this area, particularly down wind, by the precipitation of radioactive "rain". The volume of deposited radioactive material will be commensurate with the percentage of solid matter in suspension or solution in the water, augmented by "borrowing" from the sea or river bottom. If this were as little as .0001 per cent, it would still amount to fifteen tons, a quantity which, in terms of radiation emitters, is prodigious.

The residual radiation persisting in sea or river water is a problem which does not fall within the scope of this paper. One aspect of it, the radioactivation of marine flora, infusoria and plankton and their subsequent ingestion by migratory fish, opens up a fascinating field to the biologist and biochemist.

Determination of Residual Radiation

After any contaminatory burst, it will be the duty of the Civil Defence authorities to survey radiologically the disaster area. This is done by trained monitor teams equipped with appropriate clothing, respirators, portable radio transmitters and gamma survey meters. Readings at known locations or co-ordinates are reported back to the control centre, where a team of plotters prepares overlays of iso-intensity lines. In a short time an accurate picture emerges; from it may be determined the degree of urgency of the evacuation of survivors and the permissible exposure time for rescue squads and other agencies. This picture will change from natural radioactive decay and the extension of the contaminated area by down-wind fall-out.

For large private organizations marginal to the disaster area—an industrial plant, a complex of factories or railway marshalling and storage yards for example—much *the same procedure must be adopted by management*, and immediate steps taken in personnel and property decontamination.

Detection Instruments (Ionization Chambers)

The Geiger-Müller counter (dial equipped) is an exceedingly sensitive laboratory instrument, reading in three stages from 0 to 20 mr/hr[8]. By reason of its limited range, it is unsuitable for monitoring heavily contaminated areas. It is essential for research work, minimal detection and the determination of external personal contamination. The G-M counter should be fitted with a beta probe and a jack for ear-phones.

The gamma survey meter (which can also be fitted with a beta probe) is designed for the measurement of the much higher intensities encountered in monitoring. There are several sturdy models on the market; one of these in common use in the United States has four standard ranges:—

X 1,	or 0 to 2.5 mr/hr
X 10,	or 0 to 25 mr/hr
X 100,	or 0 to 250 mr/hr
X 1000,	or 0 to 2500 mr/hr

Another model has five ranges, the highest being 0 to 120,000 mr/hr. All survey meters are somewhat temperamental, requiring daily checking and periodic calibration.

In certain circumstances, unfissioned alpha-emitting material may become a serious hazard. On account of the low penetrative power of the alpha particle, a special detector is required; this is the alpha scintillation monitor, which is selective in operation and eliminates all but minimal record of background count.

In addition to these intensity-measuring instruments, all monitoring and technical teams must be equipped with dosimeters to record the cumulative amount of radioactivity they may receive. Most models of the dosimeter resemble an oversized fountain pen. All of them are essentially electroscopes, the progressive collapse of the leaves from incident radiation being recorded under suitable magnification on

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[7]Air-borne particles can travel far afield. Dust from the Alamogordo, N.M., test was detected in Vincennes, Ind., and particles from the Las Vegas tests (1951) were recorded at the R.C.A.M.C. Atomic Warfare School at Camp Borden a few days later. The amounts are, of course, negligible.

[8]The unit of radiation measurement is the roentgen (r) which is defined as the amount of radiation that produces one electrostatic unit of ions of either sign in one cubic centimeter of air at normal pressure and temperature. As this is rather a large measurement, it is subdivided into milliroentgens (mr). An amount/time factor (intensity) is written thus, mr/day, mr/hr or r/day.

a scale graduated in milliroentgens. All workers must be equipped with film detectors in which darkening of tone accurately indicates accumulated dosage when compared with a standard chart. These "photobadges" are cheap and expendable. A third type of detector, made of activated salts that change color under radiation, has recently been developed in the United States.

Permissible and Hazardous Dosage

In Canada the legally permissible cumulative dose of radiation is 0.3 roentgen per week or 50 mr per day. This is about equivalent to establishing a permissible dose of alcohol at 0.5 gram per day. In emergency circumstances both radiation and alcohol can be absorbed in much larger amounts without serious results. As in the case of alcohol, individual tolerance to radiation will vary. It can be assumed, however, that between 25 r and 100 r, if acquired in a single dose, may result in mild radiation sickness. An accumulation of 200 r over a period of ten days or less is about the limit of tolerance of any individual. His recuperative power would then be so reduced as to render him "radioactively expended."

About 400 to 450 r in less than 48 hours is LD 50, that is to say, a lethal dose in half the affected cases. Six to eight hundred roentgens over a short space of time may be considered LD 100.

In all estimates of radiation dosage the determining factor is the intensity multiplied by time of exposure. Indeterminate factors are the body area exposed and individual tolerance. Cumulative dosage can be easily recorded (see above).

However, radiation sickness and death can result not only from external gamma radiation, as described above, but equally from *internal* radiation by the lodgement in the body of alpha, beta, and to some extent gamma emitters, carried on material particles. Such radioactive particles can obtain entry by inhalation, ingestion, or adsorption through cuts or abrasions. Since alpha and beta particles are intensely ionizing, they can do great harm when embedded in tissue or bone marrow. It is difficult, if not impossible, to dislodge them and there is very slight physiological tolerance of internal radiation. Deterioration is progressive and frequently fatal.

The following table makes clear the relative hazards of the three types of radiation in terms of penetrating and ionizing power. (For full discussion of the medical aspects of radiation, see Behrens et al: "*Atomic Medicine*": Nelson, 1949.) Table I.

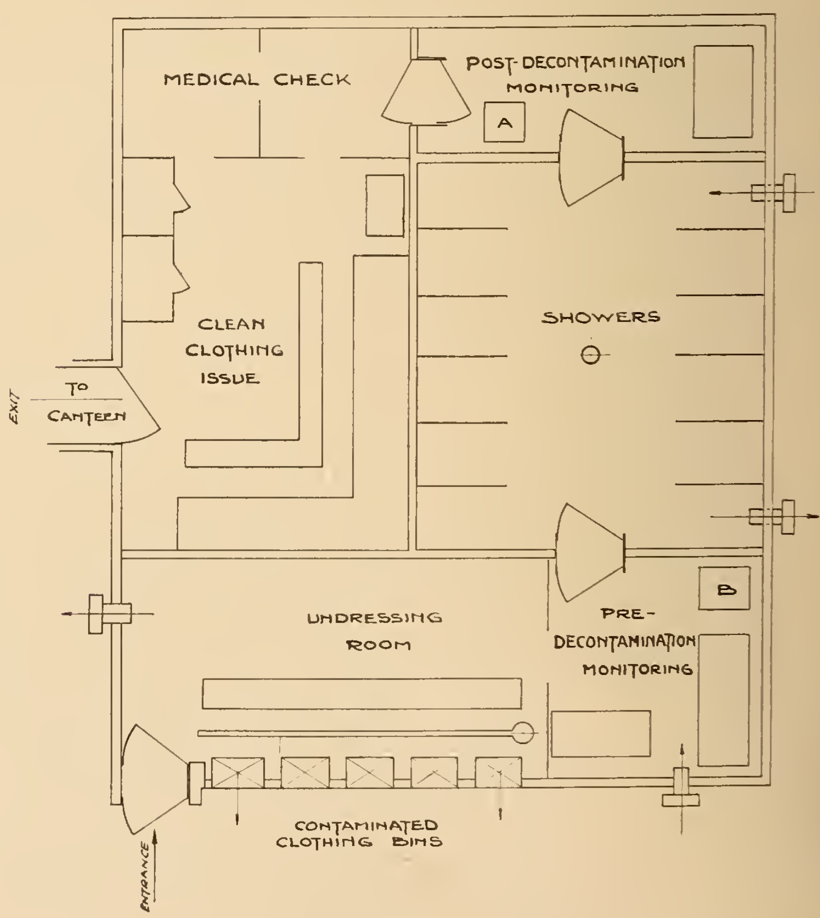
Table I

	Range in		*Specific Ionization*	*Specific[9] Hazard*
	Air	*Tissue*		
Alpha++	3 cms	0.01 cm	10,000	Internal: Very great
Beta−	300 cms	1.00 cm	100	Internal: Skin burns possible
Neutrons	2.5 x 10^4 cms	8.00 cms	8	External
Gamma	3.0 x 10^4 cms	10.00 cms	1	External

Neutrons can cause ionization by ejecting protons from nuclei in the body tissues—for example: ${}_7N^{14} + {}_0n^1 \rightarrow {}_6C^{14} + {}_1p^1$, the ejected proton causing intense ionization: or if captured by a Hydrogen nucleus thus, ${}_1H^1 + {}_0n^1 \rightarrow {}_1H^2$, will produce gamma radiation. Moreover, while it is practical to speak of massive gamma radiation as external, it is also true that many embedded isotopes (of Calcium, Barium and Iodine, among others) emit gamma rays as *internal* radiation.

Persons who have been exposed to external or gamma radiation in any serious amount must come under medical supervision and possibly be hospitalized. There is no *post hoc* method of assessing the dosage received. Those who have escaped external radiation, but who have been exposed to the radioactive cloud which follows any but a high air burst, will probably be heavily contaminated in clothes and person.

[9]For a specific instance of the alpha particle as villain, see story in TIME for May 28, 1951.



LAYOUT OF A SIMPLE DECONTAMINATION CENTER

Fig. 2

Immediate and radical measures must at once be taken to remove the contaminants which otherwise may become lodged in body tissue with serious and frequently fatal results.

Prior to thorough decontamination, such persons must not eat, drink or smoke, since these may be the means of entry of emitting particles. Respirators should be worn until they reach a decontamination centre. There they should be instructed and supervised in self decontamination.

The Decontamination Centre

In the illustration of a simple decontamination building, it will be noted that provision is made for six stages in procedure.

1. Removal and disposition of contaminated clothing. To prevent build-up of radioactivity, this room should be ventilated by forced intake through a respirator canister or other filter and a flow of clean water maintained over the floor. Contaminated clothing bins should be accessible from the exterior.

2. Pre-decontaminating monitoring. Here Geiger readings can be taken and given to the post-decontamination monitor over an intercom, each individual being identified by a numbered metal tag. Long hair should be clipped. Provision for safeguarding money and personal effects is made here.

3. Hot showers (pressurized) and wash basins. A concentration of 1.5 to 3 per cent citric acid in the water is desirable. Supplies of soap, detergents and body brushes should be lavish.

4. Post decontamination monitoring. The decontamination factor, "before" to "after", should be about 1,000 : 1; if it is much less than this, the individual must be sent back to the showers. Final reading should not exceed double the background count. If it remains high, embedded particles may be suspected.

5. Issue of fresh clothing,

6. Medical check, particularly of cuts, abrasions, body openings and mucous tissues.

In the decontamination centre all interior surfaces should be of some readily cleaned material which is resistant to mechanical adhesion. Any unbroken glaze, certain plastic paints, or polyethylene are suitable finishes. Concrete floors can be treated to offset natural porosity.

If possible, clothing should be washed, not destroyed. Thorough laundering with complexing agents and detergents will give good results. It must be remembered that, after a disaster, all clothing will be in short supply, so that existing stocks become important out of all proportion to their intrinsic value. The conversion of usual laundry facilities to effective decontamination units is quite simple.

Material Decontamination

Many factors are involved in the decontamination of land areas, industrial buildings and their installations. The first step is the determination by monitoring of the concentrations and intensity of radioactivity. From this data a priority programme can be set up, considerations being the safety of personnel, the safeguarding of water supply and the relative urgency of various branches of production or operation.

This entails a management decision as to disposal, storage, shielding pending later decontamination, immediate decontamination or utilization under hazardous conditions. The last may be justified by emergency conditions; if so, it will necessitate a turnover of operators proportionate to the intensity of radiation. Heavily contaminated areas must be placarded—for example, "RADIOACTIVE — KEEP OUT" or "SAFE FOR 10 MINS. ONLY". Decontamination teams and disposal squads must be suitably clothed and equipped with respirators. If possible, a monitor should accompany them.

Choice of procedure will depend upon the nature of the surfaces or equipment involved and the decontamination agents available.

Plant and Equipment

Radioactive dust adheres to surfaces by simple mechanical attraction, embeddment, adsorption or chemical valence bonds. Any one of a variety of decontamination methods may prove effective—complete removal of the surface, wet or dry sand-blasting, hosing down with soap or detergents or live steam under pressure. Surface removal may be mechanical or chemical, i.e., by paint removers, acids or alkalis. For instruments or precision machinery, solvents are indicated—any of the alcohols, gasoline, acetone, butylacetate or carbon tetrachloride. In certain cases (notably, unfissioned Plutonium) complexing agents such as sodium salicylate or sulphate, or citric or carminic acid may prove effective.

So wide will be the variety of problems encountered and so limited is practical experience, that all methods must to some extent be *ad hoc* and speculative. Commonly available agents include:—

(a) Water, under pressure or applied manually.
(b) Steam.
(c) Soap and detergents.
(d) Abrasives, in wet or dry application.
(e) Solvents and complexors; boiler compound: "Gunk".
(f) Chemicals; organic or inorganic acids or a combination of both; alkalis; paint removers.

Chemical action concentrates or facilitates the removal of contamination material; in no circumstances can it, of itself, affect radioactivity. Burning merely disperses part of the radioactive atoms in the smoke and gases of combustion and concentrates the remainder in the ashes. Most radioactivity will be found in components of oxides, nitrides and carbonates. Unfissioned Plutonium or Uranium may be chemically unassociated.

Dangerously radioactive areas or machinery can be shielded by earth-filled wooden walls, sandbags or water-filled gasoline drums. These methods will not be 100 per cent efficient, but they may reduce intensity to a point where it is possible to work safely in the vicinity.

Water and Food Decontamination

Streams of any considerable flow will decontaminate themselves fairly rapidly. Reservoirs and static surface water may have to be treated. Natural settling out is about 60 per cent effective but usually slow; coagulation and sedimentation will account for 85 per cent; standard filtration methods are about 98 per cent effective; ion-exchange resins are 100 per cent effective. Underground sources and deep wells (if uncontaminated by surface drainage) are usually safe.

All exposed foodstuffs must be suspect. Canned goods or food heavily wrapped or in dust proof receptacles are unlikely to be contaminated, but in all cases the container or wrapper should be thoroughly washed before it is removed.

Soil and Road Surfaces

Radioactive material tends naturally to concentrate in soil. The most practical treatment is to plough it under a foot or more so that the radiation is to some extent sealed in. Ground must be well wetted down to minimize dust spread. Areas which cannot be adequately treated

Emergency Decontamination Organization

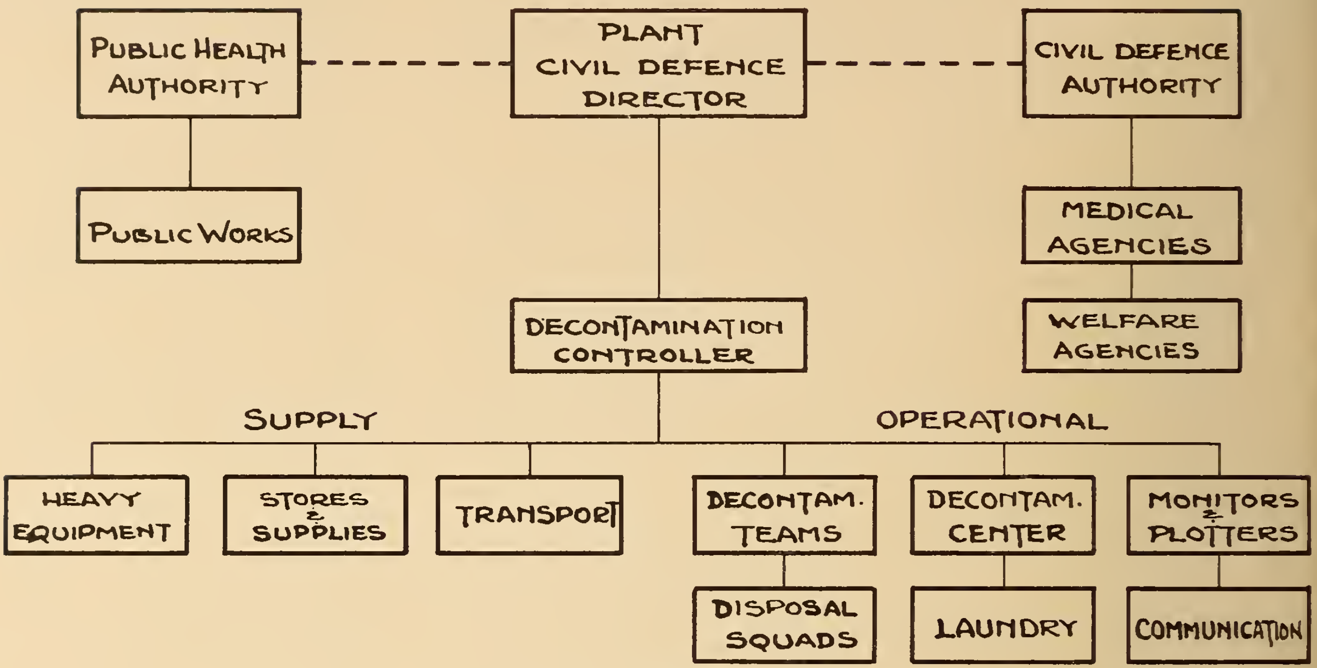


Fig. 3

should be roped off and placarded. In some instances it may be advisable to lay duck-walks over heavily travelled routes.

Road surfaces of bitumen, brick, macadam, concrete or other porous material are difficult to deal with. Sluicing down or scrubbing is of little use. An overlay, of wood or sod for example, may be a partial solution.

Disposal Control

No chemical treatment or disposal technique neutralizes radioactivity. The active material is simply removed from one place to another, concentrated for facility in shielding, or diluted. In its disposal, therefore, thought must be given both to location and method. In most cases the rather large volume of contaminated water involved must be drained or channelled into a water course. Large rivers or those of rapid current can deal safely with considerable amounts of radioactive material by dilution, adsorption and extended deposition. Sluggish streams or static water readily accumulate dangerous concentrations.

Dry materials, such as unsalvageable clothing, contaminated tarpaulins, food stuffs, used cleaning instruments and the like can be buried under adequate soil cover and the location roped off and marked. Burning, except under rigid control and down-wind from any inhabited area, is not a recommended procedure.

Advance Planning

All industrial units or groups should have both a plan and an organization for decontamination prepared in advance and well rehearsed.

These are the main points of consideration:—

(a) Inclusion in the plant civil defence set-up of a director of decontamination and of his specialized assistants (Figure 3).

(b) Selection and training of monitors and plotters, and the provision of detection instruments. Monitors must also be trained to check film badges[10].

(c) Stock piling of decontamination supplies and provisions for emergency clothing.

(d) Inventory of existing equipment suitable for decontamination work and, if necessary, provision for additional emergency equipment.

(e) Survey of available disposal sites in co-operation with local Public Health Authority.

(f) Provision of a personal decontamination centre with attached laundry and medical check facilities.

(g) Supply of film badges and respirators for all personnel.

(h) Basic education of all personnel. Civil Defence instructors will be available for this and for (b) above.

It will be apparent that in the light of present experience, or the lack of it, to cope effectively with extended radioactive contamination will call for foresight, ingenuity and imagination. Advance planning will go far to reduce this serious hazard. In any unprepared industry or community, loss in casualties and incapacitation will be very great. A prepared, equipped and disciplined community is the only possible answer.

[10]A practical geigerman sufficiently skilled for the purpose indicated herein can be trained in a few days. The Army has recently organized a course in the theory and advanced techniques of radio-detection.

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Masts and Guys Under Wind Action

by

Jack Alton, M.E.I.C.
Victoria, B.C.

The method, here described, of analysing the behaviour of masts and guys under the action of wind was developed by the author. It was effectively applied in connection with high, multi-guyed radio masts built by Marconi's Wireless Telegraph Company of London, England. The method has obvious application to any problem concerned with guys suspended between moving supports and subject to changes in length, unit loads and tension.

The masts referred to are sometimes 800 to 900 feet in height, and are stayed by guys attached at suitable points along their length, and to ground anchors set at appropriate distances from the mast base—the latter being of the ball-and-socket type. Under wind action the mast "heels over", due to the wind load on the mast itself and on its supporting guys. It behaves as a continuous beam on yielding supports located at each guy attachment point.

If the actual stresses in this beam are to bear any relation to the design stresses, it is necessary to ensure that the guy attachment points remain in a substantially straight line in the "heeled-over" condition. The only available means of securing this vital requirement is in the imparting to the guys of the proper initial tensions when no wind is acting. Furthermore, the magnitude of the final guy tensions, and the resulting thrusts down the mast, must be ascertained for purposes of design. These tensions are similarly dependent on the values selected for the initial tensions.

It is customary to establish the maximum deflection to be allowed at the mast head from practical and economic considerations, and to arrive at the corresponding deflection at each guy attachment level therefrom by proportion. Any method of determining the proper initial tensions for the guys must, to be satisfactory, take account of the wind loads on the guys themselves. It must also take account of the elastic extension or contraction of the guys, resulting from changes of tension therein.

Fundamentals of Guy Behaviour

It may be well to recall the basic equations expressing the condition of a guy suspended in equilibrium in a relatively taut manner, as is the case with the guys here considered. These are:—

$$S = \frac{w\,C^2}{8\,T} \quad \ldots\ldots\ldots \quad \text{(i)}$$

$$L = \frac{8\,S^2}{3\,C} + C \quad \ldots\ldots \quad \text{(ii)}$$

where S = Sag of guy, normal to chord.
L = Length of path of guy.
C = Length of chord of guy.
w = Load per unit length of guy normal to chord, that is, the component, normal to the chord, of the resultant of the weight of the guy and of the wind load (if any) on the guy.
T = Tension in guy at its midlength and parallel to the chord.

Equations (i) and (ii) apply to both the initial and final conditions of any guy which, having been suspended between two supports initially fixed in relation to each other, and loaded only by its own weight, is subjected to a change of chord length (say due to mast movement), a change in tension (due to wind load on mast, etc.) and a change in the normal load along its length (due to wind on the guy itself) while the change in length of the guy resulting from elastic extension or contraction due to the difference between the initial and final tensions therein will be:—

$$L_1 \sim L_2 = \frac{(T_1 \sim T_2)\,C}{AE} \quad \ldots\ldots \quad \text{(iii)}$$

where A = Cross-sectional area of guy rope.
E = Practical modulus of elasticity of guy rope.
L_1 and L_2 = Initial and final guy lengths respectively.
T_1 and T_2 = Initial and final guy tensions respectively.

Equations (i), (ii) and (iii) make it possible to express the final chord length of the guy in terms all of which are known, in a given case, except the initial and final tensions. Adopting suffixes 1 and 2 to distinguish initial and final conditions this expression will be:—

$$C_2 = \frac{w_1^2\,C_1^3}{24\,T_1^2} + C_1 - \frac{w_2^2\,C_1^3}{24\,T_2^2} \pm \frac{(T_1 \sim T_2)\,C_1}{AE} \quad \ldots \quad \text{(iv)}$$

the final term in which will be positive or negative according to whether the final tension is higher or lower than the initial tension. The use of the known initial chord length in the last two terms, rather than the unknown final chord length, is necessary to render the equation useful, and obviously involves no appreciable error.

Application to a Guyed Mast

Turning to the general problem, the system shown in Fig. 1 will be investigated, where a mast is stayed by four sets of guys in plan, the guys being attached at four elevations. For clearness in exposition the wind

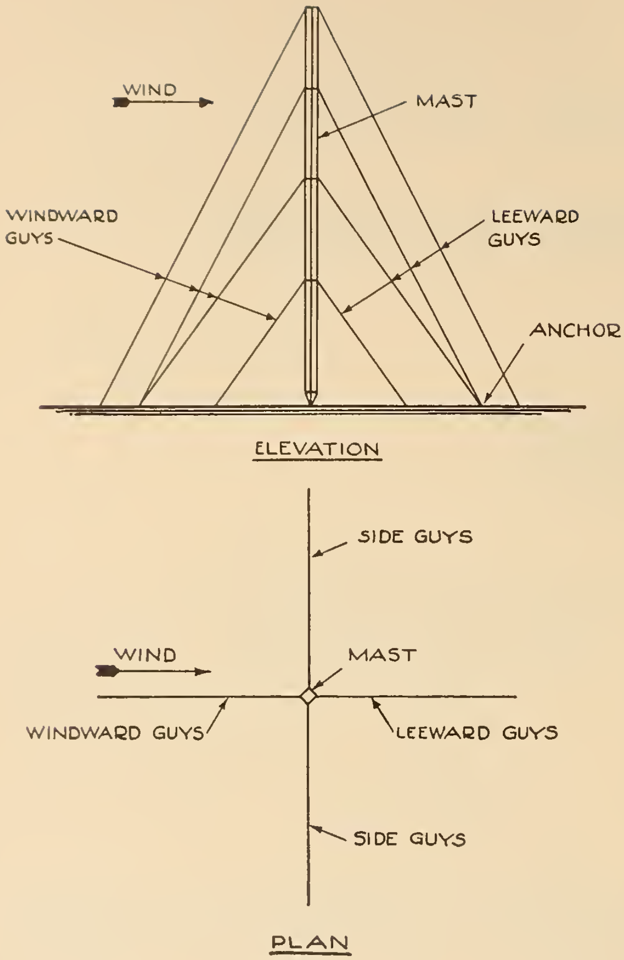

FIG. 1

will be taken as acting in the plane of one set of the guys. As will later transpire, it requires only minor adjustments in procedure to investigate conditions with other wind directions and guy arrangements. In Fig. 2 the guys attached at one guy attachment point on the mast are shown as illustrative, the ensuing treatment applying to all guys when the appropriate proportionate mast deflections, previously referred to, are used.

Fig. 2 shows the conditions for the two cases: (a) no wind on the system, hence no mast deflection and (b) with wind acting and mast deflected. Dimensions, loads and forces have been given suffixes 1 and 2 corresponding to the initial and final conditions on the windward side and 3 and 4 on the leeward side. The horizontal components of the guy tensions have been indicated as H_1, H_2, H_3 and H_4. It is patent that $H_1 = H_3$ corresponding to the "no wind" case.

Consideration of the horizontal equilibrium of the guy attachment point when wind is acting shows the relation between H_2 and H_4 to be:—

$$H_2 = H_4 + R \quad \ldots\ldots \quad \text{(v)}$$

where R represents the sum of the reaction due to the wind load on the mast at this guy attachment point and the horizontal load transmitted to the mast by the side guys attached at this level. It is convenient to re-state Eqn. (v) in terms of the actual guy tensions thus:—

$$T_2 = T_4 + R\frac{C_1}{a}$$

whence $$T_2 - T_4 = R\frac{C_1}{a} \quad \ldots\ldots \quad \text{(vi)}$$

Both windward and leeward guys being attached at the same elevation on the mast, they experience a common deflection d which may be expressed in terms

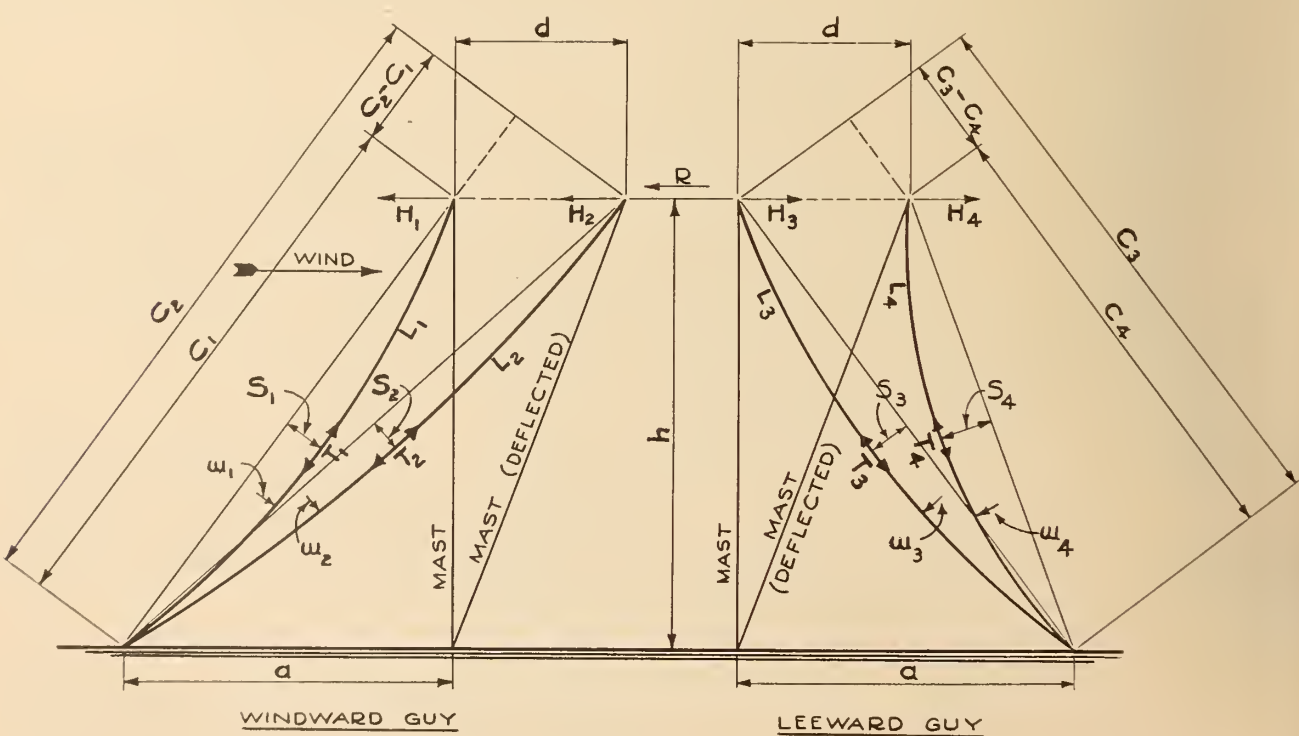

FIG. 2

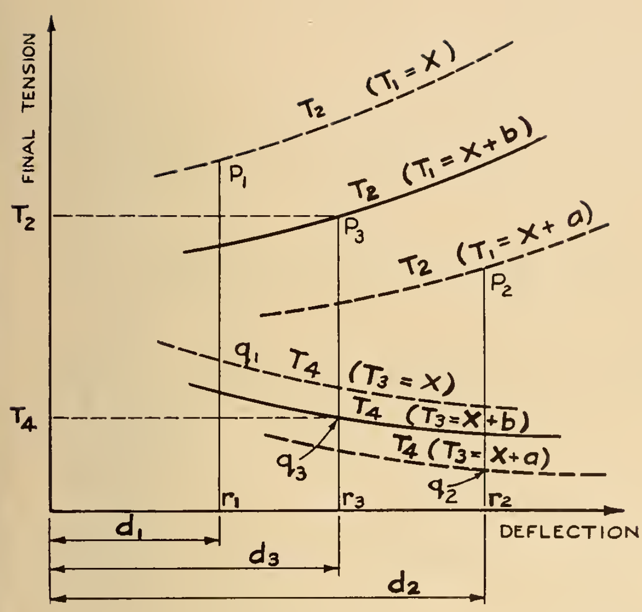

FIG. 3

of the changes in chord lengths of the respective guys. Thus, for the windward guy:—

$$d = (C_2 - C_1)\frac{C_1}{a} \quad . \quad . \quad . \quad . \quad . \quad . \quad \text{(vii)}$$

and, for the leeward guy:—

$$d = (C_3 - C_4)\frac{C_3}{a} \quad . \quad . \quad . \quad . \quad . \quad . \quad \text{(viii)}$$

Assuming that $T_2 > T_1$ and $T_3 > T_4$, which is true in all practical cases, it is now possible, from Eqns. (iv) and (vii) to write, for the windward guy:—

$$d = \frac{C_1^2}{24a}\left[\frac{w_1^2\,C_1^2}{T_1^2} + \frac{(T_2 - T_1)\,24}{AE} - \frac{w_2^2\,C_1^2}{T_2^2}\right] \quad . \quad . \quad . \quad \text{(ix)}$$

and, from Eqns. (iv) and (viii), for the leeward guy:—

$$d = \frac{C_3^2}{24a}\left[\frac{w_4^2\,C_3^2}{T_4^2} + \frac{(T_3 - T_4)\,24}{AE} - \frac{w_3^2\,C_3^2}{T_3^2}\right] \quad . \quad . \quad . \quad . \quad \text{(x)}$$

Summarizing we have, in Eqn. (vi), the relation necessary between the final tensions in the windward and leeward guys, to provide equilibrium at the guy attachment point and, in Eqns. (ix) and (x) the relation between mast deflection and guy behaviour for the windward and leeward guys respectively.

Determination of Initial Tensions

The requirement now is to ascertain that initial tension which, used in Eqns. (ix) and (x), will give (a) deflection d equal to the deflection required for rectilinear mast movement, and (b) such values of final tensions in the windward and leeward guys as will satisfy Eqn. (vi). The most expeditious solution of this problem is by means of curves derived from Eqns. (ix) and (x). The process is materially shortened when previous experience makes possible the selection at once of a trial value of the initial tension, approximating that actually required.

If a trial value, say X, is assumed for initial tensions, T_1 and T_3 curves as shown in Fig. 3 can be drawn representing Eqns. (ix) and (x) over suitable ranges of values of final tensions T_2 and T_4 in the windward and leeward guys respectively. Any ordinate, as $p_1\,q_1\,r_1$, will then indicate the difference between tensions T_2 and T_4 $(= p_1\,q_1)$ and the mast deflection $(= d_1)$ when that difference in tensions exists. The required difference in tensions is given by Eqn. (vi), that is, $p_1\,q_1 = R\,\frac{C_1}{a}$, and the sole ordinate that satisfies this requirement is readily found, the corresponding mast deflection d_1 read off and compared with the deflection required for rectilinear mast movement.

Too great a deflection will indicate that the trial value of initial tension assumed in drawing the curves was too low. Too small a deflection will indicate that too high an initial tension was assumed. New curves must therefore be drawn using higher or lower initial tensions $(X + a)$ or $(X - a)$ as indicated, the location of the ordinate satisfying Eqn. (vi) determined and this process repeated until, by converging approximations, an initial tension is found which results in the ordinate's lying at the correct point on the deflection scale.

Thus, in Fig. 3, three values X, $(X + a)$ and $(X + b)$ were successively tried, giving deflections d_1, d_2 and d_3, the last of which is found to correspond with that required for rectilinear mast movement, indicating that the last initial tension $T_1 = T_3 = (X + b)$ is to be used. It is to be noted that not only has the proper initial tension been established, but that the final tensions in guys can be read off at once and used for design purposes.

All guy tensions referred to hitherto have been mean tensions, that is, tensions at the midlength of the guys. Corrections must be made to such tensions to give maximum tensions, which occur at the upper end of the guy and which are required for mast and guy design; and to give minimum tensions, occurring at the lower end where the initial tensions will actually be measured. To adjust for the tensions at the upper and lower ends of a guy respectively, it is necessary to add to or subtract from the known mean tension, as arrived at above, half the product of the tangential component of the unit weight of the guy and the guy length.

Alternative Wind Direction

Remaining with the mast and guy system already treated, it is necessary to examine the case when the wind direction is normal to one of the mast faces, that is in a plane bisecting the angle between the planes of two sets of guys, rather than in the plane of one set of guys as previously taken. For this case the wind load reaction of the mast and the unit normal loads on all guys are different from the corresponding quantities previously used. Furthermore, there are now two windward, two leeward and no side guys to be considered.

It is, however, equally necessary to ensure substantially rectilinear mast deflection for this case also. This requirement is sometimes impossible to meet using the initial tensions found from the previous case. In such circumstances it is the practice to adopt those compromise values of initial tensions which give optimum conditions, both cases being considered. Fig. 4 illustrates the conditions at the guy attachment level for the second case of wind direction, now to be considered. The mast is shown in both its initial and deflected positions. The equations previously deduced remain applicable if adjusted to convert deflections and mast reactions into the planes of the guys.

It is apparent that such conversion is effected by dividing the r.h.s. of Eqn. (vi) by $\sqrt{2}$, and by multiplying the r.h.s. of Eqns. (ix) and (x) by the same factor. Curves similar to those in Fig. 3, but derived

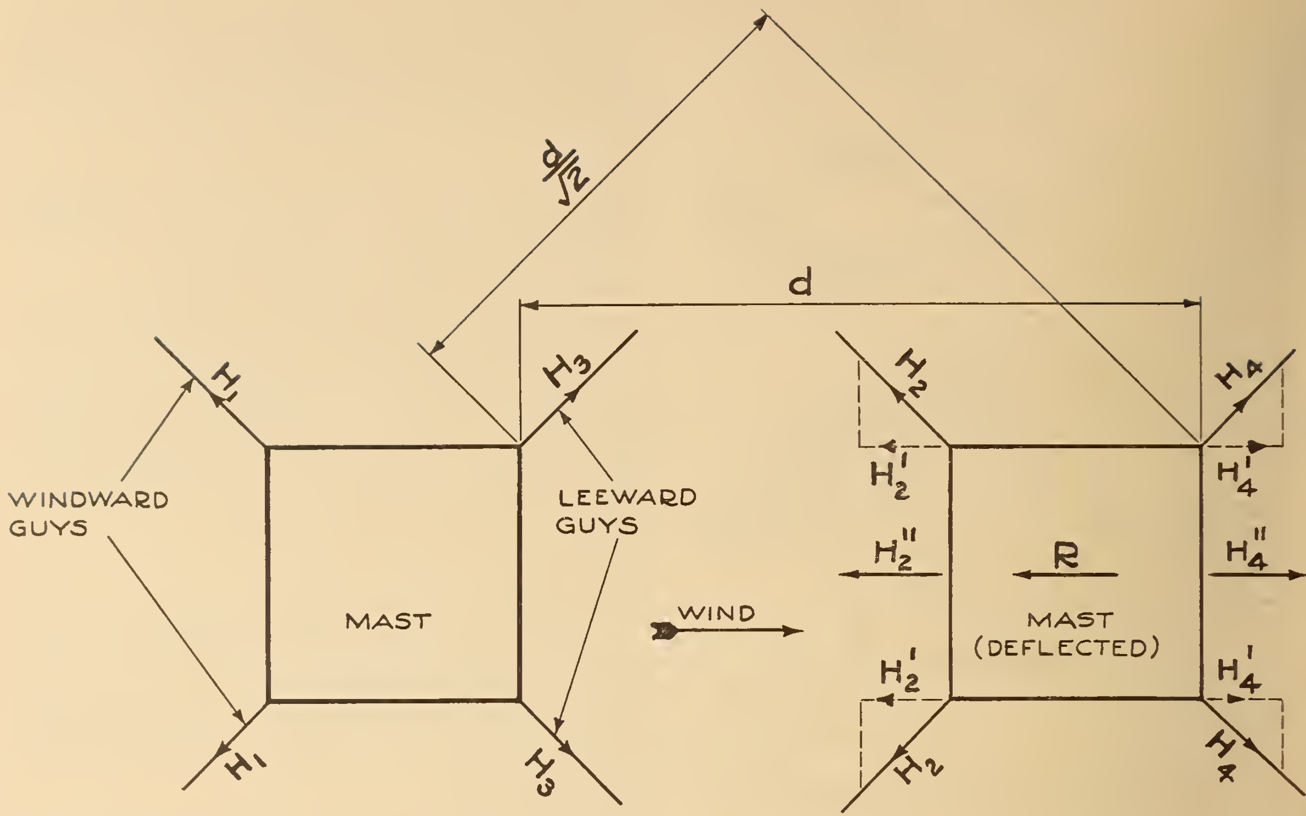

FIG. 4

from the modified equations, and using the same initial tensions as arrived at in the previous case, may now be drawn. From these the deflection of the mast under wind in this new direction may be ascertained. The final refinement may now be proceeded with, that is the adjustment of the initial tension to give optimum conditions for both wind directions.

Masts with Three Sets of Guys

The analysis in the case of a system in which a mast is stayed by three sets of guys in plan is similar to that of the system already described. Again the two possible wind directions must be examined (a) wind direction in the plane of one set of the guys and (b) in the plane bisecting the angle between the planes of two sets of guys. Consideration of the equilibrium of the guy attachment point immediately shows that Eqn. (vi) remains unaltered for both cases. The required conversion of the deflections into the planes of the guys calls for the multiplication of the r.h.s. of Eqn. (x) by 2 when used in case (a) and of the r.h.s. of Eqn. (xi) by the same factor when used in case (b).

Any extraneous horizontal loads imposed on the system by load cables, antenna pulls, backstays, etc., must obviously be taken care of in determining the reactions of the guy attachment points. Such loads will usually necessitate larger guys on one side of the system than the other. These will in turn call for differing initial tensions in the guys attached at the same guy attachment point. These factors are automatically cared for in the prescribed procedure when the corresponding values of mast reaction, unit loads on guys, guy cross-sectional areas, etc., are used. Similarly the effects of special conditions such as ice-covered guys, unequal distribution of wind pressure on the system, the breaking of one or more guys, etc., may be investigated with facility by appropriate changes in the procedure set forth.

The author feels no obligation to apologize for the somewhat rough-and-ready nature of the attack on this problem. It was found to result in an extremely useful tool in solving what seemed, at first, to be a hopelessly complicated conundrum. However, he became increasingly aware, while developing the method, that the devotion of more time to refined study of the mathematics involved might well lead to further simplification in the solution arrived at. He will be interested to see if such is the case. √

Meetings—1952

E.I.C. Annual Meeting, May 5-7, Hotel Vancouver, Vancouver.
Maritime Professional Meeting, September 1-5, St. Andrews, N.B.

The British Contribution to Science and Technology in the Past Hundred Years

An address delivered by His Royal Highness the Duke of Edinburgh, president of the British Association for the Advancement of Science, on the occasion of the 113th Annual Meeting of the Association, held in Edinburgh on August 8, 1951.

Published by special permission of His Royal Highness the Duke of Edinburgh.

My first and very pleasant duty to-night is to express to you, My Lord Provost, and to you, Mr. Principal, the British Association's deep gratitude for your charming welcome and for the splendid hospitality of the City and University of Edinburgh for this our 113th Annual Meeting. I think I speak for all members, young and old, when I say that we are glad to be back after only thirty years.

To mark the opening of this year's Meeting, His Majesty The King has been graciously pleased to send the following message:

> I shall be glad if you will express to the members of the British Association for the Advancement of Science my appreciation of their having once more honoured a member of my family by inviting him to be their President.
>
> I trust that this year's meeting of the Association will further the development of Science for the benefit of mankind throughout the world, and prove an encouragement to all those men and women who are so devotedly working for that end.

On your behalf I propose to reply in these words:

> The Members of the British Association for the Advancement of Science assembled at Edinburgh send Your Majesty their humble duty and their loyal thanks for Your Majesty's Patronage of the Association and your gracious message of encouragement.
>
> I am to assure Your Majesty that the development of Science for the well-being of Your Majesty's Realm and for the general welfare of mankind is the constant object of the Association.
>
> We will strive with all humility and with the grace of God to apply the blessings of scientific and technological improvement to the problems which face us all to-day.

In Aberdeen in 1859 my great-great-grandfather started his address to the British Association with these words:

'Your kind invitation to me to undertake the Office of your President for the ensuing year could not but startle me on its first announcement. The high position which Science occupies, the vast number of distinguished men who labour in her sacred cause, and whose achievements, while spreading innumerable benefits, justly attract the admiration of mankind, contrasted strongly in my mind with the consciousness of my own insignificance in this respect.'

I cannot improve on this to express my own feelings, but, like him, I reflected upon your invitation and came to the conclusion that it is just as an outsider, a layman so to speak, that I can be useful to you and to Science. This very invitation seems to me to demonstrate that Science is not a magic circle and that you wish us to enter your confidence. In return the least I can do is to show our appreciation of the work of scientists and to give you a layman's impression of the march of Science in the last hundred years. I crave your indulgence if I have drawn any false conclusions and I hope that during the meetings which will follow this one, the experts will take the opportunity to make any corrections.

The Prince Consort had very much less reason to be modest about addressing you than I have, because this year we celebrate the anniversary of the Exhibition which was his greatest achievement, and an event which had an untold value to Science. Let us hope that this year's Festival will be judged a worthy successor and an inspiration for the future. I am proud to pay tribute to this man who saw so clearly the part Science was destined to play in the future of this country, and my address to you to-night is largely the story of the fulfilment of his hopes.

The Starting Point

In a review of British science and technology, 1851 is a convenient starting point for two reasons. Firstly, the Exhibition of that year can be regarded as a gigantic stocktaking of the national resources and technical skill. Secondly, because it marked the end of the Industrial Revolution and the conversion of Victorian England to the policy of industrial expansion on which our future still depends. The period as a whole saw the climax of our industrial supremacy and its inevitable decline when countries with greater resources and population learned from us the lessons of the mechanization of industry. It also covers the birth and growth of the new concepts of modern science.

Social conditions of a hundred years ago were, generally speaking, the outcome of the Industrial Revolution, but with all the traditions of the England of agriculture, cottage industry, and small market towns. The population of 20 millions was growing fast but still small compared to our 50 millions of to-day. Education was limited to a minority and was almost entirely classical, so the new profession of engineering had to draw its recruits from a different sphere, that of self-educated men. A new wealthy class was growing up in the commercial world to rival the old aristocracy. There was unbounded optimism about the future and ample scope in commerce and industry to attract all intelligent and enterprising men. The number of poor was on the increase and their conditions were deteriorating because, as yet, no social conscience had grown up to replace the patriarchal responsibility of the landowners and master craftsmen.

In the domestic field, lighting was by candle and oil lamps, cooking and heating by coal or wood in ranges or open fires with the consequent enormous waste of energy. Food had to be fresh or crudely preserved, and thus needed to be produced locally. In health and hygiene the figures speak for themselves. In 1851 the infant death rate was 150 per 1,000 living births compared with 25 per 1,000 to-day. Anaesthetics, antiseptic surgery, biochemistry, tropical medicine, were all virtually unknown or in their infancy. Psychology had not yet achieved independence from philosophy on the one hand and physiology on the other.

This was the age of the practical engineer and of processes arrived at by intuition born of experience and by trial and error. Technology was concerned with the application of steam power, with metallurgy and the working of metals for various purposes, and with the production of machine tools and precision machinery. Men were already turning their minds to other types of engines and the internal combustion engine was in the process of development.

Scientists, while continuing their search for the secrets of nature, were beginning to turn their attention to exploring the empirical developments of industry. Their numbers as yet were small, the endowments for research were negligible and much of their work was carried out in the watertight compartments of the different sciences. But the seed had been sown and it was not long before scientists and engineers were preparing the way for the great technological harvest of the twentieth century.

The Conditions

The changes brought about in the lives of men and women in the last hundred years have been greater and more rapid than during any other period in history, and these changes have been almost entirely due to the work of scientists and technologists all over the world. They have not only affected the way of living of all civilized peoples but have also vastly increased our knowledge about ourselves, the earth we live on and the universe around us. I cannot emphasize too much that the sum total of scientific knowledge and technological progress is an international achievement to which every civilized country has made some contribution.

And now before considering the contribution of the British Commonwealth, I should like to sketch what appear to a layman like myself to have been the main influences on the course of scientific and technical achievement since 1851 and their relation to one another.

The great stimulus of the 1851 Exhibition created a growing interest in technical education and research, followed by a widening of the scientific horizon which was soon to find expression in borderline subjects. For the next fifty years science advanced rapidly, but in most fields there was a wide gap between science and industry. Electricity was an exception and the groundwork was already being laid for the electrical revolution of the Victorian age. Medicine was on the verge of breaking away from medieval practice and taking the first steps towards its modern pattern, while British colonial development stimulated the study of tropical disease.

Between 1851 and 1870 practice, in many industries, was ahead of science, and in that period the large number of inventions of the industrial revolution were progressively improved and widely applied. These inventions, which added so much to our industrial production, were mainly the work of British genius. They were of great economic advantage to this country and were quickly exploited commercially. New factories and plants were built to include the very latest ideas, and with the expansion of industry came the demand for more and more new ideas and greater efficiency. This demand was a direct stimulus to technological invention as well as an indirect stimulus to science. We are still struggling with the social results of this vast expansion.

From 1870 to 1890 the high-water mark of British industrial expansion, as compared with other countries, had been reached and the competition of the United States and Europe was just beginning to be felt. But the lack of serious competition hitherto had bred a feeling of over-confidence and satisfaction in the methods and processes employed. The result was a conservative attitude towards technical change and, particularly in the older industries, neglect of scientific research. Accumulation of wealth and the income from foreign investments in any case made the country as a whole less dependent on the efficiency of her industries. Concurrently a subtle change occurred in the type of British exports. So far the products of our machinery, such as rails and rolling stock, had been shipped abroad for immediate use, but now machines themselves were exported to do their work in the factories of Europe and America instead of in Britain. The result of this was to intensify foreign industrial competition between 1890 and 1914, but with the increasing demands from the Colonies the volume of British exports was not greatly affected.

Then came the critical years of the First World War bringing a realization of the part science must play in the industrial and military strength of the nation. For the first time in history a real attempt was made to enlist the services of science in the war effort and the Department of Scientific and Industrial Research was founded to further the application of science in industry through Government Laboratories and Research Associations.

The effects of these measures appeared clearly in the inter-war years when there was a marked swing of education from classics towards science. Coupled with this the war had directed the attention of many research scientists to practical objectives so that after the war there was a rapid expansion of industrial research. Scientific progress was no longer confined to the work of a few brilliant individuals, but came also from teams of research scientists each working on different parts of the same problem. It was during this period that many new commercial research laboratories grew up, employing scientists to discover new processes and materials connected with their industry as a direct weapon of competition.

The war had also shown a great weakness in our dependence on foreign production for many vital articles, such as dyestuffs, scientific instruments and optical glass, in the manufacture of which scientific research played an essential part. This weakness was remedied with the help of the Key Industry Import Duties which gave the necessary support and encouragement to the establishment of these industries at home.

It is true that manufacturers in some of the older industries still clung to traditional methods in spite of the pressure of competition from America and other countries. And in this connection it is significant that the history of production engineering after 1890 is almost entirely confined to the United States.

It was however a period of rapid development in Britain. The invention of the internal combustion engine and the pneumatic tire had opened new branches of industrial engineering, and the demand for fuel for motor cars and aircraft gave birth to the new technology of oil. In the electrical, chemical and aircraft industries, science was fully enlisted in the fields of electronics, synthetic fibres, plastics, aerodynamics and light alloys. Consequently the outbreak of war in 1939 found us in a much stronger position to meet the immense demands it made on all branches of technology for new gadgets, machines and weapons. From the outset science in all its forms and branches was harnessed and completely co-ordinated with the war effort. It was only the intimate partnership of science and engineering with the Staffs of the Fighting Services that enabled us to meet swiftly and effectively the everchanging menace of total war.

The tremendous demands on our industries had some good after-effects. Once again these demands revealed weaknesses where our industrial capacity was out of date. The realization of this has initiated comprehensive reconstruction on most modern lines. The almost complete absence of income from our foreign investments has forced us to rely once more on our capacity to make the goods the world requires. Our industry and productivity have shown a wonderful improvement, but there is still a lot more that can be done. The rate at which scientific knowledge is being applied in many industries is too small and too slow. Our physical resources have dwindled, but the intellectual capacity of our scientists and engineers is as great as ever and it is upon their ingenuity that our future prosperity largely depends.

The Contribution

I would now like to make a brief survey of the British contribution to natural knowledge and technology and pay a tribute to some of the great men of science of the last hundred years.

In some branches almost the whole story can be told since one problem after another has been solved by British scientists. In others there are many blanks and gaps where the vital links in the chain were forged abroad. But looking at the whole vast field of abstract and practical science there can be no doubt that during this period the contribution of the British Commonwealth has been of outstanding importance.

Our knowledge of the stars, the heavens, and our place in the universe has increased steadily through the centuries, but since 1851 some of the most important links were supplied by such men as Eddington, Jeans and Milne in their work on mass, luminosity and stellar evolution. Huggins made a great contribution with his application of spectrum analysis to astronomy, and Lockyer's discovery of helium in the sun had a significance far beyond the realms of astrophysics.

Coming nearer to the earth, the work of Abercromby and Shaw on the behaviour of the earth's atmosphere in the troposphere started the scientific study of weather and weather prediction, and Appleton's research into the ionosphere extended this to the upper air.

Chemistry has fascinated man from the earliest times, and vast progress has been made in the last hundred years both in knowledge and theory. Much fresh ground was broken by Crookes by his work on spectra, his discovery of thallium and of 'radiant matter' known later as cathode rays. Long after everyone was quite sure of the composition of the air, Rayleigh found another ingredient which he called argon and so started the hunt for other inert gases. In organic chemistry both Perkin and Robinson have added enormously to our knowledge of the structure of carbon compounds, and to our power to copy natural products synthetically. The development of X-ray analysis by the two Braggs, father and son, has given us a means of finding the actual arrangement of the atoms in the molecule and has revealed the accuracy of the chemists' conclusions about the architecture of molecules based on their reactions with one another. This is a most striking example of the power of the theoretical and practical scientist to penetrate nature's secrets.

Going beyond the chemist and his molecules we come to the physicist and the study of even smaller particles. Thomson's discovery of the nature of the electron was the first attack upon the integrity of the atom. Next, thanks to Rutherford's brilliant research and keen intuition, came the nuclear theory which revolutionized our ideas of matter. To prove it, he was the first man to succeed in the transmutation of an element. It is appropriate to mention Moseley's work on the X-ray spectra of the elements, as it already showed such great promise, before he was killed at Gallipoli.

Parallel with this activity in the physical sciences there occurred a technological revolution of even greater scope and variety. The Darbys of Coalbrookdale were the lineal ancestors of Bessemer, Thomas and Siemens, and the whole technology of metals. First cheap cast iron followed by cheap steel, then steel from phosphatic ores, completely changed the materials available to engineers, shipbuilders and architects. Scientific metallurgy can be said to have started when Sorby first applied a microscope to the surface of metals. The way was opened for the investigation of the metallic alloys which came in quick succession from developments in which Hadfield and Rosenhain made outstanding contributions.

It was not long before the possibilities of these new materials were recognized, and the great majority of the mechanical developments of the period were due to new alloys which could withstand higher stresses. But before these materials could be fully used Maudsley and Whitworth had to lay the foundations of production engineering, and Mushet had to do pioneer work in developing tungsten steel as the first high speed cutting tool.

The reciprocating steam engine of the industrial revolution was the main source of power until Parsons invented the steam turbine, which revolutionized large-scale power production on land and sea. But that was not the only source of power to rival the push-and-pull engine. The internal combustion engine, in which Dugald Clerk and Ackroyd-Stuart were among the early pioneers, has proved to be a formidable challenger in many fields. In marine engineering, Froude's work on hull forms and propellers enabled the full benefit of the new prime movers to be reaped at sea.

Here I wish I could mention early British pioneers of motor-vehicles but, as is well known, restrictive legislation drove the development of the motor-car abroad, until the repeal of the speed limit in 1903 gave scope to the genius of Royce, Lanchester and Ricardo. In place of the motor car, however, we have Lawson to thank for the invention of the safety bicycle; and all wheeled vehicles except those running on rails, owe their rapid development to Dunlop's invention of the pneumatic tire. The material required for this started the vast natural and synthetic rubber industry, and has made famous the name of Wickham for a brilliant feat of smuggling, when he brought the rubber seeds from Brazil to Kew, from which sprang the rubber plantation industry of the east.

In flying, the names of the pioneers and their feats are legion, and more than in any other mechanical science the development of aerodynamics has been shared by many nations, but Lanchester's vortex theory was one of the stepping stones to powered flight, and the achievement of Alcock and Brown in making the first Atlantic flight in 1919 speaks highly for the tremendous scientific and technological background of flying in this country. Of outstanding importance and consequence was the genius which Mitchell brought to aircraft design, and, more recently, Whittle's pioneer work has given us the lead in jet engine production both for civil and military use.

Following on the immense progress in metallurgy and mechanical engineering, the most far-reaching development of the period has been that of electricity and electronics. Although the key discovery belongs to Faraday in an earlier period, the second founder of the science is undoubtedly Clerk Maxwell, with his classic treatise on electro-magnetism. The use of electricity for domestic and industrial purposes was helped by Wilde's development of the dynamo and then by Swan's incandescent lamps. Wheatstone and Kelvin pioneered the use of electricity for communication by their work on line and cable telegraphy. Wireless telegraphy soon followed and the work on tuned circuits by Lodge, and Marconi's many brilliant developments made in this country with the General Post Office and the Navy, soon made radio a practical proposition. Heaviside and Appleton made further contributions on the propagation of radio waves. It is interesting to see that the technique used by Appleton in his pulse-ranging on the ionosphere and upper layers was later developed by Watson-Watt into radar which is now almost indispensable to airmen and seamen all over the world. And here Randall's development of the magnetron for high frequency radar was one of the major contributions to the Allies' equipment for war.

Television has a wide parentage, but Baird's name will always be linked with the first successful pictures.

Another great innovation of this hundred years was the discovery and development of plastic and synthetic materials. The story starts with Parke's discovery of celluloid and Cross and Bevan's manufacture of viscose which gave birth to the rayon industry and the many later types of synthetic fibre. Perkin's mauve, first of the aniline dyes and Kipping's new silicon compounds were, however, disregarded by industry in this country. But we see today a change of heart in the development of our industrial laboratories of two new plastics, perspex and polythene with almost an unlimited range of applications in the air, on the ground, and at sea.

The effect all this has had, upon the citizen varies naturally with where and how he lives, but basically it has given him reliable light and heat in his home, push button communication with almost any part of the world and home entertainment of a high quality. His transport on land, at sea, and in the air is quick, comfortable and clean. In addition he has a vast range of materials with which to clothe himself and to furnish and embellish his home. Almost more important, these developments have brought about a complete change in his conditions of work.

But if the citizen has benefited, so too has Science from the great array of new techniques that have been invented, and the new tools with which the scientist and technologist can burrow, hack and worry at the growing mountain of problems to be solved.

So far I have dealt with the physical sciences. Now I would like to turn briefly to the biological and psychological sides, which after a slow beginning in this country have made increasingly rapid progress.

The whole field of biological science in this period is overshadowed by the works of Darwin presented in his 'Origin of Species' and 'The Descent of Man.' Nothing has done so much to widen men's thoughts as his conception of evolution as the great law controlling living things, 'that progress comes from unceasing competition, through increasing selection and rejection.'

In the basic study of living things some of the most important contributions from this country were the pioneer work of Francis Galton and William Bateson in the field of heredity, Sherrington's work on the integrative action of the nervous system, and Dale's and Adrian's contributions to our knowledge of the transmission of nervous impulses.

The science of biochemistry is relatively new and Gowland Hopkins was its founder in this country. His discovery of the significance of accessory food factors, leading up to the recognition of vitamins, started the modern science of nutrition. Other landmarks were Bayliss and Starling's recognition of the part played by hormones in the blood stream, followed by Banting and Best's isolation of insulin, and Harington's synthesis of thyroxin here in Edinburgh.

Fleming working on mould cultures discovered the antibacterial properties of penicillin and later Florey and Chain, at Oxford, found that penicillin could be extracted in a highly purified form, and used it to treat human disease.

Modern surgery can be said to have been born in Scotland with Simpson's discovery of the use of chloroform as an anaesthetic and Lister's antiseptic technique based on Pasteur's bacteriological discoveries. A further advance of the greatest of value to surgery as a science was Macewen's aseptic technique which made surgery clean and safe, followed by his classic work on the brain and spinal cord.

If Lister was the father of modern surgery, then Manson was the father of tropical medicine, and it is particularly in this field that the British contribution has led the world. The discovery by Ross that malaria is carried by the anopheles mosquito and, much later, the work of Fairley in Australia on its prevention and cure have been of the greatest benefit to mankind. Bruce will always be remembered for his discovery of the part played by the deadly tsetse fly in the transmission of sleeping sickness and his work on Malta fever. Finlay, Adrian Stokes and Hindle stand high among the names linked with the study and prevention of yellow fever.

These were all vital efforts towards the prevention of sickness, but there is another aspect of medical practice in which the Commonwealth has taken a leading part—the promotion of health. It was Sir John Simon, the first Medical Officer appointed to a central authority, who made a careful statistical study of the causes of sickness, with a view to taking effective measures for the health of the community at large. Through his leadership health services have been provided in regular stages throughout the country. At first these were largely aimed at providing pure water, effective sanitation, and the abolition of slums; but since the beginning of the present century the *personal* health services especially in the case of mothers, babies, and school children, have become national in scope and lead the world.

There are two other fields in which the biological sciences play a major part. The first is in the preservation of food and in nutrition which has had the most profound economic, and social effects. The ability through freezing, drying and canning to import large quantities of food has enabled a rapidly increasing population to maintain and increase its standards of living, which would have been impossible had it been dependent on British agriculture alone. The scientific study of nutrition has made it possible to improve the health of the population and in war to feed the people with the minimum of waste.

Mort had the first freezing works in the world at Sydney, and was a pioneer in refrigeration, but success in transporting meat to Britain had to wait for the development of more reliable refrigerating plant. Since 1918 the Food Investigation Laboratories of the Department of Scientific and Industrial Research, of which Sir William Hardy was the first director, have established the basic biological knowledge on which the storage, and transport of meat, fish and fruit are now largely based.

The second field is in agriculture, where in order to compete with cheap foreign foods the most successful farmer is one who enlists the full assistance of science. Lawes, who discovered how to make and use superphosphate, and started the great fertilizer industry, was quick to realize this. He founded Rothamsted, now the oldest agricultural research station in the world, and there he and Gilbert carried out the first scientifically controlled field experiments which laid the foundation of agricultural science. Later, Biffen's pioneer work in plant breeding at Cambridge became one of the greatest contributions to the problem of feeding the world's growing population. He showed how it was possible to breed strains of wheat combining resistance to disease with high yields and good milling properties. In the field of animal breeding, the foundation of the most important aspect of British agriculture today, I will mention amongst the many investigators only Cossar Ewart and Crew who did so much to advance its scientific study here in Edinburgh. The mechanization which was to revolutionize farming in all parts of the world was also under way and Britain was playing a leading part. The reaping machine, for instance, was invented by Patrick Bell in 1826 although it was not manufactured until 1853.

There is no need to point out the effect which all these improvements, discoveries and inventions have had on Society. It is this group of biological sciences which have had the most far-reaching social results, and it is particularly during and since the last war that it has been possible to exploit them.

There is one science which I have not yet mentioned. It is both the youngest science and the oldest problem. The study of man's mind was the province of the philosopher until the middle of the nineteenth century, when it separated from him and began its independent existence as the science of psychology. The foundations were not laid in this country, but important contributions were made, both from the biological and the philosophical sides by men like Ferrier, Bain and Ward. Sully's work on child psychology was the first of its kind. But probably the most outstanding figure in this country was Galton, whose teaching is widely respected in all psychological laboratories, and who was the first to develop an interest in the mental differences between individuals — a field in which British psychology has made some of its greatest contributions. Again it is only recently that full practical advantage is being taken of the progress made in this branch of science, but the results of this application may be as important as the many more easily understood developments in the purely physical world.

The Implications

The story of the British contribution to science in the past century is indeed impressive and I am very pleased to have this opportunity to pay tribute to the men whose achievements I have been discussing. But this story would not be complete without studying the wider implications of their work and examining some of the lessons to be learnt from it.

The concrete measurement and indirect effect of all scientific effort is the general improvement in the condition in which people live and work, it is in the improvement in health, in the expectation of life and standards of living. The latter, including not only food and clothing, but housing, home comforts, medical care, education, books and newspapers, recreations and travel facilities. In every one of these directions the progress that has been made has amounted to a revolution.

Not all this springs directly from science and invention. Much has been due to the politicians and administrators, and behind them to religion, morals, education, art and the complex influences which we call culture. But even there science has stood beside the authors of progress to advise, to help and sometimes to guide.

Now as science and technology are so vital to the future strength and prosperity of the British Commonwealth, the great problem is to discover the conditions under which they are most likely to flourish. The records show that both depend very much on cooperation, and upon the linking up of a long chain of discoveries, one with another; so that it is quite exceptional for the credit of a great advance to belong to one man or even to one country, although it will always require the flash of inspiration to weld the links into the chain. Today the development of teamwork in laboratories has made this truer than ever. For many reasons, but principally because of the increasing complexity of research and its cost, such teamwork is becoming more and more the rule. We need not repine at this but it would be a disaster if the individual inquirer working in his own laboratory were discouraged out of existence.

While the quality of scientific work is determined by the quality of the scientist, the quantity of scientific output is determined by the money available. The rapid progress of science in Britain has owed much to the growing support and sympathy of government and individual benefactors and to the endowment of research by industrial corporations. However, the basic discoveries that mark the great advances depend on the accident of individual genius and are not at our command.

The scope and intensity of the progress of applied science and technology on the other hand bear a close relationship to the circumstances of the time. Technology, as the combination of scientific knowledge with the practical ability of the inventor to apply that knowledge to the solution of particular problems, comes into play with any new discovery of scientific fact. The latest particle of truth is then developed, according to the circumstances of the time for military, commercial or medico-social purposes. It is a sad reflection that the urgent demands of modern war can produce advances that might otherwise take many years to develop, especially in the costly and uncertain experimental stages.

The rivalry between large commercial undertakings, using science to improve their products or processes as a direct means of competition, has produced a steady flow of improvements and developments. However, the fruits of this form of scientific work are sometimes open to considerable misuse. The discoveries of these commercial laboratories may be kept secret and in some cases a number of teams may be working on the same problem, which may have already been solved elsewhere. The buying up and suppression of patents and discoveries to protect equipment from becoming obsolete has also been known to happen. I am glad to see, however, a change of outlook in the growing quantity of publication of the results of industrial research.

It would seem that science has become so well established that nothing can stand in the way of its natural growth. This is far from the truth. Since the earliest times the natural conservatism of laymen has acted as a powerful brake to the adoption of new ideas, which do not rigidly conform to his notion of the correct order of things. In its most violent form it will produce unreasoning anger, utter disbelief in face of the clearest evidence or provoke plain ordinary laughter. The storm raised by Darwin's 'Origin of Species' is an excellent example where even scientists failed to keep an open mind.

The position seems better today and I am sure that Sir Harold Hartley, our immediate past President, spoke for all scientists when he said:

'Today, with our greater understanding, there is humility in the minds of all scientists. The further we penetrate into Nature's secrets the more clearly we see the ever-receding frontiers of knowledge.'

The resistance towards anything new or unexpected is balanced on the other hand by bursts of enthusiasm that some particular discovery or invention will see the end of all our troubles. The belief in the philosopher's stone seems to be just as great as ever.

As the front of pure science has advanced so its lines of communication to practical exploitation have got longer and longer. The time was when the whole process of discovery, application and exploitation could be achieved by one man. In our time a great army of scientists, technicians, inventors, designers and production engineers are required to keep the lines of communication open. Quite how important some of the members of this follow-up team have become is not always appreciated. In his presidential address in 1948 Sir Henry Tizard emphasized this point when he said:

'All depends on good design and production. Our weakness in the war was not to be found in what was best to do, nor in the scientific work of how to do it. It was when the stage of design and production was reached that we fell short of the best standards.'

This was true already when Whitworth invented the screw micrometer, which was subsequently put into production in Germany and the United States and up to the 1914 war all micrometers had to be imported into this country.

To Professor Kipping of Nottingham goes the credit for the basic work which led to the development of silicones in Russia and the United States and yet until this year we have been dependent on imports from America of marketable silicone products.

There are many cases in the Navy where a piece of apparatus has been used operationally exactly as the inventor put it together, with all the resulting disadvantages in maintenance and efficient operation. The limitation in performance, except in some cases, is practical as opposed to scientific. Where the basic scientific principles are known by all nations the advantage lies in the good design of equipment for practical use.

A more general and far-reaching matter for concern and possibly the most vital factor affecting the industrial application of scientific research is the lack of a co-ordinated system of scientific and technological education in this country. Excellent as they are, the existing institutions, which have grown up to meet particular circumstances, do not produce anything like enough trained technologists to meet the urgent needs of scientific development in industry and to provide leaders for the future. It is to be hoped that the new and rather uncertain science of education will develop sufficiently quickly to point the way to a speedy solution of this problem.

The shortage in Britain of 'personnel trained and eager to apply scientific knowledge and scientific methods to practical ends'—as Sir Ewart Smith said last year — is only one of the many shortages which the world is now facing. Among them are food, non-ferrous metals, steel alloy metals and sulphur. These very shortages are due to the scientific complexity of present-day life and it is only by science that they can be overcome. Naturally there are many ways of tackling this problem; but the most obvious are firstly by improved design to secure economy in production and the minimum use of scarce materials. Secondly by the development of substitutes made from raw materials which are still abundant. Thirdly by the reclamation of scrap and improved methods of using low-grade ores. Finally the development of renewable raw materials such as timber to satisfy the world demand for cellulose. Some of these shortages are partly due to the huge inevitable waste of war and its consequences, and partly to the lack of any comprehensive survey of the world's resources and requirements. It is only by an accurate knowledge of the world's resources that we can foresee the scope and magnitude of the future problems that science and technology have to meet and that only they can solve.

It is, therefore, good news that the Economic and Social Council of the United Nations has resolved 'to promote the systematic survey and inventory' of those resources which are not already covered by the Food and Agriculture Organization.

We have evolved a civilization based on the material benefits which science and technology can provide. The present shortages are a timely reminder of the slender material foundation on which our civilization rests and of our dependence upon science and technology.

The Conclusion

The pursuit of truth in itself cannot produce anything evil. It is in the later stage when the facts dug up enter the process of application that the choice between the beneficent and destructive development has to be made. It is quite certain that it is an exception if any particular discovery cannot be used equally well for good and evil purposes. Happily the beneficent exploitation of scientific knowledge has kept pace with its destructive application.

In a mid-century article *The Times* put it this way: '. . . It has been an age of great achievement. The lines of progress in which the Victorians trusted have been pursued farther and faster than they foresaw. Scientific discovery, from which above all their doctrines of progress derived, has swept forward on an enormous front. The conquest of the air has made possible an intercourse and understanding between distant peoples such as our ancestors could not imagine—and it has been diverted to the vast destruction of men and cities. The invention of wireless telephony has opened a channel through which liberating truths might be proclaimed to all the listening earth—and every would-be despot has used it to suborn the blind masses into the worship of false gods. The medical art has performed miracles; the cures of immemorial pestilences have been found, infancy has been safeguarded and old age tended, so that the normal expectation of life has been extended by years—aside from the new and universal apprehension of sudden death.'

To my mind it is vital that the two sides of scientific development are fully and clearly understood, not only by the research scientist, inventor, designer and the whole scientific team, but also by all laymen. The instrument of scientific knowledge in our hands is growing more powerful every day, indeed it has reached a point when we can either set the world free from drudgery, fear, hunger and pestilence or obliterate life itself.

Progress in almost every form of human activity depends upon the continued efforts of scientists. The nation's wealth and prosperity are governed by the rapid application of science to its industries and commerce. The nation's workers depend upon science for the maintenance and improvement in their standard of health housing and food. Finally superiority or even our ability to survive in war is a direct measure of the excellence and capacity of the scientific team.

This team of research workers and engineers has a dual responsibility, one for its work and the other as informed citizens, and it can only fulfil its proper functions if its members have a sound general education as well as a thorough training in science. It is no less important that the people who control the scientific machine, both laymen and scientists, should have a proper understanding and appreciation of what science has grown into and its place among the great forces of the world.

Ladies and Gentlemen, it is clearly our duty as citizens to see that science is used for the benefit of mankind. For, of what use is science if man does not survive?

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The December issue will include:

"Canada, Limited or Unlimited", by J. J. O'Neill.

"Rotary Lime Kiln Operation at Shawinigan Chemicals Ltd.", by R. H. Hall.

"Development of the Avro Orenda Jet Engine", by D. W. Knowles.

MILITARY ASPECTS OF THE TRANSPORT HELICOPTER

Digest of an address presented before the Ottawa Branch of The Engineering Institute of Canada, on October 30, 1950.

by

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A rapid change is occurring in the emphasis placed upon the helicopter as a military tool. Recent experiences in the Korean War have confirmed the theories of helicopter operations under combat conditions. Although the small helicopter has been active in military service for seven years, only recently has the larger transport type of helicopter been under military trial. The discussion following is limited to this larger transport type.

Future Potential Performance

Payload Capacity

Many improvements can be made to provide material gains in the useful load capacity of the machine. A turbo-prop engine as a power plant in lieu of the piston engine can increase the useful load 35 per cent. The increase in payload, of course, depends upon the range, but even with a range of 200 miles, the improvement in payload amounts to nearly 20 per cent.

Jet powered rotors achieve large increases in payload for short-range and slow speed. The simple ram jet has been mounted on the tip of a rotor blade, and a pulse jet has similarly been experimented with. These two types of jet power systems have large fuel consumption and are useful only for short ranges and short endurances. A pressure-jet system is an intermediate type with better fuel economy but heavier installed weight.

The efficiency of the rotor can be increased by the use of smooth contour and surface of blades and the incorporation of spanwise twist in the blades. The rotor capacity per sq. foot of area can be increased with the use of higher tip speeds. The increase in overall capacity beyond present sizes is governed by rotor diameter limitations, and by the number of rotors per helicopter. The largest known helicopter rotor is 130 feet in diameter, although this is not necessarily the upper limit. To date, machines with six rotors have been flown, although from the standpoint of efficiency, the ideal number appears to be two.

If we take the present upper limit of rotor diameter (130 ft.) and the maximum number of rotors already flown, and combine them we get a machine with an all up weight of over one-quarter of a million pounds. The useful load would be in the vicinity of 80,000 lbs. and its overall dimensions would be approximately 180 ft. by 240 ft. An aeroplane of the same approximate gross weight is 160 by 200 ft. in overall dimensions but requires 5,000 ft. for a take-off and landing run. Although a speed of 140 m.p.h. has been reached by present helicopters, higher tip speeds, auxiliary wings and thrust means, plus increased power, can raise the high speed well above 250 m.p.h.

All-Weather Flight

All-weather flight has been a natural advantage of the helicopter, since it can reduce its speed and utilize any field for emergency landings. This advantage could not be fully realized in the past, since the machines had insufficient stability and required concentration by the pilot to fly on blind flying instruments. A recent development has demonstrated an artificial stabilizing means, allowing the helicopter to be brought throughout the flight range, including hovering, with full stability. This will now enable the pilot to give more attention to his navigational duties, and therefore opens the application of the helicopter to areas where 24-hour all-weather service is required.

There are several conditions of icing that deposit a permanent layer over the blades and would require de-icing equipment in the blades. Many experiments have been conducted, and it appears that successful systems will be established in the near future both of the thermal heating type and of the electrical de-icing types.

Functional Applications and Experience of Transport Types

The functions of the helicopter in military work have been divided into four general divisions of effort: initial establishment and construction, supply, defence, and attack.

Initial Establishment and Construction

The job of setting up military facilities where large masses of materiel must be moved, affords the ideal opportunity for the helicopter's characteristics of vertical lift. This could eliminate the dependence upon prepared port facilities. The removal of such a concentration point in a supply system is even of more importance when an atomic attack is considered.

The helicopter can save time and labour in construction work. Such jobs as erecting transmission towers, bridge sections, pre-fabricated housing, camouflage materials, handling dam construction materials, etc., have their difficult hoist lift solved by a helicopter. This area of helicopter employment had little development until recently, since the minimum lift is usually in terms of one or two tons, and such machines have been available only in recent years. Near Vancouver, for the first time in the World, all of the materials, equipment and supplies needed in the building of a dam were flown in by helicopter.

In this, and in numerous projected applications, the helicopter can replace other equipment or methods of transportation more economically. Therefore, when making a cost comparison of helicopter service, the cost of the roads, tracks, docks, channels, runways, etc., required for other means of transportation, should be taken into consideration. The saving of time, manpower and money can be great, but still greater is the reduction of huge capital cost in surface installations. Critical ores, chemicals, etc., necessary to support military production can be found, collected and delivered by helicopter transport in times of emergency, such as the last war's dire need of South America's mica and rubber.

The helicopter has facilitated geodetic survey operations by delivering personnel and equipment to isolated positions. Not only has the helicopter saved time and money, but it has made possible survey operations in Alaska during seasons when it would not be practical using any other means of transport. The major item of importance is the fact that the amount of work accomplished for a given period of time is so much greater, which essentially amounts to a personnel increase from a production point of view.

Hans T. Lundberg, internationally known geophysicist, states: "A ground survey made in northern Quebec of an area 12,000 feet by 10,000 feet required about 70 days to prepare and to complete the magnetic operations utilizing the services of two engineers and two helpers. Exactly the same area was surveyed by helicopter in one hour, using only an engineer-observer and a pilot, and the flown results do not differ essentially from the ground survey."

Although fixed-wing aircraft have been used for military communications-wire laying, the helicopter is ideally suited for precision applications. Helicopters provide an economical means of inspecting transmission power lines, and of transporting personnel and equipment to out-of-the-way locations. Late in the last war, successful trials were made in laying pipeline in otherwise difficult terrain. With the use of larger types, entire sections of pipe line could be laid in one assembly, and pumping stations established and supplied.

Maintenance and Supply

Helicopter supply operations can start from the base and deliver directly to the consumer. This saves the lost time of re-transfers where combinations of other transports are used.

For example, compare the time required to travel from depot to depot by a 120-m.p.h. helicopter with a 300-m.p.h. aeroplane. It is assumed that 10 minutes are required at each end of the trip for transportation between depot and helicopter and for take-off and landing time. For the aeroplane, it is assumed that one hour is required for ground transportation, taxiing, take-off and landing. The time saved by the helicopter for trips under 300 miles is substantial.

Rescue

The most publicized of the applications of the helicopter has been in rescue operations. News reports have brought to public attention the rescue of personnel from aircraft forced down in Arctic wastes, of removal from ice floes, and of transfer of medical cases from ships at sea. Navy carriers use the helicopter on a stand-by basis to rescue crewmen from water landings resulting from landing or take-off accidents. Most of the above operations have been conducted with small helicopters, picking up one or two casualties at a time.[1]

If we had to find one use for the helicopter which would alone pay for itself in military operations, it would be in the evacuation of wounded from forward areas. Over 250 men were so rescued in Korea. The lives of half of these were literally saved by sparing the wounded men an ambulance or jeep journey over Korean roads. The XH-16 pod carrier will permit the use of fully equipped surgical stations carried close to the line of battle. The economy of transporting the stations in this manner, in both time, and equipment, is large, but the better saving of lives, is incalculable in terms of money.

The helicopter makes possible the spraying of malarial areas before occupation by troops, with more complete coverage than other methods. Perhaps it could play a part of a decontamination procedure in germ warfare. Salvaging either the downed aircraft or its undamaged components is of importance when all possible use must be made of replacement parts available in the theatre of operations.[2] The large helicopter can act as a relaying station in radar operations or in television operations. It could also be utilized by the fleet or individual ships in extending the distance of their radar coverage with the possibility of keeping direct wire contact instead of radio transmission.

Defence

Where the defence job is chiefly a searching operation, and requires detail examination of the surface or under surface conditions, the helicopter provides an ideal medium. It is particularly suitable in naval activities such as anti-submarine warfare or mine clearing. It is also an ideal transport vehicle for evacuating civilian population in the event of large scale destruction of a city.

Use of the helicopter as an aerial platform from which submarines can be searched for and attacked has been the subject of tests by the United States Navy. The use of ship-based helicopters for spotting and destroying floating and fixed mines, as well as for harbour patrol, is a new use discovered through Korean experience. Land mine fields can be traversed and also opened by the use of the helicopter and the addition of towed devices.

In the event atomic bombs were

[1] Helicopters capable of evacuating larger numbers of casualties are now operating in Korea, although the statement that most rescue operations were conducted with small helicopters, was true at the time this paper was delivered.

[2] The helicopter's ability to land in otherwise inaccessible areas permits it to be used in salvaging operations almost completely regardless of where the downed aircraft may be.

to be dropped on populous industrial and military centres, the resulting destruction is difficult to comprehend. Physical devastation combined with radioactivity would make these areas practically impenetrable. The helicopter is the only vehicle which could function as a transport under such circumstances. Its basic flight characteristics should prove invaluable in decontamination work. A recent Civilian Defence study by the New York Port authority indicated 30 H-21 helicopters could evacuate 26,000 personnel a day.

Attack

The attack functions of a helicopter may be broadly divided into: carrying assault troops and weapons; redeployment of troops as the course of battle may require; and to directly attack tanks or emplacements with rockets and other weapons. The ability to land forces at strategic points behind enemy lines, and to bring up troops and supplies has resulted in recent military demands for increased helicopter production.

It is apparent that the atom bomb has not removed the necessity for amphibious assault. The helicopter is an ideal assault vehicle in many cases for more rapid delivery, and removal of large force concentrations. A suitable assault helicopter could make all standard infantry divisions capable of being air lifted into a forward airhead where there are no prepared runways. The Marines have pioneered the use of transport helicopters in assault operations. No longer is the beach head assault a "must" for a Marine landing.

Relative Cost

Initial, Operating and Maintenance

The helicopter lends itself more readily to quantity production than does the aeroplane, it does not require large sections or extremely thin materials distributed over large areas, and most of the specialized helicopter components are readily producible by economical machine manufacturing methods, given a reasonable volume of production.

In recent C.A.B. hearings a 16-to 20-passenger helicopter indicated an operating cost of 38 cents per ton mile in short haul operations. For an 8 to 10 place machine, this was 100 cents per ton mile. In comparing costs between aeroplanes, other media of transportation and the helicopter, again due consideration must be given to the expenditures that are a basic requisite of any other form of transportation. Transportation by surface motor vehicles involves the cost of highways; railroads must have large investment and expense in trackage, and the conventional aeroplane requires the expensive investment and operating costs of airports. The helicopter requires less supporting facilities and indirect expenditure than does any other means of transportation. Thus, any realistic comparison of the helicopter with other transportation media really should include all of the costs inherent to the other media.

Battle Vulnerability

Much speculation has been spent on evaluating the effects of gunfire and other weapons on the helicopter in order to ascertain its vulnerability under battle conditions. The vulnerable sections are fairly comparable to an aeroplane's, with the addition of the transmission system and the rotor system. The former, being small in area, can be protected against small caliber ammunition by suitable armour without excessive weight penalty. Since the control of the helicopter is in the rotor itself and is independent of forward speed, the helicopter can be manoeuvred rapidly about all axes even when flying at slow speeds. However, this manoeuvring rate could not escape gunfire if in an open area.

Smoke screens, fog and darkness can be utilized to hide the helicopter's approach to an objective. Consequently, the total effect of ground fire can be considerably reduced. Indications from the front line operations in Korea seem to show a low degree of vulnerability of the helicopter to small arms fire. Several tests of the helicopter's vulnerability from the air have been conducted with conflicting results. However, as in all other offensive operations, control of the air is a prerequisite for helicopter operations, so that threat from enemy aircraft is greatly reduced.

Conclusions

From the above discussion it is evident there are certain functions performed by the helicopter that cannot be performed by any other vehicle, such as evacuation from contaminated atomic areas. In such jobs, the helicopter's value, when needed, is infinite. In the main, the helicopter's major value is in performing routine missions with a large factor of increased efficiency over existing methods. With sympathetic trials and testing, many new military utilizations of the transport helicopter are yet to be found.

What is even more important in these days of basic planning, is the realization of the extent and impact that the combination of these various increases of efficiency can produce when made on a broad enough scale. However, the effect of higher transport efficiency in a perimeter war operation, or preparation, can considerably reduce the overall size of standing armies and navies. Consequently, these economies offer the defensive nations help in counteracting the very drain of resources that its enemies may have designed to use as a long range economic weapon.

Aircraft Tires Checked by Sound Beam

An ultrasonic tester has been designed for checking used aircraft tires to determine if they can be re-treaded and used again, just as motor tires are re-treaded.

The tester, developed jointly by Dunlop and the General Electric Company, checks the inside of the tire to ensure that there is no internal fault in between the fabric and rubber. If a faulty aircraft tire, superficially sound, were re-treaded, it might result in failure during a critical landing or take-off run.

The ultrasonic tester is a machine which revolves the tire in a bath of water through which is projected a sound beam of a higher frequency than the human ear is tuned to pick up. A series of receiving crystals pick up signals from a transmitter inside the tire, and the signal strengths are read off a series of dials. A fault inside the tire shows up at once.

From Month To Month

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

R.M.C. Now on Four-year Schedule

The Royal Military College at Kingston, for the first time since the last war, now has students who are taking their fourth and final year.

Those taking engineering subjects may obtain diplomas in four main branches of engineering, chemical, civil, electrical and mechanical. It is understood that holders of these diplomas will be able to obtain their degrees from any accredited engineering college or university by taking the work and examinations of the final year at such institutions. As a result of the introduction of fourth year work in these subjects considerable expansion of staff and equipment has been necessary.

Chemical engineering is given by the Department of Chemistry which is headed by Colonel W. R. Sawyer, also director of studies at the College. The new chemical laboratory will be completed shortly and will be equipped to carry out industrial experiments many of them on a plant scale and some with a direct military application.

The department of Civil Engineering which is under the direction of Major J. Burgoin has a new laboratory which contains some of the most modern equipment for testing construction materials of every description. Provision is also being made for carrying out actual construction work of various kinds on a sectional scale.

In the Electrical Department, which is headed by Lt.-Col. G. W. Holbrook, M.E.I.C., there will be an electrical workshop as well as an electronic section. The workshop will contain in addition to the usual motors and generators, a stepdown transformer and a battery bank which can be used for emergency lighting. Another feature of the Electrical Department will be the provision of a number of oscilloscopes one of which will have a camera attachment capable of producing a finished positive in exactly sixty seconds.

Lt.-Col. P. C. King, M.E.I.C., is to be the head of the Mechanical Engineering Department and in the laboratory under his charge there are steam and internal combustion engines, a two-stage air-compressor, a wind tunnel, as well as various types of equipment for use in hydraulic experiments. There is also a machine for liquefying air which is used in cooling processes.

The total number of colleges and universities now giving engineering courses in Canada will be nineteen in all.

General Discussion on Heat Transfer

Report on the General Discussion on Heat Transfer held at the Institution of Mechanical Engineers, September 11th to 13th, 1951

This Conference was arranged by two committees, meeting simultaneously on both sides of the Atlantic, the composition of the respective committees being as follows:

Acting for the Institute of Mechanical Engineers

Chairman: Professor O. A. Saunders, D.Sc.(Eng.), M.A., M.I.Mech. E.

S. F. Dorey, C.B.E., D.Sc., Wh.Ex., M.I.Mech.E., F.R.S.

J. F. Alcock, O.B.E., B.A., M.I. Mech.E.

Ezer Griffiths, O.B.E., D.Sc., F.R.S.

E. J. Le Fevre, B.Sc.(Eng.), Wh.Sc., M.I.Mech.E.

N. A. McNeill, M.A., M.I.Mech.-E.

W. F. C. Schaap.

Cover Picture

The cover picture this month shows an unusual combination of bridges. The erection of the Anlaw Bridge over the Skeena River in B.C., was featured in the October issue of the *Journal*, and the picture on this month's cover shows the completed new bridge with the Bailey temporary supporting structure still in position and the original highway bridge in the foreground.

Photograph by courtesy of Dominion Bridge Company

R. A. Smith, M.A., A.M.I.Mech.-E.

R. W. Bailey, D.Sc.(Eng.), Wh.-Sc., M.I.Mech.E., F.R.S.

Acting for the American Society of Mechanical Engineers

Chairman: Professor A. P. Colburn, Ph.D., M.A.S.M.E.

American Chemical Society—Walter E. Lobo, B.S., M.A.S.M.E.

American Institute of Chemical Engineers—T. B. Drew, B.S., M.S., M.A.S.M.E.

American Institute of Physics—Mark Zemansky, B.S., A.M., Ph.D.

American Mathematical Society—Eric Reissner, Dipl. Eng., D.Ing., Ph.D., M.A.S.M.E.

American Physical Society—Arthur Kantrowitz, B.S., M.A., Ph.D.

American Society of Heating and Ventilating Engineers—L. P. Saunders.

American Society of Mechanical Engineers:

J. A. Goff, B.S., M.S., Ph.D., M.A.S.M.E.—Applied Mechanics Division.

A. L. London, B.S., M.S., M.A.S.M.E.—Gas Turbine Division.

A. C. Mueller, Ph.D., M.A.S.-M.E.—Heat Transfer Division.

F. G. Hechler, B.S., M.E., M.A.S.M.E.—Oil and Gas Power Division.

J. L. Yellott, B.S., M.M.E., M.A.S.M.E.—Power Division.

American Society of Refrigerating Engineers—C. M. Ashley, M.E.

Engineering Institute of Canada—E. A. Allcut, M.Sc., M.E., M.E.-I.C., M.A.S.M.E., M.I.Mech.E.

Institute of the Aeronautical Sciences—J. V. Charyk, B.Sc., M.S., Ph.D.

Society of Automotive Engineers—G. J. Huebner.

After screening, ninety-one papers were selected for presentation at the Conference, and these were presented by the reporters from Europe and North America respectively.

The scope of these papers was restricted to developments which had taken place during the years 1941 to 1950, and they were arranged in five main groups, namely:

Section I—Heat Transfer with Change of State. (16 papers).

Section II—Heat Transfer Between Fluids and Surfaces. (21 papers).

Section III—Conduction in Solids and Fluids. (16 papers).

Section IV—Radiation, Instrumentation, Measurement Techniques and Analogies. (18 papers).

Section V—Special Problems. (20 papers).

The sessions were conducted by the co-chairmen, each of whom dealt primarily with the papers and discussions relating to his particular area. The names of the Co-Chairmen and Reporters were as follows:

Section I

Co-Chairmen: *Europe*—Professor Sir Geoffrey I. Taylor, Hon. M.I.Mech.-E., F.R.S.
U.S.A. and Canada—Professor E. A. Allcut, M.Sc., M.E., M.A.S.M.E., M.I.-Mech.E., M.E.I.C.

Reporters: *Europe*—R. A. Smith, M.A., A.M.I.Mech.-E.
U.S.A. and Canada—A. C. Mueller, D.Sc.

Section II

Co-Chairmen: *Europe*—Ezer Griffiths, O.B.E., D.Sc., F.R.S.
U.S.A. and Canada—A. L. London, B.S., M.S.

Reporters: *Europe*—Dr. H. S. Arms
U.S.A. and Canada—Professor Byron Short

Section III

Co-Chairmen: *Europe*—Professor O. A. Saunders, D.Sc.(Eng.), M.A., M.I.Mech.E.
U.S.A. and Canada—W. E. Lobo, B.S., M.A.S.M.E.

Reporters: *Europe*—Mrs. M. Fishenden, D.Sc.
U.S.A. and Canada—Dr. Carl Kayan.

Section IV

Co-Chairmen: *Europe*—R. W. Bailey, D.Sc.(Eng.), Wh.Sc., M.I.Mech.-E., F.R.S.
U.S.A. and Canada—L. P. Saunders.

Reporters: *Europe*—Professor A. W. Scott, Ph.D., B.Sc., M.I.Mech.E.
U.S.A. and Canada—Dr. K. Wohl.

Section V

Co-Chairmen: *Europe*—Professor D. M. Newitt.
U.S.A. and Canada—Dr. H. L. Dryden.

Reporters: *Europe*—J. F. Alcock, O.B.E., B.A., M.I.Mech.E.
U.S.A. and Canada—Professor G. M. Dusinberre.

The number of members registered for the Conference was 674, originating as follows:

From North America.... 15
Europe........... 44
Great Britain..... 615

Fifty different societies co-operated with the Institution of Mechanical Engineers and the American Society of Mechanical Engineers. Of these, twenty-nine were from Great Britain, four from Commonwealth countries, six from Europe and eleven from the American continent.

The hall was full for all of the sessions and, in addition, overflow meetings were arranged in different rooms; the voices of the speakers being carried to the audiences by a public address system. The discussions were lively and informative, as might be expected from an assembly containing so many experts in the subject. The general feeling was that the conference had been a great success and that its published proceedings would be a noteworthy addition to the literature on the subject.

On the last day of the conference, a general session was held, at which one subject was selected for special discussion. That selected in Section III was "Heat Transfer Through Thermal Insulating Materials", relating to the substance of a paper presented by me during the proceedings of that section. Another paper on "The Possibilities of the Heat Pump in Canada" was presented by Mr. F. C. Hooper and the writer. These were the only contributions from Canada.

In addition to the formal proceedings, a reception was held on the evening of Tuesday, September 11th. On the following evening the James Clayton Lecture was given by Professor A. P. Colburn, who was chairman of the North American Committee, and on Friday, September 13th, the conference closed with a dinner for those attending from overseas and for members of participating institutions and societies.

After editing, all the papers together with a report of the discussions thereon are to be printed in book form and will thus constitute the official record of the proceedings. It is expected that a copy of this report will be available in the Institute Library when issued. Titles of all papers together with the names of the authors are available meanwhile upon request.

Respectfully submitted,

E. A. Allcut, M.E.I.C.
(E.I.C. Representative).

Correspondence

Mr. Editor:

The Student Guidance Committee of the Montreal Branch has asked me to write, through your medium, to those university undergraduates in the E.I.C. who are taking part, or are about to do so, in the High School student counselling activities mentioned on page 776 of the August *Journal.*

We should like to suggest that in each city where this excellent activity is planned the engineering students involved should first check to see if the local E.I.C. branch, the C.I.M.M. or C.I.C. branches, or any other engineering group, are carrying on such student guidance work in or for the High Schools and junior colleges.

Having made contact with this group, the undergraduates could modify their programme to fit in with or, better, directly assist that of the older practising engineers. Thus youthful enthusiasm and current knowledge of engineering faculty standards could be added to the varied experience of the members of the E.I.C. or other guidance committee, to the greater benefit of the High School students who are being served, and at the same time conserving the time of the guidance counsellors on the school staffs.

We can, we believe, assure the university student delegates to the 1951 conference that they will receive full co-operation from the branch committees, where they exist. It is recognized that high school students in cities and towns where no university is situated need even more help than those located in university cities, and this is a service that the E.I.C. must endeavour to supply in the near future.

H. C. Nourse, M.E.I.C.,
Chairman,
Student Guidance Committee,
Montreal Branch E.I.C.

Erratum

In the October issue of the *Journal*, page 988, by an error, the signature of the first letter under "Correspondence" was omitted. The letter was printed with the kind permission of the correspondent, Mr. I. Raidel, M.E.I.C., of Loyola University, Los Angeles, California.

The President and Award Winners

The president, on making his annual visit to the Branches, took advantage of the opportunity to present honorary memberships and medals to recipients who were unable to attend the annual meeting last May.

Right: Dr. W. R. Turnbull was presented with the certificate of honorary membership at a dinner meeting of the Saint John Branch on October 1st. The photograph includes, left to right, Dr. Macnab, D. O. Turnbull, M.E.I.C., and Dr. W. R. Turnbull.

Lower left: W. A. Mather, president of Canadian Pacific Railway, received the certificate of honorary membership at the dinner meeting of the Montreal Branch on October 18. Left to right are: Mr. Mather, Dr. J. B. Stirling and Dr. Macnab.

Lower right: F. S. Small received the Gzowski Medal for 1950, from President Macnab, at the meeting of the Moncton Branch of the Institute on September 26. Left to right, President Macnab, E. M. Nason, chairman of the Moncton Branch, and Mr. Small.

News of Other Societies

The first general meeting for the 1951-52 season of the **Scientific Instrument Manufacturers Association** of Canada (Box 57, Postal Station A, Toronto, Ont.) took place on Wednesday, September 12th.

J. H. Palmason, M.E.I.C., general manager of Canada Creosoting Ltd., Montreal, was recently elected president of the **Forest Products Institute of Canada.**

The American Institute of Chemical Engineers (120 East 41st Street, New York 17, N.Y.) has issued the following schedule of meetings: The annual meeting, December 2-5, 1951, at Chalfonte-Haddon Hall Hotel, Atlantic City, N.J.; and meetings at Atlanta, Ga., March 16-19, 1952; at French Lick, Ind., May 11-14, 1952; and at Chicago, Ill., Sept. 11-13, 1952.

The Institute of the Aeronautical Sciences (2 East 64th Street, New York 21, N.Y.) announces the Fifteenth Wright Brothers Lecture, to take place at the U.S. Chamber of Commerce Auditorium, Washington, D.C., December 17, 1951.

American Society for Testing Materials (1916 Race St., Philadelphia 3, Pa.) announces the 50th anniversary meeting, which will take place in New York City, June 23-27, 1952.

The spring meeting of A.S.T.M., is scheduled for the week of March 3, 1952, at the Hotel Statler, Cleveland, Ohio.

A.S.T.M. has also announced the award of the Smith Memorial Medal to Professor Edward R. Schwarz, head of the Textile Division, Massachusetts Institute of Technology.

The American Welding Society has elected Charles H. Jennings, engineering manager, Welding Dept., Westinghouse Electric Corp., as its president for 1951-52. Mr. Jennings took office during the week of October 15, at the annual meeting of the Society at Detroit.

W. H. Bruckner was awarded the 1951 Lincoln Gold Medal Award at the American Welding Society's annual meeting in Detroit in October. Mr. Bruckner is research associate professor of metallurgical engineering, University of Illinois.

Andrew Reid, 11 Garrick Street, London, W.C. 2, England, announces that the third **Mechanical Handling Exhibition and Convention** is to be held at Olympia, London, from June 4 to 14, 1952.

The Institution of Electrical Engineers (Savoy Place, London, W.C. 2, England) announces a Television Convention which will be arranged by the Committee of the I.E.E. Radio Section for April 28 to May 3, 1952.

The convention will be devoted to "The British Contribution to Television", and will include sessions on Programme Origination, Point to Point Transmission, Broadcasting Sections, Propagation, Receiving Equipment Non-broadcasting Application, System Aspects.

August, 1952 is announced as the date of the fourth congress of the **International Association for Bridge and Structural Engineering** at Cambridge, England.

Elections and Transfers

At the meeting of Council held at the St. Louis Hotel, Rimouski, P.Q., on Saturday, October 13th, 1951, the report of the Admissions Committee was presented and the following elections and transfers were approved:

Members:

W. Archbold, *New Glasgow*
R. G. Barbour, *Montreal*
E. Bukkfalvi, *Montreal*
C. W. Currie, *Charlottetown*
S. J. Gore, *Toronto*
R. K. Graves, *Calgary*
L. W. Hacker, *Summerside*
B. J. d'A. Harlow, *Montreal*
G. J. Hayes, *Summerside*
E. J. Jakobsons, *St. John's*
S. P. Lockhart, *Hamilton*
E. K. Macnutt, *Charlottetown*
L. B. Stacey, *Vancouver*
R. G. White, *Charlottetown*

Juniors:

J. D. Denovan, *Montreal*
A. G. Gentle, *Montreal*
M. L. F. J. Rooney, *Landis, Sask.*

Transferred from the class of Junior to that of Member:

F. R. Boucher, *Montreal*
W. L. Bradley, *Kitchener*
J. A. Clement, *Victoriaville*
L. P. E. Dancose, *Mont Joli*
G. J. Dunne, *Montreal*
R. E. J. Dupuy, *Rimouski*
H. M. Edwards, *Kingston*
A. H. Gillis, *Summerside*
H. J. M. LeBrun, *Quebec*
J. Lemieux, *Sherbrooke*
D. E. MacLean, *Summerside*
T. B. McLennan, *Charlottetown*
H. R. Miller, *Charlottetown*
C. H. Mitchel, *Los Angeles*
V. A. Pakalniskis, *Malartic, Que.*
J. N. Proulx, *Quebec*
R. B. Smith, *Charlottetown*
R. E. Stone, *Alexandria, Va.*
C. H. Stewart, *Charlottetown*
J. S. Sugiyama, *Calgary*
J. L. Vaillancourt, *Montreal*
W. G. E. Wood, *Beaupre, Que.*

Transferred from the class of Student to that of Member:

C. F. A. Buckingham, *Charlottetown*
J. Gilmore, *Charlottetown*
K. C. Martin, *Charlottetown*
W. S. Veale, *Charlottetown*

Transferred from the class of Student to that of Junior:

M. S. Sheldon, *Vancouver*

The following Students were admitted:

A. Badner	A. Nakash
D. W. Ballantyne	A. R. Nicol
W. L. Barrett	E. G. Puddington
M. P. Estey	G. L. Roy
J. J. Gillman	R. N. Smith
P. A. Girard	R. E. Smith
S. Harvor	R. H. Vezina
S. J. Ali Khan	R. A. Williams
H. B. Kolm	F. E. Zambon

Applicaions Through Associations

By virtue of the co-operative agreements between the Institute and the Associations of Professional Engineers, the following elections and transfers have become effective:

Saskatchewan

Members:

R. S. Dawson
G. F. Miller
A. G. Roy

Junior:

R. D. Donnelly

Junior to Member:

W. H. Abel
G. M. Beaumont
W. J. Jessup
N. D. Kirton
R. J. Riecken
T. E. Tribe

Student to Junior:

W. Chow
N. Daviduk
N. A. Flaten
T. C. Morgan
W. N. Tivy

Manitoba

Members:

H. Benditt
W. H. H. Dickins
T. J. Halme
P. J. Kelly
D. S. G. Ross

Junior to Member:

W. R. Shane

Personals

News of the Personal Activities of Members of the Institute

Gen. the Hon. A. G. L. McNaughton, M.E.I.C., wartime commander of the First Canadian Army, has been appointed honorary colonel of McGill University Contingent, Canadian Officers' Training Corps.

Gen. McNaughton is chairman of the International Joint Commission in Ottawa. He is the former Minister of National Defence of Canada and the former president of the National Research Council, and was a Canadian delegate to the United Nations.

Col. R. D. Harkness, M.E.I.C., was recently appointed a director of the Royal Bank of Canada.

Col. Harkness is president and a director of Northern Electric Company Limited. He is also a director of Consolidated Mining and Smelting Co. of Canada Ltd., The Bell Telephone Company of Canada, and Howard Smith Paper Mills Ltd.

A. E. MacDonald, M.E.I.C., dean of the faculty of engineering and architecture, University of Manitoba, was appointed recently to the National Industrial Design Committee. This committee of manufacturers, retailers, and designers, meets twice yearly in Ottawa to promote greater use of Canadian talent in product design.

J. L. McKeever, M.E.I.C.

J. L. McKeever, M.E.I.C., has been appointed works engineer of Canadian General Electric Company's Peterborough Works, to succeed G. R. Langley, M.E.I.C., who retired recently.

Mr. McKeever attended the University of British Columbia and graduated with the degree of B.A.Sc. After taking C.G.E.'s "Test" Course in Peterborough, he joined the Induction Motor Engineering division there, assisting in the development of K.C. and K.H. f.h.p. motors and S.C.R. induction motors. He was transferred to A-c-d-c Engineering in 1935 and three years later was appointed general engineer, becoming the only application engineer in Peterborough Works. He headed the Industrial and Central Station Engineering section until his recent appointment.

He is a member of the American Institute of Electrical Engineers, the Canadian Electrical Association, and the Canadian Committee of the International Electrotechnical Commission.

G. R. Henderson, M.E.I.C.

G. R. Henderson, M.E.I.C., has assumed the duties of general manager for the Canadian activities of Catalytic Construction Company, and will remain at Sarnia, Ont. Previously he was chief engineer for Polymer Corporation, Sarnia.

Mr. Henderson is a Queen's University honour graduate in civil engineering, class of 1925. He followed the H.E.P.C. student apprentice course that year and later came to Montreal, to work on hydraulic machine design for Dominion Engineering Works. From 1929 to 1932 he was with the Power Corporation of Canada. He joined Shell Oil Company, Montreal, in 1932, becoming chief engineer of the refinery in 1936. In 1940 he went to England where he was in charge of construction of a new refinery of Shell Marketing and Refinery and was chief engineer during the first year of operation. He went to Polymer Corporation in 1942 and was appointed chief engineer in 1944.

Mr. Henderson was chairman of the Sarnia Branch of the Institute in 1948.

Dr. A. C. Christie, M.E.I.C., has been awarded by Johns Hopkins University the honorary degree of doctor of laws. He received this degree in June this year before leaving for Japan as a member of an Engineering Mission on Technical Education. The mission spent eight weeks in Japan at the request of the Supreme Command of the Allied Powers, to study the situation in Japan and to confer with the Japanese on future developments.

Dr. Christie is professor emeritus of mechanical engineering of Johns Hopkins University.

Harold A. Cooch, M.E.I.C., was elected president of the Canadian Electrical Manufacturers Association at the seventh annual meeting of the Association in Niagara Falls, Ontario, in September. Mr. Cooch is chairman of the board of Canadian Westinghouse Company Limited, Hamilton and he is a prominent figure in civic and industrial circles.

Harold A. Cooch, M.E.I.C.

Mr. Cooch has spent his entire business career with Westinghouse, starting as a sales engineer in 1910 following graduation with a B.A.Sc. degree in electrical engineering from the University of Toronto. He became president in 1949 and board chairman last year. He is a past-president of the Hamilton Chamber of Commerce; past-chairman of the Engineering Institute of Canada, Hamilton Branch; a former councillor of the Association of Professional Engineers of Ontario.

Mr. Cooch served in France with the 3rd Division, Canadian Engineers, in the first World War and is honorary lieutenant-colonel of the 5th Technical Regiment, R.C.E.M.E., Hamilton.

To the Canadian Electrical Manufacturers Association Mr. Cooch brings a wealth of experience as a business leader who has been closely identified with movements to promote the growth of the electrical industry for more than 40 years.

Other officers of C.E.M.A. are listed as follows: vice president: Brig. F. C. Wallace, Smith & Stone Limited, Georgetown, Ont., and Fiberglas Canada Limited, Oshawa, Ont.; **O. W. Titus,** M.E.I.C., Canada Wire & Cable Company Limited, Leaside, Ont.; Crawford Gordon, Jr., president and general manager of A. V. Roe Canada Limited, Malton, Ontario. Members of the Executive Committee are: W. C. Cannon, Frigidaire Products of Canada Limited, Leaside, Ont.; **Col. R. D. Harkness,** M.E.I.C., Northern Electric Company Limited, Montreal, Que.; **W. J. W. Reid,** M.E.I.C., Otis Elevator Company Limited, Hamilton, Ont.; H. M. Turner, Canadian General Electric Company Limited, Toronto, Ont.; secretary, H. L. Wright, Curtis Lighting of Canada Limited, Leaside, Ont.; treasurer, L. E. Messinger, Canadian Line Materials Limited, Scarboro' Junction, Toronto, Ont.

H. J. Butterill, M.E.I.C., has been appointed chief metallurgist and chief inspector at the Arvida Works of the Aluminum Company of Canada Limited. Formerly he was chief engineer in charge of Armament Design, Canadian Armament Design & Experimental Establishment, at Quebec.

A graduate of the University of Toronto, Mr. Butterill received a B.A.Sc. degree in 1940. He joined the Royal Canadian Electrical and Mechanical Engineers after graduation, serving in various ranks in the Ordnance Corps and R.C.E.M.E., being promoted to major on joining the Armament Design Department of the Ministry of Supply, England. In 1945 he went to The International Nickel Co. in Toronto, Ont., as a member of the Development and Research Division where he remained until 1948. He then joined the Defence Research Board as chief engineer of the Canadian Armament Design and Experimental Establishment at Quebec.

Philip S. Gregory, M.E.I.C., vice-president in charge of power sales for The Shawinigan Water and Power Company, has been elected a director of the Company.

After graduating from University of Bishop's College and, in 1911, from McGill as a bachelor of science in electrical engineering, Mr. Gregory spent a few years with the Canadian Westinghouse Company Limited in Hamilton, Montreal Tramways Company and the Electrical Commission of Montreal before joining the Shawinigan Company in 1918. He was in charge of the Shawinigan system's changeover from 30-cycle power between 1919 and 1923, becoming assistant general manager of the company in 1930, and vice-president in 1941. Mr. Gregory is also vice-president and a director of Quebec Power Company, and a director of Shawinigan Chemicals Limited.

P. S. Gregory, M.E.I.C.

F. R. Phillips, M.E.I.C., and H. J. Barratt, P. ENG., wish to announce that, as of October 1st of this year, they have taken over the practice of Pearson and Phillips in Vancouver, B.C. The firm will now be known as Pearson, Phillips and Barratt, consulting engineers. Arthur Pearson will not be a partner but will be available to act in an advisory capacity to the new firm.

E. H. Sangwine, M.E.I.C., of the Aluminum Company of Canada, Limited, has been transferred from Arvida, Que., to Montreal.

Mr. Sangwine studied at the University of Saskatchewan where he received a B.Sc. degree in chemical engineering in 1938. He joined the Aluminum Co. of Canada after graduation as a technical assistant at the Arvida Works. Appointed superintendent of pot rooms in 1947, he supervised the electrolytic reduction of aluminum oxide to metallic aluminums.

T. H. Jenkins, M.E.I.C., of Canadian National Railways who has been working in Toronto as a regional bridge engineer, has been transferred to Montreal as system engineer of bridges.

Mr. Jenkins graduated from the University of Toronto in 1925, and worked for a year with Canadian Bridge Company Limited at Walkerville, Ont., as a structural steel detailer. He then became connected with the Grand Trunk Western Railroad Company, at Detroit, Mich., as structural draftsman on bridges and buildings. He continued to work on design and estimate of bridges and buildings and as a bridge engineer for the Company for many years. He joined Canadian National Railways in 1950, in Toronto, Ont., as a bridge engineer.

E. L. Ruggles, M.E.I.C.

E. L. Ruggles, M.E.I.C., has been appointed as vice-president and general manager, of Bird-Archer Co. Limited with headquarters at Cobourg, Ont. At the time of his appointment, Mr. Ruggles was assistant general manager.

He was born and educated in Regina, Sask., and he graduated in 1935 from the University of Saskatchewan in civil engineering. He joined The Bird-Archer Co. Limited in 1937 as a service engineer in the Railway Department, in Western Canada. In 1943 he was appointed district manager for Western Canada. In 1946 he was appointed assistant general manager, with headquarters at Montreal.

C. A. Colpitts, M.E.I.C., has been appointed assistant chief engineer for the Canadian Pacific Railway Company with headquarters at Montreal.

Mr. Colpitts has been in Vancouver, B.C., where he was district engineer of the British Columbia district.

An engineering graduate of the University of Manitoba, he became division engineer for Canadian Pacific Railway at Saskatoon in 1941. He worked as division engineer at Vancouver for five years, after which he was assistant district engineer for a time.

L. G. Chavignaud, M.E.I.C., has been appointed general manager of mining operations for the North Western Coal & Oil Limited at Robb, Alberta.

Mr. Chavignaud has been in coal mining for the past 30 years and has held executive positions with Luscar Coals Limited, Cadomin Coal Company and McLeod River Hard Coal Company (1941) Limited.

He served in the First War in the 19th Canadian Infantry Battalion and with the Royal Air Force. He is a member of the Alumni Association of the University of Toronto, the Canadian Institute of Mining and Metallurgy, and the Association of Professional Engineers of Alberta.

J. V. Daniliauskas, M.E.I.C., is a hydraulic engineer with Power Corporation of Canada Ltd., at Montreal. Previously he was mechanical assistant in the chief architect's office of the Canadian National Railways in Montreal.

Mr. Daniliauskas graduated in civil engineering in Lithuania, in 1939.

J. M. MacBride, M.E.I.C., of Canadian Pacific Railways is in Winnipeg, Man., doing special engineering work. Mr. MacBride has been with C.P.R. since his graduation from University of New Brunswick in 1938. He has been stationed at Montreal, and was most recently assistant engineer of track.

Paul O. Freeman, M.E.I.C., is a structural engineer for Fraser-Brace Engineering Co. Ltd., at Montreal, Que. Previously he was associated with Dominion Bridge Co., Ltd., in Montreal and Winnipeg, as a designer.

Mr. Freeman studied at McGill University where he received a B.Eng., in civil engineering in 1943. After service in the R.C.E. in World War II he did post-graduate study and received a master's degree in engineering from McGill in 1946. He joined Dominion Bridge that year.

R. E. Davey, M.E.I.C., is town engineer for the Town of Brockville, Ontario. He had been town engineer for Trenton, Ont., since 1948. From 1946 to 1948 he worked as divisional operations manager with Canadian Oil Companies Limited, in Montreal. He had been associated previously with the Toronto Transportation Commission. From 1942 to 1945 he was engineer in charge of works and buildings for the Naval Service of the Department of National Defence, at Shelburne, N.S.

R. T. Houlihan, M.E.I.C., of Canadian Westinghouse Company Limited is the district sales manager of the Company in Vancouver.

After graduating from the University of Alberta in 1941 he joined the Westinghouse graduate student training course.

Upon his retirement as a lieutenant following service with the Royal Canadian Navy, he joined the staff of Westinghouse Western District at Winnipeg as an apparatus salesman. He has been the manager of the apparatus division, western district, at Winnipeg for the past year.

F. S. Heeley, M.E.I.C., is in Brazil working for the Brazilian Traction, Light and Power Co. Ltd., in the hydro electric construction department at Sao Paulo. Formerly he was in Winnipeg working for the Hydro Electric System.

Mr. Heeley studied in England where he graduated from the Royal Technical College at Salford, in 1947.

George Perris, M.E.I.C., of Canadian Industries Limited, has been transferred from Cornwall, Ont., to Copper Cliff, Ont.

Mr. Perris is a graduate of the University of British Columbia where he received the degrees of B.A.Sc. and M.A.Sc. in chemical engineering in 1946 and 1947 respectively. He joined C.I.L. as a chemical engineer in 1947.

Noel Wright, M.E.I.C., wartime deputy director of radio engineering for the Royal Canadian Navy and co-ordinator of communications equipment supply, was recently appointed to the sales engineering staff of Brown Boveri (Canada) Limited. Mr. Wright was recently eastern district manager of Ferranti Electric Limited with whom, except for the war years, he was associated since 1928. He is in charge of sales of products of Brown Boveri's new factory at St. Johns, Quebec.

Noel Wright, M.E.I.C.

S. Sillitoe, M.E.I.C., has been appointed production superintendent of the Belleville plant of Northern Electric Company.

Mr. Sillitoe, the secretary of the Belleville Branch of the Institute, has been with the Company since 1934, when he joined it as a junior engineer in the development engineering department. In 1941 he was assigned by the Department of Munitions and Supply to a technical mission to England. His subsequent positions at Northern Electric were broadcast radio engineer, broadcast equipment design engineer, equipment engineer, audio systems engineer, procurement service, and assistant superintendent of the equipment assembly shop.

Mr. Sillitoe is a graduate of University of Alberta, having received the degree of B.Sc. in 1931, and M.Sc. in 1933.

J. W. Greason, M.E.I.C., and **B. D. McCaffrey,** JR.E.I.C., left Windsor in September, to spend the remainder of the year in Australia where they will become fully acquainted with operations at the Ford Motor Company of Australia which has plants at Geelong, Sydney, Brisbane, Adelaide and Perth. On the return trip they will have a shorter visit at the Ford Motor Company of New Zealand at Lower Hutt, New Zealand.

J. W. Greason and B. D. McCaffrey are supervisors in the manufacturing department of Overseas Operations Division of the Ford Motor Company of Canada.

R. B. Walker, Jr.E.I.C., has left the employ of Canadian General Electric Co., where he was engaged in the installation of heavy electrical equipment with the engineering services department. He is with Shawinigan Chemicals Ltd. in Shawinigan Falls, in the mechanical maintenance department.

Mr. Walker studied at Queen's University where he received a B.Sc. degree in electrical engineering in 1949.

D. R. Sanderson, Jr.E.I.C., of Toronto, Ont., a professional engineer and a member of the C.C.F. party, was appointed alderman for Ward 7, Toronto, recently.

Mr. Sanderson is a structural designer with the firm of Gordon L. Wallace in Toronto. He graduated in civil engineering from the University of Toronto in 1944.

A. R. Reid, Jr.E.I.C., is with American Locomotive Co. at Dunkirk, N.Y. He was previously a junior engineer with Montreal Locomotive Works Ltd.

Mr. Reid graduated from Cambridge University in England in 1947.

D. C. Cramm, Jr.E.I.C., London, Ont., is a designing engineer with C. C. Parker and Associates Ltd., of London and Hamilton, Ont.

Mr. Cramm graduated in 1948 from the University of Toronto. He joined the company soon after graduation, and was an assistant designer at Hamilton before being appointed to his present position.

Charles G. Mills, Jr.E.I.C., is assistant engineer in the transmission department, Quebec Division, of the Bell Telephone Co. of Canada, at Montreal.

Mr. Mills has been with the Bell Telephone Co. of Canada since his graduation from McGill University in 1946. He was an engineering assistant in Montreal, and was transferred to Sherbrooke, Que., in 1948.

Jean E. Ste-Marie, Jr.E.I.C., is field engineer for Atlas Construction Co. in Montreal. Formerly he was with the Key Construction Co. in Montreal.

F. M. Tapley, Jr.E.I.C., is employed with the Saguenay Power Company as plant engineer for the Isle Maligne generating station. Previously he was with the Winnipeg Electric Company as operating distribution engineer.

J. G. Tillcock, Jr.E.I.C., is district engineer of the Municipal Roads Branch of the Ontario Department of Highways in the Counties of Essex, Kent and Lambton, Ontario. He first joined the engineering staff of the Department at North Bay, Ont., in 1947.

He is one of the few engineers in Canada who can boast prior training in the field of newspapers. He became a pressman for the Watchman-Warder Press at Lindsay, Ont., his home town, in 1933, the year following his graduation from the Lindsay Collegiate Institute. In 1940 he went to the Dominion Arsenals, prior to enlistment, in 1941 in the Royal Canadian Air Force.

On discharge he enrolled at University of Toronto, faculty of applied science and engineering from which he graduated in 1949, wtih a B.A.Sc. degree.

Capt. B. Yarymowich, Jr.E.I.C., who is with the Royal Canadian Electrical & Mechanical Engineers, and was stationed in Montreal, has been posted to a student officer detachment to take a series of specialist courses at the Aberdeen Proving Ground at Maryland, U.S.A.

A graduate of the University of Toronto he received a B.A.Sc. degree in chemical engineering in 1949.

R. K. Nicholson, Jr.E.I.C., who is employed by the Canadian General Electric Company has been transferred from Toronto to Montreal to work as sales engineer in the apparatus division.

W. R. McKay, S.E.I.C., and **G. R. de Cotret,** S.E.I.C., were recently judged the first and second prize winners in the Canadian Construction Association thesis competition for senior engineering students in Canadian universities.

Mr. McKay, student at the University of Toronto, discussed "Concrete Construction with Moving Forms"; and Mr. de Cotret, of McGill University, discussed "Usual Dredging Equipment and the New 'Crusher Pump' Method".

The construction thesis competition, was administered by the C.C.A.'s Practical Research Committee.

A. J. Williams, S.E.I.C., is one of the eleven engineers from Canadian universities who received Athlone Fellowships to study in England. Mr. Williams, a graduate of Queen's University, will spend two years in British industrial centres.

A. D. Rackow, S.E.I.C., is now employed in Ottawa by the National Research Council, in the radio and electrical engineering division.

A graduate of the University of Manitoba, Mr. Rackow received a B.Sc. degree in electrical engineering in 1950. He did post graduate work at McGill in 1950.

Ferris J. Abbass, S.E.I.C., is employed in the lamp and tube division of Canadian Westinghouse Co., at Hamilton, Ont. Previously he was with the Maritime Engineering Consultants at Sydney, N.S.

He studied at the Nova Scotia Technical College where he received a B.Eng. in electrical engineering in 1950.

Robert F. Bartlett, S.E.I.C., is working at Standard Brands Ltd., in Montreal, Que. After graduating from McGill University in 1950, he worked for the White Motor Co. of Canada Ltd., in Montreal until his recent appointment.

F. J. R. Gabriel, S.E.I.C., is a field engineer for Foster Wheeler Limited at St. Catharines, Ont. Mr. Gabriel has just returned from Africa where he was sent by the Aluminum Company of Canada in 1950.

Mr. Gabriel received a B.Sc. degree from Dalhousie, in 1948, and a B.Eng. degree in civil engineering from Nova Scotia Technical College in 1950.

J. G. G. Hamel, S.E.I.C., has joined the firm of Canadian Johns-Manville at Asbestos, Que., as a mill engineer. Previously he worked for H. J. Doran, architects and engineers in Montreal. He has also worked for the Foundation Co. in Ottawa, Ont.

Mr. Hamel graduated from McGill University in 1950.

W. Kostyshyn, S.E.I.C., (University of Saskatchewan, B.Sc., electrical, 1951) of Saskatoon, Sask., is now in Toronto, employed by Canadian General Electric.

H. F. McCoubrey, S.E.I.C., sailed from Halifax in September for Tanganyika, British East Africa, where he will work for the Public Works Department. He has worked for Standard Paving (Maritimes) Limited in Halifax since his graduation in 1951 from Nova Scotia Technical College.

J. D. Richards, S.E.I.C., (Queen's University, B.Sc. civil, 1951) who joined Dominion Structural Steel, Ltd., in Ottawa, has been transferred to Montreal.

J. Slusarchuk, S.E.I.C., (University of Manitoba, B.Sc., mechanical, 1951) of Winnipeg, Man., is now employed by A. V. Roe Canada Ltd., at Malton, Ont.

Visitors To Headquarters

George M. Dick, M.E.I.C., Sherbrooke, Que., September 14, 1951.

Gordon O'Brian, Nassau, Bahamas, Sept. 25.

Basil Smith, JR.E.I.C., Montreal, Que., Sept. 25.

Dr. C. J. Mackenzie, HON. M.E.I.C., Ottawa, Ont., Sept. 26.

J. R. Menard, M.E.I.C., Rimouski, Que., Sept. 27.

J. W. Gray, M.E.I.C., Victoria, B.C., Sept. 29.

E. P. Muntz, M.E.I.C., Hamilton, Ont., October 2.

Hugh P. Jolling, Johannesburgh, South Africa, Oct. 9.

J. Day, London, England, Oct. 10.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

Kenneth Moodie, M.E.I.C., who was a consulting mechanical engineer in Victoria, B.C., died on September 12, 1951, at his residence in Victoria, B.C.

Mr. Moodie was born in Montreal in 1871. He studied at McGill University, where he received a B.A.Sc. degree in 1895. After graduation he went to Chicago and worked successively for Fraser and Chalmers; Sargent & Lundy, consulting engineers; Western Electric Co.; American Siemens-Halske Co.; Link Belt Machinery Co. In 1908 he joined the Canadian Pacific Railway Co., as piece-work inspector, and he was for 5 years assistant superintendent of the Angus locomotive shops. From 1914 to 1920 he worked for the Rosedale Coal & Clay Products Co. Ltd., at Rosedale, Alberta, as chief engineer. He was in private practice for about three years, and in 1924 he went to P. Burns Co., Limited, in Calgary as chief engineer. He joined the Department of Public Works of British Columbia as a combustion engineer in 1934. Retiring from the Department in 1948, he was in private practice in Vancouver until the time of his death.

He joined the Institute as a Student in 1895 becoming an Associate Member in 1911 and a Member in 1926. He attained his Life Membership in the Institute in 1947. He was an associate of the Institution of Mechanical Engineers.

William Forrest Angus, M.E.I.C., philanthropist and industrialist, died at his

W. F. Angus, M.E.I.C.

home on October 14, 1951. He was president of the Dominion Bridge Company, Limited, and of Dominion Engineering Works Limited.

He was born at Montreal in 1873, a son of the late Richard B. Angus, one of the original promoters of the Canadian Pacific Railway and of other pioneer enterprises that contributed to the economic growth and development of Canada.

He was educated at Montreal private schools and at McGill University, where he was graduated as a civil engineer in 1895. Thereafter his career was identified with development of the steel industry. In 1896 he joined the Dominion Bridge Company. He then went with the old Lawrie Engine Company and next joined the Canada Switch and Spring Company which was formed into the Montreal Steel Works, becoming one of its original directors and subsequently vice-president and managing director. This company was eventually taken over by the Canadian Steel Foundries, a subsidiary of Canadian Car and Foundry Co. Ltd.

In 1911 he became vice-president and managing director of the Canadian Steel Foundries and a few years later took office with Canadian Car and Foundry Co. Ltd., being appointed vice-president in 1921. Meanwhile, in 1917, he rejoined Dominion Bridge Company Limited as vice-président. He became its president in 1936, a position he held continuously until his death. In 1936 he also became president of the associate company Dominion Engineering Works Ltd. He also retained his connection with Canadian Car and Foundry Co. Ltd., as senior vice-president up to the time of his death.

As a philanthropist his experienced counsel and leadership were used by many organizations. He was chairman of the Board of Governors of Financial Federation for many years and was president of the Mental Hygiene Institute for 22 years following its inception.

He was a director of the Royal Bank of Canada, Montreal Trust Company, Bell Telephone Company, Northern Electric Company, Foundation Company, Canadian Locomotive Company, Eastern Canada Steel, and Dominion Hoist and Shovel Company.

Mr. Angus joined the Institute as a Student in 1895, becoming an Associate Member in 1903 and a Member in 1913. He attained his Life Membership in 1947.

Murray C. Hendry, M.E.I.C., retired hydraulic engineer of the Hydro-Electric Power Commission of Ontario died at his home in Toronto on September 21, 1951.

Mr. Hendry was born in Toronto in 1881. He attended Public School and Collegiate there, and graduated from the University of Toronto in civil engineering in 1909.

Mr. Hendry's engineering experience commenced, prior to his university course, on the engineering staff of the Canadian Niagara Power Company during the period of extensive development of hydro-electric works at Niagara Falls. Following a year there, he entered the

M. C. Hendry, M.E.I.C.

University of Toronto, and on graduation was employed by the Temiskaming and Northern Ontario Railway, which was then under construction northerly from New Liskeard.

Mr. Hendry returned to the University at the end of three years for a post-graduate course, and thereafter was engaged as resident engineer on a number of projects in various parts of Canada, among them the Coquitlam dam in British Columbia. He carried out an extensive power survey of the Bow River in Alberta, the report of which was published by the Dominion Water Power Branch. Thereafter he was appointed chief engineer of the Manitoba Hydrometric Survey, and in that office, as representative of the Dominion Government, was closely associated with power projects being carried out on the Winnipeg River and elsewhere in the province of Manitoba.

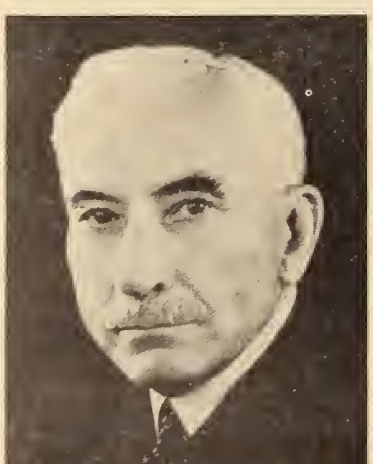
Mr. Hendry's connection with power projects on the St. Lawrence River commenced in 1919 when he was placed in charge of the survey and investigation of the International section of the river being carried on by the Hydro-Electric Power Commission of Ontario. He took a large part in the preparation of the report submitted in 1921 to the International Joint Commission by the Ontario organization, embodying the results of the investigation and offering proposals for the development of power in that part of the river. During a brief period when attention to the proposals abated somewhat, Mr. Hendry was engaged by the Nova Scotia Power Commission in building a power plant at Sheet Harbour. On completion of this work he returned to the Hydro-Electric Power Commision of Ontario, with which he has been connected continuously since 1923. During the next eighteen years the St. Lawrence River investigations engaged almost continuous attention on his part, in connection with extension of surveys, foundation explorations and ice flow. Throughout this time also, he was constantly in touch with studies conducted by the various National and International Boards to which the project has been referred.

From 1941 a greater part of his attention was diverted to hydrometric investigations. He was responsible for the extension of snow surveys throughout the Province and their application to water supply and storage investigations. He also instituted studies aimed at forecasting floods. He took a logical view of such work, realizing that to secure results, years must be spent in the collection of basic data and their proper correlation. He was thus laying a foundation upon which others can build for the advantage of those who are to follow him.

Mr. Hendry retired from the Ontario Hydro-Electric Power Commission earlier this year.

He took a great interest and had read widely on early exploration and travel in northern and western Canada and was also greatly interested in the history of pioneer days in the country around the lower Great Lakes.

Mr. Hendry joined the Institute in 1908 as an Associate Member, becoming a Member in 1920. He attained his Life Membership in 1947.



John Callaghan, M.E.I.C.

John C. Callaghan, M.E.I.C., one of western Canada's pioneer railway builders, died in Edmonton on September 3, 1951.

Mr. Callaghan was born in Iowa in 1868, where he was educated. Widely known in railway work, Mr. Callaghan was a former deputy minister of railways and telephones for Alberta. He was general manager of the Northern Alberta Railway for eight years, retiring in 1937.

In 1895 he was employed by the Kaslo and Slocan Railway and the Canadian Pacific Railway in British Columbia, and he was on location and construction for the Columbia and Western Railway from Robson to Trail and Rossland, B.C., in 1896-97.

In 1898-99 he was engaged on location and construction for the C.P.R., Robson to Midway, and on work from Midway to Spence's Bridge.

Mr. Callaghan then went east and worked on C.P.R. location and construction work in Ontario and Manitoba. After a year on this work he returned west and in 1901-02 was employed on construction for the Crowsnest Southern Railway (Great Northern) from Jennings, Montana, to Morrisey Junction, B.C. This was followed by work for the Great Northern on location and construction at Vancouver, B.C., and vicinity.

In 1904 he was engaged on reconnaissance and location for the Grand Trunk Pacific railway and the C.P.R. For the next five years he had charge of location and construction of C.P.R. western lines, west of Winnipeg.

Joining the railway construction firm of Foley, Welch and Stewart, Mr. Callaghan had charge of various contracts they were carrying out for the C.P.R. and C.N.R. in 1910.

In 1911 Mr. Callaghan was appointed to take charge of location and construction, Mountain division, G.T.P., from Edmonton to Prince George.

The next year he was named chief engineer for the Pacific Great Eastern Railway with headquarters at Vancouver. He remained in this post for six years, after which he was named chief engineer for the Calgary and Southwestern Railway, a post he held for the next three years. From 1919 to 1921 he also was superintendent for Stewart and Welch, railway contractors at Calgary.

In 1921 Mr. Callaghan went to Edmonton. He became manager of the then provincial government owned railways, while also holding the post of deputy minister of railways and telephones.

When the province's railways were sold to the C.P.R. and C.N.R. in 1929, Mr. Callaghan became the first general manager of the reorganized Northern Alberta Railway.

Since his retirement, Mr. Callaghan had lived at the McDonald. He made several trips to visit relatives in the U.S., including a brother in St. Paul.

Mr. Callaghan became a Member of the Institute in 1908. He attained Life Membership in 1947. He was a member of the American Society of Civil Engineers and of the Association of Professional Engineers of Alberta.

Frank Lee, M.E.I.C., of Parksville, B.C., retired railway engineer, passed away in Nanaimo on May 21st, 1950. The Institute learned of his death only recently, with deep regret.

Mr. Lee was born in Chicago, Illinois, in 1873. He received his engineering education at the Sheffield Scientific School of Yale University, graduating in 1894 in civil engineering. Upon gradution he left the United States to take part in the location and construction of the government railway in Trinidad. He returned to the United States in 1896 to join the engineering staff of the Chicago and Northwestern Railway as an instrumentman and assistant engineer. In 1902, he came to Canada to join the engineering department of the Canadian Pacific Railway, remaining with them until his retirement in 1940. He first came to British Columbia as district engineer at Vancouver in 1927.

Mr. Lee was familiar with sections of the Canadian Pacific line in British Columbia and though he came to the district after such engineering feats as the Connaught Tunnel had been completed, he nonetheless was able to participate in a number of improvements.

Mr. Lee became a Member of the Institute in 1908. He was a life member of the Association of Professional Engineers of British Columbia.

Frederick Coburn Jewett, M.E.I.C., died in hospital in Ottawa on August 28, 1951.

Mr. Jewett was born in Sheffield, New Brunswick, April 18, 1880. Following graduation from the Provincial Normal School at Fredericton, N.B., he taught school in the province for several years, until entering McGill University.

A graduate of the class of 1904 as a bachelor of science in civil engineering, Mr. Jewett joined the firm of Smith, Kerry & Chase of Toronto, consulting engineers, for hydro-electric development projects on the Trent River. Later, he joined the firm of Haney, Quinlan & Robertson, as contractor's superintendent on the construction of the Trent Canal.

During the First Great War, Mr. Jewett was plant manager for the firm of Quinlan and Robertson, at their munitions plant in Campbellford, Ontario. Upon the termination of hostilities, he joined the engineering staff of the Department of Railways and Canals, now known as the Department of Transport, and was engaged as a division engineer in charge of construction of Sections 1 and 2 of the Welland Ship Canal, which extended from the Niagara Escarpment at Thorold, Ontario, north to Lake Ontario. Following the completion of the Welland Ship Canal, Mr. Jewett was engaged in harbour construction for the National Harbours Board at Saint John, N.B., and Montreal.

In 1938 he was appointed by the Imperial Government, chief engineer of the construction of what is now known as Gander Airport in Newfoundland. In 1943, he rejoined the Department of Transport, with the appointment of chief of wartime construction. In this capacity, he was very largely responsible for the construction of airfields across Canada, including the large airports at Goose Bay, Labrador, and those of the North-West Staging Route.

Following his retirement in 1948 from the Department of Transport, Mr. Jewett carried on a consulting engineering practice, making Ottawa his residence. In February, 1948, Mr. Jewett was made a Commander of the Order of the British Empire, Civil Section, by His Excellency, the Governor General, Lord Alexander, at an investiture held at Government House.

Since 1948 Mr. Jewett had been a Life Member of the Institute, which he joined in 1902 as a Student. He transferred to Associate Member in 1910, and to Member in 1940. He was one of the original members of the Association of Professional Engineers of Ontario.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment.*

Situations Vacant

CHEMICAL

CHEMICAL ENGINEERS with 2 to 4 years operation experience in the chemical industry. Successful applicants will be given 6 months special training period in the U.S.A. before being permanently located in Central Alberta by a major organic chemical industry in the production department. Apply to File No. 4075-V.

CHEMICAL ENGINEERING department of a large Canadian University will have a vacancy in the staff at the professorial level in the 1952-53 session. Major qualifications: ability to teach and direct research in the unit operations field, a good background in physical chemistry. An interest in the petroleum field would be useful though not necessary. Apply to File No. 4076-V.

CHEMICAL ENGINEER to act as economics analyst in large chemical organization in Ontario. Applicant should be a graduate with about 2 to 5 years experience and should possess a high degree of analytical ability, responsibility, maturity and facility for writing comprehensive reports. Apply to File No. 4081-V.

CHEMICAL ENGINEERS required by a paper company located in Province of Quebec. Time and motion study engineers with at least 2 years experience in time and motion study methods, plant layout, machine loading and operation write up. Time and motion engineers should be free to travel. Apply to File No. 4082-V.

CHEMICAL ENGINEER or chemist, recent graduate, to undergo training for a supervisory position in the fabric dyeing and finishing department of organization in Province of Quebec. Salary according to qualifications. Apply to File 4093-V.

CHEMICAL ENGINEER required with 3 or 4 years experience, preferably in the pulp and paper industry. Location Province of Quebec. Apply to File No. 4096-V.

CIVIL

EIGHTEEN CIVIL engineers required in head office, Tel Aviv, for surveying, designing and planning of roads, for construction planning and structural design of water and sewage works. Length of service a minimum of 2 years. Permanent position to begin as soon as possible. Qualifications: academic diploma or membership in a recognized professional organization with at least 2 years experience. Knowledge of Hebrew is desirable but not essential. Apply to File No. 4070-V.

TWENTY-SEVEN CIVIL engineers for supervision and field work of road work, bridges, buildings, water works, sewage and other public works. Location Tel Aviv and surrounding districts. Length of service a minimum of 2 years. Qualifications, academic diploma or membership in a recognized professional organization. Experience, at least 2 years. Specialized knowledge in equipment necessary for public works. Knowledge of Hebrew desirable but not essential. Age 24 to 40 years. Apply to File No. 4070-V.

CIVIL ENGINEER required for general contractors office in Montreal. Work consists of estimating, quantity take-offs, purchasing materials and construction design. Applicant should have 2 or 3 years experience. Salary commensurate with experience. Apply to File No. 4072-V.

CIVIL ENGINEER required by construction company in Province of Quebec preferably recent graduate who would be interested in building construction work as assistant to job engineer. Apply to File No. 4080-V.

CIVIL ENGINEERS required for large construction programme in Northern Canada, various locations. Six field engineers, chief of survey party, instrumentmen and draughtsmen. Head offices located in Montreal. Apply to File No. 4091-V.

CIVIL ENGINEER required for construction of service stations by petroleum marketing company located in Montreal. Applicant should be recent graduate and preferably bilingual. Apply to File No. 4094-V.

ELECTRICAL

ELECTRICAL ENGINEER required by public utility in Ontario. Graduate with general knowledge of public utility operations. Apply by letter stating age, qualifications, experience and salary expected. Apply to File No. 4079-V.

APPLICATIONS ARE invited for the post of professor and head of the department of power engineering in the India Institute of Science, Bangalore (India). The candidates should possess a degree in electrical engineering and should possess very high academic qualifications and experience, associations with engineering and technical institutions and teaching experience are necessary qualifications. For further information apply to File No. 4086-V.

ELECTRICAL ENGINEERS required to act as field service engineers for the overseas operations of Montreal manufacturer of specialized instruments. Duties include trouble shooting and supervision of installations of equipment. Age 26 to 35 years. Apply to File No. 4087-V.

TWO ELECTRICAL or electronic engineers required by specialized industrial plant in Montreal area. Applicants should have 5 to 10 years experience in production control. Apply to File No. 4088-V.

ELECTRICAL ENGINEER to act as sales engineer for Montreal manufacturer of electrical meters, fans, pumps and hoists. Applicant should be preferably recent graduate and must be bilingual. Territory Montreal. Apply to File No. 4089-V.

ELECTRICAL DESIGN ENGINEER with experience in lighting and power distribution in commercial and industrial buildings required by large consulting engineering firm located in Montreal. Apply to File No. 4097-V.

MECHANICAL

YOUNG MECHANICAL ENGINEER required by manufacturer in Ontario for time study and methods work. Salary depending on qualifications and experience. Apply to File No. 4068-V.

MECHANICAL ENGINEER required in Province of Quebec with approximately 5 to 10 years experience. Duties include general plant operations and to offer constructive ideas regarding operating problems in conjunction with process equipment, piping power drives, heat transfer fans and building structure, etc., to assume responsibility in designing and putting the above ideas into effect and be capable of working effectively with master mechanic tradesmen and other plant personnel. Apply to File No. 4074-V.

MECHANICAL ENGINEER required in Montreal in a shop producing small assemblies. The applicant should have several years experience and a reasonable knowledge of draughting is desirable. Salary based on qualifications and experience. Apply to File No. 4033-V.

MECHANICAL ENGINEER required to act as assistant plant engineer for new operations in Ontario. Applicant should be capable of supervising installation of plant machinery, plant layout and building structures, air, water, steam and sewer lines. Apply to File No. 4085-V.

METHODS ENGINEER required by Montreal manufacturer of fine instruments. Applicant should be preferably mechanical engineer capable of supervising groups of engineers engaged in drawings, etc. Apply to File No. 4087-V.

MECHANICAL ENGINEER required by specialized industrial plant located in

Montreal area. Applicant should have 5 to 10 years experience in production. Apply to File No. 4088-V.

MECHANICAL ENGINEER required to act as sales engineer by Montreal manufacturer of all types of sheet metal work. Applicant should have definite sales ability and be preferably a Montrealer. Apply to File No. 4090-V.

MISCELLANEOUS

ENGINEER WITH SOME experience in sewer design and construction and also experience in sewage treatment, required by public utility in Western Canada. The latter experience is more essential as plans are being made for the rehabilitation of the sewage treatment plant. Salary according to qualifications. Apply to File No. 4065-V.

RESPONSIBLE OPENING IN engineering department of firm manufacturing industrial gases and welding equipment. Applicant must be a graduate engineer and should have experience in a metal fabricating plant. After suitable training the individual will perform consulting engineering duties in the use of our equipment and products. Excellent opportunity along technical administrative lines for suitable person. Salary will be commensurate with qualifications. Apply to File No. 4066-V.

ENGINEER REQUIRED by organization in Toronto for new division being established. This position will present excellent opportunity for advancement in a fast growing company. It will also carry considerable responsibility. The man selected will temporarily work along product and tool design lines, but will be given training in mechanical and foundry fields. Previous experience in mechanical lines would be useful but this position could be filled by any young engineer with a mechanical bent who has a keen adaptable mind. Apply to File No. 4067-V.

A LARGE PAPER manufacturing company in the Province of Quebec requires a competent man to head up a new research project involving the fundamentals of paper making and machine design. Applicants should have an honors degree or a doctorate in either mechanical engineering, chemical engineering or engineering physics and must have some knowledge or experience in organizing research, some knowledge of paper manufacture is desirable. When replying give full details of education, technical experience, marital status, etc., and include photo. Apply to File No. 4069-V.

MECHANICAL AND ELECTRICAL engineers for planning and supervision of air-conditioning and power plants in buildings, supervision of technical equipment for buildings and public works, planning and installing, heating and hot water systems for cooling systems in buildings, required in Tel Aviv. Length of service a minimum of two years to begin as soon as possible. Qualifications: academic diploma or membership in a recognized professional organization with 3 to 10 years experence. Knowledge of Hebrew desirable. but not essential. Age 25 to 40 years. Apply to File No. 4070-V.

ENGINEER REQUIRED in the office of city engineer in Western Canada with experience on reinforced concrete structures and building design, for the design of an incinerator and building and provide such accessory services as may be required. Apply to File No. 4071-V.

ASSISTANT FACTORY MANAGER required by internationally known manufacturer of power equipment. Applicant must have a good technical background and extensive experience including several years management in the mechanical or preferably the electrical engineering field and be familiar with labor relations, employee training, cost estimating and accounting, factory organization and maintenance, modern production methods and equipment and be preferably bilingual. Please include photograph. Apply to File No. 4073-V.

AN ONTARIO MANUFACTURING company with sales offices across Canada making and marketing heating equipment used in all types of buildings requires an experienced business sales and advertising executive. He should have contacts with architects and the construction industry and have proven executive abilities. An opportunity for a young man 35 to 40 years old, married, ambitious, temperate in habits. All applications will be treated confidentially. Send complete details regarding age, marital status, education, etc., with at least two business and character references. Apply to File No. 4077-V.

SALES ENGINEER required by manufacturer of machinery tools and supplies to cover central and western Canada. Apply to File No. 4078-V.

INDUSTRIAL ENGINEER required by large manufacturer in Toronto. Applicant should be a recent graduate with one to two years experience in time-study, budgetary control, cost reduction, preferably in the metal industry. Apply to File No. 4084-V.

PRODUCTION CONTROL SUPERVISOR required by Montreal manufacturer of specialized instruments. Applicant should be a graduate engineer with some experience in production planning and scheduling. Age about 35 years. Apply to File No. 4087-V.

CHIEF ENGINEER required by manufacturer in Montreal of specialized instruments. Applicant should be preferably mechanical or electrical engineer with some experience in tool design and the light metal working industries. Age 30 to 35 years. Apply to File No. 4087-V,

JUNIOR ELECTRONIC engineer required by specialized Industrial plant in Montreal for research laboratory work. Experience not essential. Apply to File No. 4088-V.

ENGINEER PREFERABLY WITH 3 to 4 years experience in industry required by pencil manufacturer in Province of Quebec to act as assistant factory manager in plant employing 100 persons. Applicant should be preferably bilingual. Salary range $300.00 to $400.00. Apply to File No. 4092-V.

ENGINEER REQUIRED to head up newly formed engineering department of large group of chain stores. Applicant should have broad industrial background and would be self directing. Prepared to live in Toronto and travel considerably in Ontario, Quebec and the Maritimes. The purpose of the department will be to explore present methods of procurement and handling of merchandise from a scientific point of view aimed at reducing costs through improved methods of handling. The field will cover both distribution plants and retail stores and transportation. Apply to File No. 4095-V.

MECHANICAL OR ELECTRICAL engineer, 1951 graduate required by pulp and paper industry in Province of Quebec. Real opportunity offered to young man who desires to enter a pulp and paper industry from the engineering side. Salary open. Interviews in Montreal or Toronto. Apply to File No. 4096-V.

MECHANICAL OR ELECTRICAL engineer required by large oil company in Montreal. Applicant should be university graduate with experience in design and application of process control instrumentation. Apply to File No. 4098-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

CHEMICAL ENGINEER required by Montreal organization with knowledge of plant layout, material specifications A.S.M.E. code design and job scheduling. Experience of three to four years in the foregoing is desirable. Some knowledge of control instrumentation also beneficial. Salary according to qualifications. Apply to File No. 4023-V.

A PROMINENT CHEMICAL INDUSTRY has an opening in a plant in southern Ontario, for a Ph.D. with about ten years experience in research and development work. Some experience in administration is required in addition to that in the direction of research and development activities. Chances of advancement are excellent. Apply to File No. 4036-V.

CHEMICAL ENGINEERS preferably with post graduate training to act as process development group leaders for an expanding technical division in a large chemical plant in Southern Ontario. Applicants should have about five years experience in development and for operations in a chemical industry. The work will involve direction of a group of chemical engineers working on laboratory and pilot plant investigations, plant tests, and will include the evaluation of proposed new processes or process improvements. Apply to File No. 4036-V.

FIVE CHEMICAL ENGINEERS required by large chemical organization in Ontario to act as Sales Engineers. Chemical Engineer or Chemist from any Canadian University. Selling experience is preferred but not necessary. Preferably young men with a definite aptitude for selling. Apply to File No. 4060-V.

CIVIL

YOUNG CIVIL ENGINEERS required by organization in Province of Quebec, duties include design and field work on construction. Apply to File No. 4024-V.

MUNICIPAL ENGINEER for town in Niagara Peninsula population 7,000. Requirements are for civil engineer who has had experience in maintenance of pavements, side walks, sewers and surveying for new subdivisions. Salary open, middle-aged man preferred. Apply to File No. 4025-V.

CIVIL ENGINEER required to act as junior office engineer in Western Canada. Duties to include draughting, plotting, topography design, development of minor concrete and timber structures, computation of quantities for earthwork, rock excavation and concrete, and similar work required in the office of such a project. Apply to File No. 4041-V.

CIVIL ENGINEER required for the permanent staff of city engineers, department in Ontario. Work includes the design, layout and supervision of roads, sewers, sidewalks, etc. The salary is dependent on qualifications and full employee benefits are available. Apply to File No. 4046-V.

Sales Executive

An Ontario manufacturing company, with Sales Offices across Canada, making and marketing Heating Equipment used in all types of buildings, requires an experienced Business, Sales, and Advertising Executive.

He should have had contacts with Architects and the Construction Industry and have proven executive abilities. A member of the Professional Engineers Association of Ontario would be an advantage, but more important is the ability to enthuse and inspire by leadership those working under him.

An opportunity for a young man 35 to 40 years of age, married, ambitious, temperate in habits.

All applications will be treated confidentially. Send complete details regarding age, marital status, education, and comprehensive review of your business experience and church activities. Give at least two business and character references.

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Apply to File No. 4077-V

CIVIL ENGINEER required by the department of highways in Ontario. Applicant should have some experience in highway engineering and be preferably bilingual. Salary is $4500.00 per year with car allowance. Apply to File No. 4049-V.

A CIVIL ENGINEER required by firm of consulting engineers in Toronto with practical experience covering the design and installation of sewerage and sewage disposal systems. Salary according to qauilifications. Apply to File No. 4050-V.

CIVIL ENGINEER required with extensive experience in Canada or United States in water main, water pumping plant, sewer and sewage treatment plant layouts. Duties will include preliminary survey, design, draughting, and supervision. Permanent position with large organization in Toronto with generous pension, sick leave, and vacation privileges. Salary can be arranged to suit qualifications of successful applicant. Apply to File No. 4052-V.

THREE GRADUATE CIVIL Engineers with at least four years experience in design of reinforced concrete structures for work in Montreal. Apply to File No. 4056-V.

ELECTRICAL

ELECTRICAL ENGINEERS with experience in electronics and radar for positions in Ottawa. Salaries open. Apply to File No. 1588-V.

ELECTRICAL ENGINEER to take charge of switchgear estimating department. Qualifications required are that the applicant should have a sound general knowledge of electrical engineering fundamentals and should have a specialized knowledge of medium and high voltage switchgear. He should have experience in the preparation of specifications, tenders and cost-estimates. Salary would depend on qualifications. Cost of living bonus and pension scheme. Location Montreal. Apply to File No. 4051-V.

ELECTRICAL ENGINEER required, young university graduate with research outlook, to join a team working on aircraft de-icing. The work is mainly in the electrical field, with some observational flying. Some experience with aircraft electrical power systems is desirable. Initial salary up to $3,900.00 depending on age, qualifications and experience. Apply to File No. 4054-V.

MECHANICAL

TWENTY MECHANICAL engineers, senior and junior, are required to work in Montreal office, on design of special machines, design of heating and air conditioning systems. Must have college degree or equivalent background. Some practical experience in either field is desirable. Apply to File No. 4003-V.

MECHANICAL SALES ENGINEER with three or more years experience on hydraulic presses or rolling mills, design layout, application, servicing and sales. Salary commensurate with ability. Responsible position in Montreal office of firm with international reputation. Apply to File No. 4032-V.

THREE MECHANICAL engineers required by firm in Newfoundland, for process and general engineering duties. Single men are preferred who have experience in the pulp and paper industry. Salaries open. Apply to File No. 4055-V.

MECHANICAL DESIGN engineer required by locomotive works in Montreal. Apply to File No. 4062-V.

METALLURGY

METALLURGIST, RECENT GRADUATE required by large transport company in Montreal. Duties include microscopic and physical study of various metallurgical problems. Apply to File No. 4063-V.

MISCELLANEOUS

THE PUBLIC SERVICE OF CANADA REQUIRES electrical engineers (electronics and communications) appointments at Ottawa, Toronto and Montreal. Salaries up to $4,740.00 per annum. Details and application forms may be obtained by writing C. S. Comm, Ottawa, Competition No. 50-158-B. Apply to File No. 2016-V.

REFRIGERATION ENGINEER required in Montreal to do design and development work on ice cream cabinets, refrigerated merchandising equipment. Preferably graduate from Canadian University 1950 or 1951. Practical experience in commercial refrigeration possibly through summer work would be advantageous as a supplement to a theoretical knowledge of refrigeration. Age under 30 years. Applicant should have initiative and perseverance, should be interested in engineering as a profession rather than as an immediate key to an administrative position. Salary open. Apply to File No. 4026-V.

SALES ENGINEER preferably chemical or mechanical as representative in Montreal and vicinity on exclusive commission basis. The man we require must be experienced in industrial applications as he will be required to call on chemical, food and other processing industries. This is a real opportunity as the commission rate is good, equipment is top quality, and the successful applicant will be given the opportunity of acquiring an interest in the company after proving his worth. Apply to File No. 4028-V.

SENIOR INDUSTRIAL ENGINEER required to supervise manufacturing methods and standards. The location is approximately 16 miles east of downtown Toronto. Salary open. Apply to File No. 4029-V.

ENGINEERS REQUIRED with experience in heating and plumbing by consulting engineering firm in Montreal. Apply to File No. 4031-V.

MECHANICAL OR CHEMICAL ENGINEER to act as junior project engineer in chemical organization in Ontario. Applicant would work with plant engineer on piping layouts and design plant and equipment layouts, some process and machine development maintenance problem, etc. Preferably graduate with one or two years experience or 1951. Apply to file No. 4034-V.

ENGINEER REQUIRED to act as assistant purchasing agent for manufacturer of engineering supplies, located in Province of Quebec. General duties consisting of preparation of engineering quotations, sales correspondence and purchasing of equipment. Preferably bilingual but not essential. Apply to file No. 4038-V.

ENGINEER REQUIRED by organization in Ontario with good knowledge of Marine radar with training and ability to handle service and installation crews. Considerable travelling involved. Apply to File No. 4042-V.

ENGINEER TO ACT AS assistant, to deal with technical and administrative work and to do some outside sales work for organization in Ontario, manufacturing radar and navigation equipment. Travelling involved. Apply to File No. 4042-V.

SENIOR DRAUGHTSMAN required by firm located in Ontario. Must have several years all-round experience in plant layout and special machinery and equipment. Salary commensurate with experience. Application with sample of work to File No. 4043-V.

PLANT ENGINEER for textile mill in Province of Quebec. Applicant should be about 35 years of age with three to five years' experience in plant maintenance, preferably a textile mill. Salary open. Apply to File No. 4044-V.

INDUSTRIAL ENGINEER to act as leader and instructor of industrial engineering teams in applied field work. Will be required to instruct various teams of engineers in methods for increased productivity and plan the activities of these groups of engineers. This will be mainly practical work and will require much travel. Responsible to the industrial consultant of the ministry of labour. Travel throughout Israel. Length of service one year. Experience: should possess experience in the field of industrial engineering in general, and particularly practical experience in serving as consultant to industrial projects. Hebrew desirable but not essential. Age 35 to 55 years. Apply to File No. 4045-V.

PROFESSOR OF INDUSTRIAL engineering to teach both undergraduates and graduates in the field of industrial engineering. Responsible to Ministry of Labour, Hebrew Techion, Haifa. Length of service indefinite. Previous experience as professor in the field of industrial engineering at an accredited university. Knowledge of Hebrew is desirable but not essential. Age 25 years and over. Apply to File No. 4045-V.

RESEARCH DIRECTOR of Israel Rubber Research Assoc. Research in improving production methods as well as quality of products. Instruction in the plants. Length of service 2 years. Degree preferably in field of chemistry of rubber Age 35 to 50 years. Hebrew is desirable but not essential. Reading knowledge of English, German and French is desirable. Apply to File No. 4045-V.

RESEARCH DIRECTOR of the Israel Ceramics Research Assoc. for research in improving production methods as well as quality of products. Research in the conservation of imported raw materials and the utilization of local raw materials. Length of service 2 to 3 years. College degree preferably in the field of ceramics. Candidate should have some practical experience in the manufacture of ceramics and be familiar with the semi-automatic equipment used, especially dishes, electrical ceramics, building and sanitary ceramics, and should be familiar with tunnel kiln process. Knowledge of Hebrew is desirable but not essential also knowledge of English, French and German. Age between 30 and 45 years. Apply to File No. 4045-V.

TWO FULL PROFESSORSHIPS and two associate professorships to the faculty of electrical engineering, Hebrew Institute of Technology, Haifa. Duties to commence about October, 1952. Instruction in the fields of telecommunications and power engineering, in due course instruction to be conducted in Hebrew. Applicants must have specialized professional and academic qualifications in telecommunications and power engineering. Salaries fixed in relation to the highest grade of the Israel Civil Service. There will be a pension scheme. The Haifa Institute will pay transportation expenses and will also undertake to provide housing. Apply to File No. 4045-V.

TWO PROFESSORSHIPS TO THE faculty of mechanical engineering at Hebrew Institute of Technology, Haifa. Duties to commence in October, 1952 or earlier. One of the above two positions requires special knowledge of applied thermodynamics. In due course instruction to be conducted in Hebrew. Salaries will be fixed in relation to the highest grade of the Israel Civil Service. There will be a pension scheme. The Haifa Institute of Technology will pay transportation expenses and will also undertake to provide housing. Apply to File No. 4045-V.

INDUSTRIAL ENGINEER instructor for field engineers and advanced industrial engineering methods. Will instruct groups of field engineers in methods for increased productivity. Time and motion studies, etc. Work of industrial engineer would be both theoretical and practical and would require direct contact with projects in the field. Will supervise approximately ten engineers. Responsible to industrial consultant of Ministry of Labour. Travel throughout Israel. Length of service one year. Knowledge of Hebrew is desirable but not essential. Age 40 and over. Apply to File No. 4045-V.

SUPERINTENDENT REQUIRED by gold mining company in Western Canada. Salary range $500.00 and a new house may be rented at a very nominal price. Apply to File No. 4048-V.

RECENT GRADUATE required by Hamilton organization for training as sales engineer on sheet metal building and industrial products. Qualifications: graduate civil engineer or architect, age 20-25 years preferred, knowledge of industrial building construction an asset, to locate in Toronto or Hamilton area. Excellent opportunity for career in sales. Apply to File No. 4053-V.

ENGINEER REQUIRED in B.C. for research work on hydraulic model laboratory, to examine the nature of water currents in the vicinity and to determine what alterations will be necessary to accomplish certain industrial requirements. Besides these possibilities of industrial and research experience, there is the privilege of using the research as a thesis material for advanced degrees. The position offers a full-time salary at a level in keeping with the qualifications of the candidate. Apply to File No. 4057-V.

THE MANUFACTURING and assembly department of the overseas operations division of a large automotive industry in Canada is offering to the engineering graduate extremely valuable experience in all lines of automotive engineering endeavour. The work is essentially one of liaison in Australia, India, New Zealand and South Africa. Men for this department should have a broad inquisitive interest in everything automotive (as opposed to those with specialized interests). As they will deal with both directors and labours alike, a personality neither forceful or reluctant is desirable. Should the need arise they should also be willing to serve in India and Malaya. Apply to File No. 4059-V.

RECENT GRADUATE ENGINEERS required by manufacturer in Ontario of steel chains, conveying and power transmission equipment for the expansion of their engineering and sales department. Applicants will be given thorough training and then be placed in key positions where they are most suitable. Apply to File No. 4061-V.

SUPERINTENDENT OF PRODUCTION control required by large locomotive industry in Montreal. Apply to File No. 4062-V.

UNIVERSITY GRADUATE DESIGN Engineer required in Toronto, Ontario, capable of designing hydro-electric equipment and in particular hydraulic turbines and auxiliaries. Apply to File No. 4064-V.

Situations Wanted

CIVIL ENGINEER, 1949 graduate, age 27. Experience in highway construction and concrete construction. Desires responsible position with construction company or consulting firm in Ontario or Western Canada. Apply to File No. 203-W.

ELECTRICAL ENGINEER, age 42, widower, 4 children, bilingual, experienced sales and service, administration, purchasing and office routine, interested in appointment as branch manager or representative of well established manufacturing company or agency. Apply to File No. 1421-W.

ELECTRICAL ENGINEER, M.E.I.C., P.Eng. (Que.) University of Alberta 1936, age 38, small family. Desires position in Western Canada, preferably Alberta or B.C. Fourteen years varied experience in the electric wire and cable manufacturing field, with emphasis on Power Cable. Experience includes considerable application engineering involving extensive studies of cable rating and impedance calculations, considerable overhead conductor design calculations; laboratory experience covering a wide range of electrical measurements, general and high tension cable testing techniques, laboratory apparatus design; knowledge of manufacturing methods; some plant layout. Considerable practical experience with electronic apparatus in the measurement and audio fields. Available on reasonable notice. Apply to File No. 1460-W.

TOWNSITE ENGINEER, capable of taking complete charge of the administration, design and construction of Townsite developments or extensions, including planning, roads, drainage, sewers, water supply, Hydro distribution, buildings. Qualifications include fourteen years experience in Canada and abroad, C.E. (Toronto), P.Eng., M.E.I.C., A.I.E.E., A.S.C.E., A.W.W.A., C.I.S.S. Apply to File No. 2466-W.

ENGINEER, MECHANICAL, interested in position offering opportunity as representative, plant or assistant engineer. Experience includes twelve years design, construction and maintenance with pulp and paper industry. Age 40, married. Apply to File No. 2642-W.

WELL QUALIFIED ELECTRICAL and mechanical engineer, '31, with ten years experience in equipment manufacturing, chemical plant operation and design of large industrial steam and power generation and distribution systems would welcome change of employment leading to increased responsibilities. Aggressive, efficient and capable of handling complete projects. Cost conscious. Could be available at 30 days notice. Please address enquiries to File No. 2912-W.

CIVIL ENGINEER, Jr.E.I.C., bilingual, with 1½ years experience with consulting engineer firm and three years with steel fabrication company. Work consisting mostly on design of reinforced concrete structure. Desires position in Montreal area in architect's office or with consulting engineering firm as structural engineer. Apply to File No. 2947-W.

CIVIL ENGINEER, M.E.I.C., desires to obtain part time work (evenings and Saturdays) design and detailing in reinforced concrete and structural steel, in Montreal. Apply to File No. 3315-W.

CIVIL ENGINEER, B.Sc. '47, Jr.E.I.C., P.Eng. (Que.), age 26, married, with car, 3½ years varied structural experience with architects, fabricators and contractors, covering design, detailing and estimating of structural steel and concrete as well as liaison work, desires position with responsibility. Must include outside work in design and supervision, and/or liaison work, or sales promotion. Available on one months' notice to present employer. Ontario or Alberta preferred. Apply to File No. 3340-W.

MECHANICAL ENGINEER, M.E.I.C., P.E., Quebec, seeks position with progressive organization where training and experience could be best utilized in administration or production. Experience includes 5 years as works manager of large engineering plant and covers inspection, design, manufacturing and administration. Apply to File No. 3355-W.

MECHANICAL ENGINEER, M.E.I.C., A.M.I., Mechanical Engineer, Chartered Engineer, 1st class B.O.T. (Steam and Motor) Stationary Engineer A.B. Certificate. Management administration, construction, power plant operation. Desires more progressive position at senior executive level. Apply to File No. 3420-W.

GRADUATE ENGINEER, Jr.E.I.C., N.S.T.C., 1949. Married. Age 27, with qualifications and experience to handle position as workshops superintendent. Experience in production control, employing and interviewing personnel. Presently employed as workshops supervisor and as production engineer for a small assembly plant. Desires position where experience may be beneficial for administration and production duties. Apply to File No. 3547-W.

GRADUATE STRUCTURAL ENGINEER, M.E.I.C., A.M.I., Struct.E., with 10 years experience (about a year in Canada) in design and erection of reinforced concrete, steel and timber structures, well experienced in prestressed concrete design and construction, capable of supervising a team work. Would accept a position of Senior Designer. Apply to File No. 3552-W.

PART TIME WORK: Graduate Civil Engineer, B.A.Sc., S.E.I.C. desires to obtain part time work (evenings and Saturday) drafting and detailing in Toronto. Some experience in reinforced concrete and steel design. Apply to File No. 3553-W.

ELECTRICAL ENGINEER, Jr.E.I.C., P.Eng., experienced at draughting, designing and estimating power and lighting layouts, substations, control schemes, etc., now fully employed, desires part-time work in Montreal area for evenings and week-ends. Apply to File No. 3554-W.

CIVIL ENGINEER, B.Sc., U. of S. 1950, Jr. E.I.C. Age 32, married, veteran. Presently employed as resident engineer on highway construction work. 12 years experience in all phases of survey work and 5 years as resident engineer. The latter position entails full charge of surveying, designing and construction of the 2 or more highway projects placed under my control. The position also demands considerable administrative ability. Desires permanent position with organization in which hard, good work and initiative leads to advancement. Wishes to get away from position which entails too much travelling. Would like to settle in one locality. Apply to File No. 3555-W.

CHEMICAL ENGINEER, British subject, 25 years old, B.Sc. (Chemical Engineer), A.C.G.I., 2 years experience chemical and petroleum refinery development. Capable, and hard-working. Has served in Armed Forces. Apply to File No. 3560-W.

MECHANICAL ENGINEER, McGill, aged 31, Canadian, with capital, is interested in representing or becoming dealer for Canadian or English company to work in either Canada or Mexico. Has full working rights in Mexico, many business contacts and speaks and writes Spanish fluently. Apply to File No. 3561-W.

ELECTRICAL ENGINEER, S.E.I.C. Age 31, single. Graduate of the University of Manitoba, 1951. Experience in house service wiring, and topographical survey. Done some line tracing and mapping. Presently employed in hydro plant. Will be prepared to leave any time after October 1st. Would prefer work as designer or maintenance engineer in an electrical firm. Apply to File No. 3562-W.

CIVIL ENGINEER, University of Toronto, 1949, Jr.E.I.C., P.Eng. Experience has been mainly on heavy construction, three years as resident engineer on diversified hydro-electric work, also 2 years of office design and administration. Desire position in construction or work closely allied thereto. Apply to File No. 3604-W.

GRADUATE ELECTRICAL ENGINEER, S.E.I.C., Manitoba 1951. Married, one child, R.C.A.F. veteran, presently employed. Desires to gain experience in Electronic design. Willing to work for moderate salary during training period. Montreal or Toronto area preferred. Available on two weeks notice. Apply to File No. 3651-W.

CHEMICAL ENGINEER, McGill, 1951 graduate, 24 years old, single. Worked two summers for large Pulp and Paper Industry in Ontario. Desires position in production organization. Would prefer working in the Province of Quebec. but would accept work at any other location. Apply to File No. 3679-W.

ELECTRICAL ENGINEER, Jr.E.I.C., 1949 graduate. Age 26, married, bilingual, desires employment in Montreal. Test course experience with a large electrical firm; design and sales training. Would like position preferably with consulting engineers firm or electrical sales firm. Any interesting position with opportunity for advancement will be considered. Available in two weeks notice. Apply to File No. 3699-W.

ELECTRICAL ENGINEER specializing in permanent magnet applications, open for engagement. Apply to File No. 3700-W.

U.K. ENGINEERING EXECUTIVE, M., I.E.E., contemplates immigration to Canada. University engineering degree and 25 years industrial experience in mechanical, electrical and electronic engineering. Wide knowledge of commercial and government research and development including aircraft accessories, guided missiles, naval equipment, electronic and television work. Knows Canada well and speaks French. Apply to File No. 3701-W.

EXPERIENCED STRUCTURAL ENGINEER. M.E.I.C., A.S.C.E., seeks employer wishing to delegate responsibility for design (and erection) of structures and foundations for buildings and industrial plants. Trained in England (Field and Office); 15 years experience on mill buildings, warehouses, chemical plants, etc. Sound theoretical approach, employed for past three years in Canada as senior design engineer with Hydro-electric utility. Interested only in position of responsibility. Apply to File No. 3702-W.

CHEMICAL ENGINEER, Jr.E.I.C. Married. Presently employed. Four years service in paper industry. Supervisory experience and ability to organize. Familiar with control statistics and instrument maintenance. Would like responsible position in process control with opportunity of advancement. Apply to File No. 3772-W.

PART TIME WORK: Graduate Civil Engineer, Jr.E.I.C., desires part time work in Montreal for evening and weekends. Some experience in design of steel, reinforced and prestressed concrete structures and bridges. Apply to File No. 3773-W.

CIVIL ENGINEER, Jr.E.I.C., Montreal 1946, age 29, married, bilingual. 5 years experience on road construction projects; some knowledge but no experience in metallurgy. Would like to acquire more varied experience in either construction or metallurgy. Apply to File No. 3774-W.

ENGINEER, Jr.E.I.C., B.A.Sc., University of B.C., M.Sc. Civil Engineering, Utah State Agricultural College 1951. Special training in Hydraulics and soil mechanics. 27 months experience in drainage, irrigation work involving survey, small dam construction, wash-bore drilling. Present position responsible for field and office work 3 survey crews. Desire research, teaching or extension work. Consider foreign appointment. Experienced public speaker and research report writer. Ex-navigator R.C.A.F., 4 years overseas. Married. Age 30. Apply to File No. 3776-W.

YOUNG MECHANICAL ENGINEER, Jr. E.I.C., P.Eng., single, 5 years design experience in process industries, power and construction, desires a position as group leader. or any related position offering a genuine opportunity for initiative and advancement. Personal interview by appointment. Available on two weeks notice to present employer. Montreal preferred. Apply to File No. 3777-W.

GEOLOGICAL ENGINEER, S.E.I.C., recent graduate, 24 years old, single, bilingual, with experience in geological exploration and valuation of ore deposits desires position as production or industrial engineer. Available on short notice. Apply to File No. 3778-W.

CIVIL ENGINEER, 27, B.Eng., McGill 1949, Jr.E.I.C., P.E.O., P.E.Q. Presently employed with a steel construction firm, 3 years experience prior to university and 3 years of design experience. Type of experience in design covers: design of bridges, factory buildings, apartment buildings, transmission towers and structures, guyed and self supporting radio masts. Interested in working with a construction firm or general contractor, preferably with the option of becoming a junior or full partner. Apply to File No. 3779-W.

WANTED

Experienced, well-qualified Civil Engineer, for the Town of Bathurst, N.B.

Reply in writing to E. J. Doucet, Town Clerk and Treasurer, P.O. Box 60, Bathurst, N.B., before November 30th, giving full particulars as to experience, qualifications, reference and salary expected.

Attention, Members

Please telephone in advance and make an appointment if you propose using the Institute's Employment Department.

This will result in a better service to everyone concerned.

TELEPHONE PLATEAU 5078

Except in special cases all interviews will be arranged between the hours of 9 and 12.

INDUSTRIAL ENGINEER

Here is an excellent opportunity for the right man to take over a key executive position with a large progressive merchandising organization with headquarters in Toronto.

The purpose of the position is to explore present methods of distribution and handling of merchandise from a scientific point of view aimed at reducing handling costs. The field will cover distribution plants, retail stores and transportation.

The man we are looking for must be capable of advising with construction engineers and architects on the planning and functional design of sales space and storage space in retail stores together with exterior design. This will include the selection of materials having regard to availability, appearance, economical maintenance and overall building costs. He must also be capable of advising on the functional design of fixtures and mechanical equipment. He will be expected to explore the possibilities of cost-reduction in such items as wrapping materials, garbage disposal, lighting, maintenance of floors, etc. Finally he will be expected to study procedures and methods of handling merchandise from the source right through to the consumer with a view to suggesting improvements which will result in a more efficient operation and reduced expense.

The person selected will have to be selfdirecting, be prepared to travel considerably in Central and Eastern Canada. He should be a University graduate in Engineering and have some experience in materials handling.

Salary will be commensurate with knowledge, ability and experience and will be supplemented by modern employee benefits including Pension Plan.

Reply in confidence, giving age and details of education and experience to file No. 4095-V.

News of the Branches

Activities of the Thirty-five Branches of the Institute and abstracts of papers presented at their meetings

Belleville

S. Sillitoe, M.E.I.C.,
Secretary

First meeting, October 15, 1951

The seventh meeting of the Belleville Branch of The Engineering Institute of Canada and first of the 1951-52 season was held at the Kiwanis Centre with 70 members present.

In the absence of Mr. Fulton, the treasurer W. L. Langlois took the chair. The business of the evening included the announcement that elections would be held at the December meeting because the membership of the executive had been depleted through transfer and sickness. He called upon Mr. Sillitoe to report on the appointment of a nominating committee and the arrangements for the combined meeting with Peterborough November 7th for the President's Visit.

Mr. Sillitoe introduced the speaker of the evening Mr. J. E. Hayes, assistant to the chief engineer of the Canadian Broadcasting Corporation, who spoke on the subject "C.B.C. Television Facilities". With the aid of slides and later motion pictures, Mr. Hayes described the buildings in Montreal and Toronto which will house the studio and control facilities for television programming. He outlined the special arrangements necessary for lighting, scenery and prop manufacture and storage. There will be one large studio and one smaller studio in each of the installations at Montreal and Toronto. The Montreal studio facilities are incorporated in a new building adjoining the Radio Canada Building, while the transmitter facilities will be located on the top of Mount Royal, where a 283-foot mast supporting four antennae is being constructed. In Toronto the studios will be located on the ground floor of a new structure being erected on the Jarvis Street property with a 500-foot mast. The transmitters will have a power of 5 kilowatts, but the effective radiated power due to frequency assignment and the effective height and gain of the antenna will be about 16 kw. in Montreal and 20 kw. in Toronto.

There followed an interesting description of television camera equipment and the methods of transmitting motion picture films by television. Mr. Hayes explained that in the absence of cable facilities which will be provided next year by the Bell Telephone Company of Canada much of the programme material would be processed on fine grain 16-mm. film to enable broadcasting of the same programme from both outlets. An interesting description of the equipment and the technical problems encountered in the "Telecinė" and "Kine-recording" equipment were culminated in a motion picture demonstration of the impressive results that will be achieved by the equipment chosen. Colored slides of the present C.B.C. master control facilities constructed by the Northern Electric Company in Belleville were shown and described in their relation to television programme facilities. An interested discussion followed.

In giving a vote of thanks to the speaker, Mr. R. H. Tanner added to the amusement of the evening by relating some incidents in his experience at the B.B.C. in London and drew interesting parallels with the situation in Canada.

Cape Breton

G. W. Ross, M.E.I.C.,
Secretary-Treasurer

Joint meeting, September 28

A meeting of the Cape Breton Branch of The Engineering Institute of Canada, and the Mining Society of Nova Scotia, was held in September to hear a talk on "The Electronic Rope Tester", by Messrs. P. E. Cavanagh, R. S. Sedgworth and W. Simpson.

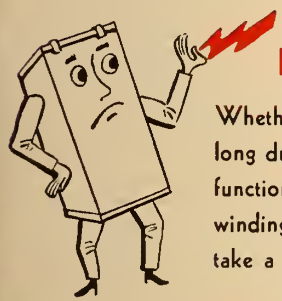
This machine has been in operation at Nova Scotia coal mines since February, 1950, and there is every expectation that it will predict hoisting rope failures, so as to enable ropes to be removed before damage is done. This will be a major step in mine safety.

The speakers stated that the machine owes its success in the Nova Scotia coalfields to the skill and perseverance of Mr. William Simpson, mechanical inspector, Nova Scotia Department of Mines, who has been in charge of the Government rope testing truck methods of operation which were described by Mr. R. S. Segsworth of the General

This photograph was taken during the visit of the Cornwall Branch to Canada Starch Co. Limited, Cardinal, Ont., on September 22, 1951.

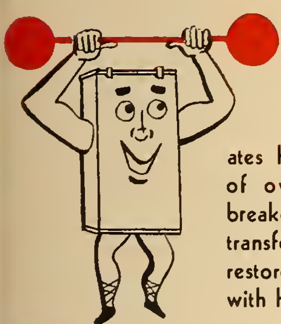
"CSP" *means completely self-protecting*

The Westinghouse CSP is the only transformer that meets all requirements for service continuity! H.V. "De-ion" arresters protect windings against surges. L.V. has thermal breaker protection against overload or short circuit. "De-ion" arresters can be arranged for grounded or ungrounded neutral systems. Performance and dependability are backed by over a million successful installations.



LIGHTNING

Whether lightning is of short or long duration, "De-ion" arresters function to prevent damage to windings. CSP transformers will take a direct stroke of lightning.



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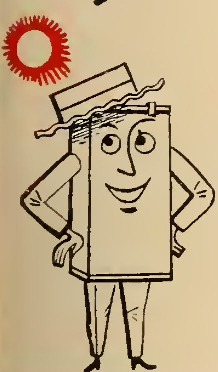
Thermal breaker in secondary winding eliminates high voltage fuses. In case of overload or short circuit, breaker trips, thereby relieving transformer of fault. Service is restored by reclosing breaker with hook-stick.



SERVICE

Signal lamp forewarns utility of increasing load which might cause tranformer to be removed from service by secondary breaker. An aid in maintaining continuous service, this visible indicator often eliminates load surveys.

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6 p.m. Sunday evenings—"Westinghouse Presents" John Fisher and the Don Wright Chorus—C.B.C. Dominion network

Engineering Co., Toronto, and the principles of operation by Mr. P. E. Cavanagh, Ontario Research Foundation.

The meeting was under the joint chairmanship of Mr. H. H. Marshall and Professor D. J. McNeil. A number of questions were put to the speakers by engineers from local coal mines and by metallurgists. The meeting concluded with an interesting vote of thanks to the speakers.

Cornwall

John A. Sarjeant, jr.e.i.c.,
Secretary-Treasurer

A. A. B. McMath, m.e.i.c.,
Branch News Editor

Plant visit, September 22, at Cardinal

The Canada Starch Co. Limited plant at Cardinal, Ontario was the scene of the first autumn meeting for Cornwall branch. On the afternoon of September 22nd, a group of 12 ladies and 20 men were welcomed there by R. H. Wallace, plant superintendent.

While the ladies were being conducted on a tour of the plant, the men held a brief business session. Then Mr. Wallace delivered a paper on the subject "A Steam Plant in a Small Industry Keeping Pace with Plant Extensions". He was assisted by F. E. Trewartha, superintendent of the power house. Both men are members of the branch. Several other members, from the Cardinal plant, were also in attendance to answer questions.

Mr. Wallace traced the history of the plant from the time it was established 93 years ago. He outlined particularly some highlights from the time the present plant was completed in 1921, describing various steps by which the power house was built up to meet increasing demands from the plant. He then stated that an ultimatum from the insurance company in 1950, forced a decision to install a new boiler before 1953, to replace two old boilers. A second new unit is also planned before 1960.

To supplement the above paper, Mr. Wallace guided the group through the power house to inspect the crammed conditions which will make the new installations difficult. Later, refreshments were served to the visitors in the plant cafeteria. Branch Chairman H. W. Nickerson expressed the appreciation of those present, to Mr. Wallace and the plant management.

This was an excellent effort on the part of the Cardinal members, to start the ball rolling for a new season.

Hamilton

G. L. Schneider, jr.e.i.c.,
Secretary-Treasurer

Bernard A. Warren, s.e.i.c.,
Branch News Editor

Plant visit, September

The September meeting of the Hamilton Branch took the form of a visit to the Dominion Foundries and Steel new blast furnace. Over 300 members and guests took advantage of the visit to acquaint themselves with this portion of Hamilton's industrial development.

Two guides boarded each of the seven buses provided by the Dominion Foundries and Steel which left the Dofasco Veterans Club at 5.30 to take the tour through the new blast furnace which was put into operation last July.

After an extremely interesting visit to the plant, the members and guests arrived back at the Veterans Club for a fine buffet supper provided by the Company.

The professional engineers of Hamilton and district were invited, and one highlight of the day was the signing into membership in the E.I.C., ten of these men.

Mr. F. J. McMulkin, research and development engineer of the Dominion Foundries and Steel was in charge of the arrangements for the visit and, following supper, he spoke on the technical aspects of what makes a blast furnace and how this one was different from others. He spoke on a broad basis generally so that all could follow his remarks.

Mr. D. O. Davis, Dofasco's chief engineer, spoke on the problems of design and construction of the furnace and how they were overcome by co-operation between designers, erectors and owner.

A brief question and answer period followed the two talks and everyone agreed that the meeting provided a good send-off for the 1951-52 programme of the Hamilton Branch.

Professional Development Course

An important part of the programme for the younger members of the Hamilton Branch was inaugurated this fall with the commencement of a course in Professional Development, and modelled after last year's Toronto Experiment.

At last year's E.I.C. Convention in Montreal, Messrs. E. T. W. Bailey, W. E. Brown, and G. L. Schneider, all from the Hamilton Branch heard Colonel Grant speak on the benefits to be had from a course for junior engineers, following the recommendations of the Monteith Report as presented to the Engineer's Council for Professional Development, in the U.S.A. and Canada.

The Hamilton threesome agreed that the idea had considerable merit, and asked Col. Grant to attend a meeting of interested members of the Hamilton Branch at the home of G. L. Schneider in Burlington.

This meeting was extremely successful and Col. Grant aroused sufficient enthusiasm, that a second meeting was called at which representatives of the Toronto experiment, Messrs H. Kolesar, D. Burns, and C. Mitchell, were present to offer guidance.

Mr. C. P. Layard, last year's winner of the Students' and Juniors' papers competition was elected chairman of the course, with Mr. Robert Kerr, the previous year's winner, as secretary. G. L. Schneider and B. A. Warren were appointed interim chairman and secretary, respectively.

Several committee meetings, with M. A. Reid and Mr. J. B. Carruthers attending, would be required to line up speakers, topics, and prospects for the course and, generally, to get things rolling.

From over 60 who applied for admission, the first 25 were taken, so that the course might not become too unwieldy.

Col. Grant spoke the first night on the 'Background of the Engineer's Professional Development," while Mr. Stuart Armour, the economic advisor to the president of the Steel Company of Canada spoke on the "Phases of the Canadian Economic Situation," with special references to inflation.

Miss Audrey Gregg spoke on "Vocal Expression," and the subjects of future lectures include Management Relations, Engineering Law, Social Graces, and Contracts and Patents.

Throughout the course, in which sessions are to be held weekly, top-notch men in their particular fields, have signified a ready willingness, often at personal sacrifice, to present their talks, and guide the hour's discussion which follows. In that Hamilton is such a thriving industrial and commercial centre, there is an abundance of talented speakers in the fields to be covered by the course, and these are sought out to give the members in the course the finest in information and guidance.

The attendance for the first three meetings has been 97 per cent which indicates its early success.

Buffet supper at Hamilton Branch September meeting.

Engineers' Ball, November 22

The Hamilton Branch is holding its Second Annual Engineers' Ball at the Brant Inn on November 22, 1951. This event proved to be an extremely popular affair last year. This year, the committee is arranging to have the branch members and their ladies attend dinner in the Tower Room of the Brant Inn previous to the dance. It is expected that a representative of the E.I.C. President will be in attendance to bring greetings from Headquarters to the branch.

An engineers' painting, photography, and etching exhibition is being held in conjunction with the ball activities.

As is customary, the Professional Engineers of Hamilton and District are being invited to attend.

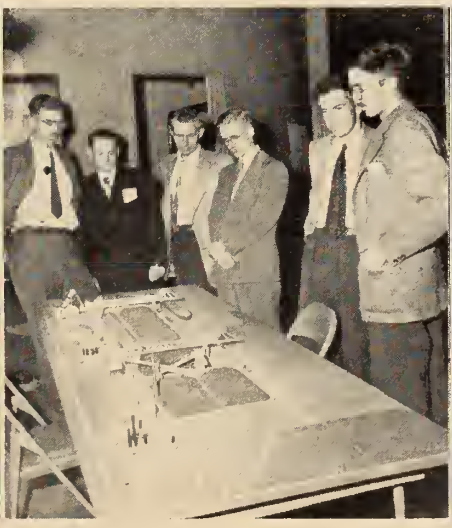
Kingston

S. H. Rochester, M.E.I.C.,
Secretary-Treasurer

Hugh D. Forbes, Jr.E.I.C.,
Assistant Secretary

Plant tour, September 25

The Kingston Branch held its first meeting of the 1951-52 Session on Tuesday, 25th of September, 1951, the occa-



The Hamilton Branch visited the Dominion Foundries and Steel new blast furnace in September. Pictured above as they addressed the meeting are D. O. Davis (left) and John McMulkin (right), respectively chief engineer and research and development engineer of the Company. At centre is pictured a group inspecting the model of the new blast furnace layout.

sion being a tour of Aluminium Laboratories Limited, Kingston, Ontario. A most encouraging attendance of the local membership was achieved, together with a large number of visitors, the overall number being approximately 80.

Following a few brief opening remarks by Major A. L. MacLean, Chairman of the local branch, the meeting was handed over to Mr. John Millson of Aluminium Laboratories Ltd., who had arranged an excellent sequence for the tour. Conducted parties of members proceeded through the many departments over a period of some 2½ hours.

After witnessing the casting of aluminum for spectrographic samples in the foundry, the parties went on to the machine shop. An ingenious hydraulic shaper processing aluminum specimens, aroused considerable interest, and the Mechanical Testing Laboratory included a demonstration of tensile and fatigue testing. In the Welding Laboratory, members were given a most interesting demonstration of Argon metallic welding, and were shown examples of many types of welds.

After leaving the cable testing machine and the Finishing Laboratory, where methods of plating, anodizing and chemical brightening were studied, the parties moved into the Metallographic Laboratory to view the electron microscope, which has a magnification of 20,000, and when specimens are photographed, enlarged and reviewed, will produce a magnification of 100,000. Representative negatives were viewed in the X-Ray Diffraction Laboratory, together with an explanation of structural analysis. In the chemical and corrosion laboratories, samples were undergoing tests for corrosion in various solutions, to determine the rate of corrosion for various alloys. After a visit to the Paint Laboratory and the Library, members re-assembled in the conference room for lunch.

At the conclusion of the meeting, Professor S. D. Lash called for a vote of thanks to Aluminium Laboratories Ltd., which was responded to by Mr. John Millson on behalf of the Company.

Regular meeting, October 24

The Kingston Branch held their October meeting in the Biology Room, Old Arts Building, Queen's University, with Major A. L. MacLean as chairman.

The guest speaker, Dr. R. A. Preston, Professor of History at the Royal Military College, was introduced by Col. King. The theme of his subject, "United Nations—A Problem in Social Engineering" proved of general interest to all in attendance. Dr. Preston talked very briefly on the aspects of social science and claimed that this type of science is much more difficult than engineering science. As an example of this he mentioned that during the last election in the United States when the Gallup Poll indicated that President Truman would be defeated whereas the actual results proved the opposite to be true. He also mentioned that over specialization caused some scientists to change their political views. In this regard he stated that many scientists in Germany before the last war swung over to Nazism and Communism.

Dr. Preston continued to expand his understanding of the problem by giving in very precise detail the history working up to the present conflict between Egypt and Britain. In 1875 Britain purchased for £4,000,000 shares in the Suez Canal. Entanglement in Egyptian affairs first occurred in 1882 when she was requested to stop a revolt of the Egyptian Army. The Suez Canal in 1888 was declared an international waterway, however, Egypt was not a party in the agreement. When Turkey declared war on Britain in 1914, and as Egypt was part of Turkey, Britain declared herself the protectorate of Egypt. Petty grievances soon developed between the two countries, and were further aggravated when Egypt was not given a seat at the peace table in 1919.

A Declaration of Independence was signed in 1922 with certain limitations which included the canal zone to be under British control. Corruption in the Egyptian government and the murder of the British Commander in 1924 again lead to British control of Egypt. Finally in 1936 the Anglo-Egyptian Treaty was signed which included a seat in the League of Nations for Egypt. This treaty also included mutual military aid. In the second world war good co-operation was obtained from Egypt even though this country did not declare war.

Poor relations again occurred between the two countries during the Palestine crisis, with the Egyptians blaming the British. To make matters worse the Egyptian Army lost considerable prestige when their army was defeated by the Israel Army. Egypt finally declared that the Anglo-British Treaty would be cancelled.

In the second part of his address Dr. Preston said that the difficulty in Egypt is only one part of the trouble in the world caused by the upsurging of nationalism. To help solve these problems the United Nations was formed. The United Nations has failed to control the Atomic Bomb, and to create an International Police force. The ultimate aim would be the formation of a super state, but Dr. Preston does not consider this possible as long as countries refuse to give up their sovereign rights.

According to Dr. Preston the United Nations has not been a complete failure as it has limited, or stopped a number of small wars, e.g. in Iran, in Palestine and the Greek problem. The United Nations has also been able to bring diplomats together, and to keep them talking. Another important mission of the United Nations is carried out by the Social and Economic Council. The primary purpose of this council is to attempt to study the major causes of wars. This council also supplies technical assistance to undeveloped countries. The assistance normally consists of experts in such fields as Engineering, Medicine and Government.

Dr. Preston concluded that the United Nations is the only hope for a reasonable future for mankind. To help advertise the United Nations every city is urged to form a United Nations Association. These associations are not to be government agencies but financed through membership donations.

A vote of thanks to Dr. Preston was given by Dean D. S. Ellis.

Lakehead

Frank E. Ayers, M.E.I.C.,
Secretary-Treasurer

September meeting

Some of the problems and integral workings of the Association of Professional Engineers of Ontario were discussed at the Lakehead by two executive members of the association.

Heard were T. M. Medland, executive director, and T. C. Keefer, field secretary, both of Toronto. They spoke to about 35 members of the Lakehead branch of the Engineering Institute of Canada, meeting in the Highland Inn.

The functions, purposes and problems of the Association of Professional Engineers were outlined to the Lakehead engineers by Mr. Medland.

The executive director discussed various aspects of public relations in promoting the engineering profession.

Mr. Medland called upon the engineers to "sell" themselves, their profession and their accomplishments to the people of Canada.

"Selfishness" was not the motive behind this selling job, Mr. Medland said, but a sense of "duty" that the people should be told more about the accomplishments of the engineering profession.

Mr. Keefer explained some of the aims of the association in respect to sick benefits, salary schedules, employee-management relations, and the general well-being and status of the profession.

Mr. Medland was introduced by O. J. Koreen. Upon completion of his address, Mr. Medland introduced Mr. Keefer. The speakers were thanked by J. M. Fleming. A. J. Mickelson was chairman for the meeting.

Montreal

R. B. Wotherspoon, M.E.I.C.,
Secretary-Treasurer

The Student Guidance Committee of the Montreal Branch met on October 11th last. Plans for the current scholastic year were made, it being decided to hold a forum in November for the Collèges Classiques, one in January for English High School students, and one in February for the boys in the French High Schools (Ecoles Supérieures). The general subject will be as in previous years, "Engineering as a Career".

The Committee now consists of Messrs. T. G. Anglin, Henri Audet, Jacques Benoit, Pierre Bournival, Arthur Goodwin, W. H. Moore, G. B. Moxon, Leo Roy, Walter Wong, Howard Tinkler (Secretary), Jacques Laurence (Vice-Chairman), and Hugh Nourse (Chairman).

The panel of prominent Montreal engineers who are willing to counsel high school students by granting them interviews, by arrangement through a committee member, is at present as follows:

French-speaking: Messieurs Paul A. Béique, Maurice Guerin, J. N. Langelier, Huet Massue, Leopold M. Nadeau, Charles E. Tourigny, et P. E. Poitras.

English-speaking: Messrs. John E. Armstrong, J. R. Donald, Walter Griesbach, P. E. Jarman, F. L. Lawton, C. C. Lindsay, D. C. MacCallum, C. K. McLeod, J. G. Notman, P. L. Pratley, A. D. Ross, E. R. Smallhorn, J. B. Stirling, and B. Wheelwright.

An informative bulletin, in both English and French versions, has recently been sent to all known guidance counsellors on the staffs of the high schools and classical colleges in the Montreal district.

Ottawa

W. R. MEREDITH, M.E.I.C.,
Secretary-Treasurer

Luncheon meeting, September 20

Alarm over the attitude which he said labour groups outside of Canada and the U.S. are developing at the annual meetings of the International Labour Organization was expressed at the opening luncheon meeting of the 1951-52 season of the Ottawa Branch, at the Chateau Laurier, September 20.

The speaker, A. C. Ross, president of the Ross-Meagher Construction Company of Ottawa, and a past-president of the Ottawa Branch of E.I.C., stated that "the attitude of labour groups of I.L.O. is developing in an ill-advised and unfortunate fashion."

Mr. Ross, who attended the 1951 I.L.O. convention, held in Geneva last May, as a representative of the Canadian Construction Association, charged that "there was an obvious ganging up of Latin American and Asiatic countries in the Organization's election."

He maintained these countries were "ganging up" on the North American countries whose popularity in the world, he admitted, "is waning and our unconscious superiority attitude is not reacting to our advantage."

In addition, the Communist-controlled labour groups from Poland and other satellite countries are operating counter to everything at the I.L.O. meetings.

"The Communists are putting a spike into everything they can," Mr. Ross charged flatly. "Their only interest at the meetings lay in adding difficulties to the deliberations."

Concerning the position of labour here at home, the speaker had some counsel for the engineers in his audience, some of large employers.

"The reason I am bringing this subject before you," he said, "is that these problems are becoming more prominent in our national economy. Labour problems are closely related to social measures and I suggest that you give both more thought."

During the remainder of his address Mr. Ross briefly outlined his tour of Europe, particularly Germany and England, following the I.L.O. convention, and of his attendance as an observer at another labour meeting in Stockholm, Sweden.

He was introduced by the chairman of the meeting, B. G. Ballard.

Vancouver

STUART S. LEFEAUX, M.E.I.C.,
Secretary-Treasurer

H. T. LIBBY, M.E.I.C.,
Branch News Editor

Inspection meeting, October 17

Approximately eighty-five members and visitors of the Vancouver Branch met at the University of British Columbia for the purpose of inspecting the Fraser River Model.

The meeting was opened by Syd De-Jong, programme chairman, who gave a resumé of the programme to the end of the year, and then introduced Edward S. Pretious, professor-in-charge of the Fraser River Model Project.

Professor Pretious commenced his address by explaining that, contrary to the common belief, the object of the Fraser River Model was to study ways and means of improving the river for purposes of navigation rather than for studying flood control. He gave a quick summary of hydraulic model construction and then outlined the details of the model itself.

The model was built by the National Research Council of Canada in co-operation with the University of British Columbia for the Federal Department of Public Works. It is built on a horizontal linear scale of 1/600, vertical linear scale of 1/70, discharge scale of 1/360,000, velocity ratio of 1/8.4 and a time scale of 1/70.

The model requires two pumps for its operation; one twenty-cubic-foot per second, axial flow, propeller pump which delivers the water for producing

In September, members of the A.S.M. and E.I.C. Vancouver Branches visited plants of Consolidated Mining and Smelting Company, accompanied by members of the Kootenay Branch of the Institute.

the tides, and one two-cubic-foot per second centrifugal pump which pumps the water for the water discharge. By means of self-balancing survo mechanisms, perfect control may be had of the tide level in the tidal basin, the river discharge and the sand injection rate. The tides are operated by tilting weirs hydraulically operated from a slave hydraulic cylinder which is controlled by an electronic curve follower which in turn follows actual tide curves which are drawn on transparent charts. The river discharge is governed by a weir which is controlled by the balancing mechanism operated by a reversible motor which, in turn, is controlled from a servo transmitter upon which is placed a cam cut to correspond with actual flows that have been recorded at Hope, B.C. The sand injector is coupled to the flow control mechanism so that the sand injection rate is proportionate to the water flow rate. By these means, although all three variables can be controlled separately, they may be synchronized so that any known conditions can be duplicated in the scale model.

The scale model which occupies several acres, covers the prototype area from Sumas to a point eight miles west of the sandheads and from the upper reaches of Pitt Lake to the location well south of the most southerly arm of the River outlet. A basin representing a portion of the Straits of Georgia, about eight miles by nineteen miles and occupying 12,700 square feet, serves as the ocean into which the model river flows, and it is within this area that the tides are controlled.

The total amount of water used in the model is 10,890 cubic feet and 80 cubic yards of actual Fraser River sand are used in the erodible basin part of the Model.

Professor Pretious explained that, at the present time, experiments are being conducted with the model in order to get it to duplicate known past performance of the prototype. When the model satisfactorily reproduces conditions that have been known to prevail in the past, it will be used for predicting what can be expected in the future.

The model is being constructed in Vancouver so that all those with practical experience with the River and its vagaries will have an opportunity to add their knowledge to that already accumulated by the various agencies.

Upon completion of Professor Pretious' explanation, the members inspected the model. Competent personnel were stationed at the various points of interest and explained the apparatus and methods in use.

After the meeting, everybody returned to the University Lecture Room where refreshments were servd. The members and their friends pronounced this one of the most informative and enjoyable evenings of the current season.

Field trip, September 12

Members of the Vancouver Branch of the E.I.C. and members of the Vancouver Branch of the American Society of Metals left by C.P.A. plane on Wednesday, September the 12th, for a field trip to Trail. The day was ideal for flying and the party enjoyed the trip over scenic Southern British Columbia.

The party was met at Castlegar by the chairman and secretary of the Trail Branch of the E.I.C., and representatives of the Consolidated Mining and Smelting Co.

The members of the Trail and Vancouver Branches were guests of the Company at luncheon. Mr. Stiles, chief engineer of C. M. & S. at Trail, welcomed the visitors and outlined briefly the history of the Company and the processes which would be seen during the plant visits planned. Mr. Hamilton outlined the programme planned for the visits. Mr. de Jong replied briefly, expressing thanks of the visiting party for hospitality of the Company in entertaining at luncheon and making the plant visits possible.

After lunch the visitors were taken through the Tadanac Plant to see the process of reducing zinc and lead concentrates to the pure metals. Following this plant visit, members desiring to see the new ski lift, were taken to Red Mountain and given a ride on the lift.

The following morning the party viewed the Warfield plants, producing fertilizers and in the afternoon inspected the research and testing facilities of the C.M. & S. Co.

On Wednesday evening the Branches of the E.I.C. and A.S.M. met at dinner at the Crown Point Hotel with Mr. H. P. Hamilton, of the Trail Branch, presiding. Mr. W. O. Scott spoke briefly on behalf of the Vancouver Branch A.S.M.

and Mr. S. H. de Jong on behalf of the Vancouver Branch, E.I.C. Mr. H. N. MacPherson gave a short address telling of some of the Institute activities of which the members and the public are not sufficiently aware. Dr. Pidgeon, head of the Department of Metallurgy, University of Toronto, spoke briefly, stressing, among other things, the need for more students in engineering field and in particular the metallurgical branch. Other speakers on the programme were Mr. Eric Broadbent and Mr. J. A. Merchant.

Winnipeg

C. S. Landon, M.E.I.C.,
Secretary-Treasurer

Electrical Section

K. Hallson, Jr.E.I.C.,
Secretary-Treasurer

J. G. Dickinson,
Branch News Editor

Tour of Naval Station

Members of the Winnipeg Branch of the E.I.C., Electrical Section, were favoured with a very pleasant evening on HMCS Chippawa, October 4th. Thanks to Commander L. D. G. Main, R.C.N.(R), and staff, approximately sixty members toured the ship, showing special interest in electrical apparatus.

HMCS Chippawa was formerly the Winter Club of Winnipeg, and is now a permanent naval training station for reserve units. The tour was very interesting for both ex-navy types and others. To especially interest the communication engineers were the various electronic items, such as radio, teletype, radar and asdic. Of interest to the power engineers were the electrically controlled and operated guns. To many it was somewhat of a surprise to see how quickly and accurately heavy guns could be manœuvred to seemingly any direction using only a 4-kw. Hewittic Rectifier for d.c. power.

Asdic, a submarine detecting device proved very interesting. The equipment consisted of a frequency generator which normally operated at about 12 kc., an oscillator circuit, the sound wave directing head and the electronic timing elements measuring the echo return and showing it in distance. As pointed out by Lt. Commander Rooke, Asdic is not the full answer in submarine detection due to its limitations in distance, which varies considerably with the density of the water. Possibly underwater Radar will be next.

After seeing the maze of electrical apparatus that is now a must on naval vessels, it is easy to appreciate the space problem, particularly on Destroyers, where overall size is kept to a minimum.

The evening was very pleasantly concluded with refreshments and lunch served in the rather attractive and comfortable Officers' Lounge.

Sincere appreciation was extended to the Captain and his ship by Mr. L. A. Bateman, the Electrical Section Chairman, on behalf of the members present.

Engineers' Wives Associations

Hamilton

Mrs. J. S. R. Beck,
Publicity Representative

The Engineers' Wives Association, Hamilton Branch, opened the programme of fall activities with a dinner meeting in September. Head table guests included Mrs. William Brown, Mrs. J. M. Elliott, Mrs. E. T. W. Bailey, Mrs. James Vance and Mrs. Neil Metcalf. The special speaker was Mrs. Irene Booth, a well known fashion consultant of Hamilton.

Mrs. G. L. Schneider, president, welcomed several new members and reviewed briefly the activities of the group last season. In March, the association entertained Mrs. A. G. L. McNaughton at luncheon and at a tea held at the home of Mrs. W. J. W. Reid. At the April meeting, held at the Camesco Club, the members enjoyed a review prepared by Mrs. Laura Arnold of the book "A Pocketful of Canada".

The May meeting took the form of a court whist party, the conveners being Mrs. J. R. Carruthers and Mrs. J. S. R. Beck.

A special treat was the June picnic held at historic Battlefield House, Stoney Creek, where a blazing fire on the hearth provided an attractive setting for supper. Afterward the ladies toured the old farmhouse and saw the interesting collection of Canadian antiques.

One of the most successful projects of the Association last year was the formation of smaller groups devoted to particular interests and hobbies. Three were formed for craft work, music appreciation, and bridge. These will be continued this year and others added if the members so wish.

The October meeting, presided over by Mrs. Schneider, was devoted to the ratifying of the constitution on which a committee, headed by Mrs. W. Whetan had been working for several months. Following the business, an excellent programme of Nova Scotian and Newfoundland folk songs was presented by four young Hamilton artists. Mrs. D. J. Haines, who introduced the guests, prefaced their songs with a short talk on folk music and its place in Canadian culture. A vote of thanks was expressed by Mrs. L. C. Sentance, and the meeting was adjourned for refreshments.

Calgary

The annual membership tea of the Engineers' Wives Club, was held at The Hudson's Bay Company Store auditorium Thursday, September 6, from 2.30 to 4.30 p.m.

All wives of members of the Institute or of registered professional engineers of Alberta and associate members were invited to attend.

An arrangement of sweet peas and snapdragons flanked by pink and white tapers centred the tea table where honours at the tea urns were shared by Mrs. Victor Kastberg, Mrs. H. M. Hunter, Mrs. C. K. Bridgman and Mrs. J. McMillann.

Assisting in serving were Mrs. H. H. Beech, Mrs. C. O. Hage, Mrs. N. J. Christie, Mrs. J. C. Scott, Mrs. G. Sharpe, Mrs. W. A. Cairns, Mrs. J. D. Weir, Mrs. Ian Cook and Mrs. D. F. Kobylnyk.

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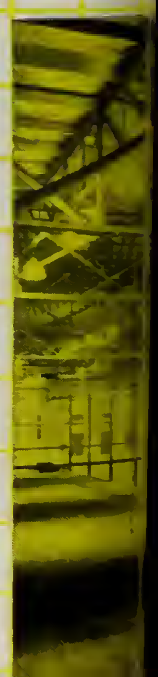

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

Festival of Britain, 1951: Selected Designs. London, Association of consulting engineers; Toronto, International Trade Press, 1951. 411 p., illus. $11.00.

As the official custodian of the ethical code governing the relations of the British Consulting engineer to his clients, to contractors, and to the public, the Association of Consulting engineers invited its members to prepare brief descriptions of their work in various parts of the world. These descriptions form the contents of this book.

The first design in the book is the Royal Festival Hall, which is described and illustrated in detail, in plan, construction, and numerous aspects of the finished construction.

In all, 47 designs are included, and they vary in range from the Captain Cook Graving Dock in Sydney; to Pimlico housing estate heating scheme; Design and construction of the Ladybower reservoir; Civil engineering services for steelworks; and, Factors for the production of Portland cement, to mention just a few picked at random.

Excellent detail photographs of models, methods of construction, bridge spans, interiors, working conditions, and general views, make the book both attractive to use and an invaluable reference tool for practically all types of engineers.

Plans, elevations, and location maps are also included where necessary.

In all cases, the engineers responsible for the project being considered are named and in some cases the principal contractors and sub-contractors are included.

It seems rather a pity that, with the obvious care and expense to which those responsible for its publication have been put, that FESTIVAL OF BRITAIN 1951 is not indexed.

While the book itself is most attractive in format, and most valuable in content, we feel that all this could have been further magnified by a detailed index. E.K.

BOOK NOTES

Prepared by the Library of The Engineering Institute of Canada

Applied Electricity. Edward Hughes. Toronto, Longmans, c1950., 412 pp., illus., $2.10.

A sequel to Electrical engineering science, by Morley and Hughes, and published in England, this book covers the syllabuses of the Ordinary National Certificate in Electrical Engineering, the "Applied Electricity" of Part I of the B.Sc. (Engineering) examination of the University of London, the Intermediate examinations in "Electrical Engineering Practice" of the City and Guilds of London Institute and the "Principles of Electricity" of the joint section A examination of the Institutions of Civil and Electrical Engineers.

B S I symbols and nomenclature are used, and the text includes 54 worked examples and 307 problems, most of the questions being taken from examination papers. The Appendix includes Supplementary questions, and answers to examples. The book is indexed.

Canadian Income Tax Act, 17th Ed., Consolidated to Adjournment of Parliament, June 30, 1951. Toronto, CCH Canadian Limited, 1951., 321 pp., $2.50.

This edition contains the 1951 amendments implementing the 1951 Budget Resolutions and, as formerly, the full text of the analogous provisions of the Income War Tax Act. A two-way cross reference table is provided giving the analogous provisions for each section of the new Act, and vice-versa. In addition, full texts of the Canada-United States reciprocal tax convention, and of Canada-United Kingdom and Canada-New Zealand tax agreements are reproduced.

Compulsory Arbitration of Utility disputes in New Jersey and Pennsylvania. R. R. France. Princeton, Princeton University, 1951. 90 p., illus., $2.00.

While these findings on compulsory arbitration of utility disputes are concerned only with the states of New Jersey and Pennsylvania, the authors go into much detail which will be found useful, certainly in other parts of this continent.

The operation and an analysis of both acts, are considered and broken down in detail, and the pamphlet concludes with comparisons and conclusions on the forms of compulsory arbitration in the two states.

"Reports consulted" and a short bibliography are included.

Destins Industriels du Monde. Albert Ducrocq. Paris, Berger-Levrault, 1951, 326 pp., illus., 560 fr.

"On fermera ce livre dans l'enthousiasme ou dans le désespoir."

This succinct statement on the book jacket is in itself intriguing.

In the same vein, at the close of the main part of the preface, is quoted: "L'histoire a vendu son âme à l'industrie."

To summarize it briefly, DESTINS INDUSTRIELS DU MONDE is a brilliant, thought-provoking synthesis of mankind, the humanities, power and energy (with all that those terms imply in the mid-twentieth century) metals and plastics. On doit le lire pour l'apprécier.

Equivalent Valves. H. Gordon Hawes, M.I.T., ed. San Francisco, Hooper Publishing Co., 1950. 150 innumbered loose leaf pages, thumb indexed, $15.00. Annual set of new sheets, $10.00.

Designed as a reference tool for the engineer, purchasing agent, and valve salesman, this volume is a guide to the differences between the valves offered by the 18 manufacturers involved for a given type, material, and pressure rating.

Its five sections, Brass, Cast iron, Cast steel, Forged steel and Bar stock are all

PUBLICATIONS OF OTHER ENGINEERING SOCIETIES

Exchange arrangements exist between The Engineering Institute of Canada and engineering societies in the British Empire and the United States whereby members of the Institute may secure the publications of these societies at special rates which, in most instances, are the same as charged to their own members. A list of these publications with the amounts charged is given below. Subscriptions should be placed at E.I.C. Library, 2050 Mansfield St., Montreal 2, Que., but **NO REMITTANCE** should be made until an invoice has been received. **THESE PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.**

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Electrical Engineering—monthly, single copies	$ 1.25	$ 3.00
Per year (including postage to Canada)	8.00	16.00
Transactions—annual, bound (including postage to Canada)	8.00	16.00
Combined subscription (including postage to Canada)	10.00	20.00
AMERICAN SOCIETY OF CIVIL ENGINEERS		
Separates of papers published during year, per year (including postage to Canada)	$ 6.00	$12.00*
Civil Engineering—monthly, single copies	.75	.75
Per year (including postage to Canada)	5.50	7.00
Transactions—annual, per year	6.75†	13.50‡
(Other publications 50% reduction on Canadian price to E.I.C. members)		
** If subscription received before Dec. 1st, otherwise $14.00*		
† If subscription received before Jan. 1st, otherwise $10.00		
‡ If subscription received before Jan. 1st, otherwise $20.00		
AMERICAN SOCIETY OF MECHANICAL ENGINEERS		
Mechanical Engineering—monthly, single copies	$ .75	$ 1.00
Per year (including postage to Canada)	5.00	10.00
Transactions & Journal of Applied Mechanics (available only in combination subscription; including four issues of the Journal of Applied Mechanics, and eight issues of Transactions	12.00	
Transactions & Journal of Applied Mechanics (available in bound form in April)	17.00	
Applied Mechanics Reviews—monthly, single copies	.75	
Per year (including postage to Canada)	11.00	
INSTITUTION OF CIVIL ENGINEERS		
Proceedings—three parts, per year		
Part I	$ 4.00	$ 8.00
Part II	2.00	4.00
Part III	2.00	4.00
INSTITUTION OF ELECTRICAL ENGINEERS		
Proceedings—four parts, per year		
Part I (General)	$ 3.00	
Part II (Power Engineering)	4.00	
Part III (Radio and Telecommunication Engineering)	4.00	
Part IV (Collected Monographs)	1.75	
All four parts together	8.50	
INSTITUTION OF ENGINEERS, AUSTRALIA		
Journal—monthly, per year	$ 8.00	$16.00
INSTITUTION OF ENGINEERS (INDIA)		
Journal—quarterly, single copies	$ 1.00	$ 2.00
Per year	3.00	4.50
INSTITUTION OF MECHANICAL ENGINEERS		
Proceedings—quarterly, per year	$12.00	$16.00
NEW ZEALAND INSTITUTION OF ENGINEERS		
Proceedings—annual, bound	$ 2.50	$ 4.00
SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS		
Transactions—monthly, single copies	$ .75	$ 1.00

Members wishing their subscriptions to commence with the January issue should place orders with the E.I.C. Library immediately. Every effort will be made to comply with requests. However, receipt of the January issue cannot be guaranteed

indexed and numbered, and the information sheets are listed in table form and include the type of valve, various descriptive material, and the manufacturer of each.

Equivalent Valves should prove of value to all of our members having anything to do with the choice, location or purchase of valves.

Handbook of Oil Burning. F. H. Faust and G. T. Kaufman. New York, Oil-Heat Institute of America, 1951. 978 pp., illus., $10.00.

In 1931, the Handbook for which the oil burner industry had been waiting, was published. A small printing of 4,000 copies was quickly exhausted. Since that time, you have again been waiting.

Oil burning actually begins with the removal of crude oil from the earth and ends with the discharge of heat and gas into the atmosphere, and this handbook does seem to cover that broad field.

Oil as a fuel, its combustion, preparation for combustion, burning equipment, heating system, controls, selection of equipment, and application, and installation and maintenance of the oil burner are all covered in the eight numbered sections of the volume.

A very useful section of standards, both compulsory and voluntary, are appended to the text, as are also thumb-nail sketch biographies of the authors and editors. Seventeen pages of index, further enhance the value of this handbook.

Industrial Democracy at Work: a factual survey. W. R. Brown and N. A. Howell-Everson. Toronto, Pitman, 1950. 104 pp., $3.15.

The recognized practice of industrial democracy is less than fifty years old.

At the turn of this century, very little was known or thought of joint consultation between management and workers, profit-sharing, welfare or vocational work, or any general consideration for the feelings or conditions of others.

This volume, which considers all these aspects of commerce and industry, is the first of its kind to be published, and comprises a factual report on the experience of some 600 representative British industrial firms practising the policies of Industrial Democracy.

Besides the table of contents, the contents of the five parts of the book are briefly suggested in the front which is a tremendous help for quick reference to a definite aspect of the problem in hand.

The book is indexed, and carries an appendix in the form of the questionnaire, "Nation-wide inquiry into certain aspects of management-labour relations".

Low Temperature Properties of Ferrous Metals. New York, Society of Automotive Engineers, 1950. 97 pp., illus., $4.00.

This report evaluates the effect of metallurgy, heat-treatment and design on low-temperature behavior of ferrous materials. Also considered, are the effects of manganese, silicon, sulfur and phosphorus, chromium, molybdenum, nickel and copper, vanadium, columbium, titanium and other alloying elements. Among the other significant phases covered, are test procedures and equipment for measuring low-temperature embrittlement. This publication includes 62 charts, graphs and photographs, plus 22 tables.

Operation of Sickness Benefit Plans in Collective Bargaining. Fred Slavick. Princeton, Princeton University, industrial relations section, 1951. 109 pp., $2.50.

The present work deals with recent general developments in Union-management sickness benefit plans, framework for financial operation, standards of financial operation, administration of benefit provisions, problems and experience in benefit administration, and industrial economy and adequacy. This report, of which the focus is organization and administration, offers answers to the problems of policy and administration within a trade union and of the mutual benefit or insurance program.

Petroleum Geology. E. N. Tiratsoo. London, Methuen, 1951. 449 pp., illus., 42/–.

This work covers both the academic questions related to the origin, migration and accumulation of petroleum in the subsurface, and the practical problems of discovering and exploiting oil deposits. Surface methods of discovery, such as geological mapping, aerial survey and the evaluation of oil seepages and asphalt deposits, are described, as well as subsurface methods integrating geophysics and geochemistry with geology. The world's oilfields are reviewed, particularly with reference to their structural and stratigraphic history. There is a bibliography of more than 1,000 references to current geological literature. Besides an alphabetical index of subject, etc., in which oil fields are in italics, there is a name index to authors whose works are quoted in the main text.

Relaxation of Constraints and Moment Distribution. J. Jennings. Manchester, Emmott, c1951. 40 pp., illus., 3/-. (Mechanical world monograph No. 62).

An attempt has been made in this monograph to explain carefully the principles of the methods of R. V. Southwell and Hardy Cross for the solution of structural problems, omitting as few essential steps as possible, and depicting by sketches the state of the structure of beam at various stages in the solution. The jack and the clamp analogies have been emphasized as giving a valuable physical picture of what could otherwise be a purely mathematical process.

Reviews of Petroleum Technology, V. 10, 1948. Institute of Petroleum. London, the Institute, 1951. 350 pp., 27/6.

The progress made in the scientific and technical aspects of the petroleum industry during 1948 is the general subject matter of the 27 papers comprising this volume. Perusal of the contents, shows the coverage to be an exceedingly broad one. To add to its reference value, each paper in the book carries a synopsis at the beginning, and a list of references at the end. Index is both by subject and by name.

Safety in the Chemical Laboratory. H. A. Peters and J. W. Creyton. London, Butterworths, also Lange, Maxwell & Springer, 1951. 258 pp., illus., 15/9.

In this work, the principles underlying hazards and corresponding precautionary measures have been emphasized. In treating the hazards connected with the handling of chemicals, gases and dusts, the principles of physiology are outlined, and special reference is made to the respiratory process and the way in which harmful substances penetrate into the organism to exercise their toxic effect. Safety appliances are described and a compilation of safety rules and regulations is given. The last chapters of the book describe a series of analytical procedures for detection and estimation of contaminating substances in the air.

Simplified Mechanics and Strength of Materials. Harry Parker. New York, Wiley, c1951. 275 pp., illus., $4.00.

This is an elementary treatment written for those whose training has not included a practical appreciation of mechanics or advanced mathematics; a working knowledge of algebra and arithmetic is sufficient to enable one to understand the mathematics involved. Detailed explanations of numerous practical examples, followed by problems to be solved by the student, make this a both convenient and valuable handbook.

Techniques of Plant Maintenance 1951. New York, Clapp and Poliak inc., 1951. 223 pp., illus., $6.00. (Proceedings of the technical sessions sponsored by the American Society of Mechanical Engineers and the Society for the Advancement of Management held concurrently with the 2nd Plant maintenance show, Cleveland, January 1951).

This volume comprises the text of all papers and discussions presented at the second Plant Maintenance Conference, as well as answers prepared by speakers to questions that lack of time prevented answering at the sessions. There are about four papers on each of the following subjects: general plant maintenance, electrical equipment, power plant and heating equipment, small plants, lighting, chemical plants, paper and paper products, food-processing plants, metal-working plants and applied lubrication.

STANDARDS

ASTM Standards, American Society for Testing Materials, 1916 Race street, Philadelphia 3, Pennsylvania.

ASTM Standards on Gaseous Fuels. $1.75.

In this standard, methods are given for sampling natural gas and measurement of gaseous fuel samples. Also covered are methods of analysis of natural gases by the volumetric-chemical method, and of natural gases and related types of gaseous mixtures by the mass spectrometer. Water vapor content, caloric value and specific gravity, are also treated.

ASTM Standards on Metallic Electrical Conductors. $2.50.

This publication deals with copper, copper alloy and copper covered steel (wire, stranded conductors, rod, bar and shapes, pipe and tube), aluminum (wire, stranded conductors, rod and bar), galvanized steel core wire, galvanized iron and steel guy, messenger, span, overhead ground, and line wire. It includes a section on classification of and specifications for non-ferrous metals.

1950 Supplement to book of ASTM Standards including tentatives. Part 1 — Ferrous Metals. $3.50.

Includes 66 standards covering steel (pipe and tubes, castings, bolting material, boiler plates, structural and rivet, bar, forgings, heat treated tires and springs, concrete reinforcement, etc.), cast and malleable iron, ferro-alloys, metallography and general testing methods.

Part 2 — Non-ferrous Metals. $3.50.

Includes 42 standards covering copper and copper-base alloys (wire, rods and stranded conductors for electrical purposes, plate, sheet and strip, wire, rods, bars and shapes, pipe and tubes), aluminum and copper wire, rods and stranded conductors, aluminum and aluminum-base alloys, die-cast metals and alloys and general testing methods.

Part 3 — Cement, Concrete, Ceramics, Thermal Insulation, Road materials Waterproofing, Soils. $3.50.

Includes 68 standards covering cement, lime, gypsum, thermal insulating materials glass and glass products, ceramic whitewares, natural building stones, masonry building units (brick, structural clay tile), pipe and drain tile, mineral aggregates and concrete, etc.

Part 4 — Paint, Naval Stores, Wood, Adhesives, Paper, Shipping Containers. $3.50.

Includes 54 standards covering pigments (mineral iron oxide, blue green, red and metallic), drying oils, shellac, varnish and varnish products, lacquer and lacquer materials, general paint tests, paint weathering tests, naval stores, wood, adhesives, paper and paper products, shipping containers, tests of building construction, fire tests, thermometers and general testing methods.

Part 5 — Textiles, Soap, Fuels, Petroleum, Aromatic Hydrocarbons, Anti-freezes, Water. $3.50.

Includes 93 standards covering textile materials (asbestos, glass, rayon and estron, wool and general), soap and detergents, coke, petroleum products and lubricants, greases, methods of measuring and sampling petroleum and petroleum products, industrial aromatic hydrocarbons, gaseous fuels, engine antifreezes, industrial water, thermometers and general testing methods.

Part 6 — Electrical Insulation, Plastics, Rubber. $3.50.

Includes 30 standards covering electrical insulating materials (shellac, tubes and molded materials, mineral oils, ceramic products, fabrics and papers) plastics (melamine-formaldehyde molding compounds, optical properties, molds and molding processes) runner products, thermometers and general testing methods.

British Standards, British Standards Institution, 24/28 Victoria street, Westminster, London, S.W.1. British Standards are available from the Canadian Standards Association, National Research Building, Ottawa, Canada.

B.S. 1262, Part 2:1950 — Sizes of Tins for Paints and Varnishes and other Liquid Products of the Paint Industry. 2/–.

Compliance with the lists of sizes will facilitate distribution and packing, reduce production costs, and enable manufacturers, wholesalers and retailers to save valuable storage space.

B.S. 1735:1951 — Flanged Cast Iron Gate Valves, Classes 125 and 250 for the Petroleum Industry. 5/–.

In view of the international character of the petroleum industry, it is essential that there should be interchangeability between equipment produced by American and British manufacturers. Use of data from American Standard Association is acknowledged.

LIBRARY REGULATIONS

Hours

Mon., Tues., Wed., Fri. . 9 a.m. - 6 p.m.
Thursdays . . . . . 9 a.m. - 8 p.m.
(For Montreal branch meetings)
Saturdays . . . 9 a.m. to 12 noon

Bibliographies and Literary Searches

Short subject bibliographies are compiled on request.

Extensive searches will be made at a charge of $3.00 per hour to members, and $5.00 per hour to non-members.

Please give as much detail as possible when requesting information of either type.

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Books, periodicals, photostats, translation, etc. may be borrowed for two weeks at a time. **A fine of 25c. per day will be charged for each day borrowed items are retained beyond this period.**

A library deposit of $5.00 at par in Montreal is required for which two items may be borrowed at one time. Books, periodicals, etc. may be ordered by members through the library. All carrying charges are payable by the individual concerned. Except in the case of library deposits, please make **no payments in advance.**

Non-members may consult the library, but may not borrow material.

Canadian Standards. Canadian Standards Association, National Research Building, Ottawa.

CSA B1. 1:1949, addendum No. 1:1951 — Unified and American Screw Threads. 50 cents.

Changes of primary interest to the user of the standard are: 1) inclusion of the 1 in. 14 NF size as an optional American Standard in the fine thread series, 2) introduction of the designation "UNEF" for certain sizes of the extra-fine thread series, 3) deletion of the ½ in. 12 NC and 1 in. 12 NF threads from classes 2 and 3, 4) corrections to the headings of table 26, and 5) revision of "Limitations of design".

CSA B51:1951 — Construction and Inspection of Boilers and Pressure Vessels, 3rd ed. 75 cents.

The present publication contains sections on registration of designs, registration of fittings, registration numbers, identification, blow-off pipes and tanks, boiler suspension and support, supplement-construction and installation requirements, pressure gauges, etc.

CSA C22.2, No. 38:1951 — Construction and Test of Rubber-covered Wires and Cables, 2nd ed. 75 cents.

This specification deals with conductors, insulation, moisture-resisting rubber insulation, coverings, saturation of fibrous coverings, lead coverings, assembly of multiple-conductor cable, polarity identification, electrical properties of rubber insulation, and markings.

CSA C22.2, No. 48:1951 — Construction and test of Non-metallic Sheathed Cable, 2nd ed. 75 cents.

This work is divided into chapters on insulated conductors, protective sheath, assembly of conductors, fillers, outer covering, physical and electrical tests on finished cables, polarity identification, and markings.

CSA C83.1:1950 — Pole Line Hardware Communication Lines, 2nd ed. 50 cents.

This standard deals with workmanship, designs and dimensions, materials, grade A, B, and C steel, brittleness, galvanizing, finish, bolts and drive screws, nuts, bolt and nut threads, inspection, etc.

CSA C83.2:1950 — Pole Line Hardware, Power Lines, 2nd ed. 50 cents.

This subject is dealt with in the same manner as CSA C83.1.

BOOKS RECEIVED

Algebra of Vectors and Matrices. T. L. Wade, Cambridge, Mass., Addison-Wesley, 1951. 199 pp., $5.85.

CCH Canadian Master Tax Guide, 7th ed. Toronto, CCH Canadian limited, 1951, 314 pp., $3.00.

Canada Year Book 1951. Ottawa, Dominion bureau of statistics, 1951. 1219 pp., illus., $3.00.

Conversion Factors and Tables. O. T. Zimmerman and Irvin Lavine. Dover, New Hampshire, Industrial research service, 1944. 262 pp., $3.85.

Drainage and Sanitation, 10th ed. E. H. Blake and W. R. Jenkins. Toronto, Clarke, Irwin, 1951. 572 pp., illus., $3.00.

Fuel Oil Manual. P. F. Schmidt. New York, Industrial press, c1951. 160 pp., illus., $4.20.

Fundamentals of Electronics. F. H. Mitchell. Cambridge, Mass., Addison-Wesley, 1951. 243 pp., illus., $5.85.

Galvanizing (hot-dip), 3rd ed. Heinz Bablik. London, Spon, 1950. 502 pp., illus., 70/–.

Hot Working of Non-ferrous Metals and Alloys. London, Institute of metals, 1951. 208 pp., $2.50 (Institute of metals monograph and report series No. 9).

Interpretation of X-ray Diffraction Photographs. N. F. M. Henry and others. Toronto, Macmillan, 1951. 258 pp., illus., $8.20.

Introduction to Acoustics. R. H. Randall. Cambridge, Mass., Addison-Wesley, 1951. 340 pp., illus., $7.50.

Irrigation Engineering, v. 1: Agricultural and Hydrological Phases. I. E. Houk. New York, Wiley, c1951. 545 pp., illus., $11.25.

Machine Drawing. Deane Lent. New York, Prentice-Hall, 1951. 523 pp., illus., $8.80.

Nature of Polyphase Induction Machines. P. L. Auger. New York, Wiley, 1951. 397 pp., illus., $9.15.

Newnes Engineer's Reference Book, 4th ed. F. J. Camm ed. Toronto, British book service, 1951. 1727 pp., illus., $10.00.

Piano, Pianists and Sonics. G. A. Briggs. Idle, Bradford, Yorkshire, Wharfedale wireless works, c1951. 192 pp., illus., 10/6.

Preparation of Programs for an Electronic Digital Computer. M. V. Wilkes and others. Cambridge, Mass., Addison-Wesley, 1951. 170 pp., $6.25.

Principles and Practice of Radar. H. E. Penrose and R. S. H. Boulding. Toronto, British book service, c1950. 708 pp., illus., $8.50.

Principles of Electrical Engineering, 4th ed. W. H. Timbie and others. New York, Wiley, c1951. 626 pp., illus., $8.25.

Restless Universe, 2nd ed. Max Born. New York, Dover, 1951. 315 pp. illus., $4.95.

Soil Testing for Engineers. T. W. Lambe. New York, Wiley, c1951. 165 pp., illus., $6.25.

Theory of Perfectly Plastic Solids. William Prager and P. G. Hodge. New York, Wiley, 1951. 264 pp., illus., $6.90. (Applied mathematics series).

Vibration and Shock Isolation. C. E. Crede. New York, Wiley, c1951. 328 pp., illus., $8.25.

Wavelength Tables of Sensitive Lines. L. H. Ahrens. Cambridge, Mass., Addison-Wesley, 1951. 86 pp., $3.75.

Welding Principles for Engineers. J. L. Morris. New York, Prentice-Hall, 1951. 511 pp., illus., $6.00.

World Resources and Industries: A Functional Appraisal of the Availability of Agricultural and Industrial Materials, rev. ed. E. W. Zimmermann New York, Harper, c1951. 832 pp., illus., $7.50.

Canada. Canadian Government Specifications Board. Specifications:

No. 17-GP-1, 1951 — Welding high temperature steam piping.

Central Mortgage and Housing Corporation. Standards:

No. C.M. 8 and addenda — Building standards (excluding apartment buildings). No. C.M. 9 and addenda — Apartment building standards.

Harvard University. Publications from the Department of Engineering:

No. 492 — Sewage treatment in low-temperature areas, by H. A. Thomas, Jr. No. 493 — Fundamentals of chlorination of sewage and waste, by E. W. Moore. No. 494 — The Schwarzenbach method for determination of hardness, by J. C. Morris. No. 495 — The Dirichlet problem for multiply-connected domains, by R. R. Reynolds.

Hokkaido University. Memoirs of the Faculty of Engineering:

V. 8, No. 3, parts 1 and 2—The commemoration number, the twenty-fifth anniversary of the faculty, March 1950.

Institute of Metals. Reprints:

No. 1311 — The titanium-hydrogen system for magnesium-reduced titanium, by A. D. McQuillan. No. 1312 — A provisional constitutional diagram of the chromium-titanium system, by M. K. McQuillan. No. 1313 — An X-ray study of the phases in the copper-titanium system, by Nils Karlsson. No. 1314 — Science in the service of the community, by John Anderson. No. 1315 — Grain-boundary energies in silver, by A. P. Greenough and Ronald King. No. 1316 — The study of recrystallization in zinc by direct observation, by G. Brinson and A. J. W. Moore. No. 1317 — Internal friction and grain-boundary viscosity of tin, by L. Rotherham and others.

TECHNICAL BULLETINS RECEIVED

American Concrete Institute. Standards:

No. 318-51 — Building code requirements for reinforced concrete.

Bell Telephone System. Monographs:

No. 1843 — Lattice vibration and London theories of superconductivity, by J. Bardeen. No. 1844 — Electrical excitation of nerves in the skin, by A. B. Anderson and W. A. Munson. No. 1845 — Dissipation in the cochlear partition, by B. P. Bogert. No. 1846 — A study of nuclear and electronic magnetic resonance, by K. K. Darrow. No. 1847 — Mobility and life of injected carriers in germanium, by J. R. Haynes and W. Shockley. No. 1848 — On the theory of spin waves in ferromagnetic media, by Conyers Herring and Charles Kittel. No. 1849 — An ultrasonic barium titanate transducer, by W. P. Mason and R. F. Wick. No. 1850 — Characteristics and applications of varistors, by F. R. Stansel. No. 1851 — Magnetic domain patterns, by R. M. Bozorth. No. 1852 — Ferromagnetic resonance, by Charles Kittel. No. 1853 — Some theorems on the free energies of crystal surfaces, by Conyers Herring. No. 1854 — Particle size in suspension polymerization, by F. H. Winslow and W. Matreyek. No. 1855 — Electronic Traveling-wave systems, by W. E. Mathews. No. 1856 — An improved telephone set, by A. H. Inglis and W. L. Tuffnell. No. 1857 — Transmitter radiation measuring methods, by Nean Lund. No. 1858 — Measurement of residual stresses, by R. G. Treuting and W. T. Read, Jr.

British Electrical and Allied Industries Research Association. Technical Reports:

No. L/T234 — Relaxation spectrum for rubber, by B. Gross. No. L/T240 — Dielectric relaxation in dilute solutions of polar molecules in a non-polar liquid, by S. Zienau. No. G/T252 — Rates of rise of restriking voltage at circuit-breaker positions on 66-kv systems (systems D, E, F, G, H and K), by L. Gosland and J. S. Vosper. No. G/T254 — Maximum arc energy liberated during the first current loop in a series A. C. circuit, by H. Goldenberg. No. G/T258 — Intrinsically safe electrical apparatus: relation of igniting current to circuit inductance for inflammable mixtures of blue water-gas with air, by E. M. Guenault and E. Atherton.

U.S. Highway Research Board. Bulletins:

No. 37 — Roughness and skid resistance.

University of California. Publications in Mathematics, new series:

V. 1, No. 8, pp. 281-340 — Lectures on multiple valued harmonic functions in space, by G. C. Evans.

University of Washington Engineering Experiment Station. Reprints:

No. 40 — Rotating electrode in manual metal arc welding, by G. S. Schaller. No. 41 — A note on control area, by T. M. Stout. No. 42 — Clarification of equations for simple forced vibration, by B. D. Mills, Jr. No. 43 — A high temperature porcelain enamel for tungsten, by J. C. Horsfall. No. 44 — A chromatographic study of sulfite waste liquor sugars, by P. K. Mulvany and others. No. 45 — Climatology as an aid in heat pump design, by G. S. Smith.

PAMPHLETS RECEIVED

Carbonization. W. A. Lang. (Reprinted from The Canadian Mining and Metallurgical Bulletin, July, 1951).

Engineering Registration. N. W. Dougherty. Knoxville, University of Tennessee press, 1951.

Jubilee book of the National Physical Laboratory. John Langdon-Davis. London, HMSO, 1951.

Sampling and Analysis of Tin Ingots. J. W. Price, Greenford, Middlesex, Tin research institute, 1951.

Steam-generating Station as a Source and Sink for the Heat Pump. J. A. Eibling and B. A. Landry. Pittsburg, Bituminous coal research, inc., 1951.

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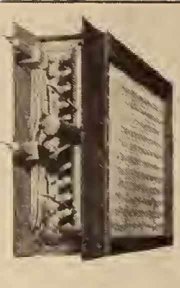

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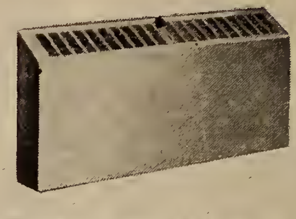

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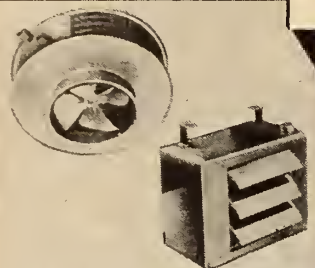
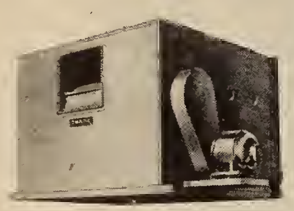
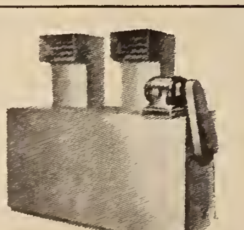


TRANE UNIT AND PROJECTION HEATERS



TRANE CLIMATE CHANGERS

TRANE FANS



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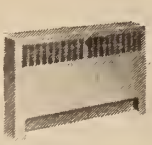

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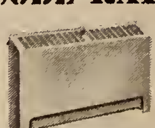

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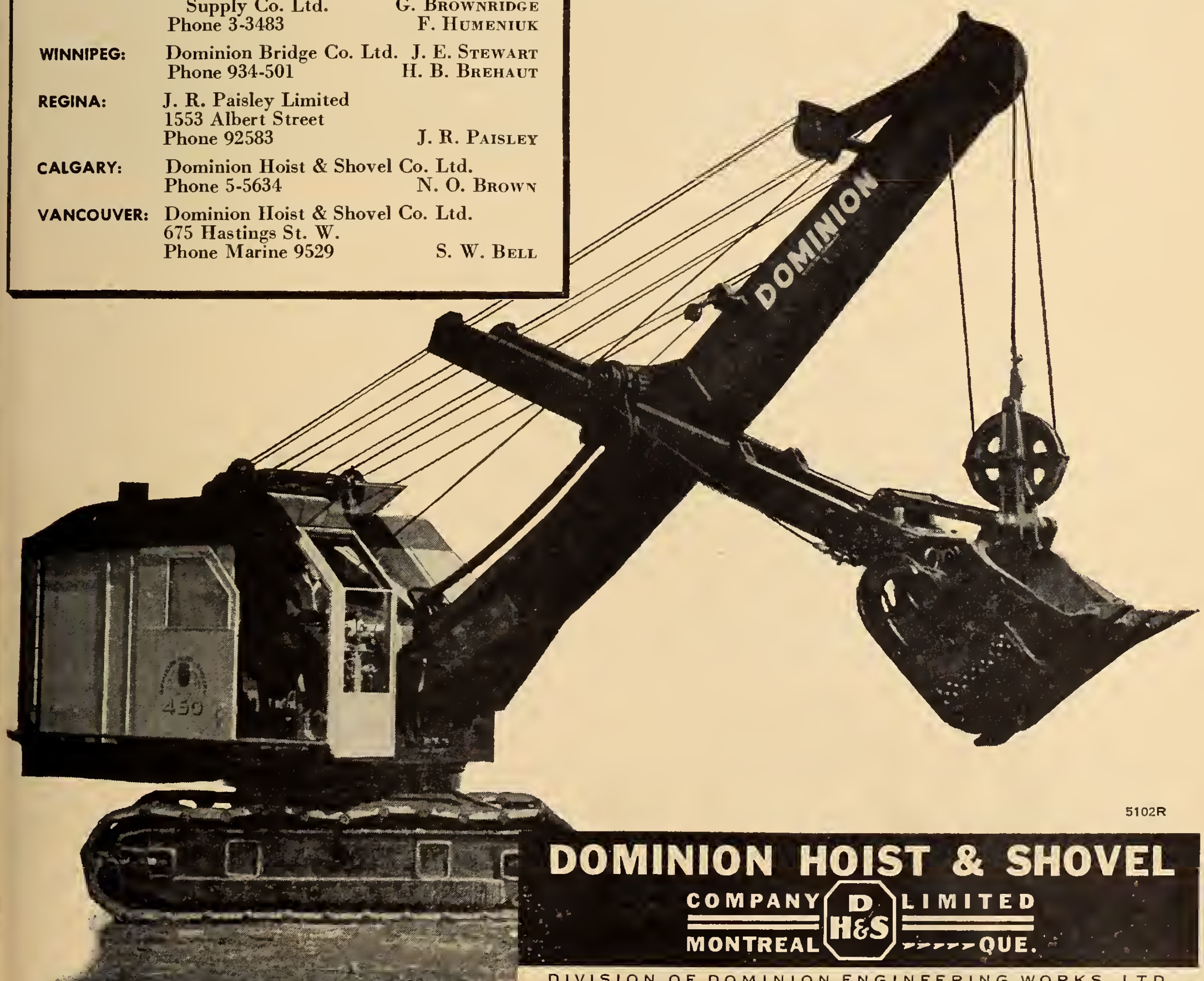
FREDERICTON:	J. Clark & Son Ltd. Phone 5561	F. A. Terris
TORONTO:	Dominion Hoist & Shovel Co. Ltd. C.P.R. Building Phone EMpire 4-6118	W. L. Grisdale
FORT WILLIAM:	The Northern Engineering & Supply Co. Ltd. Phone 3-3483	G. Brownridge F. Humeniuk
WINNIPEG:	Dominion Bridge Co. Ltd. Phone 934-501	J. E. Stewart H. B. Brehaut
REGINA:	J. R. Paisley Limited 1553 Albert Street Phone 92583	J. R. Paisley
CALGARY:	Dominion Hoist & Shovel Co. Ltd. Phone 5-5634	N. O. Brown
VANCOUVER:	Dominion Hoist & Shovel Co. Ltd. 675 Hastings St. W. Phone Marine 9529	S. W. Bell



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4 GREATER FINAL STRENGTH — Tests have shown that calcium chloride increases final strength by from 7% to 12%.

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6 UNIFORM CURING Brunner Mond Calcium Chloride is recommended for *all* structural concrete — floors, walls and columns.

7 SHORTER PROTECTION PERIOD — It cuts the period in half. Expenses of time, labor, heaters, fuel and canvas are much reduced.

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9 INCREASED DENSITY & HARDNESS — It makes the mix "fattier", more workable. The concrete is denser, harder, more durable.

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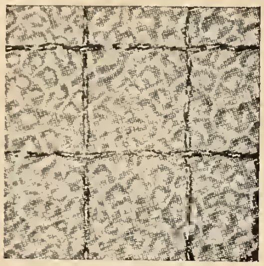

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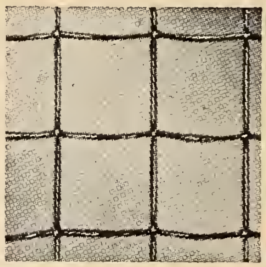
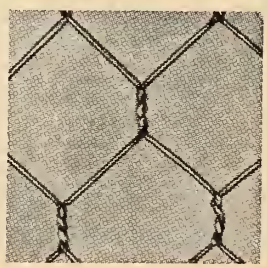


Polished Georgian Wired

Wired Cast



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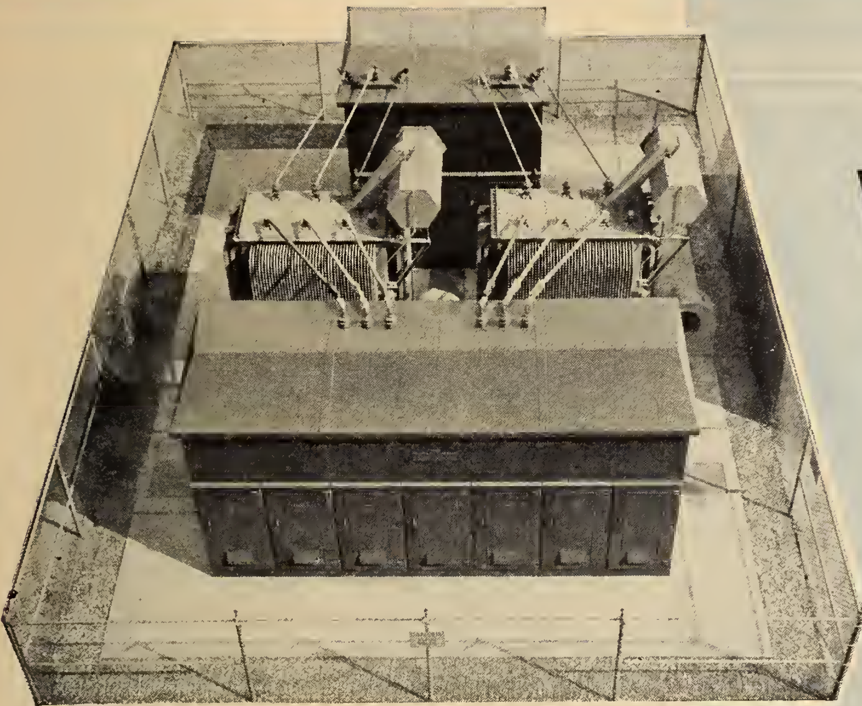
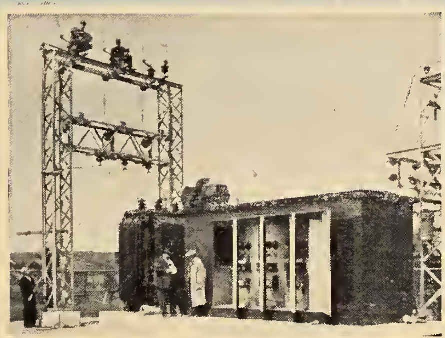
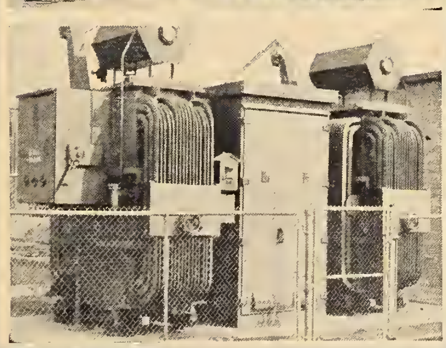


'Bepco' Substation at Canada Packers Limited, Toronto, controlling two 13,200 volt incoming lines, two 2000/3000 KVA 'Bruce Peebles' Dual Frequency Transformers and 2300 volt distribution.

Let BEPCO Engineers Lay out your Substation

'Bepco' Substation on the Milton Hydro System controlling an incoming 26,400 volt line, 2000/3600 KVA 'Bruce Peebles' Dual Frequency Transformer, 4000 volt distribution and capacitor units.





'Bepco' Substation on the Toronto Hydro Electric System, controlling two 13,600 volt incoming lines, two 1000 KVA 'Bruce Peebles' transformers and 575 volt distribution.

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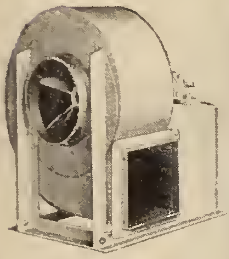
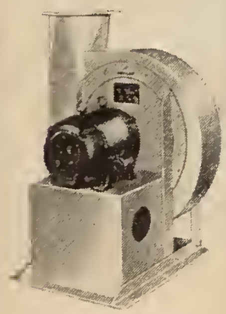


MILL EXHAUSTERS



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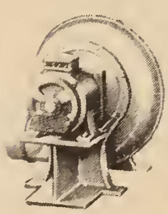

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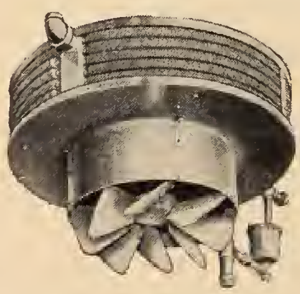

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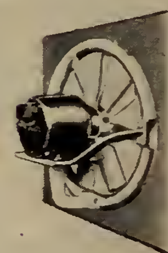

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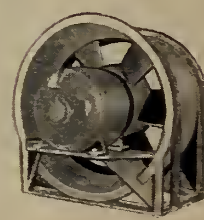

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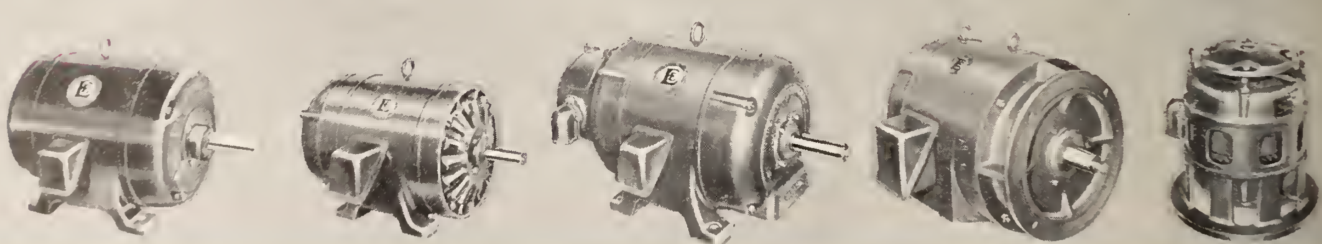


Business & Industrial Briefs

A Digest of Information received by The Editor

Appointments and Transfers

B.C. Bridge and Dredging Co., Ltd.—The appointment of Joseph M. Cunningham as manager of operations is announced by B.C. Bridge and Dredging Co., Ltd. Immediately prior to joining this company Mr. Cunningham was vice-president of James Stewart and Co., of New York, Chicago and Dallas, with which organization he was associated for 16 years. Previously Mr. Cunningham had been with the Foundation Company of New York.

J. M. Cunningham

Major construction projects now under Mr. Cunningham's supervision include the forty million dollar newsprint plant of the Elk Falls Company at Duncan Bay, V.I.; the mill development at Port Mellon of Howe Sound Pulp Company; Vancouver's new Granville Street bridge; and certain phases of the Aluminum Company of Canada's multi-million dollar power and plant development at Kitimat.

•

New Director of Trade and Commerce Information Division.—The department of Trade and Commerce recently announced the appointment of H. Leslie Brown as director of the department's information division. Mr. Brown succeeds Mr. B. C. Butler, whose appointment as Canadian consul in Detroit was announced at the same time.

Mr. Brown is a native of Vancouver and a graduate of the University of British Columbia. He has been in the Trade Commissioner Service since 1930, and served in Mexico, London, Cape Town, Johannesburg and Buenos Aires. Prior to joining the department he had gained considerable business and industrial experience.

•

Dearborn Appoints Research Director.—Announcement has been made recently by H. N. Potter, vice-president and general manager of the Dearborn Chemical Company Limited, Toronto, Ont., of the appointment of Dr. William A. James as director of research and Mr. Jerry Shaw as sales representative.

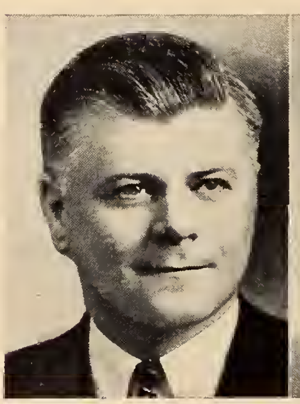
Dr. James will assume charge of all research activities at the Dearborn Laboratories located at 2454 Dundas Street West, Toronto. Dr. James was formerly senior research chemist for the Standard Chemical Company, Ltd., of Toronto. Prior to this he was employed for ten years by the Aluminium Laboratories, Limited, in a research and supervisory capacity. He received his Ph.D. from the Department of Chemistry of the University of Toronto in 1939. He is a member of the executive committee, Toronto section, of the Chemical Institute of Canada.

•

Canadian Line Materials Enlarges Sales Staff.—D. R. E. Barnaby, assistant to the president, Canadian Line Materials, Limited, Toronto 13, has announced recently the appointment of Messrs. R. K. Puttee and S. E. MacPherson to the sales staff of this organization.

Mr. Puttee will join the company's Montreal office staff in association with L. A. de Savoye, district manager. Prior to his new appointment Mr. Puttee was with the Northern Electric Company for fourteen years. He was educated at McGill University and is a member of the Electrical Club and the Electrical Maintenance Club, both of Montreal. During the recent war he served overseas with the Black Watch regiment in the rank of captain.

Mr. MacPherson will be located at the company's Ottawa office in association with C. Ray Thornton, Ottawa district



Bryce Kell

Roy Bunston

F. W. Patterson

New Appointments by Burndy Canada Ltd.—Mr. W. A. Hill, general manager, Burndy Canada Ltd., manufacturers of electrical connectors, announces the following executive changes and appointments. Mr. Bryce Kell, formerly Eastern district manager with headquarters in Montreal, becomes general sales manager, located at the company's head office in Toronto. Mr. Roy Bunston, formerly chief sales engineer, has been appointed chief engineer of the company. Mr. F. W. Patterson, for many years manager of the supply division of the Canadian General Electric Co. Ltd. Montreal, becomes eastern district manager with headquarters in that city.

•

manager. Mr. MacPherson was educated in Montreal and served during the war with the Canadian Active Army after which he spent three years with Calgary Power Limited in Alberta before joining Canadian Line Materials at their Scarboro plant.

•

Canadian Engineer For Ceylon.—Under the provisions of the Technical Co-operation Programme of the Colombo Plan, George M. Nixon, left Ottawa recently for Ceylon to assist in the installation and maintenance of refrigeration equipment in that country.

Mr. Nixon was born in Montreal in 1918, and graduated from the University of Toronto in 1943 after which he took the two-year course with the Canadian General Electric Company, Limited. He returned to the University of Toronto in 1945 as an instructor in mathematics and two years later joined the Carrier Engineering Limited. While with this company, Mr. Nixon gained considerable experience in air conditioning and refrigeration spending one year in Peru as chief engineer of the international division of the Carrier Corporation. In 1950 Mr. Nixon returned to Canada to accept a fellowship in engineering for graduate studies while at the same time carrying on a consulting practice in this field.

•

New President for Avro Canada.—Crawford Gordon Jr., Canada's Co-ordinator of Defense Production, has been appointed president and general manager of Avro Canada Limited, designers and producers for the RCAF of the CF-100 fighter and Orenda jet engine.

Mr. Gordon succeeds Mr. Walter N. Deisher, vice-president and general manager, who has retired due to ill health. Mr. Deisher will remain a director of the Company. He has been vice-president and general manager almost six years, practically since the inception of the Company.

The new president served in the Department of Munitions and Supply from 1941 to 1945 as director general of organization and assistant co-ordinator of production. He continued with the Department of Reconstruction and Supply as director general of industrial reconversion, and in 1946 was awarded the O.B.E. for his services. He is a former president of the English Electric Company of Canada and vice-president of the John Inglis Company.

Sir Roy Dobson, C.B.E., until now the Company's president, becomes chairman of the board, a post left vacant by the recent death of Mr. J. P. Bickell.

•

Dow Appoints Duncan G. Grant.—Dow Chemical of Canada Limited announces the appointment of Duncan G. Grant to handle merchandising and sales promotion for the Company.

Mr. Grant, who has been associated with Dow for the past six months, has had wide experience in merchandising in both the industrial and advertising fields. For several years he specialized in merchandising and market development for the Mechanical Rubber Goods section of the Goodyear Tire and Rubber Company of Canada, Limited, and was later an account executive for two years with the advertising agency Ruthrauff & Ryan Inc. More recently, he has been associated with E. L. Ruddy

Company, Limited, in sales and merchandising. He is a graduate of the University of Toronto in engineering.

•

Phillips and BICC Conclude Canadian Sales Agreement.—Phillips Electrical Works Limited, the pioneer manufacturers of wire and cable in Canada, and British Insulated Callender's Cables Limited, one of the largest electrical manufacturers in England, have joined forces to provide Canadian industry with the products and resources of both these organizations.

This arrangement, which includes a mutually advantageous interchange of technical information, makes available in Canada certain highly specialized electrical conductors, power capacitors and other apparatus not now manufactured in the Phillips plants but produced in British Insulated Callender's factories from the background of their extensive European technical research.

Distribution of all these products will be handled through the coast-to-coast sales organization of Automatic Electric (Canada) Limited.

•

New C-I-L Appointments.—The appointment of J. D. Converse, development division manager of the chemicals department of Canadian Industries Limited, as an assistant manager of the department was announced recently. Dr. J. H. Shipley succeeds Mr. Converse as manager of the department's development division.

Mr. Converse has been associated with the chemical industry in Canada since 1926, and was supervisor of the shift which produced the first Canadian-made "Cellophane" cellulose film at Shawinigan Falls, Que., in 1932. Born at Way's Mills, Que., he was educated at Stanstead College and McGill University where he received the degree of bachelor of science in chemical engineering.

Mr. Converse joined C-I-L in 1929 as a chemical engineer in the Company's research and development laboratory at the Beloeil works. In 1932, he was transferred to the "Cellophane" division at Shawinigan Falls, Que., and in six years he rose through various posts to become works manager of C-I-L's Shawinigan Consolidated Works.

In 1924, he transferred to Montreal and since 1947 he has been manager of the development division of the chemicals department. Mr. Converse is a member of the American Institute of Chemical Engineers and a fellow of the Chemical Institute of Canada.

Dr. Shipley was born in Cambridge, Mass., and educated at Lord Grey and Kelvin High Schools in Winnipeg, the University of Alberta and McGill University. He received his bachelor of science degree with honours in chemistry, and a master of science degree at the University of Alberta, and a Ph.D. degree in physical chemistry at McGill. Dr. Shipley joined C-I-L in 1938 as a chemist in the commercial explosives works at Beloeil where he became chief chemist a year later. In 1940 he was transferred to Defence Industries Limited in which he served, successively, as chief chemist, superintendent of TNT and technical superintendent at Nobel, Ont., from 1940 to 1944. In 1944, he became technical superintendent for D.I.L. at Winnipeg, and later general superintendent of production for the war-time organization at Nobel.

(*Continued on page 1149*)

HAMILTON BRIDGE COMPANY LIMITED

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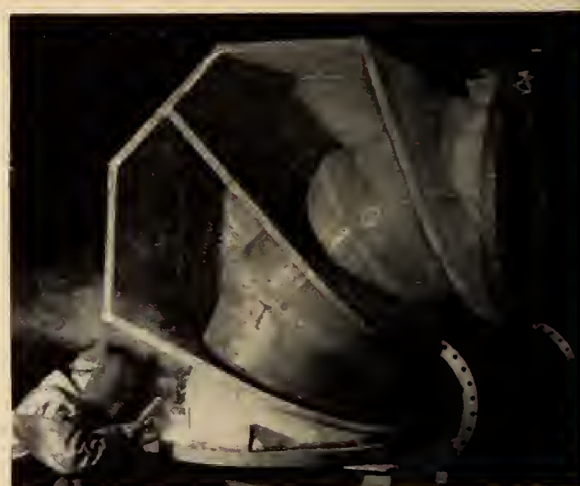
WELDED ASSEMBLIES
MACHINED IF DESIRED

FABRICATION—
MECHANICAL EQUIPMENT
DESIGNED OR TO YOUR DESIGN

ERECTION—
CUSTOM MACHINE WORK

Port Arthur ore dock approach

80 ton truss 220 feet by 28 feet ready for raising on 68 ft. columns on new Kitchener Auditorium.



Welded pipe and elbows, tees, etc., for Hamilton City Waterworks

Pulpwood barking drum

DEMPSTER
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for
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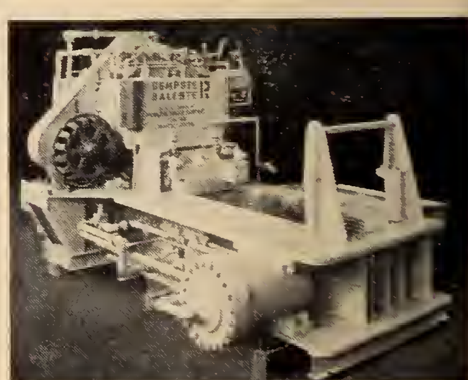

Dempster hydraulic baling press for sheet metal scrap

In 1945, Dr. Shipley returned to the Beloeil works of C-I-L as chief chemist and the following year transferred to Montreal, where he has held a number of appointments in the chemical and purchasing departments, becoming assistant manager of the development division of the chemicals department in 1950. Mr. Shipley is a member of the American Chemical Society and a fellow of the Chemical Institute of Canada.

●

Standard Machine and Tool Company Named Distributors.—John Lund Limited, Crosshills, near Keighley, England, announces the appointment of Standard Machine and Tool Company, Limited, of Windsor, Ontario, as distributors for "Precimax" Precision Grinding and Boring Machines.

The John Lund Company specializes in the manufacture of cylindrical grinding machines; automatic sizing equipment; plain cylindrical finegrinders for externally grinding cylindrical components to the closest tolerances; universal grinding machines, hand and hydraulically operated; rotary surface grinding machines; vertical spindle surface grinders; vertical spindle rotary surface grinding machines; and precision boring, turning and facing machines.

●

Quebec Department of Mines Awards Scholarships.—The Honourable C. D. French, Minister of Mines for the Province of Quebec, announces the award of 34 scholarships to students in mining, geology and metallurgy. Twenty-two of these young men are graduates pursuing advanced studies in those sciences; six of them are registered in American universities. The others are undergraduates attending the Faculty of Applied Science of Laval University, McGill University, and the Ecole Polytechnique of Montreal.

By granting these scholarships, the Government endeavours to supply competent technicians to meet the increasing demand of the mineral industry in view of the great mining developments taking shape in the Province.

●

New Co-Ordinator of Defense Production Branch.—The Right Honourable C. D. Howe, HON. M.E.I.C., announced recently the appointment of Reginald M. Brophy as co-ordinator of the Production Branch of the Department of Defence Production.

Mr. Brophy, a prominent Canadian industrialist, is chairman of the board and president of Rogers Majestic Electronics Limited, and president of the Canadian Radio Manufacturing Corp., Toronto. He is also a director of the Canadian Industrial Preparedness Association.

In connection with the appointment Mr. Howe said, "I am very happy that Mr. Brophy has joined the Department. This of course is not the first time that he has served the government. He is a director of the Crown-owned Canadian Overseas Telecommunication Corp., and in 1950 represented Canada on a North Atlantic Treaty Organization task force. In this capacity Mr. Brophy spent four months studying production facilities in Western Europe, visiting nearly 100 plants of various types."

●

Canada Wire and Cable Make New Appointments.—L. G. Lumbers, general sales manager of Canada Wire and Cable Company Ltd., Toronto, announces the appointment of O. W. Francoeur as eastern district manager, succeeding the late George Kirlin. Mr. Francoeur has been associated with the Eastern District sales division of the Company since 1940.

G. W. Vogan has been appointed assistant eastern district manager. Mr. Vogan has been associated with the Ontario Sales Department of the Company since 1930, both at the Hamilton sales office and the head office at Toronto.

The territory covered by the eastern district of the Company extends from Montreal to Newfoundland with the principal Sales Office located at 159 Craig Street West, Montreal.

●

Conveyancer Fork Trucks Appointment.—Mr. E. J. Napier has been appointed Canadian manager of Conveyancer Fork Trucks (Canada) Limited, P.O. Box 14, West Toronto P.O., Ontario. This appointment has been made by Conveyancer Fork Trucks Limited, Warrington, England. Mr. Napier was formerly production engineer of the parent company in England for 11 years.

The Canadian company has been formed to distribute in Canada the Conveyancer range of electric and gas fork lift trucks, and to provide parts and service facilities to their Canadian customers.

●

New Equipment and Developments

New Ozone Lamp by Westinghouse.—Canadian Westinghouse Company Limited, Hamilton, Ontario, announces that a new and tiny lamp that dissolves odours with a triple dash of ozone is now being manufactured by their Company. Reported to be three times as powerful as the germicidal-ozone lamp the Company has been marketing for the past few years, the new "Odorout" bulb dispels odour molecules in the air instantly.

The new lamp, which is about the size of a ping-pong ball, generates ultra-violet radiations of special wave length which transform the oxygen around the lamp into ozone. The ozone, an air purifier, clears the air of odours instantly.

Special fixtures have been designed for this 3½-watt lamp and are now being manufactured. Included in its functions will be the destruction of odours from cooking, smoking, dampness, mildew, and perspiration. It can be used in kitchens, living rooms, dining rooms, bedrooms, and any other household units, as well as any number of business or industrial locations where more healthful and pleasant working conditions are desired.

The new lamp was developed as a "by-product" of a search for another engineering improvement. The original assignment was to improve lamp starting and in the process of working on this, Westinghouse engineers not only simplified starting but also almost tripled the amount of ozone-inducing radiations. Selection of a glass bulb that transmits more ultra-violet completed the job.

The special fixture previously mentioned and a current-controlling device are necessary for successful operation of the new "Odorout" lamp and the complete units are now available.

•

400-Cycle Servo Amplifiers.—Industrial Control Company, Wyandanch, Long Island, New York, announce the following technical details with respect to the above equipment. The 421-A and 423-A are universal, 400-cycle servo amplifiers, designed to drive two-phase servo motors requiring 6 and 9 watts per phase respectively. They feature independent screw-driver controls on damping, gain and carrier phase, and thus can be stocked for use in all servo loops requiring their rspective servo motors.

Other characteristics are as follows: maximum gain, 1000; phase adjustable through 160 degrees; internal pickup below 2 millivolts damping adjustable over wide range. Their plate and filament power can be supplied by any power supply, with no regulation, filtering or additional bias sources necessary. They will function with any carrier frequency data system, and yield servo loops of broad frequency transmission and low static and velocity errors.

These amplifiers, together with their 60 cycle predecessor, the 410-B, advance the concept of "breadboard circuitry". Their range of adjustment and universality of application can bypass time consuming engineering development. By using these units, together with breadboard mechanical apparatus, a servo loop can be set up in the few hours required to design and construct an interconnecting harness.

•

Powerstat Variable Transformers.—Recent advances in electrical apparatus for aircraft and ship use, motivated by the national emergency, have necessitated the design of new equipment. Much of the new electrical equipment, to conserve space and to keep weight to a minimum, is designed for operation at frequencies of 400 cycles and higher. The Superior Electric Company of Bristol, Connecticut, announce the offering of a line of Powerstat variable transformers for high frequency duty.

Since most of the higher frequency applications involve electrical equipment built to specific requirements, it is impossible to offer a complete line to fulfil every need. However, a wide variety of Powerstat variable transformers have been built and units are available in a multitude of voltage and current ratings in single and polyphase models.

•

New Welding Process by C.G.E.—"Fillerweld", a new product designed to speed alloy-metal welding on applications where filler-metal must be added, has been announced by Canadian General Electric Company, of Toronto. Used with gas-shielded arc welders, Fillerweld allows the operator to control the continuous flow of filler-metal automatically by means of a finger switch mounted on the torch. The operator may start or stop the flow of filler-metal without breaking the arc, resulting in a smoother, faster weld. Wide application is expected on food and dairy equipment and in the fabrication of aluminum containers and light structural shapes.

The new process can be applied to best advantage on stock less than 3/16 inch thick. However, where speed is not of paramount consideration, Filler weld will produce a high quality weld on thicker material. Either argon or helium can be used with the equipment.

•

New Centrifugal Governing Friction Brake. Wilson-Albrecht Company, Inc., of 3565 Wooddale Avenue, Minneapolis 16, Minn., steel scaffolding manufacturers, announce the production of a new centrifugal governing friction brake designed for their Waco portable elevator and material hoisting tower power unit.

The built-in brake acts to govern platform descending speed and automatically checks the free-fall speed of a 1500 pound load at 100 feet per minute. Called a "slow-up" brake, the device has a braking surface of 33 square inches and is contained in an aluminum-magnesium housing (Almag-35) with a high heat dispersion factor.

Power units for the portable elevator and material hoisting tower are interchangeable 6-hp. gasoline or 3-hp. electrical units. "Slow-up" brake housing (with fins) lies between gear box and clutch on power shaft.

•

New Electric Generator Contract. — Construction is to be started shortly at the Peterborough Works of the Canadian General Electric Company of a new electric generator for the Aluminum Company of Canada's Kemano Power Development in northern British Columbia.

It is reported that this generator will be the largest in the point of k.v.a. capacity ever to be built in Canada. It will be rated at 106,000 k.v.a., operating at 327 r.p.m. and will be a totally enclosed vertical water-wheel driven type. The generator will be approximately 33 feet from end to end and about 24 feet in outside diameter, with a shipping weight of 700 tons.

The new powerhouse at Kemano in which the generator will be housed is to be underground and will be the first such one in Canada. This powerhouse will be carved from solid rock one-quarter of a mile in the side of a mountain and the water for its operation will be carried through a tunnel 10 miles in length from a chain of lakes down a 2,600-foot drop to develop an eventual 2,000,000 hp. capacity.

•

New Liquid Sulphur Dioxide Plant.—Fraser Brace Engineering Company (Ontario) Limited commenced a new plant last month adjacent to the International Nickel Company smelter at Copper Cliff, Ontario, for Canadian Industries Limited. This plant will produce liquid sulphur dioxide from smelter gases given off from the Inco operations.

When completed next fall, the plant will have an initial capacity of over 90,000 tons of liquid sulphur dioxide destined for use by newsprint, sulphite pulp and other manufacturers who now

have to depend upon elemental sulphur imported from the United States. Since each ton of the liquid product can replace half a ton of imported sulphur, the new plant will help to overcome the sulphur shortage as well as to conserve American dollars.

C-I-L has been operating a sulphuric acid plant in this location for a number of years using as a basic raw material the waste fumes from the Inco smelter. An expansion of this acid plant is expected to be in operation shortly which will enable production to be increased by approximately 60 per cent.

The research work leading up to the construction of the new liquid sulphur dioxide plant has been going on for many years. As far back as 1932 C-I-L had proven that liquid sulphur dioxide could be produced from the fumes but the cost was too great to permit of economic competition with imported elemental sulphur. Eventually, Inco developed a new oxygen flash-smelting process for its operations and this led to the successful evolution of the final process. A pilot plant was built by C-I-L at Copper Cliff, and it was then found possible to produce the liquid sulphur dioxide from the new smelter fume at an economic price. The new product was then tested out by a Fort William, Ontario, paper mill and found to be satisfactory for its requirements. Plans were then proceeded with for the construction of the new plant which is now being commenced.

•

British Television Station Opens.—The new B.B.C.'s Northern Television Station at Holme Moss was officially opened on Friday, 12th of October, 1951.

A special feature of this station is the 750-feet high television mast designed and erected to B.B.C. specifications by British Insulated Callender's Construction Co. Ltd. This mast is very similar to one previously erected at Sutton Coldfield by the same company.

This new television aerial which is 2,500 feet above sea level, is reported to serve the most powerful television station in the world, and it is estimated that it will bring television within the reach of 7,000,000 people in northern England.

•

Transformer Plant for Toronto Area.—The Canadian General Electric Company has announced that they are to build a large transformer plant on a recently-acquired 148-acre site in Etobicoke Township in suburban Toronto.

This new plant will produce large power transformers, high-voltage bushings and instrument transformers for installation on the transmission systems of utilities. The total investment in land, buildings and equipment will be about $12,000,000, and it is planned to come into operation by 1953. The new plant will be located about two miles from the town of Weston on the C.N.R. and adjacent to the "by-pass" highway now being built to connect the provincial highways in the area.

•

Heat Seal Label Show.—In order to introduce to Canada's packaging and allied industries a new process of labelling, T. B. Little Papers Limited of Montreal arranged for a demonstration to be given under their auspices at the Mount Royal Hotel on October 30th and 31st. This new process depends on the application of heat rather than moisture to activate the adhesive surface. Lectures, films, machinery and package demonstrations all contributed to the success of this novel show.

•

New Absorption and Backscatter Beta Gauges. — Based on experience gained from a number of gauges now in successful use in several process industries, Tracerlab Incorporated, 130 High Street, Boston 10, Mass., announces the introduction of two new model absorption and backscatter beta gauges for the low cost determination of the weight per unit area of sheet materials.

Absorption beta gauges basically determine weight changes in sheet material —paper, plastics, rubber, thin metal sheets—by means of a small beam of beta rays. These rays, actually high energy electrons, are emitted from a sealed radioactive source and pass through the sheet to be measured.

A beta gauge, in effect, weighs a small area of the moving sheet by means of a beam of radiation. If the density of the material is maintained constant, the meter can be calibrated in units of thickness, thus making the gauge a sensitive thickness control instrument.

Beta gauges are unaffected by speed of the moving web, do not contact the material being gauged, may be installed in any location on the machine, and the meters or recorders may be placed at a distance. Beta gauges measure extremely thin materials impossible to gauge by other methods and measure more types of materials because only weight per unit area is the controlling factor.

Backscatter beta gauges offer advantages for many installations because they are mounted on one side of the sheet only. Backscatter gauges use the same console and recording apparatus as absorption types, but work on a slightly different principle. Literature describing the above equipment is available from the Tracerlab Company upon request.

•

Shelf-Mounting Type Battery Charger.—A motor-generator type battery charger, designed to permit mounting on balconies or shelves in order to save vital floor space, is now available from the Canadian General Electric Company, Limited.

For charging batteries in driver-lead and small driver-ride industrial lift trucks, the new unit accommodates lead-acid batteries of 6-19 cells and nickel-iron-alkaline batteries of 10-30 cells. It is about the size of a tank type vacuum cleaner with a control box mounted on its side, weighs only 190 lb., and can be installed on a shelf measuring 6¾ by 8¼ inches.

The unit is fully automatic and easy to operate. It is only necessary to plug it in and set the timer; automatic controls do the rest.

Protection from external damage to the charger is provided by completely enclosed construction, and maintenance is simplified by the easy accessibility of control parts, commutator, and brushes. Mounting feet are integrally cast with the intermediate frame — no special foundation is required. Permanent bearing alignment cannot be disturbed during mounting.

Features of the unit include automatic disconnection of charger from power line and opening of charging circuit in case of power interruption, automatic restart of charger upon resumption of power supply following an interruption, and automatic cut-off of battery and shutdown of charger when battery is fully charged.

The single-circuit equipment operates on 3-phase, 60 cycle a-c power, and has generator-overload and motor-overload protection to guard against excessive currents.

•

New Factory for Cornwall, Ontario.—A new plant is being constructed at Cornwall, Ontario, to manufacture transparent cellulose film and other packaging materials by a company recently formed there and known as T C F of Canada Limited.

This Company is closely associated with British Cellophane Limited, of England, the principal producers of transparent cellulose film in the British Commonwealth, but the majority shareholders in the new Company will be Courtaulds Limited, and Courtaulds (Canada) Limited, manufacturers of rayon and other products by means of the viscose process.

It is hoped that the new factory will be in production by the spring of 1953, and the initial annual output is expected to be in the neighbourhood of 7,000,000 pounds.

•

Paris Exhibition of Machine Tools.—A very interesting report has just been received in connection with the first European machine tool exhibition which was held in Paris in September last. There were approximately 850 exhibits, and manufacturers from France, Germany, Denmark, Belgium, Switzerland, Austria, Sweden, Holland, and Italy. were well represented. Practically no British or United States equipment was on display. It has been estimated that there are approximately two and one half times as many machine tools manufacturers in unoccupied continental Europe as there are in America and Great Britain combined. The total number of workers, however, is approximately the same in each of the two groups. On the other hand, the combined value of the American and British production was approximately 50 per cent greater than the total production from continental Europe. It is of interest to note that approximately 50 per cent of all European production is for export.

Predominant in the exhibition were French capstan lathes, German heavy turning and boring mills, Swedish centerless machines, automatic screw machines of Swiss, German, Austrian, French and Italian manufacture, and lastly, and what is perhaps most important, a German index machine. The interesting feature about the latter is the fact that the works manufacturing this equipment was dismantled and all the equipment removed to England soon after the conclusion of the war. Now, after five years, the original German company is back in production with a representative range of equipment.

Considerable heavy equipment was in evidence at the show, the largest item reported being a Belgian lathe weighing 105 tons. There was also a French lathe weighing 70 tons, and a German planer of 65 tons weight. A considerable number of German machines in the 20 to 50 ton class were in evidence, and this indicated clearly the re-emergence of the German heavy machine industry from its war-time destruction.

•

New Type Starter for Arc Welder.—A new type starter which is basically a fused high-capacity interrupter switch, is now being used on all production models of Canadian General Electric's type WD-42, -43, and -44, motor generator d-c arc welders.

According to the Company's engineers, the new starter provides positive motor starting because the contacts are locked in by mechanical action. A direct-acting lever physically closes or opens the contact when it is operated, affording direct control over starting and stopping. This reduces maintenance by eliminating intermediate devices (circuit coils, magnetic contacts) which might fail or malfunction. It also reduces pitting and erosion on contact tips by eliminating chattering or misstarts. A time delay fuse connected directly in the line protects the motor circuit from overload. The new starter is mounted on the end panel of the welder control box, which has been redesigned to allow easy access to the fuse and connection terminals.

•

Cushion Clutch Air Screw Drivers.— Canadian Ingersoll-Rand Company Limited of Montreal announces a new line of cushion clutch air screw drivers in three basic sizes for general manufacturing operations. These tools are expected to have wide application among fabricators of metal products, in automotive, aircraft, furniture, household appliances and other fields using screw assemblies.

The cushion clutch construction is said to offer several distinct advantages. It consists of two units—an engaging clutch and a torque limiting clutch. The engaging clutch enables the screw driver to be moved from screw to screw without stopping the motor—since slight forward pressure on the tool is necessary to rotate the bit. The ball-type torque limiting clutch permits adjustment for precise torque control, and enables the operator to drive all screws to the same degree of tightness. This ball-type design is noted for absence of rotary impact, which maintains torque requirements uniformly, reduces work spoilage and increases production. Ballbearing construction keeps friction to an absolute minimum, for more accurate torque settings and longer clutch life. Torque adjustments are readily changed and torque accuracy is not dependent on correct lubrication, as is usual in jaw type clutches. In addition, these cushion clutch screw drivers have adjustable exhaust deflectors which permit operators to direct the exhaust air as desired. Other features include conveniently located throttle and reserve valves, bit holders which permit quick and easy changing of bits and finders, comfortable handles, compact and rugged construction, and ample bearings for minimum friction.

The screw drivers are available in Series 000 for driving small screws up to No. 8 free-running or No. 5 self-tapping; Series 00 for medium screws up to ¼-in. free-running, or No. 10 self-tapping; and Series 0 for large screws up to 5/16-in. free - running or ¼-in. self - tapping. Reversible and non-reversible models are made in each Series, and the two larger Series can be had with either straight or pistol grip handles. Thirty-eight sizes are available for all speeds and capacities.

•

New Stress Relieving Furnace at Lachine. — Dominion Bridge Company Limited, Lachine, Quebec, announced the installation, recently, of a new and larger stress relieving furnace at their Lachine plant. This Company was one of the first in the Dominion to instal industrial X-ray and stress relieving equipment for the manufacture of Class 1 pressure vessels, including boiler drums and similar welded equipment.

The largest furnace for such work in Canada has been in operation at the Company's Lachine plant for several years but this has now been supplemented by a still larger structure. The new furnace designed by the Company's own staff is 85 feet long, 18 feet high and 18 feet wide. These dimensions permit the sectional stress relief of refinery towers and similar vessels up to the largest sizes being built at the present time. The furnace is oil fired and the temperature is recorded by a 16-point pyrometer. The door is of the steel frame type — instead of the usual cast iron, and the furnace and door are insulated by means of light weight insulating refractory bricks.

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(*Continued on page 1163*)

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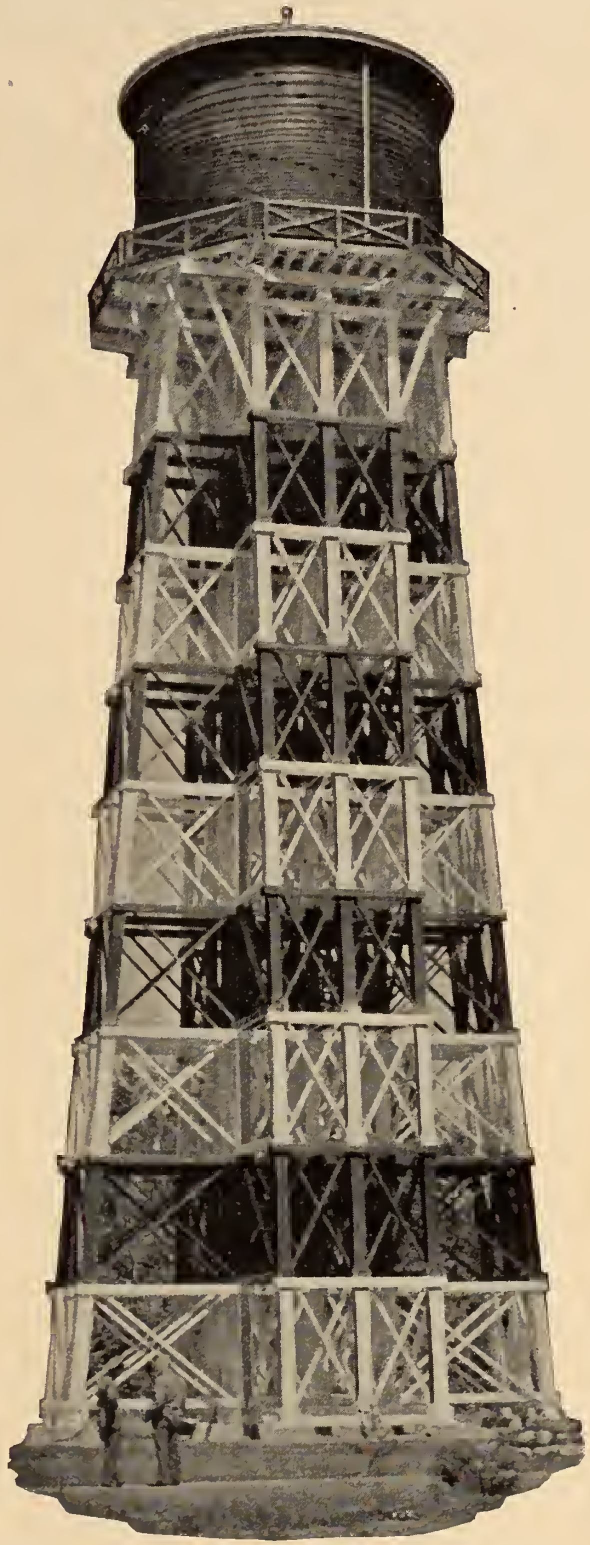

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(*Continued from page 1157*)

Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

New Booklet on Welding of Nickel and Nickel Alloys.—Several new booklets dealing with the above subject may now be obtained without charge from the International Nickel Company, 25 King Street West, Toronto, Ontario.

The first of these, entitled "Welding of Monel, Nickel and Inconel Pipe, Tubes and Wrought Welded Fittings" is a compilation of information contained in Inco bulletin T-2. It emphasizes the more important methods used in joining nickel alloy pipe, tubing and welded fittings. Complete information on the fusion welding of nickel and high nickel alloys is contained in a revised edition of a former publication. The new bulletin contains all the information contained in the former bulletin and its supplements, plus considerable new data on welding processes and procedures. The bulletin "Guide to the Selection of Engineering Irons" has likewise been revised and has been made up primarily to assist design engineers and to illustrate the broad acceptance of modern alloyed cast irons throughout industry. It also outlines the characteristics of the products, and their applications in the various fields.

●

Radioactivity Equipment Catalogue.—A new 108-page catalogue containing full information on their extensive line of radioactivity equipment, tagged chemicals and consulting services has been issued by Tracerlab, Inc., 130 High Street, Boston 10, Mass.

Many new items for laboratory, medical and industrial use are included, as well as a complete listing of chemicals tagged with radioisotopes. One section describes the consulting service now available from this organization, which is especially adapted to the needs of industries not possessing laboratories of their own, or wishing to use radioactivity for only one or two problems.

●

Concrete Testing Machine.—Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa., has issued a new 2-page bulletin, No. 327, describing its 100,000-pound capacity concrete testing machine. The bulletin covers features, including hydraulic loading, independent hydraulic load weighing, accessories, and specifications.

●

Miniature Lathe Catalogue.—Two new miniature catalogues Nos. 5104 and 5119, are now available from the South Bend Lathe Works, South Bend 22, Indiana. These catalogues are only 2½ inches by 1⅝ inches in size with accordion folding and contain 28 pages descriptive of the entire line of precision lathes, drill presses, shapers, attachments and accessories marketed by this company. These miniature catalogues were developed for the express purpose of enclosing with each item packed for shipment no matter how small. However due to their unique size they have proved to be most popular and are much in demand as novelties.

●

Floor Brick Setting Bulletin.—A new four-page illustrated bulletin describing how to install floor brick and heavy tile to produce a floor with exceptional durability has just been published by the Master Builders Co., 7016 Euclid Avenue, Cleveland 3, Ohio. Discussing the importance of narrow, tight joints in obtaining long life where corrosive conditions exist, this bulletin tells how floors with joints down to ⅛ inch can be installed by using a readily flowable, non-shrink mortar produced with Embeco. In addition to presenting information and data of interest to both those who install, and use, floor brick and heavy tile floors, the bulletin gives complete specifications.

●

Twin Column Punch Presses.—Catalogue TC is an eight-page bulletin recently issued by Wales-Strippit of Canada Limited, 344 Sherman Ave., N., Hamilton, Ont. This catalogue illustrates and describes the new Wales twin column presses.

These presses may be used for all types of blanking, forming, drawing and bending. Also Wales hole punching and notching equipment is used very efficiently on the rugged, versatile Wales twin column presses. In addition, a self-contained shearing attachment is available as optional equipment for precision shearing.

●

Diamond Core Drill Standards.—The Diamond Core Drill Manufacturers Association, 122 East 42nd Street, New York 17, N.Y., announces publication of Standards Bulletin No. 1. The bulletin lists all the various types and sizes of core drill equipment in general use for which standards have now been written in whole or in part. The publication clearly shows these parts, with cutaway drawing and nominal dimensions.

The objective of the Diamond Core Drill Manufacturers Association is to improve diamond drill efficiency through publication of standards covering core drill accessories, and to distribute new and helpful information on drilling techniques. The standards provide for interchangeability of equipment and components, but great care has been taken to leave the way open for individual ingenuity and invention in the future.

Standards Bulletin No. 1 represents the collected knowledge, experience and thought of the sixteen member companies of the Diamond Core Drill Manufacturers Association, following the work of the association's technical committee. The work is being continued and as further standards are approved from time to time, revisions of the bulletin will be issued.

Copies of this bulletin may be obtained at cost of 50c each, from the above association.

●

Portraits of Royalty in Atlas Steel News.—Atlas Steels Limited, Welland, Ontario, has featured in the October issue of "Atlas Steel News", some excellent portraits of Princess Elizabeth, the Duke of Edinburgh and their family, taken by Yousuf Karsh of Ottawa. The issue also includes Mr. Karsh's own story of what transpired when he visited Clarence House to take the portraits.

●

Avro Canada News.—The September issue of the above publication contains two very interesting articles dealing with technical matters. One is a description of aeronautical research in Canada and the formation of the national aeronautical establishment under the direction of the National Aeronautical Committee. The other article is a description of Avro Canada's full-scale test plant at Nobel, Ont.

●

Corrosion-Resistant Phosphate Treatment.—A new 8-page booklet describing Anchorite 100, a paint-anchoring corrosion-resistant phosphate treatment for metals, has been published by Octagon Process, Inc., 15 Bank Street, Staten Island 1, New York. This booklet describes in detail the common causes of paint failure and how they can be prevented. It then goes into methods of application including immersion and spraying of the Anchorite 100 treatment.

A separate discussion of typical products to which this process can be applied is well illustrated, and includes a number of defense items.

●

New Liquid Level Gauge Catalogue.—Peacock Brothers Limited, P.O. Box 6070, Montreal, announce the release of a new catalogue bulletin No. 176 by their associates Jerguson Gage and Valve Co., 80 Fellsway, Sommerville 45, Mass. This catalogue illustrates and describes the Jerguson Truscale remote reading liquid level gauges.

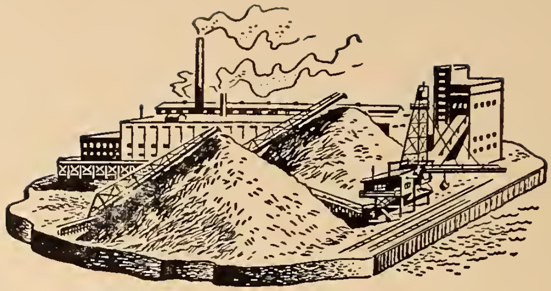
●

Metallic Rectifier Power-Conversion Unit.—Publication GEA-5658 dealing with the above equipment is now available from the Canadian General Electric Company Limited, Toronto, Ont. This bulletin describes the features of the equipment, its application and operation. It contains photographs line drawings and charts showing the efficiency and regulation curves for the various sized units and a specification guide for G.E. d-c power supplies and exciters, together with complete rating charts and dimensions.

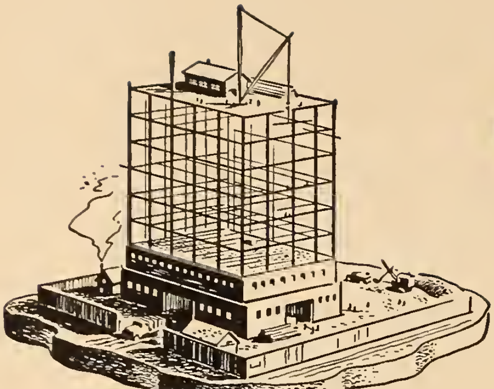
●

Protective Lighting.—A new bulletin L.T. 3 has recently been issued by the Northern Electric Company Limited of Montreal giving a brief resume of lay outs and equipment for the flood lighting of building exteriors and grounds where such protection is considered necessary or desirable.

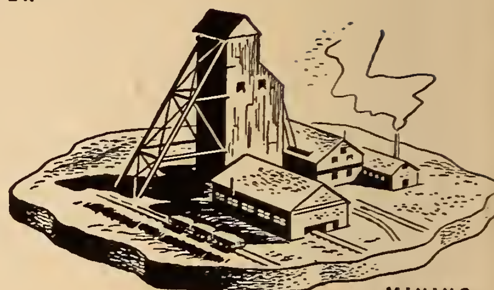
●



PULP and PAPER



CONSTRUCTION



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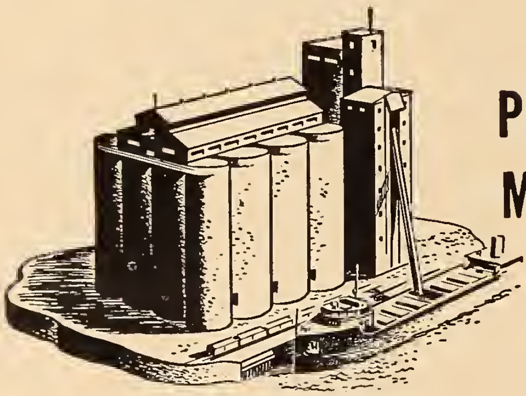

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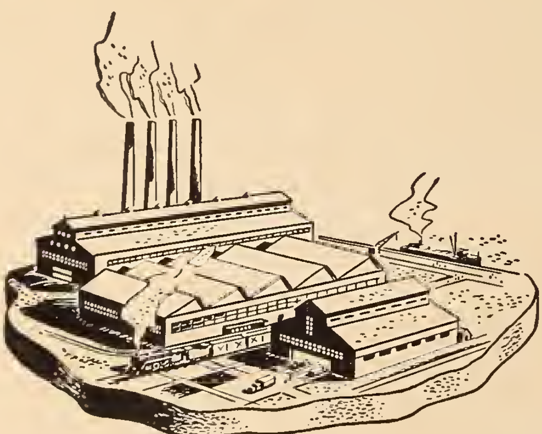

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CONTENTS

15,250 copies of this issue printed

ONCE AGAIN THE HOLIDAY season approaches and it is my pleasant privilege through the pages of *The Engineering Journal* to extend to you and to your families my sincere wish for a Happy Christmas and a Bright and Prosperous New Year.

As I look back over the past year, I am more and more impressed with the fact that we are members of one of the most important professions at this time, and therefore have a great national duty laid upon us.

I have already had the privilege of visiting with the branches of the Institute in Newfoundland, Nova Scotia, Prince Edward Island, New Brunswick, Quebec and Ontario and of talking with members, their wives and families, and I wish to extend my sincere thanks for the gracious hospitality which has been extended to Mrs. Macnab and me.

It is a great inspiration to note the expansion which is taking place in the areas I have visited. This development has resulted not only from present world conditions, but because Canada is rapidly taking her place as a great industrial nation and a leader in world affairs.

Because of the growth which has already taken place and the great potential wealth which we have inherited, as yet undeveloped, the engineer must of necessity occupy a position of ever increasing importance in our national economy. Because of this we must use our best efforts to see that the youth of our land, with an aptitude for engineering, is directed to the proper courses of study. We must also see that our younger engineers are given every assistance by more senior men to develop and take their full part in the national growth which must come. This is Canada's age, and in the words of His Royal Highness the Duke of Edinburgh—"Canada is a good investment."

While these are troubled times it is my hope and wish that we the members of the Engineering Institute of Canada, as well as all our professional associates, shall keep in mind that our first duty is service to the public. By so doing our professional status will be enhanced and recognized as one which is contributing its full share towards the orderly development of a better world.

This is the time of year when we celebrate with our families the era of Peace on Earth and Good Will towards Men. While we regret this condition does not exist today, it is my hope that we will all work to make this ideal become a reality and so enable those people of the world, less fortunate than ourselves, to share our blessings.

Yours sincerely,

Ira P. Macnab

IRA P. MACNAB, M.E.I.C.
President

CANADA—Limited or Unlimited

by

J. J. O'Neill, M.E.I.C.

Dean, Faculty of Engineering, and Vice-Principal, McGill University, Montreal.

Presidential address to the Royal Society of Canada at the Annual Meeting in Montreal, June 5th, 1951.

This is the presidential address delivered before the Royal Society of Canada at its annual meeting in Montreal on June 5th last. Its subject is so important and so timely that the *Journal* is happy to present it to readers who would otherwise probably not see it. Its engineering implications are many and engineers as a group should give some thought to the important questions it raises and to its recommendations, many of which can be carried out successfully only by engineers.

Fifty years ago, Canadian leaders with vision, faith and courage proclaimed that the twentieth century belonged to Canada; they considered that the foundations for a great nation were well and truly laid and that the superstructure would develop logically and swiftly, having as an object lesson the marvellous expansion, consolidation and prosperity of our neighbour to the south under what were considered to have been parallel conditions.

Now half of the century has passed. Where do we stand? How true have been the optimistic prophecies of 1900? What may we expect during the second half of the century? So far as we have gone, can we now see finite limits? Are we approaching full development, or are our limits still beyond the horizon?

Some of us in this room have been first-hand observers of the developing picture during the past fifty years; practically all of us have made contributions to some phase of Canada's progress; all of us are vitally interested in Canada. I venture to say we all have feelings of uneasiness and frustration when we contemplate the Canadian picture as it appears at present. We are not alone in this, for many articles have appeared which deplore a situation where the enthusiasm, energy and aggressiveness of about fourteen millions of people are dampened and frustrated because the larger part of the fruits of their labours must be spent for general overhead of the country as a whole.

There are five main reasons for this state of affairs:—

(1) Because of its great expanse from east to west, the cost of providing minimum facilities for the opening up and development of even the southern quarter of the country has created great overhead charges for railways, canals and roads built in the past, which must be carried by today's population.

(2) There is a huge national debt incurred in non-productive activities in two world wars, which must be carried.

(3) Having claimed the status of "Nation", we must shoulder expensive provisions for means of defence — naval, army and air-force—for which we formerly depended largely on Great Britain.

(4) Government has instituted and pledged social services costing annually several hundreds of millions of dollars, which must be included in the general tax bill.

(5) For thirty years immigration has been discouraged and there has been much emigration to the United States. The total population has not increased greatly, but it must support enormously increased governmental expenditures, the larger part of which do not directly increase national productivity.

Population

Many of our financial and industrial leaders consider that only a great increase in our population will lay the foundation for real prosperity. Let us first look at that part of the picture and the arguments presented.

Canada has a total area of 3,750,000 square miles, over 7 per cent of the area of the world. Its population, however, is only about 14 millions, which is only 0.53 per cent of the population of the world. This means that, theoretically, Canada should support about 190 million people if it accepted its fair share of world population.

The true answer to the questions "How many people can Canada support?", "How can it support them?" and "What kinds of people would be most suitable?" must await the scientific stock-taking urged in this paper.

A courageous attempt to find some immediate answers to these questions and to assess the reasons why increase in population has been so slow, was made at McMaster University in April, 1949. That symposium on "Population, Growth and Immigration into Canada" gave a comprehensive picture of the situation, presented by authorities in the major fields concerned. Estimates were made of how many immigrants we could absorb annually, but at the very best they were only guesses. Economic study suggested that, under favourable conditions, we could absorb about a million people in the next five years. Estimates of final population ranged from 20 millions to as high as 100 millions, with little attempt to justify the figures, other than personal opinion.

In February of this year, Mr. Donald Cameron, Director of the University of Alberta's Department of Extension, reviewed the economic and social development of western Canada before the Canadian Club in Montreal. He said that Canada should have a population of 17 millions by 1960, even without immigration, and that an average of 300,000 immigrants should be brought in each year, or about 3 millions over a ten-year period. He thought it unlikely that more than 2 millions could be placed on farms in the next twenty years, but that during the twenty-year period, Canada would have an increase of 7 millions in natural population, and should absorb another 13 million immigrants. This means that while the period 1900-1930 in Canada was associated with the establishment of an agricultural economy in the West, the period 1950-1970 must be associated with the establishment of an industrial economy.

It seems clear that many leaders of industry are quite convinced that Canada must have a larger population, and it is equally clear that there is much difference of opinion between government administrators and others as to whether such an expansion is practicable and as to what classes of people we should have.

I quote from the report of a speech delivered by Mr. W. F. Holding of Toronto, President of the Canadian Manufacturers Association, on March 2nd of this year: "A minimum of 50 millions to 75 millions of people in Canada would be in balance with our natural wealth, and with what Canadians know of their resources in oil, metals, forest products, iron ore, coal, potential hydro-electric power, etc. Most important of the potential advantages of increased population would be security from aggression.

"So long as our domestic market remains so small that we must follow the present policy of trading raw materials or semi-fabricated materials for finished goods, not only our national prosperity, but also *our national security* will be dependent on conditions over which we have little or no control."

Mr. James S. Duncan, president of the Massey-Harris Company, has given earnest study to this question. In his address at the McMaster symposium, he stated:—

"The government has always agreed that Canada needs population, that its natural growth can be stimulated by an active immigration policy, but it has frequently contented itself with adding that the number of immigrants must be related to the absorptive capacity of the country. This is a truism . . . but the real questions which have not always been asked or answered are:—

"How much, and what kind, of population does Canada need?

"How rapid a rate of national growth can, in fact, be achieved for the benefit of all?

"How intelligently and promptly can the absorptive capacity of Canada be expanded, now and for the future?"

In another place he said:—

"If we had shown more courage and faith in the years immediately preceding 1939, Canada could have welcomed large numbers of highly skilled, industrious citizens, along with their capital, from several nations of Europe where precision industries have been built up for generations, even for centuries. For every Bata we admitted, however, we rejected many like him to our permanent loss. How much more effective and prompt our national effort during World War II could have been with a much larger number of these industrious, skillful people, needs little imagination to measure."

"Towards the end of World War II the government of Canada was urged from many quarters to move quickly in selecting, inviting and bringing to Canada highly skilled scientists, design engineers and technicians of enemy as well as of liberated countries. Little was done about it till 1947, but by that time these potential immigrants had already been chosen by some farseeing nations or had been lured or pushed behind the Iron Curtain. The excuses of shortage of shipping, political inadvisability, the need to repatriate our forces, lack of facilities *including housing*, were real enough, but could have been resolved if the will were there to do it."

In confirmation of Mr. Duncan's statement, the following is from the *Montreal Star* of March 8th of this year:—

"Canada, her defence build-up greatly swelling her labour needs, is willing to take 100,000 immigrants from countries with surplus populations, if transportation can be arranged.

"Arthur MacNamara, Deputy Minister of Labour, told the Senate Immigration and Labour Committee today:—

"Senator Tom Reid asked why Canada was searching the continent of Europe for workers when there appeared to be many Britons who wanted to come to Canada. Mr. MacNamara said the United Kingdom could supply *skilled labour*, but no farm hands and other unskilled men which Canada was seeking. Canada needed more labour than skills."

Now, both these views are understandable and logical from different viewpoints. The government undoubtedly knows the urgent need for greater population, but it also knows that unless work for immigrants is available immediately, the country would be faced with problems of unemployment and the dole. It knows that ultimately employment is dependent on the utilization of available resources, and that, while we know we have huge latent resources, we are not yet able to utilize large parts of them.

Let us look back and see what has happened to bring about this state of affairs. We started in 1900 with a clear understanding of the road we wished to travel towards nationhood. There were two parallel paths which must be travelled at the same rate:

(1) The intensive development of Canada, based on our natural resources, thus permitting accelerating increase in population.

(2) The gradual assumption of political responsibility in world affairs, as our economy strengthened.

Somewhere along the line we lost our clear understanding that travel on these two roads must be at about the same pace. While we kept driving ahead along the political road, we lagged farther and farther on the economic road. We have arrived at the status of "Nation" long before we are prepared to carry such a load. Our political status has developed much too fast in relation to our material development, and has resulted in an unbalanced situation which was never contemplated in the original picture of planned growth.

How has this situation come about ? We were progressing more or less according to schedule, until suddenly in 1914 all our national energies had to be focussed on a war of survival, with the disruption of our economy and the vital loss of large numbers of splendid young men, who would have made great contributions to the progress of Canada in peacetime development.

Our government, harassed by that war, a depression in agriculture in the 'twenties, followed by the industrial catastrophe of the 'thirties, and the great questions involved in the changing picture within the British Empire, could spare little time or resources for internal development, since the political side forced their attention.

Before we were recovered from the industrial depression, we were engulfed in another world war, with far greater disruption than before, and further vital losses of our young population. The tremendous tasks of rehabilitation and reconversion were not complete before we were faced with the world threat of Communistic aggression, and our whole economy must again be organized for defence for survival.

One crisis after another has arisen, and each one has had its effect in the postponement of major action to balance our development. We have now reached a further crisis which may last for one or more generations; our internal development can no longer be neglected, crisis or no crisis.

Effects of Unbalanced Development

The result of this unbalanced growth is evident, both in the physical state of the country, and, what is perhaps worse, in the mental attitude of the great bulk of its population.

The pressure of development of the easily accessible and obvious natural resources has been focussed on a small area of the country where settlement is concentrated. It has been carried out with a view to immediate and large profits with no concern for the long term view; we have not considered that we are merely trustees of these resources and that succeeding generations should receive them unimpaired or even enhanced. Ruthless exploitation has greatly impaired or destroyed many of our original assets in fertile farm lands, forests, fisheries, mines, etc., and has created conditions which can be remedied now only at great cost. We have hypnotized ourselves with the delusion of illimitable resources and are only now coming out of the trance to realize many unpleasant truths.

This intensive exploitation realized great sums of money. The country could not only pay its way, but, with an almost static population, our status of living rose proportionately until we now rate high in that scale. Our industrial expansion, based on resources, has been great and we have obtained a high percentage of employment for our limited population. Costs of labour, have risen tremendously and costs of basic materials have become greater and greater as the near sources have become exhausted. All these conditions were intensified by the emergency demands of the late war. During that period not only was a great part of our manpower and production devoted to nonproductive ends, but our national debt increased enormously.

Our burden of debt plus the increased costs of services assumed by the government, plus the relatively great costs of developing and maintaining the armed services, and other large expenditures deemed imperative to the maintenance of our place in the sun, has created a situation in which the government demands in taxes, direct and indirect, a very large part of the national income. A very small fraction of that tax money goes into building up and expanding the basic economy of the country on which the whole structure rests. The effect of all this may be flattering to our ego and give us the illusion of great prosperity, which fades out on close examination.

A situation has arisen where people do not save money, but live at an extravagant rate, buy expensive cars, radios and television sets and go travelling to expensive hotels and resorts. They do not see any object in putting money into the bank, into annuities or into insurance, when the chances are that the dollar they will finally get back will be a miniature of that deposited—the future can take care of itself and we will enjoy our money to the full now when it still will buy something.

The incentive to save, to provide for old age, for emergencies such as accident or illness, to look after less fortunate members of their families or their parents, has been lost for various reasons:

(1) Taxes absorb the largest part of the income which would normally be available for saving.

(2) The value of money has been shrinking and people consider it foolish to save and so lose a large part of what that money will buy at present.

(3) Government or private charity will look after older people and the very young, and provide for sickness or for indigents! Why should we shoulder those responsibilities? Let us get something back for our taxes.

(4) With graded taxation much incentive for hard work is killed, as the extra money earned goes to the government. Why should a man work hard for nothing?

What Canada really needs is efficient labour, skilled and unskilled. It is said that about 60 per cent of the cost of the nation's output is wages and salaries, so that any change in these must have a strong effect on prices, unless production is correspondingly increased. Statistics show that despite the fact that during the past five years many millions of dollars have been invested in new machines, plant equipment, etc., there has been no measurable increase in per capita productivity in Canada.

There seems to be little incentive or ambition to work as hard as possible and gradually achieve independence. Nor is there any obvious sense of responsibility for, or pride in, the building up of the country in which we live. This disappearance of initiative and self reliance is common throughout the western world, and it is even more apparent in some other countries than in Canada. It is particularly unfortunate in a young country, which has escaped the physical ravages of war and which needs all the ambition and drive of a young energetic people to develop its domain. One of the immediate problems is to bring about conditions in Canada which will bring back the pioneer spirit of "will to achieve". That cannot be done under a system of graded taxation which penalizes, rather than bonuses, the urge to achieve independence.

Let me say at once that despite the generalized picture I have painted, there have been and are at present, some farsighted individuals, associations and corporations which regardless of hampering conditions, have spent largely of their time and money in gathering data, carrying on crusades for better conditions, or in actual testing and developing, against long odds. To all such organizations, Canada owes a great debt in that they have led the way and shown what may be done by determination, directive vision, skill and energy.

We owe it to the farsighted policy of our Federal government that, long before the late war came to an end, it had set up a comprehensive and highly efficient organization, the Committee on Reconstruction, to examine into the whole question of Canadian development. The report of that Committee constitutes an invaluable guide to a proper balanced development.

Wise Development of Resources Long Urged by The Royal Society of Canada

With this general situation in mind, it seems worth while to look back through the years and see if our Society has done anything to warn our people of the dangers ahead.

The ways in which our resources were being exploited, and the inevitable result of such haphazard development, have caused much concern to the Royal Society of Canada for some decades, as is recorded in the transactions. In 1940 and 1941 this accumulated concern found expression in a series of papers and addresses which gave a very clear picture of the situation, gave strong warning of the results which must follow unless we had a radical change in our economic thinking and performance in relation to natural resources, and offered specific suggestions as to the proper methods of procedure for logical, scientific development to the end of full and wise use. The Council gave wide distribution to some of this material and the response from scientific societies was enthusiastic, all pledging full co-operation, expecting the Royal Society of Canada to act as the spark plug and co-ordinator for the whole programme suggested. The response from leaders in public affairs, governmental as well as in industry, was about nil.

When the National Committee on Reconstruction was set up in 1942 under the Chairmanship of Dr. F. Cyril James, a subcommittee on natural resources was formed with Dr. R. C. Wallace as Chairman. The whole field of natural resources was investigated with the cooperation of the leading men concerned with each resource The report of this subcommittee confirmed with much emphasis and elaboration the work of the Royal Society of Canada, and made specific recommendations for prompt and far-reaching actions by government to bring about marked improvement in the study and exploitation of our resources.

It appeared for a time that government would really take constructive action at last. Some of the basic recommendations were put into departmental hands for action and were dealt with promptly and efficiently, for example, the making of an aerial map of Canada. The photographs are taken and we hope for the map in the near future.

However, the organization which was recommended by the Committee on Reconstruction as most suitable to deal with natural resources was not brought into being. When the new Federal Department of Reconstruction was formed, it absorbed all such matters together with all problems of reconversion. It is not surprising, but very disconcerting to those who sponsored them, that the organization and work planned to place our natural resources in their proper perspective in the Canadian economy were largely neglected and apparently dropped from consideration, let alone action.

It is a distinctly encouraging sign that business and industry are beginning to see the danger signals which have so long been apparent. The pulp and paper industry has at last recognized where its interest lies if it plans to be other than transient in nature. Bankers and industrialists begin to see that we are trustees of our resources, and must have some concern for our descendants and for the future of Canada as a whole, rather than for immediate profit. There still remains much to be done between a perception that we have been on the wrong track, and a realization of how we can perhaps get on the right one, and also arrive at the right way of procedure without again going astray.

Having had occasion to see much of Canada both in settled and unsettled regions, and by training and experience having some knowledge of natural resources, I venture to suggest steps that must be taken in a new approach to the question of wise use of our natural resources. Some of these have been strongly recommended by the Committee on Reconstruction or other bodies; I take full responsibility for the rest.

Suggested Procedure

In the first place, this entire question is vital to the development of Canada as a whole. The fact that natural resources are now under the jurisdiction of the provinces does not relieve the Federal government of responsibility in so far as their exploitation affects the whole country.

To be considered there is the matter of taxes, of control of exports and imports, of interprovincial transport, of controls for defence purposes, control and marketing as in the case of wheat, gold and uranium, control of disease of plant life or of animals, of forest fires, of interprovincial or international waters, etc., as well as of all the resources of the Territories.

It would seem that these matters vital to the growth and well-being of Canada, are important enough to warrant continuous comprehensive study by an impartial national body, which would devote all its time to gathering the basic information required for intelligent decisions, and to making recommendations for action, based on that information.

It should be clearly understood at once that there is no suggestion that the government should enter into business, but it should provide the necessary basic information for potential development in any part of the country, and see that opportunities are made clear to the public for exploitation in some logical order of priority, each step determined in relation to an objective of full utilization of all potentials in that particular region and in balance with other economic considerations. That is really planned development.

The General Picture

It has been pointed out that over half the population of Canada lives within 100 miles of the United States border, and most of the remainder within 200 miles of that border. In other words, there average between fifteen and twenty persons per square mile in the southern fifth of Canada, and less than one per square mile in the remaining four-fifths. This sharp division of population was distinctive more than thirty years ago and there has been little change since, except for certain mining developments in the north. Thus, two divisions of Canada are clearly indicated and there are two major problems to be considered in dealing with natural resources:

(1) The settled southern fifth of Canada.

(2) The unsettled, but major northern part.

Let us consider possible procedure in each case.

The Settled Part of Canada

There are a few outstanding facts that must be kept in mind in considering full development in Canada:—

(1) Only about 16 per cent of its area is classed as agricultural. Only about 8 per cent of Canada is presently occupied by farms, the rest of the agricultural land is still covered by forests. Even in the settled portions, about one-fifth of the agricultural land is left in forest for wood-lots, etc.

There is great variation in the productivity of the various areas classed as agricultural, and the methods of farming employed have over large areas greatly reduced the productivity of originally good soils. On the whole, it is considered that our agricultural land is being utilized far below its potential. Even under that handicap, Canada produces a surplus over domestic needs of about one-quarter of the total production. It is believed that with full utilization of agricultural lands, worked efficiently, Canada could feed a population of about 30 millions of people, and farming itself could absorb at least 2 millions of people. It is obvious, however, that the best land has already been taken up and it should not be allowed to deteriorate.

Because we have such a limited amount of good arable land, it should be set aside for farming and care must be taken that it is not used as the sites for towns, cities, national parks, air fields, play-grounds, or any other purposes. We will urgently need it all in time.

(2) Even in the settled areas there are large tracts which are presently non-productive because of deforestation on poor land, soil erosion, or even impoverishment under poor methods of farming. They are not pulling their weight in the general economy. What can be done about them?

Large areas are subject to periodic flooding and some to stream erosion. Some areas have too much water, others suffer from drought. There is a great variety of problems which can be met only by thorough study in the light of all information that can be secured. Such a study can be made effective only by integrated groups or teams of specialists working and collaborating to include all viewpoints. Such organizations must work in very close co-operation with the community to solve conflicting interests at the source before final overall plans are completed.

The organization may be the community itself through its council, bringing in expert advice as required, an example of which is the excellent planned development for Etobicoke on the western outskirts of Toronto, or a group organized by government may handle the problem, as in the Ganaraska district near Port Hope, Ont., or as in the Cumberland County survey in Nova Scotia. On a broader scale, the Dominion Government has changed a situation of haphazard and unwise use of land in the Prairie Provinces to one of wise use based on scientific study, through the Prairie Farm Rehabilitation Act. A similar procedure would effect an enormous benefit if applied to the other provinces as a basis for the more detailed work of the individual community.

We know *what* should be done and have demonstrated successful methods of attack. Now is the time to set up a central organization to initiate the work throughout the country, to see that proper means are provided for carrying it out, and to co-ordinate the results and encourage the fulfilment of opportunities brought to light. In this way, the settled part of Canada can operate at a very much higher efficiency than at present, which many believe to be less than 50 per cent. The national income will rise accordingly, and we will have fairly exact information as to how many people may earn a livelihood in each district and the number and types of immigrants we can economically accept for those districts.

The Unsettled but Major Part of Canada

Here is the potential that will determine whether Canada will become a great nation or be forever limited in size, population and productive capacity to its present prescribed boundaries. Why has it received such scant attention in the first half of the century?

The great difficulty seems to be that we have forgotten in large measure that the first and most important task confronting Canada is to explore its potential resources and then to provide means of access and general facilities for their orderly, but persistent, exploitation on the basis of full knowledge, to the maximum and, if possible, continuing benefit to the country as a whole.

Sir Wilfred Laurier envisioned the British Commonwealth as a logical development of the older Empire, gaining strength and prestige in granting individual freedom, but with a unity of purpose. Each unit of the Commonwealth was encouraged and free to work out its own destiny, protected by the Commonwealth as a whole, but expected to make its maximum contribution to the union. He realized that sound economic development must be the basis of nationhood, and started with a long step forward in approving the Transcontinental Railway to open up a second great slice of Canada parallel to that serviced so well by the Canadian Pacific. The great clay belt through which that railway passes for 600 miles in northern Quebec and Ontario has not been developed as the great agricultural region Sir Wilfred predicted, nor have other resources, with the exception of minerals, received any but cursory attention. It is true there are encouraging salients, but little is known of the resources or potentials and little effort is made really to find out about them.

Is it any wonder that our industrial leaders think and speak of Canada, meaning only that part lying south of the Transcontinental Railway, and refer with delighted amazement to the fact that some people have had the nerve and foolhardiness to spend money in some section north of that and have started something of great promise. The suggestion is that any success was only a fluke, and, while a welcome asset, anyone would be mildly insane to risk capital under such conditions.

I am entirely serious when I say that Canada can never attain and maintain an important place among nations unless and until she sets her house in order and starts using her brains instead of trusting to luck.

What is the picture and what is it we think must be done about it and why must it be done now?

We are faced with a problem which can only be approached with techniques which must be developed as we proceed. We have no cut and dried precedents to follow. We do know that except on the southern fringe, there is practically no arable land in Canada; the forests occupy a large transitional area, but large stretches of them are on watersheds which drain away from, not towards, the settled areas. Those in the best position to know see no reason why, with reasonable communications established, living in practically any place in our north should be greatly different from living in settled communities farther south.

The symposium on the "Arctic" presented last year, supplemented by other recent papers, should dispel many of the shibboleths of defeatism which have influenced our thinking during the last half century. What Russia has accomplished in Siberia under forced expansion can surely be accomplished in Canada by democratic planning with less rigorous conditions to face. That valuable resources are in the north is well known, but we haven't a fraction of the information about them that is needed to take full advantage of their potential. Much has been accomplished in a quiet way and without fanfare, but the story is not known to the public at large.

Fur, Game and Fish

Over most of the country trapping has little regard to fur population and we have very little idea of a possible normal "take", or how much it could be increased under scientific management. Great strides have been made by the Hudson's Bay Company and by the Federal government in utilizing delta areas of otherwise waste land for the regulation and gradual increase of beaver and muskrat, thus stabilizing and greatly improving conditions for large numbers of the native human population. This business produces millions of dollars annually. Similar methods could be applied to other regions, with the promise of greatly increased returns on a regulated annual basis. Scientific handling of other forms of wild life and fisheries offers similar great opportunities.

Forests

Great progress has been made in the last few years in proper forest utilization. One of the most important developments and one of the brightest in Canadian economy, is the new approach of our pulp and paper companies to long term planning. Mr. James Muir pointed this out in his address to the Canadian Pulp and Paper Association's Woodland Section in Montreal on March 27th of this year. Now that the companies recognize that their long-term interest coincides with the best conservational practices, we may hope that our remaining forest resources will receive attention long overdue. A complete inventory of our forests is being planned, based on aerial photographs already obtained supplemented by spot ground surveys.

The task of forest protection must be tackled energetically to reduce losses from fire, pests and disease. There is much good arable land scattered through the accessible forests and combined farming of field crops and of forest products may well form the basis of settlement in those districts.

Mining

Within the last two decades mining camps have sprung up in many places throughout the country north of the settled districts, spreading nearly to the Arctic circle. Under existing conditions of transportation only the exceptionally rich or exceptionally large deposits have warranted attention. The surprising thing is that so many have been established and become the centres of flourishing communities; only the crushing handicaps which have developed in gold mining have prevented the establishment of many more centres of activity.

With well established transportation facilities and reasonable freight costs, and with some of the hobbles removed, mining would expand enormously throughout the north. The life of the mines would be lengthened many times, as not only the high grade, but millions of tons of intermediate and low grade ores could be mined. Where gold and uranium deposits are about the only possible producers now, the whole body of base metals and non-metallics would become available.

Enough has been said to indicate that our unsettled northland is far from devoid of resources. We know enough to realize that they are there, and in places in abundance. We do not have the detailed information necessary for general planned development, and so far we have made only small and spasmodic efforts to get that data.

No business of importance can develop unless those responsible have a clear idea of the factors basic to that business. What we lack in Canada is fundamental knowledge of our country and we cannot progress far without it. We have many striking examples in the settled part of the country of development which should never have been allowed to take place and enormous sums have had to be spent in reclamation because of past mistakes. We cannot afford to go on until we really know where we are going.

Consolidation of Gains in Development

The fact that there are mining centres throughout the north, with communities and the services which go with them, offers a unique opportunity for the appraisal of other resources in the same regions. Perhaps 80 per cent of each mining community is made up of service people who could serve any other resource industry as well.

Mining is a wasting asset, so it would seem to be good business for the country to assist the development of any and every other potential industry in the region of a mining community while mining is paying the general costs, and thus consolidate at least part of the community on a permanent basis, before the mines become exhausted and the whole area reverts to wilderness.

There is no resource other than that of the mines which seems to be rich enough or concentrated enough to warrant the expense of opening up the country for that alone, but when once opened, at least in part, a combination of continuing resources may well serve to consolidate the gains permanently into the Canadian economy.

Suggested Method of Procedure

It is suggested:

(1) That a small board be established by the Federal Government to devote full time to the problem of organization and co-ordination of the work in association with Federal and Provincial officials for all areas in Canada.

(2) That the first concern in the unsettled part be an intensive study of the potentials of the fringe area immediately north of the settled area, and that investigations centre about established communities and gradually extend laterally to include the whole intervening country.

(3) That teams of specialists be organized from the larger universities, competent to appraise possibilities in the fields of forestry, agriculture, mining, geology, furs, fisheries, game, transportation, recreation, waterpowers, social and general economics or any other resources which might be developed in any district. The teams should be chosen of men who are used to working together if possible, and others added as required.

(4) Each team should be charged with the task of collecting all available and pertinent information on the districts to which it is assigned, and then be required to visit the district and discuss the possibilities and suggestions with competent local people. It should then indicate what must be done to secure the additional information needed. Provision should be made to carry out the recommendations of the teams with the least delay.

(5) In the light of sufficient information, each team should formulate a comprehensive report on the economic possibilities in its assigned area, with recommendations concerning the logical ways in which development should take place.

(6) The country bordering the Grand Trunk Pacific would be the logical starting areas for Quebec and Ontario, with a team working in each province. Manitoba and Saskatchewan with similar problems, could be taken together. Alberta might require a team somewhat differently organized or with different emphasis, and British Columbia would again require a team of different composition. In all, five such teams should be able to handle this work across the country. The experience gained would aid in determining how later extensions of the work farther north should be handled.

(7) North of the fringe belt, there are obvious important gaps in our knowledge of resources, and special groups should be organized to help fill those gaps before any comprehensive appraisal is attempted.

(8) It would not be necessary to await a complete report before encouragement of the developments which appear to be economical which would not interfere with other possible projects.

In that way, within a few years, we would have the basic knowledge of another great slice of our country, sufficient to attract major development on a continuing basis, and so consolidate the gains made in the first instance by mining.

It is obvious that all departments of the Federal Government and of the provinces would be vitally concerned with such stock-taking: indeed it would be practically impossible to go far without their efficient and hearty co-operation. I am sure there would be wholehearted support and eager participation by all these groups of men, who have so far done a marvellous job with the facilities they have been given. All would be eager to pool their information and skills in a concentrated effort to get a comprehensive and panoramic picture of each section of the country in its proper economic setting; they would be depended upon to fill gaps in required knowledge and to assist in the preparation of final reports.

In the settled part of the country, the objective should be to have each community, township and county active in determining what could be done in its own district to bring it to a high level of productive efficiency. Each planning unit would have self interest as an incentive, and local plans could be integrated where necessary into those of the next larger unit, until the provincial body was reached; the latter would integrate the planning for the whole province. Where provincial boundaries were crossed on a regional basis, the co-ordination would be a Federal responsibility.

Allocation of Costs

Since the Federal Government would be the prime mover and would be the largest beneficiary of a major expansion and consolidation of productivity and of increased population, much of the expenses of the appraisals should be a Federal charge.

Each district should be asked the questions:

(1) In what ways can your district be improved to permit it to make a direct increased contribution to the national income, based on the utilization of your natural facilities and resources on a really efficient basis?

(2) What can be done similarly to improve your environment as a place to live?

(3) After ironing out all conflicting interests, what things must be done, and in what order, to attain the desired state of affairs?

(4) If developed as envisaged, how many more people, and what kind of people, could your district support at a reasonably high standard of living?

Special problems will develop which will require expert advice. To meet this need, and to ensure that certain types of problems have a uniformly high standard of solution, e.g., flood control, land classification, etc., the Federal Government should supply experts free of charge to the district, and should also pay for the actual preparation of at least final plans when approved by the provincial authority.

As an example of what it has cost the people of Canada to alleviate situations in agriculture alone, which arose from lack of basic full information and scientific development of our arable lands, I quote an editorial from the Montreal Gazette of April 17th:—

"Figures recently tabled in Parliament by Rt. Hon. J. G. Gardiner, Agricultural Minister, revealed the total of farm subsidies, bonuses, and subventions paid out in the last twelve years had amounted to $845 millions." That is an average of over seventy million dollars per year. A fraction of this amount spent on obtaining precise data on land classification, soil analysis and other research basic to full and economical use of our agricultural potentials in Canada, would have returned large dividends to the Canadian economy as a whole. It would have struck at the root of the trouble and obviated the necessity of paying large sums from the general treasury periodically to alleviate the results of unsound developments.

Advantages to be Gained

With the full co-operation of the provinces, whose interest would be greatly furthered by such a system, we should have, within a relatively few years, a reasonable picture of just what each section of the settled part of Canada can contribute to the national economy, and how many people and with what skills can be absorbed by each section.

We would have a backlog of useful projects in every section of the country which could be implemented in orderly succession as opportunity offered, or which could constitute a shelf from which to draw if, as, and when acute unemployment develops in any section. Each project would be a direct advance in the gradual betterment in Canadian economy and could be expected to pay for itself and return perpetual dividends in productivity and better living conditions throughout the years.

We would at last have an accurate yardstick by which to measure scientifically the capacity of Canada, both for production and for maintaining a population. Our immigration problem would be put onto a scientific basis, and we would have a ready answer for the teeming nations which now look askance at our great unoccupied territories. We would know how many we could take, what kinds of people we could accommodate and where they should go when they arrive.

Summary and Recommendations

In summary then, I have tried to show that the failure to carry out intensive economic development of Canada parallel to the drive for status as an independent nation, has created an intolerable situation.

Our fixed overhead and our attempt to "keep up with the Joneses" in the community of nations, force the imposition of taxes which seriously hamper industrial development, and worse still, have killed much of the incentive of large sections of the population to work and progress, a deplorable situation in any young country.

Because of faulty initial development, due to the lack of basic information on which to base a wise one, large sums are spent by government to relieve those faced with hardship or disaster and in trying to remedy past mistakes.

The lack of any clear and sustained policy for the fostering and continued orderly development of Canada, probably determines the policy of permitting immigration to meet only obvious and insistent need as it develops. This lack has also delayed and hampered expansion of our settled areas. The result is a practically static population, and the need for the periodic expenditure of large sums to tide over awkward and embarrassing situations as they arise, without removing the basic causes.

One of the main reasons for the apparent impasse seems to me to be that development in the two divisions of Canada which I have termed the "settled" and the "unsettled" areas, offers problems of very different character.

The development of the "settled" area seemed straightforward and followed closely the pattern of that followed in the United States; our development needed no new techniques. The pattern of early mistakes in exploitation of our neighbour was closely followed in Canada, and when the forests, furs, fisheries, game and minerals were largely exhausted in any area, agriculture expanded to support the population, except in regions such as those north of Lakes Huron and Superior, where the country is not suitable for farming. Unless sustained by continued mining, these areas reverted to wilderness.

For many years now the part of Canada in which the land is suitable for agriculture has been largely taken up; there is very little homestead land still available. Development of the hinterland obviously required new techniques since exploitation along the old lines was not feasible. The forests changed northward with the disappearance of merchantable timber and change of species, and it was only the rise in demand for small pulp wood that warranted the development of accessible border areas south of the continental watershed.

Important salients have been driven into the general unsettled regions to develop some conspicuous resource — oil in the MacKenzie; gold and uranium at Great Bear Lake and Great Slave Lake, and more recently, iron in Ungava. These are welcomed, but the progressive development and consolidation of the unsettled areas must be undertaken scientifically and on the basis of full information, if they are to succeed and achieve their proper importance in Canadian economy. They must be made to produce a part of the national wealth somewhat in proportion to their great relative area.

With the exception of experience in Northern Europe and Russia, there is little precedent to guide our development, but we know it can be done and we must develop our own techniques to do it.

I have suggested a method by which the settled country can have a thorough appraisal and be brought up to a much higher state of efficient utilization than exists at present, i.e., have the people most interested do it themselves with suitable urging and expert assistance. I have also suggested a technique which has been found to be effective in other lands and which is used by the United Nations Commission, for the progressive appraisal of our unsettled areas, and recommendations as to how their potentials may best be realized.

Although exploration of our northern areas has for long had to depend on canoe and dog team as means of access, great strides have in recent years been made in developing transportation suitable to those areas. Presently there is in process of development in the gas dynamics laboratory at McGill University, a machine whose power output actually increases instead of diminishes with colder weather. The development of military aircraft, reliable and efficient under any conditions of weather, linked with radar control stations, will make possible communications undreamed of a few decades ago.

The suggested methods of tackling our problems are in line with the best of democratic practices and contain nothing of regimentation on the one hand, or of government entering business on the other.

It has been shown that, in the nature of the case as it stands, we cannot rely on private initiative for these purposes, despite the conspicuous cases of interest and activity mentioned. It is suggested that a small part of the amount now spent annually on nonproductive projects of government would easily finance the whole undertaking.

Finally, it is strongly suggested that, regardless of our preoccupation with military activities at present, activities which may be forced on us for even a generation or more, we have reached a time when Canada can no longer afford to neglect the task of having a thorough investigation of the basis of its existence, its natural resources, not only to build up its population and economy for selfish reasons, but as a vital measure of defence to guard its actual existence.

Conclusion

I have tried to throw some light on the reasons why Canada finds herself at the half way mark of her century a definitely Limited Country, and apparently limited in her appreciation of her own potentials.

If I have succeeded in giving a logical explanation of basic causes and if the procedure suggested to remedy the situation seems reasonable, I hope that the Royal Society of Canada will sponsor a concerted drive, through all our national societies and major organizations, to obtain immediate action on these vital matters.

I am convinced that with the will to do and the brains to guide, the picture of Canada will emerge rapidly, and that within a very few years, we will change our crest from "Canada Limited" to "Canada Unlimited." √

Jordan Valley Irrigation Scheme Report

By William Bluett[1]

One of the main problems facing the Hashemite Kingdom of the Jordan today is to find progressive and productive room for the absorption into the national economy of the great majority of the 750,000 Arab refugees from Israel. By some means, an extra 165,000 acres of the Jordan Valley must be turned into arable land.

How this can be done is told in a report on a vast project to irrigate the length of the Jordan Valley from Lake Tiberias to the Dead Sea. The report is the work of Sir Murdoch Macdonald and Partners, the United Kingdom firm of consulting engineers who were commissioned to carry out an investigation into the possibilities of the scheme in 1949. Broadly it envisages the construction of two main canals, running down either flank of the Valley and fed by the Jordan and its tributary, the River Yarmuk, with Lake Tiberias acting as a storage reservoir for winter flood water.

The scheme would result in the establishment of 18,000 agricultural tenancies, each consisting of some seven and a half acres fully irrigated. Allowing for an average of five persons to a family, 90,000 people would thus gain a direct livelihood from the soil, and many hundreds more find employment as shopkeepers, traders, officials in providing the countless services, from education to entertainment, a thriving community needs and creates in its progress. The fulfilment of the project will enable the refugees to become useful and hopeful people with lives to live and jobs to do.

Though Macdonald and Partners estimate that the scheme will cost £23 millions and take 16 years to carry out in full, they emphasize in their report that a labour force of between 6,000 and 7,000 will be employed continuously throughout that period. Employment will begin as soon as the word to start is given. But, so thorough are the preparatory steps recommended that three years may pass before the actual construction of the canals is started. This initial phase will be devoted to geological, hydrological and site surveys, to agricultural research, soil analysis, and the creation of nurseries and field experimental plots.

In Four Stages

The actual process of irrigation is scheduled for completion in four main stages, each conclusive in itself yet forming an integral part of the whole tremendous experiment. The first stage will provide perennial irrigation for some 47,000 acres on the east side of the Jordan, stretching southwards from the River Yarmuk, the water flowing through a diversionary canal 44 miles in length.

The second stage will produce water for 27,500 acres in the region of the Dead Sea, on both sides of the Jerusalem-Amman road. For this purpose the canal constructed in phase one will be extended for 16 miles.

Stage three will create conditions permitting the winter flow of the Jordan to be "stored" in Lake Tiberias, and so provide water to complete the irrigation of the river's east side from the Yarmuk to the shores of the Dead Sea. The fourth and final stage will embrace the irrigation of 50,000 acres on the west side of the Jordan in the Jericho area, through "storing" the winter flow of the River Yarmuk.

All told, it is planned to irrigate 139,000 acres for agriculture in Jordan, and to "reserve" water for 26,000 acres in Israel. It is not unlikely that this arrangement, beneficent as it is, may be complicated by the habitual enmity between Arab and Jew, but it is devoutly to be hoped that wise statesmanship on both sides will ensure that the life-giving water is scientifically diverted for the benefit of both nations rather than being allowed to flow to waste in the Dead Sea, as so much of it does at present.

The project envisaged by the famous United Kingdom engineering consultants is bold, imaginative and—according to expert opinion—supremely practicable. Its fulfilment—if the authorities agree to its being fulfilled—will bring added prosperity to the people of Jordan, and fresh hope and wellbeing to the unhappy refugees who have claimed sanctuary within their borders.

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[1]Well-known English journalist who has specialized in Middle-East affairs, having lived and worked there for many years.

Rotary Lime Kiln Operation

by

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A paper presented before the 65th Annual General and Professional Meeting of The Engineering Institute of Canada, at Montreal, May 9-11, 1951.

The large quantities of different aliphatic chemicals synthesized from acetylene at Shawinigan Chemicals require the production of many tons of calcium carbide daily. A substantial sale of commercial calcium carbide, in addition to this, adds to the tonnages produced, so that to-day the carbide plant at Shawinigan Falls, is the largest on this continent.

The raw materials required for the production of calcium carbide are lime and coke, as indicated by the following simple reaction:

$$\underset{\text{(Lime)}}{CaO} + \underset{\text{(Coke)}}{3\,C} \longrightarrow \underset{\text{(Calcium carbide)}}{CaC_2} + \underset{\text{(Carbon monoxide)}}{CO} \quad \ldots\ldots (1)$$

As can be seen from the molecular weights, one ton of calcium carbide theoretically requires 1,750 lb. of pure lime.

Commercial carbide always contains some unreacted lime, so that, in actual practice, one ton of carbide requires about one ton of lime.

Further, in addition to this large lime demand for carbide, considerable quantities of lime are supplied to various consumers, the chief of which is the pulp and paper industry.

To meet these requirements Shawinigan Chemicals operates eight rotary kilns, each capable of calcining 9 tons of limestone per hour. This is equivalent to a daily capacity of about 120 tons of lime per kiln. The capacity of a kiln can be considerably greater than this when calcining lime hydrate briquettes, so that the total plant capacity is greater than 1000 tons of lime per day. This gives it the distinction of being the largest rotary lime kiln installation in Canada.

A fundamental difference between this and most other lime plants is that lime production is only one of several unit processes

Fig. 1. Aerial view of Shawinigan Chemicals.

TABLE I

Typical Analysis of Bedford Limestone Lime Hydrate and Lime Product

Limestone		*Lime Hydrate*	
$CaCO_3$	97.5%	$Ca(OH)_2$	88.5%
$MgCO_3$	1.0	$Mg(OH)_2$	0.2
*R_2O_3	0.3	R_2O_3	1.7
SiO_2	1.0	†SiO_2	2.7
S	0.02	S	0.3
P	0.007	P	0.001
		§Combined CaO	6.5

Lime

	From Limestone	*From Lime Hydrate*
Total CaO	95.5	93.1
Available CaO	92.0	84.1
Combined CaO	3.5	9.0
SiO_2	1.1	3.5
R_2O_3	0.8	2.2
MgO	0.9	0.2
Loss on Ignition	1.5	1.0

* R_2O_3 stands for $Fe_2O_3 + Al_2O_3$ and any other Group III precipitate.
† SiO_2 actually includes insolubles such as traces of free carbon, ferro-silicon, etc.
§ Combined CaO is that CaO which is present in such compounds as calcium silicate, calcium aluminate, calcium sulphate, etc.

The carbide plant of Shawinigan Chemicals Limited is the largest in the world. The rotary lime kilns with daily capacity exceeding 1000 tons comprise the largest rotary kiln installation in Canada. This paper describes the raw materials and tells how they are used. Details of the main components of the plant are given. The various fuels used are analyzed and compared, and operating data is given. In conclusion some of the current development work is outlined. Numerous descriptive tables are added.

which make up the integrated industry at the Shawinigan plant. Thus there is ample opportunity for decreasing operating costs by the exchange of by-product materials and by-product heat with these other unit processes.

For example, the waste heat in the exhaust gases from the kilns is used to generate some of the heating and process steam for the plant. Also, lime hydrate, which is a by-product in the generation of acetylene from calcium carbide, is briquetted and recycled to the kilns as an alternative source of lime. Part of the carbon monoxide which is generated as a by-product in the carbide furnaces as indicated in equation (1) is collected and used as lime kiln fuel. Still further, the hot volatile gases from the unique travelling grate "coking stokers", which produce much of the coke required for the carbide reaction, are used as an excellent lime kiln fuel. A more detailed description of these methods will follow.

Fig. 1 shows an aerial view of Shawinigan Chemicals with the Chemical Division in the foreground and the Carbide Division in the background.

Raw Materials

Limestone

Lime for carbide production must contain a minimum of impurities. Thus only very pure limestone can be used. Such a limestone is found near Bedford, Que. It is a dense Ordovician stone having the average analysis shown in Table I. It is quarried, crushed, and screened and transported by rail some 150 miles to Shawinigan Falls. Two sizes of stone are calcined: ¼ in. - 1 in. and 1 in. - 2 in. Quarrying operations are carried to a depth of about 140 ft.

Lime Hydrate Briquettes

In the generation of acetylene from calcium carbide, a lime hydrate which is mainly calcium hydroxide is produced as follows:

$$CaC_2 + 2\,H_2O \longrightarrow C_2H_2 + Ca(OH)_2$$

In the dry generators the lime hydrate is produced as a finely divided solid containing less than 2 percent water. The analysis is shown in Table I. A screen analysis is shown in Table II. Hydrate is pneumatically conveyed to the briquetting plant, where it is mixed with about 12 per cent water, and compressed into pillow shaped briquettes by rotary presses.

The moist briquettes are comparatively weak, but after drying are hard enough to withstand the tumbling action in the kilns. The briquettes are dried in special vertical basket-type dryers. Hot gases from the lime kiln stacks are used to supply the necessary heat. This makes good use of some of the low temperature heat in these stack gases, which would ordinarily be lost. Fig. 2 shows the moist briquettes being conveyed to the dryer.

Comparison of Limestone and Lime Hydrate as Raw Materials

Table I shows the analyses of Bedford limestone and lime hydrate, and the lime produced from each. SiO_2, Fe_2O_3, Al_2O_3 and sulphur impurities are higher in lime hydrate than in the limestone. This is due to

TABLE II

Screen Size of Lime Hydrate before Briquetting

On 48 mesh	—	1.5
65 "	—	3.5
100 "	—	3.7
150 "	—	6.5
200 "	—	15.5
Through 200 "	—	69.3

Fig. 2. Moist lime hydrate briquettes being conveyed to dryer.

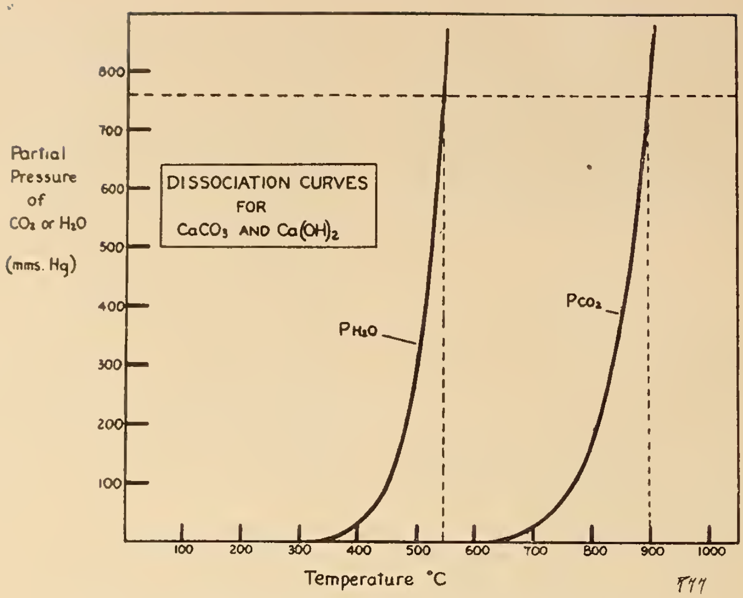

Fig. 3. Dissociation curves for $Ca(OH)_2$ and $CaCO_3$.

impurities introduced with the coke ash in the carbide reaction. Thus there is a limit to the amount of hydrate which may be recycled, due to this build-up of impurities. Two impurities, MgO and phosphorus, are noticeably less in the lime hydrate. MgO is reduced to Mg and volatilized in the carbide process. Phosphorus is removed as phosphine (PH_3) in acetylene generation. The quality of lime from each source shows the same trend in impurities.

In addition to high chemical purity, carbide manufacture requires a reactive or soft-burned lime. Excessively high calcining temperatures cause a rearrangement in the porous, active structure of the soft-burned lime, rendering it less reactive. The danger of overburning becomes less with decreasing amounts of impurities. Since Bedford stone falls in the category of a high purity limestone, it is comparatively difficult to overburn. Thus high kiln temperatures and high operating rates can be used.

Lime from lime hydrate has more impurities, but this is conveniently offset by the lower temperatures required to decompose the hydroxide. Hence the lime from both Bedford stone and lime hydrate is soft-burned and active.

From a thermodynamic standpoint, lime hydrate offers certain advantages over limestone. The following equations show that the heat input per pound of lime is less when calcining lime hydrate.

$$CaCO_3 \longrightarrow CaO + CO_2$$
$$\Delta H = 77{,}500 \text{ B.t.u./lb. mole} = 1{,}385 \text{ B.t.u./lb. CaO}$$

$$Ca(OH)_2 \longrightarrow CaO + H_2O\ (g)$$
$$\Delta H = 47{,}700 \text{ B.t.u./lb. mole} = 853 \text{ B.t.u./lb. CaO}$$

The temperature of calcination is also lower with lime hydrate. This contributes still further to higher lime: fuel ratios. Fig. 3 shows the dissociation curves for $Ca(OH)_2$ and $CaCO_3$. It can be seen that the partial pressure of H_2O vapor in equilibrium with CaO and $Ca(OH)_2$ is equal to 1 atmosphere at 547°C. or 1017°F. The atmospheric dissociation temperature of $CaCO_3$ on the other hand, is 900°C. or 1650°F.

Heat balances which appear later demonstrate the much higher lime: heat input ratios that can be obtained when using lime hydrate briquettes. Other benefits derived from the lower calcination temperatures, such as increased life of refractory linings, etc. are apparent.

General Description of the Lime Plant

Fig. 4 shows a schematic elevation of one of the lime kilns. All eight kilns are essentially the same. Limestone (or lime hydrate briquettes) is stored in a tank over the charging end of each kiln. The stone passes over a constant rate feeder, and down the feed pipe into the kiln. The lime product falls from the firing end onto a step-grate Fuller cooler which is divided into two compartments.

Secondary air for combustion sweeps through the grates in the first compartment of the cooler, recovering most of the sensible heat in the discharged lime. Additional air is blown through the second compartment to cool the lime to a suitable handling temperature.

The hot flue gases from the kiln pass over the U tubes of the superheater in the dust chamber and through the horizontal tubes of the waste heat boiler. They continue then through an induced draft fan to the stack.

Each kiln can be fired by three main fuels: a) hot volatile gases from the "coking-stoker", b) pulverized coal, c) carbon monoxide gas from the closed carbide furnaces. All three fuels are commonly used together. The approximate fraction of heating load supplied by each fuel is respectively: a) 60 per cent; b) 30 per cent; c) 10 per cent. Coke fines have been pulverized and used in relatively small quantities as a fuel. Experimental quantities of peat have also been pulverized and fired successfully.

Details of Plant Components

Kilns

Each kiln is 120 ft. long and has an inside shell diameter of 8 feet. The first 80 ft. from the charging end is lined with standard fireclay kiln block 6 in. thick. The remaining 40 ft. at the firing end has 9 in. thick block made of high temperature refractory material.

The kiln slope is about ½ in. per foot. The speed of rotation is 40

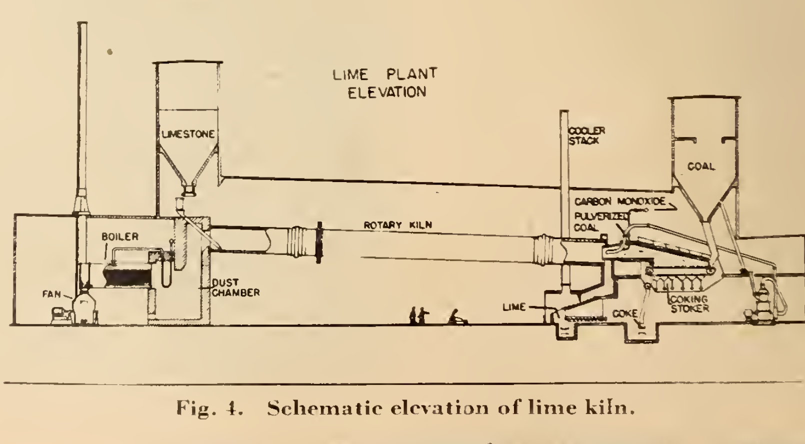

Fig. 4. Schematic elevation of lime kiln.

revolutions per hour. Under these circumstances with a limestone feed of 9 tons/hr., the time of passage through the kiln is about 2 hours. Fig. 5 shows a view of the Kiln Room.

Waste Heat Boilers

Each boiler has 360 horizontal fire tubes, 2 in. O.D. x 20 ft. long. This is equivalent to a gas side heating surface of 3,365 sq. ft. The 1½ in. O.D. superheater tubes add another 140 sq. ft. of heating surface. Steam is generated at 150 p.s.i.g., and is superheated to about 475° F. The rate of generation depends on the rate of lime production and the type of fuel used, etc., as shown in the accompanying heat balances.

Boiler feed water is de-aerated at atmospheric pressure by direct contact with steam, and is pumped to the boilers at 212° F. Boiler feed water treatment consists of adding sodium hydroxide solution to maintain a pH of about 11, and a disodium phosphate solution to precipitate calcium and magnesium salts and maintain water hardness equivalent to 0.5 - 1.0 grains $CaCO_3$ per U.S. gallon. The boilers are blown down two times per shift. Dust plugs some of the boiler tubes after several days of operation. Routine tube blowing is necessary about once every two weeks.

Fans

The induced draft fans handle about 22,000 c.f.m. at 450° F., and are capable of delivering this volume at this temperature against a static pressure of 8.0 in. H_2O. The pressure drop occurs almost entirely across the boiler. Thus the pressure drop across the kiln even with considerable clinker formation may be only 0.5 in. H_2O, whereas that across the boiler varies from 4 - 7 in. H_2O, depending on the cleanliness of the tubes. The fans are driven by 75 hp. motors through a hydraulic coupling, which allows the fan speed to vary in accordance with draft requirements.

Coal Pulverizers

Four bowl mills pulverize coal for the eight kilns. Each mill can pulverize about 80 lb. of coal per minute. Hot air is drawn from within the hood at the firing end of the kiln, and is swept through the mill to carry the powdered coal to the kiln. The hot air facilitates grinding by evaporating any moisture in the coal, besides acting as primary air for combustion. About 3 lb. of air is used per pound of coal, which is almost ⅓ the total air required for complete combustion.

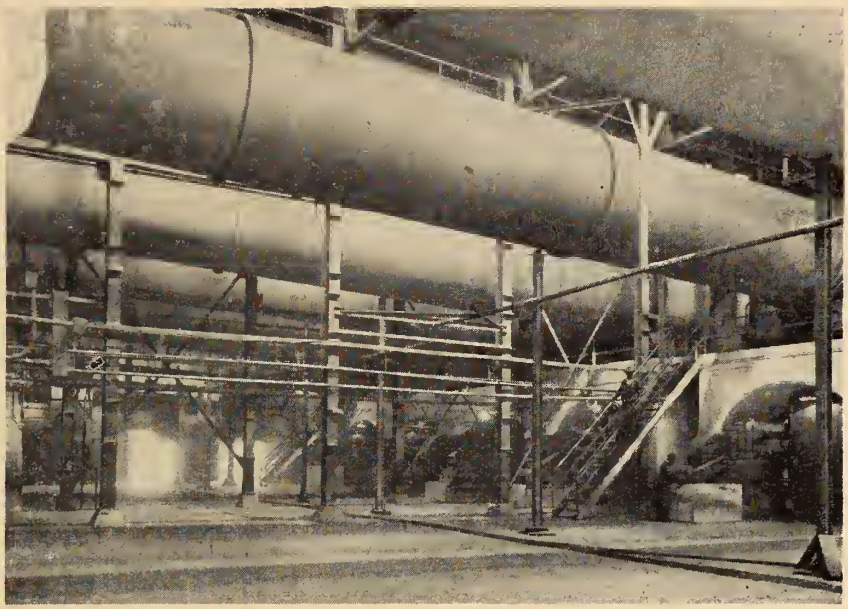

Fig. 5. The kiln room.

Coking-Stokers

The travelling-grate coking stokers were developed by Shawinigan Chemicals to produce coke required for carbide manufacture. They were adapted to the kilns, so that the hot volatile gases could be used for lime burning. Their operation has been described in various patent disclosures (1), (2), (3) and their application to rotary lime kiln operation has been described by Andersen.(4)

Fig. 6 shows the essential construction of the stoker. Bituminous coal from an overhead tank is spread on the travelling grate to a thickness of 2 in. - 4 in. Air is blown through the grate from several compartments, so that the combustion may be carefully controlled. As the grate travels along, volatile matter is distilled off and partially burns, supplying the necessary heat. Coke containing about 3 per cent volatile matter discharges to a conveying system at the end of the grate. The coking operation is accomplished with a small loss (about 1/12) of the original fixed carbon in the coal.

The hot volatile gases pass through a 4 ft. diameter burner pipe to the kiln. The temperature of these gases is about 2,200° F. (1,200° C.), so that almost all coal tar products are cracked to carbon and the simpler gases CO, H_2, CH_4, etc. Table I shows typical operating data for the coking stoker.

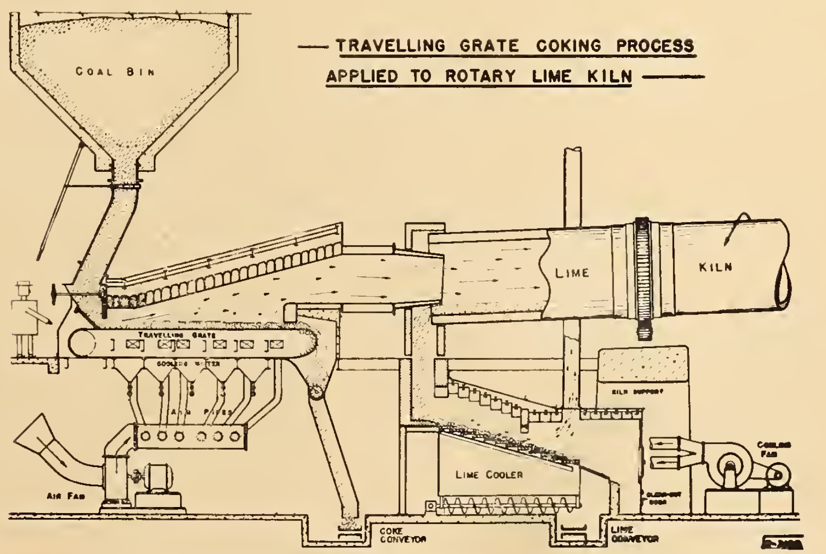

Fig. 6. Sectional elevation showing stoker arrangement.

TABLE III

Typical Stoker Operating Data

Coal feed rate = 3.0 tons per hour
Coke production rate = 1.7 tons per hour

Coal analysis (as received)			*Coke*
H_2O	—	4.5	—
V.M.	—	36.0	3.0
F.C.	—	54.0	87.2
Ash	—	5.5	9.8

lb. air per lb. of coal = 2.7 lb.
lb. gas per lb. of coal = 3.2 lb. = 43.3 ft.^{3} at N.T.P.

Gas Analysis

CO_2	—	8.0	
CO	—	7.0	(+about 0.4 g. of free carbon per ft.^{3}.)
H_2	—	10.4	
CH_4	—	0.9	
O_2	—	0.5	
N_2	—	61.1	
H_2O	—	12.0	

Gross calorific value
= a) Chemical heat (pure gas) — 70 Btu/ft^3 at N.T.P.
b) Free Carbon (solid) — 13.5 " "
c) Sensible Heat (gases at 1,200°C.) — 46.0 " "
129.5 " "

Net calorific value—122 Btu/ft^3 at N.T.P.

The presence of free carbon in the gases gives the flame in the kiln good radiant qualities, which aids in heat transfer to the kiln charge.

Comparison of Fuels

Table IV shows the analyses etc. of the three fuels used. The volume of combustion products per million B.t.u. heat input gives an indication of the fan requirements for a given firing rate. It can be seen that a greater volume of gas must be handled in the case of stoker volatile than with the other fuels. In addition the pounds of lime per million B.t.u. input differs considerably with the different fuels, so that further factors must be considered when making comparisons at a given lime production rate.

Two qualities of a flame for lime-burning are important; a) The temperature, and b) The emissivity. The temperature determines the potential sensible heat above 1650° F., which may be transferred to the lime to supply the actual calcination heat. This is important in calculating the highest theoretical lime: fuel ratio obtainable in a rotary kiln. Also the rate of heat transfer from the flame to the charge is a very sensitive function of the temperature. Being largely radiant heat transfer, this rate will vary as the fourth power of the flame temperature. The flame temperature depends on the heat capacity and weight of combustion gases per unit of heat in the fuel.

The emissivity also effects the rate of heat transfer, and thus influences the lime:fuel or lime: heat input ratio. Thus pulverized coal and carbon monoxide have about the same flame temperature, but pulverized coal has a higher emissivity, due to the presence of incandescent carbon particles and gives higher lime:heat input ratios. The coking-stoker gases have sufficient free carbon to have good radiation characteristics, but the flame temperature is slightly lower, due mostly to the quantities of diluent nitrogen and CO^2. Thus, as will be seen in the following heat balances, the lime:heat input ratios are less for stoker gases than for pulverized coal.

Operating Data

Table V shows a comparison of operating data when calcining limestone and lime hydrate briquettes. Lower operating temperatures, lower gas rates and higher lime production rates are the main features of lime hydrate calcination. Pulverized coal is seldom used for lime hydrate calcination, as the heating requirements can be adequately fulfilled by the stoker running at reduced capacity.

The 90 lb. of coal per minute to the stoker gives a heat equivalent of about 37 lb. of coal per minute to the kiln. 200 c.f.m. of CO gas is equivalent to about 4.6 lb./min. of coal. In this case then, the total coal equivalent to the kiln would be about 53.6 lb./min. The stack gas rates include about 15 per cent excess air (3 per cent O_2 in the stack

TABLE IV

Comparison of Fuels Used

	Fuel Analysis		
	Coal	*Stoker Volatile*	*Carbon Monoxide Furnace Gas*
	C — 75.7 Wt. % H — 5.0 O — 4.8 N — 1.4 Ash — 8.6 H_2O — 4.5 100.0	CO_2 — 8.0% Vol. CO — 7.0 H_2 — 10.4 CH_4 — 0.9 O_2 — 0.5 N_2 — 61.1 H_2O — 12.0 100.0 (0.4 g. Carbon/ft^3 at N.T.P.)	CO_2 — 1.0% Vol. CO — 81.0 H_2 — 9.5 CH_4 — 1.0 O_2 — 1.0 Ill. — 0.2 N_2 — 5.3 H_2O — 1.0 100.0
Heating Value (Btu/lb.)			
a) — Gross	13,500	1,840	4,575
b) — Net	13,000	1,730	4,480
lb. air per lb. of fuel (perfect combustion)	10.4	0.7	2.6
lb. combustion gas/lb. fuel	11.4	1.7	3.6
lb. of combustion gas/MM Btu.	77	93	79
Density of combustion gas at N.T.P. (lb./ft^3)	0.084	0.079	0.087
Volume at N.T.P. of combustion gas per lb. MM Btu	917	1,175	910

gases). This air is a result of leakage at the junction of the kiln and the dust chamber, and is very difficult to avoid. In all subsequent heat balances a similar 15 per cent excess air in the stack gases is assumed.

Heat Balances

Tables VI-IX inclusive show the typical distribution of heat for limestone and lime hydrate calcination, when using either pulverized coal or stoker gases as a fuel. At lower limestone or lime hydrate feed rates, the per cent heat recovered from the lime in the cooler would be greater. Also the percentage of heat lost by radiation would be greater, etc. Hence the heat distribution shown only applies to the feed rate of 300 lb./min.

The shell temperatures of kilns calcining limestone have been measured, and used to calculate the heat lost by radiation from the shell alone. Lower figures ranging from 65,000 - 85,000 B.t.u./min. were obtained. The balance includes losses from the firing-end hood, dust chamber, boilers etc.

Table X shows a comparison of heat distribution reduced to a "per ton of lime produced" basis. The general inefficiency of the rotary kiln is apparent. Roughly only ⅓ of the heat input to a kiln is used in actual calcination of limestone, The waste heat boilers recover another ⅓ of the heat input, but the remaining ⅓ is lost.

As mentioned previously some of the heat in the stack gases finds useful application in the drying of lime hydrate briquettes. In the case of lime hydrate, about ½ the heat input is used for the calcination reaction. The boilers recover an additional ¼ but about ¼ of the heat input is still lost.

Reduction of heat losses through the shell by the use of insulating brick is the most promising method of increasing kiln efficiencies. Work is proceeding along these lines at Shawinigan now. The low temperature of the heat in the stack gases limits its usefulness, except for special applications such as briquette drying.

Development Work

Current development work is proceeding along two main lines: a) the improvement of heat efficiencies, and b) the collection of dust from the stack gases. The former involves the use of insulating firebrick, to reduce heat losses from the shell, the use of oxygen recorders to aid in proper firing, etc. Also, some work is being done on the

TABLE V

Typical Operating Data when Calcining Limestone and Lime Hydrate Briquettes

	Limestone	*Lime Hydrate Briquettes*
Charge rate	9.0 tons/hr.	9.0 tons/hr.
Lime production rate	4.9 "	6.9 "
Solid material loss to Dust chamber and stack	0.2 "	0.2 "
Steam production rate	13,500 lb./hr.	5,500 lb./hr.
Steam pressure	150 p.s.i.g	150 p.s.i.g.
Steam temperature	450°F.	390°F.
Fuel rate:		
a) Coal to stoker	90 lb./min.	65 lb./min.
b) Pulverized coal	12 "	—
c) Carbon monoxide	200 c.f.m.	—
Lime temperature at firing end	2000°F.	1500°F.
Dust chamber temperature	1400°F.	1090°F.
Stack temperature	430°F.	400°F.
Stack gas rate	925 lb./min. 20,000 cfm at 430°F.	435 lb./min. 10,000 cfm at 400°F.
Gas analysis (% by volume)	CO_2 — 20.4	CO_2 — 9.2
	O_2 — 3.0	O_2 — 3.1
	N_2 — 64.7	N_2 — 65.3
	H_2O — 11.9	H_2O — 22.4

TABLE VI

Typical Heat Balance for Pulverized Coal Firing
(Limestone Feed)

Basis: Limestone feed = 300 lb./min.
Heat input: 48 lb. of coal per min.
Net calorific value, 13,000 Btu/lb. = 625,000 Btu/min.

Heat for calcination (162 lb./min. of lime)	=		225,000	Btu/min.	(36.0%)
Sensible heat in lime to cooler (1,800°F.)	=	67,000		"	
Sensible heat in lime from cooler (250°F.)	=		5,800	"	(0.9%)
Sensible heat in cooler stack gases (4,700 c.f.m. at 200°F.)	=		9,200	"	(1.5%)
Heat returned to kiln with secondary air from cooler	=	52,000		"	
Heat recovered from lime	=	77.5%			
Heat loss to stack (16,000 c.f.m. at 425°F.)	=		70,000	"	(11.2%)
Heat to steam:					
a) 11,000 lb. steam per hour at 150 p.s.i.g. and 450°F. (boiler feed water at 212°F.)	=		195,000	"	(31.3%)
or b) Dust chamber temp. at 1,310°F. gives heat to boiler from gases	=	(196,000)		"	
Heat loss to cooling water on burner pipes	=		10,000	"	(1.6%)
Total radiation losses (by diff.)	=		110,000	"	(17.5%)
			625,000	"	100.0%

TABLE VII

Typical Heat Balance for Stoker Volatile Firing
(Limestone Feed)

Basis: 1) Limestone feed = 300 lb./min.
2) Coal rate to stoker = 135 "
3) Stoker gas to kiln = 417 " (5850 c.f.m. at N.T.P.)
Heat input: (Net heating value of stoker gases including sensible heat and free carbon present = 1,700 Btu/lb.)
= 1,700x417 = 710,000 Btu/min

Heat for calcination (162 lb./min. of lime)	=		225,000	Btu/min.	(31.7%)
Heat in lime from cooler	=		5,800	"	(0.8%)
Heat in cooler stack gases	=		9,200	"	(1.3%)
Heat lost to stack (21,000 c.f.m. sy 450°F.)	=		95,000	"	(13.4%)
Heat to steam					
a) 14,100 lb. steam per hour at 150 p.s.i.g. and 475°F.	=		255,000	"	(35.9%)
or b) Dust chamber temp. at 1370°F.	=	(258,000)		"	
Cooling water loss	=		10,000	"	(1.4%)
Radiation loss (by diff.)	=		110,000	"	(15.5%)
			710,000	"	100.0%

utilization of low grade fuels such as peat, which may reduce the cost of heat input to the kilns.

The collection of dust from the stack gases requires a collector which will handle large gas volumes, and is capable of removing particles of very small diameter. The dust which originates from the limestone and lime, is a result of the attrition action of the tumbling charge in the kiln, and also comes from the fly-ash when pulverized coal is used. This dust may have 20 per cent by weight which has a particle diameter less than 10 microns. (1 micron = .001 mm.). Dry cyclonic collectors usually show low collection efficiencies in the minus 10 micron range of particle diameters. Electrostatic precipitators are effective in this range but, since the dust has little or no value, the high first cost of this type of collector seems unjustified.

'Wet cyclonic' scrubbers have high dust removal efficiencies and at present one of these is installed on one of the stacks. It removes 98-99 per cent of the dust which is discharged as a water slurry. Problems of corrosion due to SO_2 and SO_3 in the gases present themselves and proper materials of construction must be used.

References

① U.S. Patent 2,209,225 (Anderson & Renaud)

② U.S. Patent 2,380,930 (Anderson & Fasken)

③ Can. Patent 447,170 (Andersen & Fasken)

④ A. H. Anderson (Can. Inst. of Mining & Metallurgy, Trans. Vol. XLVII, 139-51 (1944) √

TABLE VIII

Heat Balance: When Firing with Pulverized Coal
(Lime Hydrate Briquettes)

Conditions: — Hydrate briquette feed = 300 lb./min.
— Lime production rate = 230 "
— Coal rate = 25 "
— Net calorific value of coal (as received) = 13,000 Btu/min.

Heat input: 25 x 13,000	=		325,000	Btu/min.	
Heat required for calcination (correction for impurities, etc.)	=		163,000	"	(50.2%)
Heat in lime from kiln (temp. = 1300°F.)	=	65,000		"	
Heat in lime discharged from cooler (temp. = 250°F.)	=		8,300	"	(2.5%)
Heat discharged to cooler stack (6,800 c.f.m. at 300°F.)	=		20,400.	"	(6.3%)
Heat returned to kiln from cooler with secondary air	=	36,300		"	
Heat recovered from lime	=	56%			
Heat lost to stack (9,000 c.f.m. at 370°F.)	=		33,300	"	(10.2%)
Heat to steam:					
a) 4,000 lb./hr. at 145 p.s.i.g. and 375°F. Boiler feed water at 212°F.	=		68,000	"	(20.9%)
or b) Dust chamber temp. at 900°F. gives heat to boiler from gases	=	69,500			
Heat lost by radiation and to burner cooling water (by diff.)	=		32,000	"	(9.9%)
			325,000	"	100.0%

TABLE IX

Heat Balance when Firing with Stoker Gases
(Lime Hydrate Briquettes)

Conditions: — Hydrate briquettes feed = 300 lb/min.
— Lime production rate = 230 "
— Coal rate to stoker = 68 "
— Stoker gas to kiln = 210 lb./min. { including free carbon
— Net heating value of gas = 1730 Btu/lb.

Heat Input: 1,820 x 200	=		364,000	Btu/min.	
Heat required for calcination	=		163,000	"	(44.8%)
Heat in discharged lime	=		8,300	"	(2.3%)
Heat in cooler stack gases	=		20,400	"	(5.6%)
Heat lost to stack (10,000 c.f.m. at 400°F.)	=		40,300	"	(11.1%)
Heat to steam					
a) 5,500 lb./hr. at 145 p.s.i.g. and 375°F., boiler feed water at 212°F.	=		94,000	"	(25.8%)
b) or Dust chamber temp. at 1090°F. gives heat to boiler from gases	=	(94,000)			
Heat lost by radiation and to burner cooling water, etc.	=		38,000	"	(10.4%)
			364,000	"	100.0%

TABLE X

Comparison of Heat Distribution per Ton of Lime when Calcining Limestone and Lime Hydrate Briquettes using Different Fuels

Raw Material	*Limestone*		*Lime Hydrate Briquettes*	
Fired by	*Pulv. Coal*	*Stoker Gases*	*Pulv. Coal*	*Stoker Gases*
Total heat input (millions of Btu)	7.72	8.75	2.82	3.16
Heat distribution (millions of Btu):				
a) For actual calcination	2.78	2.78	1.42	1.42
b) Discharge lime	0.07	0.07	0.07	0.07
c) Lime cooler stack gases	0.11	0.11	0.18	0.18
d) Main stack gases	0.87	1.15	0.28	0.35
e) Steam	2.41	3.16	0.59	0.81
f) Radiation, burning cooling water, etc.	1.48	1.48	0.28	0.33
	7.72	8.75	2.82	3.16
% of heat input:				
a) For calcination	36.0	31.7	50.2	44.8
b) Discharge lime	0.9	0.8	2.5	2.3
c) Lime cooler stack gases	1.5	1.3	6.3	5.6
d) Main stack gases	11.2	13.4	10.2	11.1
e) Steam	31.3	35.9	20.9	25.8
f) Radiation, burner cooling water, etc.	19.1	16.9	9.9	10.4
	100.0	100.0	100.0	100.0

DEVELOPMENT OF THE AVRO ORENDA JET ENGINE

A paper presented before the Semi-Annual Meeting of the American Society of Mechanical Engineers, at Toronto, Canada, June 11-14, 1951.

by

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This paper describes the development history of the AVRO Orenda jet propulsion engine, the first aircraft engine to be put into quantity production in Canada. Its rated thrust is in excess of 6000 lbs., and its fuel consumption is about 1.00 lbs./lb. thrust/hr. both under sea level static conditions. The engine has an axial flow compressor, 6 combustion chambers, single stage turbine and an exhaust assembly. A number of development problems are discussed such as blade vibration, oil consumption and performance improvement. Flight testing and experimental equipment are also covered. The engine has been brought into production in a period of 4½ years.

The beginnings of the Avro Orenda extend much further back in history than the discussions which produced the first design layout. In 1942 reports about the Whittle jet-propulsion engine began to reach Canada. Just prior to that time the Canadian government had seen the country's aircraft industry slowed down awaiting engines from abroad for there was no native aircraft engine industry. The meagre information received seemed to indicate that the new engine was light, of great power, easy to design and simple to manufacture. It appeared to offer the possibility of establishing a Canadian engine industry without the costly delay required to set up an internationally competitive piston engine enterprise.

Late in 1942 the Royal Canadian Air Force investigated the situation and a technical mission was sent to Britain early in 1943 to study the new development. The group recommended that Canada could make an important contribution to the British programme by establishing a cold weather experimental station to test jet engines under temperature conditions which prevail at altitude or even at sea level in the Arctic. The project was assigned to the National Research Council of Canada. ① ② The mission also suggested a gas turbine research establishment with the thought of setting up a development and manufacturing organization at a later date.

The former step was taken in 1944 when the government set up Turbo Research Limited to carry out all Canadian research work on gas turbine engines. The company took over the National Research Council's cold weather testing activities. Plans for a research establishment were started.

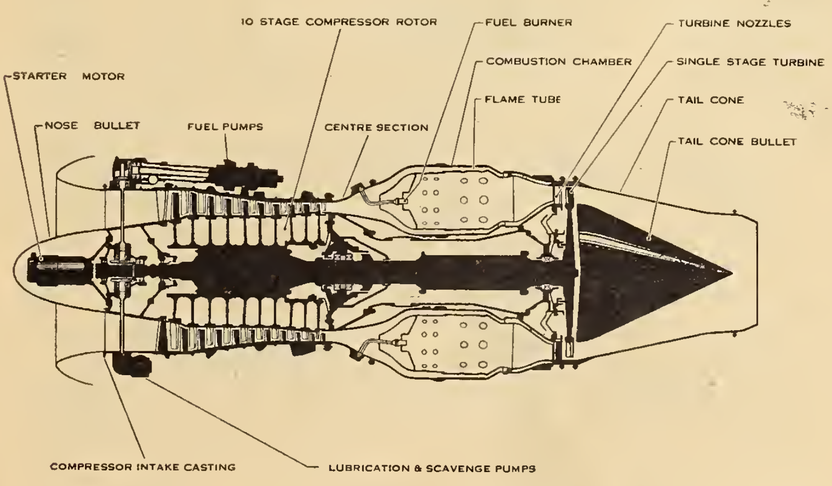

Fig. 1. Diagrammatic section of Orenda engine.

But before they were complete the scope of activity was broadened to include actual engine design. A provisional engine specification was agreed upon and design work started.

In the spring of 1946 the government assigned the task of design, manufacture and development to A. V. Roe Canada Limited, a member of an English group of companies which had produced many famous aircraft and engines. The allied fundamental research work was turned over to the National Research Council to whom the cold test facilities reverted.

At this time a small engine named the "Chinook" was in an advanced state of design. In order to confirm design assumptions, establish manufacturing techniques, get development experience, and educate subcontractors a decision was made to build this engine on a development basis. Much of the test equipment designed by Turbo Research Limited was manufactured in the Avro shops and installed in the experimental laboratories. This work culminated in the first running of the Chinook Engine on March 17th, 1948. In the ensuing twenty months over 1,000 hours were logged on Chinook engines and the thrust was increased from the original design value of 2,600 lb. to a figure well over 3,000 lb.

History

In 1946 the Royal Canadian Air Force requested AVRO to develop an engine for the twin-engined long range fighter being designed by the Aircraft Division of the company. The Specification called for an engine of a thrust equal to that of the largest engines on the drawing boards of British and American companies. With the Chinook a decision was made to name engines after Indian spirits. Following this tradition the new project was christened the "Orenda" — an Iroquois spirit whose presence in an object or person confers power. Design studies were started in September, 1946, and finalized at the end of the year.

Drawings began to appear in the shops in May, 1947 but the drawing issue was not complete until January, 1948. There were two reasons for this seemingly long time required to issue the design. The first was a policy decision to do the detail design extremely carefully in order that a minimum of development difficulties would be built into the prototype. The second was the result of a crisis in 1947 when development work at the English firm commissioned to design the combustion equipment, indicated that a longer combustor would be necessary. This discovery necessitated a complete redesign of the backbone casting, shafting and turbine bearing to accommodate the lengthened combustion chamber.

The first engine was assembled and delivered on February 8th, 1949. Two days later the first attempted start was successful. In the ensuing weeks there were no immediate operating problems, in fact the engine logged its first 100 hours in 8 weeks time and accumulated almost 1,000 hours of running with only minor rebuilds in 8 months. The engine now being produced does not incorporate any basic differences from the original design.

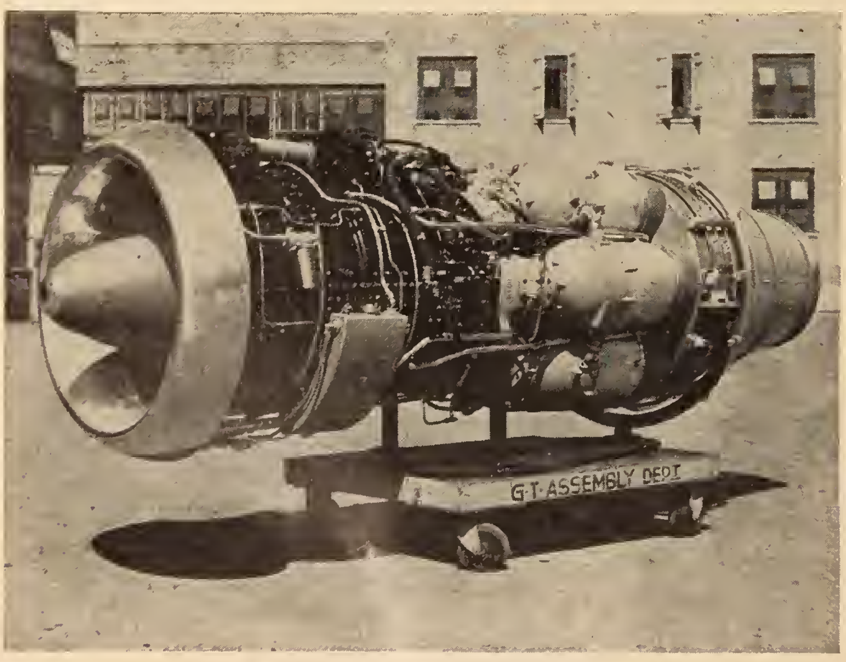

Fig. 2. Exterior view of the Orenda.

Description of Engine

The Orenda is an axial flow jet engine having 10 compressor stages, six combustion chambers, a single stage turbine and an exhaust cone. Under sea-level static conditions the version now in production has a thrust in excess of 6,000 lb., and a specific fuel consumption of about 1.00 lb. per hour per pound of thrust. The dry weight is about 2,500 lb. The nominal diameter is 42 inches and the overall length is very close to 10 ft.

Two mounting arrangements are possible. The first is a four point suspension with two trunnions on the turbine nozzle box and two mounting pads on the centre casting. The second is a three point pick-up having two trunnions on the centre casting, and an adjustable strut on the backbone casting. A diagrammatic section of the engine is shown in Fig. 1 and an exterior view in Fig. 2.

Compressor

The compressor intake is a magnesium alloy casting having an annular air entry around the drive gear box for the engine auxiliaries and the compressor front bearing. The housing is supported by six struts. The electric starting motor is mounted on the housing and is covered by the entry bullet.

The rotor is composed of discs mounted on an internal drum. The first nine stages have aluminum discs while the tenth disc is steel. A stepped sealing ring projects from the rear of the tenth stage disc into a gland. The air which is permitted to leak past this seal is used for cooling the rear face of the turbine disc. The blades are retained in the discs by a form of "fir tree" fixing for the first three stages and dovetails for the remaining ones. The first, second, third, and tenth rotor blades are steel. The rest are an aluminum alloy. Rotor and stator blades are unshrouded. The rotor is supported on a bearing in the intake casting and on the centre bearing in the centre casting.

The compressor stator casings are of magnesium alloy. The stationary blades are mounted by dovetails in rings, retained in place by lips on interstage spacers, bolted to the stator casing. Provision is made for bleeding air at the second, fifth, and eighth stages.

Centre Section and Backbone

The centre section is an aluminum alloy casting containing the diffusing ducts from compressor to combustion chambers. The centre bearing assembly is mounted inside the centre section. The rotor is retained axially and the rotor thrust absorbed at this point. The centre bearing assembly consists of two bearings with accurately ground spacer rings between them, which permit the bearings to share the thrust load. The bearing housing is spherically ground on its outer diameter to allow the bearing to accommodate angular misalignment of the main shaft due to aircraft manoeuvres. The backbone, a light alloy casting, joins the centre section and the turbine nozzle box. The turbine bearing is mounted on an internal flange at the rear of the backbone.

Combustion Chambers

The six combustion chambers are bolted to the centre casting at the front, and are a sliding fit in the nozzle box at the rear. They are arranged around the backbone. Interconnector tubes are provided between chambers to allow crossfiring on light-up. Torch igniters are mounted on two interconnectors for ignition purposes. These consist of a small fuel atomizing nozzle and a spark plug. The combustion chamber consists of a cast aluminum expansion section, and a mild steel outer casing with a high temperature alloy flame tube mounted within. The atomizing burners are mounted on pads on the diffuser ducts and project into the combustion chamber.

Nozzle Box

This assembly consists of a welded structure of steel castings and pressings. The turbine nozzle blades are mounted into it, as well as the transition ducts which lead the products of combustion from each chamber to the nozzle annulus. The shroud ring which surrounds the turbine rotor blades is attached to the nozzle box.

Turbine and Drive Shaft

The turbine consists of an austenitic steel disc with an integral stub shaft. The blades of nickel-chromium alloy are mounted on its periphery by "fir tree" fixings. The turbine bearing is mounted on a sleeve on the stub shaft section. The stub shaft is attached to the main shaft which drives the compressor through a splined coupling near the centre bearing. The front face and rear faces of the turbine disc are cooled by fifth stage air and tenth stage air respectively. The turbine bearing is cooled by second stage air.

Tail Cone

This assembly is fabricated largely from stainless steel sheet. It consists of an outer cone and an inner bullet, supported front and rear by four tubular struts covered by a fairing. Tenth stage air is conducted through the front struts and forward to the front of the bullet. From here it flows outward between the face of the bullet and the turbine disc escaping into the gas stream at the disc periphery. The outer surface of the tail cone is insulated by a fibre glass and foil blanket, protected by aluminum covers.

Fuel System

The fuel system is the means of controlling engine output. The pilot's throttle is connected to an altitude-sensitive scheduling-type flow control unit, which varies the delivery of two engine-driven pumps through a servo-system. This maintains engine speed constant for any throttle setting irrespective of altitude. The pumps have integral overspeed governors. The remaining fuel system components are:

1—Solenoid operated reducing valve to supply fuel to the torch igniters.

1—Flow distributor to meter the flow to the burners.

6—Double orifice burners arranged to allow good atomization over a wide flow range.

1—Dump valve.

A high pressure shut-off cock for the pilot and a low pressure filter are incorporated in the flow control unit.

Lubrication System

The lubricant is supplied by the oil pump to the rotor bearings, gearboxes, front bearing seal and drive shaft flexible coupling through a ring main. Pressure is kept constant in the main by a pressure control valve, which returns excess oil to the reservoir. Separate scavenge pump elements are used to pump lubricant from the following sumps:

1. Rear bearing; 2. Centre bearing; 3. Front oil drains, and 4. Flexible coupling.

These discharge into the oil reservoir, which is a tank of 13 Imperial pints capacity. The lubricant returned from the rear and centre bearings is cooled by a heat exchanger which uses incoming fuel as a coolant. The ring main system operates at 15-18 p.s.i. The engine oil consumption is about 1 pint per hour.

Cooling Air System

Air is bled from the compressor at the second, fifth and tenth stages and used for cooling as follows: *Second Stage Air:* (a) backbone cavity, (b) turbine bearing, (c) nozzle box.

Fifth Stage Air: (a) centre bearing, (b) front face of turbine disc.

Tenth Stage Air—rear face of turbine disc.

Starting

Starting is effected by a 32 volt electric motor housed in the nose bullet. An over-riding clutch disengages the starter motor when the engine reaches self sustaining speed. The rest of the starting system consists of the booster coils for the torch igniter spark plugs and the control circuit for the torch igniter reducing valve. An external sequence control is necessary to ensure that starting current, fuel for the torch igniters, and power for the torch igniter spark plug are provided at the correct times to permit clean starts.

Mechanical Development

The early development running showed that the engine lived up to expectations from the performance standpoint, the predicted thrust being obtained with design speed and jet pipe temperature at an early point. Starting was excellent, and acceleration reasonable. Oil consumption was very high. Tenth stage stator blades showed a regrettable tendency to come off in quantities, and turbine blades developed cracks at the tip near the trailing edge.

Oil consumption continued to give trouble on most succeeding engines, but their performance, in this respect, was erratic. Before this problem could be tackled it was necessary to get a proper adjustment of bearing oil flows cooling air flows and air flow to pressurized glands. When these were corrected to give satisfactory bearing conditions the oil consumption still remained high. Initial attempts to localize the oil loss were misleading but, it was finally traced to the turbine bearing area. The trouble was apparent when it was discovered that a steel sleeve supporting the bearing was not sealing one of the oil drillings in the casting.

Under operating conditions the casting had a greater thermal expansion than anticipated, thus relieving the interference fit and often permitting oil to escape. The end of the oil drilling was plugged and after confirmatory tests it was announced, with some embarrassment, that the oil consumption problem was solved. During the course of development the rest of the oil system behaved very well. There were no aeration difficulties. Little effort was required to get adequate venting arrangements for oil tanks and sumps, although pressurization of the oil tanks produced spectacular results at times before the problem was cured.

The failures of tenth stage stators were initially traced to fatigue cracks from resulting intercrystalline corrosion. Other blades in the engine were also found to be subject to this form of attack. The material used in the later stages of the compressor was changed to a similar material which was more resistant to this kind of corrosion. However, the failures continued to give trouble, appearing now as ordinary fatigue cracks. A study of the resonance conditions of the blade showed that it was being excited by the tenth rotor in the second flexural mode. Strain gauge tests indicated that the blade would be strong enough if made in steel. The change proved to be a satisfactory solution.

The turbine blade cracks originated in the blade tips near the trailing edge. As originally designed the blade had a feather edge, provided to prevent serious damage in case of tip rubs. A survey of the nodal patterns of the vibration modes showed that the second complex mode had an area of high bending stress, extending right to the tip. Cracks started in the thin feather edge and were propagated along the line of high stress. As the behaviour of turbine shroud ring under operating conditions was established it was possible to employ satisfactory tip clearances without the danger of rubs. Since the need for the feather edge had disappeared it was deleted to strengthen the blade tip.

As more running hours were accumulated further difficulties began to crop up. Almost all engines were inclined to heavy rubbing of the tenth stage peripheral seal, with complete loss of its effectiveness. This was thought to happen on running down from high speeds, when the pressure behind the tenth stage disc decreased rapidly but a high pressure could remain momentarily between the ninth and tenth discs, causing the disc to flex and the stepped sealing ring to foul its gland. The interstage cavity was vented through the tenth stage disc which cured the trouble.

Considerable work was involved in the development of the flexible thrust ring of the centre bearing assembly. This feature was incorporated in the design to look after angular misalignment resulting from flight manoeuvres. A similar design had been used on the Chinook engine and proved to be an excellent method of obtaining the required degree of angular flexibility. As originally designed the rings were of soft rubber with slotted steel corner braces. They suffered from extrusion of the rubber around the edges of the corner braces, through the slots in the corner braces and from the unbraced corners.

The resulting collapse of the ring permitted the compressor to move forward and foul the stator assembly. The problem was finally solved by using a composite ring with a hard exterior and soft core which did not alter dimensionally during operation.

The front bearing seal went through several stages of development to produce a satisfactory design. The seal in question is introduced behind the front bearing of the compressor rotor to prevent lubricant from escaping into the cavity immediately in front of the first rotor discs. Several arrangements of spring backed carbon rings and glands were tried and rejected due to heavy seal rubbing. Finally a carbon ring seal supported by a multiplicity of small springs was adopted. The new seal worked well on rig tests but was erratic on the engine. It was thought that the differential thermal expansion of the rotor and stator casing was causing the trouble by permitting the sealing surfaces to move apart. This was checked by introducing wear plugs near the seal which showed that little differential expansion was taking place. It was discovered that the spring rate and travel of seals as supplied was varying from specification When these were brought under closer control the trouble disappeared.

One of the more difficult problems did not become apparent until almost a year of testing had been done and after about 2,000 hours of operation. Then a single seventh stage rotor failed, followed by several more within a short period, some on engines with relatively few hours of running. Failures continued in random fashion thereafter, appearing as fatigue cracks. This trouble will serve to show the many steps necessary to get a satisfactory solution to development difficulties in aircraft engines. They are the result of the high vibratory stresses induced in the blade by the coincidence of one of the natural frequencies of the blade with an exciting force, such as that caused by the passage of the blade through the wakes of the preceding row of blades.

The first step is a precautionary one taken in the design stage. The fundamental flexural and torsional critical frequencies of all blades are calculated. A check is then made to determine that these are not in resonance with known exciting frequencies within the engine operating range. The frequencies of higher modes of vibration which could cause trouble are found experimentally when the first blades are manufactured. From this information an "interference diagram" is plotted for each blade. The frequency of various exciting forces is plotted against engine speed and the criti-

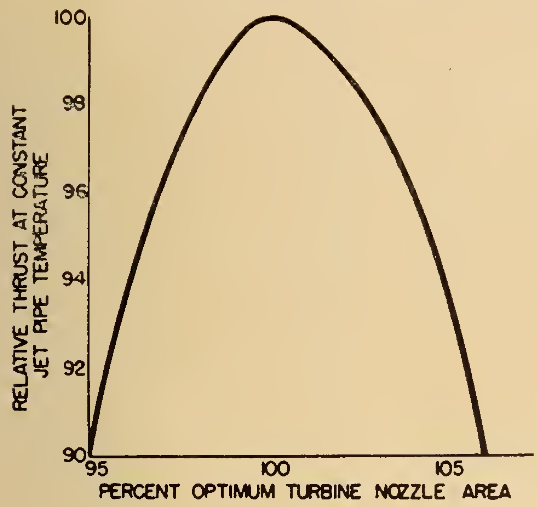

Fig. 3. Variation of thrust with turbine nozzle area, Chinook engine.

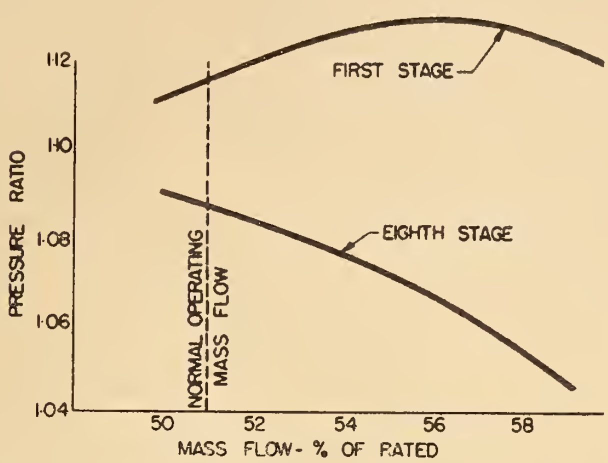

Fig. 4. Typical mass flow—pressure ratio curves.

cal frequencies of the blade are also plotted. At the speed where the lines cross, the blade will be in resonance with the exciting frequency. At this time the vibrational pattern of each mode is studied and recorded to assist in the identification of any failures. It is usual to do about 150 tests of this type for an engine such as the Orenda.

As the failures being considered were somewhat sporadic, occurring after widely varying running periods, it was suspected that the material might be at fault. Consequently, a survey was made of the physical properties of the batches of material from which the failed blades had been made. These were compared with the properties of batches which did not produce failures. This threw little light on the situation.

A detailed analysis of the running history of all engines was then undertaken in an attempt to relate failures to operation in certain speed ranges. This also proved abortive.

As more failures occurred they were tentatively identified from the nodal pattern surveys as being caused by either second torsional mode or the first complex mode, both of which occurred within the running range. But it was still not possible to explain how some engines could run several hundred hours without failure and others would fail in less than one hundred hours. Failed blades were carefully examined for manufacturing flaws and inconsistencies, without result.

As soon as it was apparent that the failures were not isolated ones, a decision was made to study the problem using strain-gauge techniques. Several months of laboratory work and engine testing were required before an adequate slip ring unit, proper instrumentation and reliable wiring methods were established. It was then possible to determine the relative magnitudes of the stresses in the various

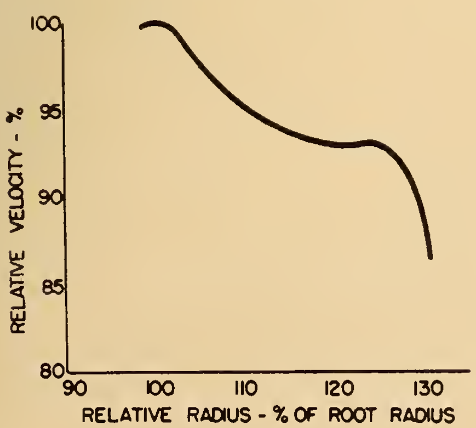

Fig. 5. Velocity traverse behind first rotor blades, Chinook engine.

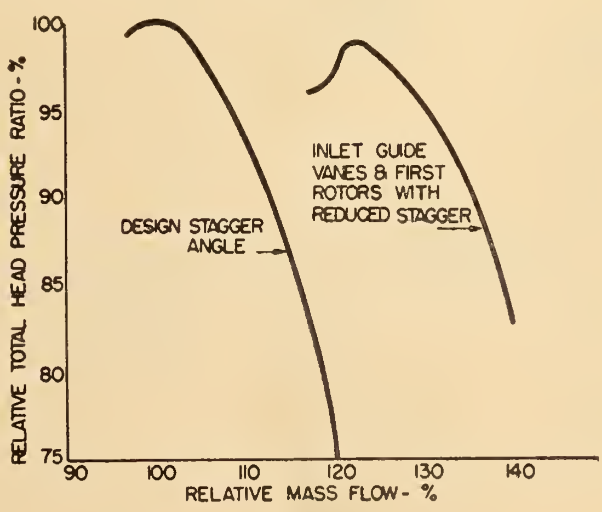

Fig. 6. Mass flow—pressure ratio curves—Chinook two-stage tests.

resonances, and also the width of the resonance bands. At the same time the problem was being attacked using more ad hoc methods by running engines to a test schedule which consisted of equal operating periods at 25 r.p.m. speed increments, with frequent inspection of the blades.

During the special engine tests one engine ran for several hundred hours without failure, while another failed blades consistently with a few hours of running. Both engines were carefully examined for component variations, the only apparent difference being the relative indexing of the rotor blades. When the method of blade indexing was reversed on the two engines their blade breaking abilities did also. This largely explained the wide variations in running time to failure. The favourable indexing was then adopted as standard for all engines. Further studies with controlled indexing variations are now proceeding using strain gauges to get quantitative information to guide future work.

The final solution of blade vibration problems requires that one of the following courses shall be adopted:

(a) the damping action of the blade root shall be increased sufficiently to prevent the blade from being overstressed.

(b) the blade shall be strengthened to be able to withstand the vibratory stresses.

(c) the blade shall be redesigned, or the exciting frequency altered, so that the natural frequency of the blade does not coincide with the troublesome exciting frequency within the engine operating range.

The final method was adopted as the solution for this particular problem.

Performance Development

The Orenda gave little performance trouble as originally designed. The starting characteristics were good. As a hedge against possible difficulties a test stand starting motor was provided which could turn the engine at idling speed. The engine itself was built with blow-off valves to permit the early stages to run unstalled at low speeds. The initial tests showed that an electrical starting motor would accelerate the engine to pull-away speed without trouble, and that the use of blow-off valves was unnecessary. The engine exhibited a distinct change of note at about 60 per cent of full speed, and some instability at 70 per cent of full speed. The first phenomenon was associated with the unstalling of the early compressor stages and the latter was an indication that the engine was operating close to the surge point at this speed.

The first step in performance development was the determination of the correct turbine nozzle guide vane throat area for best performance. The optimum nozzle guide vane area is a function of the slope of the mass-flow versus pressure ratio curve of the compressor. If the rate of change of slope is large, small variations in throat area can have an appreciable affect on engine output. Since it is almost impossible to predict the shape of the curve it is necessary to adjust the nozzle area and the ratio between nozzle area and jet area experimentally, to obtain maximum output within the established limits of combustion temperature and speed. This was done quickly on the Orenda, which proved much less sensitive than the Chinook, where small variations caused considerable change in output, as shown in Fig. 3.

Evidence showed that the Orenda was unstable in a narrow portion of the operating range. Consequently, it was not surprising when the engine showed a tendency to surge during rapid accelerations. It was known this would cause more trouble at altitude so a thorough investigation of the compressor characteristics was carried out. This revealed a mismatching between the earlier

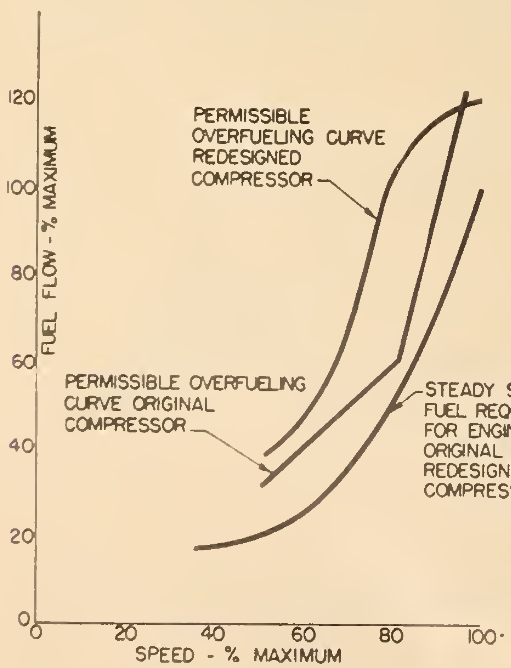

Fig. 7. Overfueling curves.

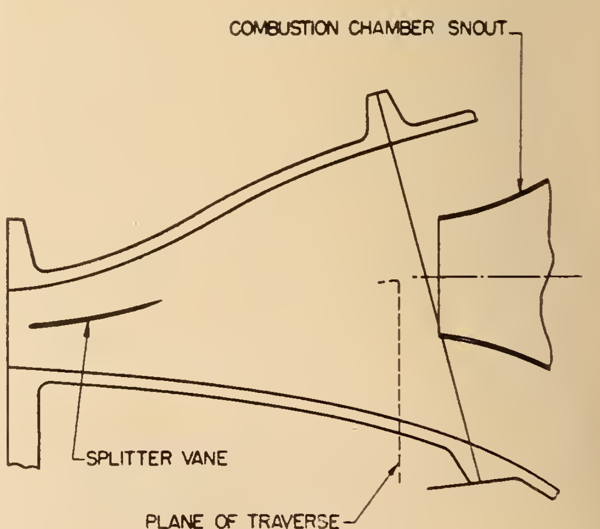

Fig. 8. Diagrammatic section—Orenda diffuser with splitter.

and later stages of the compressor. Typical mass flow-pressure ratio curves of the first stage and a later stage are given in Fig. 4 showing the working point.

The same trouble had shown up on the Chinook, where it was associated with low outlet velocities at the tip of the first stage rotor, as shown in the velocity traverse along the blade, Fig. 5. When temperature and pressure traverses were done on the Orenda it was confirmed that the situation was similar. A satisfactory solution had been worked out for the Chinook on a two-stage compressor test rig. Fig. 6 shows how the pressure ratio of the first stage was increased by restaggering the inlet guide vanes and first rotors. This was tried on the Orenda. It did achieve better matching, but as the relative air velocities were higher on the Orenda, and the restaggering effected an increased angle of incidence on the rotor blades, the overall compressor efficiency was lower, with a consequent serious loss of engine performance.

The first two stages of the engine were then redesigned using radial equilibrium principles to get a better velocity distribution. This improved the matching of the front and back stages of the compressor considerably. In consequence the acceleration was greatly improved. For purposes of assessing the acceleration potential of an engine an overfueling curve is plotted on a speed basis. This shows the ability of the engine to accept fuel over that required for steady state operation at any speed, without surging the compressor or exceeding jet pipe temperature limitations. The extra fuel represents, of course, the energy that is available for acceleration. Typical overfueling curves for engines incorporating the original and revised compressors are shown in Fig. 7.

An interesting feature of the original design was the splitter vane located in the diffuser, Fig. 8. These were incorporated to improve the velocity distribution to the combustion chambers. The improvement in outlet velocity distribution effected by the splitters is shown in Fig. 9. Considerable difficulty was experienced in designing an aerodynamically acceptable splitter, which did not suffer fatigue failures due to buffeting of the air stream, consequently this feature was deleted. Although some combustion chambers have failed due to buckling it has been after long periods of engine running and is not considered a limitation on the engine.

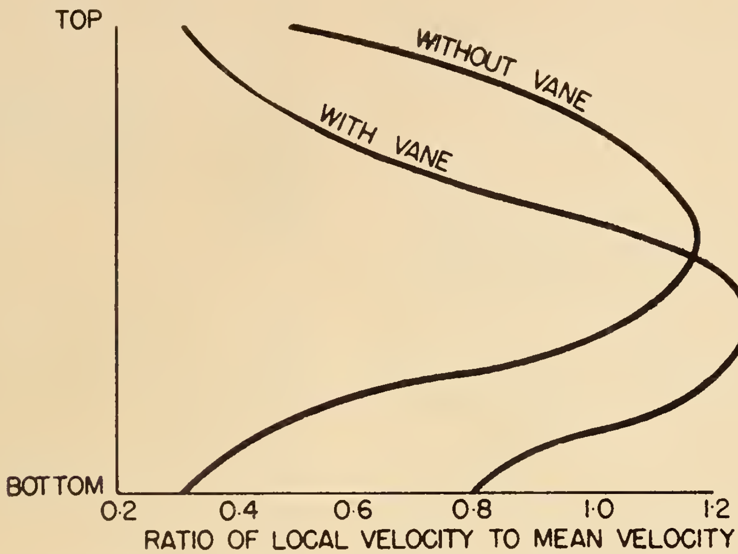

Fig 9. Velocity distribution—diffuser outlet.

Flight Development

The flight testing of the Orenda began in an Avro Lancaster bomber suitably modified for test work. The outboard piston engines were replaced by two Orendas mounted in new nacelles. A completely new fuel system was installed to serve the jet engines. Nose and tail fairings were added to replace the bomb sight position and the tail turret. New fuel tanks were installed in the bomb bays for long test flights. New cockpit instrumentation, controls, and starting systems were provided, and non-essential military equipment deleted. A test observers panel was installed and an elaborate automatic observer was designed and developed to record all important test measurements.

The Lancaster has many advantages as a flying test bed. An aircraft of this type will carry enough fuel for several hours of test flying. It permits great flexibility in the installation of instrumentation due to its size. It is not dependent upon the jet engines except during take-off. However, its ceiling limits flying to about 33,000 ft. which is far short of the required operational altitude for jet engines. However at 33,000 ft. 93 per cent of the temperature variation and 82 per cent of the pressure variation between ground and required maximum operational altitude have taken place. Test conditions are thus not as far from those experienced at higher altitudes as it would appear initially.

Further flight testing has been carried out in a North American F86 Sabre aircraft. This has extended the range of testing to much higher altitudes, and flight speeds than has been possible with the Lancaster. One of the notable features of this work has been the exploration of the stability limits of the combustion chamber, which has shown itself to be extremely good in this regard.

Test Equipment

During the Orenda development considerable effort was expanded on the design and manufacture of test rigs and experimental plant. Most aircraft engine companies have accumulated a great variety of such equipment over a period of years. When a new problem arises it is often possible to construct an urgently required test rig from equipment already on hand. In fact some very valuable experimental work has been done on such "hay-wire" set-ups. In the case of the Orenda this was more difficult as no laboratory facilities existed initially. Their design and construction was proceeding in parallel with the engine work. This necessitated an extreme degree of improvisation at times when trouble arose. A case in point was the over-might construction of a flow checking rig for fuel system distributors which was lashed up from six modified garbage cans, an oil drum, some galvanized iron and a commercial weigh scale when the program was suddenly beset with a rash of temperature distribution difficulties.

Avro were fortunate in the acquisition of a steam generating plant which had a large air compressor installation associated with it. This plant, a part of a wartime explosives factory at Nobel, Ontario, permitted the early erection of compressor and combustion test facilities. It has now been expanded to include two compressor rigs, full pressure, low pressure, and altitude combustion test bays, a cascade wind tunnel, high speed air flow rigs, a turbine test rig, a small combustion chemistry laboratory and an experimental machine shop. Much effort was required to commission these valuable facilities at the time engine manufacture was proceeding.

An important part of the success of the Orenda development programme has been the presence of a strong instrument design and manufacturing group from the very early stages. This has permitted the development of many special measuring techniques and automatic rig controls with associated data plotting gear which have greatly increased the usefulness of some of the test facilities.

Conclusions

It has been stated that there is no device as simple in conception, but as complicated in resolution, as an aircraft gas turbine. The author hopes the reasons for this have been made clear to those who are unfamiliar with the aircraft industry. It is hoped they will have gained from this paper some idea of the scope and magnitude of the work required in developing a successful aero engine. The features which distinguish this branch of engineering from others are:

1. The painstaking and often rigorous design methods employed in the thermodynamic, mechanical, and metallurgical phases of the work. It was originally thought jet engines would require less effort to design than piston engines. This was undoubtedly true in the case of the original engines of the type introduced by the pioneer, Sir Frank Whittle. Since then, however, great demands have been made in the way of increased thrust, less fuel consumption, lower weight and better operational qualities. This has tended to produce larger and more complicated engines requiring more engineering effort.

2. The extent of the work required during the development period. This involves the construction of a number of prototype engines to permit problems to be attacked in parallel, and the provision of a large test plant in order to develop individual components to give the maximum in the way of reliability and performance.

3. The elapsed time from the initiation of a new project to the commencement of the production. This is largely due to the two points mentioned above, combined with the fact that prototype engines are produced with simple tooling by "job shop" methods, and hence take considerable time to construct.

These points are elaborated and indeed the whole field of aircraft engine development covered by Banks in his paper "The Art of the Aircraft Engine" (Ref. 7). This admirable treatise, written with the background of the British aircraft engine industry over the last two decades, provides a convenient yardstick for the assessment of an engine development programme.

Coming back to the Orenda project specifically:

1. An engine of advanced design has been developed.
2. Major test plant and laboratory facilities have been provided.
3. Experimental and production manufacturing organizations have been created.
4. The shop staff has been trained to do work of an accuracy and complication not previously undertaken in Canada.

All of this has taken place within the space of 4½ years, during which time 5,000 hours of bench testing and 150 hours of flying have been accomplished. This is the standard which Banks has set as being the desirable time for an established company to bring an advanced engine design into production. It constitutes a real achievement on the part of Canadian engineers and manufacturing personnel. It has firmly established the Canadian aircraft engine industry in competitive world markets.

Acknowledgements

The author's thanks are due to the management of A. V. Roe Canada Limited, the Department of Defence Production and the Royal Canadian Air Force for permission to present the information contained in this paper. He also wishes to acknowledge the help given by his colleagues in its preparation.

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N.R.C. Postdoctorate Fellowships

National Research Council will award 40 postdoctorate fellowships in 1952. Tax-free grants of about $3.000 will be awarded, with travel grants for winners from abroad.

Twenty fellowships in pure chemistry, and 14 in physics will be tenable at N.R.C. Laboratories at Ottawa; and 5 in microbiology and biochemistry, at the Saskatoon Regional Laboratory of N.R.C.

Applications should be received in Ottawa before February 15, 1952. For particulars apply to the Secretary, Laboratories Awards Committee, National Research Council, Ottawa; or Chief Liaison Officer, National Research Council of Canada, Africa House, Kingsway, London, W.C. 2, England.

FROM MONTH TO MONTH

Notes of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

Money, Money, Money!

Voluntary Contribution - 1952

This is a message from Council. It tells something about Institute income and it explains how you may help. Please read it carefully.

Once again the Institute is going into a new year without making any change in the amount of the annual fees—this in spite of increased costs on every side, and plans to increase and expand service to the members which is necessary due to expanding engineering throughout Canada. It is inevitable that additional revenue must be found some place.

With organizations everywhere asking for larger fees and with the cost of living continuing its meteoric performance, the Institute will be unique if it is able to continue at the old rates. There is no guarantee that it can but one thing is certain —there will be no change as far as the 1952 fee is concerned.

Two factors have made it possible to continue thus far without an increase—a, a substantial increase in membership, and b,—an improvement in revenue from *The Engineering Journal*. For years the *Journal* has been a financial liability—the losses going as high as $9,000.00 one year—but last year it carried itself, and this year it is expected to show a small profit.

Last year Council invited members to make a voluntary contribution to Institute funds. The response was excellent. The sum of $5,100. was realized. This year the appeal is made again. On the account for annual fees which members will receive in January there will be an extra item reading "Voluntary Contribution . . . $. . . . . ."

In the provinces of Nova Scotia, New Brunswick, Manitoba, Saskatchewan and Alberta where there is a co-operative agreement and the account is sent out by the Association, members are asked to add their contribution to the cheque for joint fees and to return it to the Association. In Quebec where the co-operative agreement does not include provision for a joint fee, the contribution should be sent to Headquarters.

If members would look on this proposal as a voluntary increase in fees it should encourage them to contribute. If this method fails to produce adequate results, there will be no alternative but to increase eventually the fees for everyone, with the possible exception of Students.

Going back into the records it is disclosed that in over thirty years the fee for Members has been increased only a net amount of $4.00. In 1946 it was increased $5.00 but in 1941 it had been decreased $1.00. In the same period the admission fee was reduced from $25.00 to $10.00. That is a record equalled by very few organizations—if any! Perhaps it merits recognition in the form of a voluntary contribution at this time. What do you think?

In any event, at the regional meeting of Council held in Sherbrooke on November 9th, Council agreed unanimously to take no action towards increasing fees, but instead to again invite these members who feel they can and would like to, to make their own special contribution in this way.

Look for the item "Voluntary Contribution" on your 1952 account—put in something—even if it is only a dollar!

I. P. MACNAB, M.E.I.C.,
President.

Overseas Engineers for Canada

Report from the General Secretary

It is not a simple thing to tell within the limitations of a report, the story of the recently completed visit to Great Britain and Europe to interview engineers. However, it is necessary that a report be made to Council, as the authorization came from them and it is desirable as well that the membership be informed, so they too will have an understanding of it.

For Purposes of Clarification

It seems that in the minds of some persons there has been a misunderstanding with regard to this project. Some people have suggested that the Institute was going to bring in hundreds—if not thousands — of engineers from overseas. Others believing there is no shortage, have criticized the Government, the Institute and all others concerned for encouraging anyone to migrate here. A factual account of the proceedings should relieve the minds of at least some of these people.

To begin with let it be recorded clearly

a—The Institute had no intention of and did not select, employ, induce, nor arrange employment for even one engineer.

b—Not one cent of Institute money was spent on the project.

c—The entire project was carried out on behalf of and in collaboration with three government departments or agencies.

d—The Institute has no present or future obligations to any engineers who may wish to come to Canada, but will be glad to help in any way that seems appropriate if the need arises.

e—There *is* a shortage of engineers in Canada—and a serious one. There can be no doubt about that. Ample proof is available on all sides.

f—There is nothing new in the government's or industry's proposal to employ foreign born engineers. Canada has many such now and they have made a great contribution to the country's development and expansion. In fact, all Canadians as we think of them, are here because their forefathers migrated here. Surely there is nothing wrong with others following their example.

Here is the story.

The Background

Early in the year an inquiry was made at Headquarters as to the possibility of the Institute assisting the National Employment Service of the Department of Labour in screening engineers in Europe who if found suitable might be brought to Canada under various schemes of various government agencies. This inquiry was reported to Council.

At about the same time it became apparent to Institute officials that the number of engineers being sought through the Institute's employment service was far beyond the supply of available personnel. In the Institute's record there were the names of over eighty prominent employers who were seeking something over two hundred engineers. Many of the companies were engaged on work of considerable importance, and in some instances in defence production of great urgency.

Through the employment bulletin issued monthly, and through the employment pages of *The Engineering Journal,* practically all of these openings had been brought many times to the attention of members over a period of several months. The response was almost nil, so it was apparent there were no unemployed in the membership and few who were dissatisfied with their present employment. The Institute was able to find applicants for very few of the openings, and the list continued to grow at a disturbing rate.

Over the last few years at Institute Headquarters there has been a trickle of applicants from the United Kingdom and a still smaller number from Europe. Those from the United Kingdom found employment almost over night, and the Europeans who could speak English were absorbed also within a reasonable period of time. Thus it became apparent that if Canadian employers really needed more engineers they could find them abroad, and it appeared wise to seek at least some of their needs from such sources.

Further inquiry revealed clearly that the new Canadians were quite satisfactory to their employers, and in turn were happy over their new work. Discussions with several employers indicated that in the absence of Canadian applicants, they would be interested in knowing more about British and European engineers who wished to migrate to Canada.

The Interest Grows

About this same time the federal Department of Citizenship & Immigration, and the International Refugee Organization (I.R.O.) wrote to the Institute to express their interest in the suggestion that the Institute might assist in screening European engineers. Each organization explained that they had the records and applications of many who wished to come here, but that they wanted to know first, whether or not such persons had the proper qualifications to support themselves in engineering or allied fields in Canada. In other words, they wanted to know the qualifications of these people in terms of employment opportunities in Canada.

After interviews with Institute officers, the General Secretary visited Ottawa to discuss the matter in detail with the three interested departments, and about this same time a circular letter was sent to those employers who were seeking engineers through the Institute service, to see if they would consider employing Europeans.

Official Approval

The next step was to present the situation for the second time to Council. After due consideration, Council agreed without a dissenting voice, that the General Secretary would be loaned to the Government for these services, it being stipulated that there would be no expense to the Institute. A month later final details of the project were presented to Council and unanimous approval was given.

Overseas

On June 20th the General Secretary and Colonel Geo. M. Morrison, director of the National Employment Service's E. & P. Division (Executive and Professional) flew to London as a government mission. They visited the United Kingdom, the Netherlands, Germany, Austria, Trieste, Italy, Switzerland, and France, holding interviews in most instances at one centre in each country. Their itineraries were arranged by, and their activities were carried out entirely under direction of the various government agencies.

In Europe about 200 engineers were interviewed. There were many more who desired to come to Canada, but unfortunately the members of the mission could not see them all. Generally speaking interviews were limited to those who could be interviewed in English, and those who had university degrees or diplomas. Just how many will be brought to Canada eventually, depends entirely upon the I.R.O. and the Canadian departments of Labour and Immigration.

Qualification

It was interesting to note the high calibre of the applicants. There were about 16 different nationalities represented but in the great majority of cases regardless of national origin their educational qualifications were excellent. Many had more than one degree and several had their doctor's or master's. Most of them had held posts of real responsibility both in the technical field and in administration. Beyond a doubt they were well qualified engineers and potentially good citizens.

As a matter of fact the 200 men interviewed—in several instances with their wives and children—

might have been 200 Canadian engineers and their families. They were just as well educated, had been just as successful in their profession, just as cultured, and had achieved the same social status as could be the lot of any group of Canadians. The great difference was that the war had been in their countries and not in Canada.

Although the time was too short to go into each individual's personal history, the written record and the occasional "flash back" revealed appalling stories of suffering, privation and frustration, but withal great courage. The useless and stupid cruelty of the Germans, and the later stupidities of the Russian Communists and their satellies were a part of each man's experience. Just how they could find the courage to go on and to struggle for survival, to beg for an opportunity to work at their own profession, is something not easily understood by any observer.

Some slight appreciation of what all these people and millions of others had been through became apparent during a visit to the infamous prison camp at Dachau. This historic spot is preserved and maintained as a monument to the 70 thousand who were tortured and murdered there, and as a reminder to the German people and to others as well, "Lest we forget". It was a grim experience to go through the buildings and crematorium even as a free man. It was an experience one will not forget—nor will he wish to have it again, but it was part of an education that was valuable in appraising people.

Back in United Kingdom

In England and Scotland, advertisements inserted in newspapers and technical publications by the Department of Immigration, revealed that there were many hundreds of engineers who wanted to know more about Canada as a field of opportunity. Here too the qualifications of most persons interviewed were excellent. Only 300 could be interviewed because of time limitations, but every one of them was well educated, either to a university degree or to the Higher National Certificate, and most of them had had very useful experience.

Here again it is impossible to say how many of them will get to Canada. British subjects do not require a visa and therefore they may come freely as they see fit. However it isn't likely there will be any noticeable rush, for all of them are presently employed, and will not leave their employers without a long period of notice. Transportation, too, is very difficult to get, and requires many months of waiting. As far as the Europeans are concerned the processes of immigration, security, health, transportation, etc., are quite involved, and will delay their arrival here for many months.

Impressions

Two things were very striking throughout the whole experience. The first was the ardour—almost a fervour—with which the Canadian representatives in the various offices over there carried out their duties. Men and women alike worked without regard to time or personal interests. The needs of the people they were handling, the need for these people in Canada seemed their only concern. There was a great activity in every office. Corridors were packed with waiting men, women and children, and offices were busy in every corner with patient, helpful, intelligent Canadians trying to do something for those who so badly needed intelligent handling, understanding, advice and direction. It was very gratifying to a visiting Canadian to see the country's representatives doing such an excellent job. It was more than gratifying—it made one proud to be a Canadian.

The other notable feature was the esteem in which Canada is held. Everywhere people spoke well of Canada—told of friends or relatives already there who had written back in glowing terms urging them to follow—asking about employment and how to get there. In the United Kingdom it was the same thing. Apparently Canada is on everyone's lips and minds. It looks at last as though it were Canada's turn.

Personal

As far as the General Secretary is concerned he would like to say that he feels greatly honoured in having been selected by the government to share in this task. He is grateful to Council for making it possible to accept. He is humble in recognition of the seriousness and the responsibility of the work, and of his limitation in accomplishing it. He hopes that Canadian engineers right across Canada will go out of their way to be interested and to be helpful to any of these people with whom they may come in contact. There is room in Canada for more people. It seems to make sense that some of them should be engineers, and that engineers should help engineers. He hopes too that members of the Institute will be pleased and perhaps proud that their organization has had some part in this humanitarian effort which is unique, at least as far as professional societies are concerned.

Cover Picture

The cover picture for December was selected for its seasonal appeal rather than its importance as an engineering achievement. It is the drilling rig at the Stolberg Well, owned jointly by Imperial Oil Ltd. and Shell Oil Ltd. It was abandoned as a dry hole after drilling to a depth of 13,047 feet at a cost of more than $1 million.

Photo courtesy of Imperial Oil Limited.

Sixty-sixth Annual General Meeting

Notice is hereby given, in accordance with the by-laws, that the Annual General Meeting of The Engineering Institute of Canada for 1952 will be convened at Headquarters at eight o'clock p.m. on Thursday, January 31st, 1952, for the transaction of necessary formal business, including the appointment of scrutineers for the officers' ballot. It will then be adjourned to reconvene at the Hotel Vancouver, Vancouver, British Columbia, on Wednesday, May 8th, 1952.

An Historic Occasion

Left, Ira P. Macnab, president E.I.C., right, J. Calvin Brown, president A.S.M.E. In background, portrait of James Watt, the inventor of the steam engine.

Co-operation and the International Council

Herewith is the text of a recently rewritten co-operative agreement with the American Society of Mechanical Engineers. The agreement was signed first in 1943, but after several years of operation and experience it was agreed it should be rewritten to record all the original points and to include all those that have been developed since. It was signed by the president of A.S.M.E., J. Calvin Brown, and the president of the Engineering Institute, Ira P. Macnab in New York on October 26th.

Here is a document which is unique in engineering circles. Its significance goes far beyond the words contained in it. It is an expression of friendship and goodwill between societies of two different countries. It is a declaration of faith in each other, and in the profession. It is a promise of better understanding and co-operation between all engineers. It is a plain statement of determination to work together patiently and intelligently to the end that the profession and the public may be better served.

The officers of the Institute are proud to be associated in this manner with this great American organization of mechanical engineers. It is their hope that the years ahead will see an ever widening circle of co-operative accomplishments through the International Council.

Agreement of Co-operation between The Engineering Institute of Canada and The American Society of Mechanical Engineers

By this agreement, the Councils of The American Society of Mechanical Engineers and of The Engineering Institute of Canada, pledge continuing mutual co-operation, and establish an agency to be known as the ASME-EIC International Council for fostering such co-operation.

This agreement supersedes the previous agreement adopted in 1943, and as amended in 1945 and 1948.

The International Council

Each society shall appoint four representatives, one if possible from the current membership of each governing body, to constitute a continuing ASME-EIC International Council which shall select its chairman and secretary and shall meet at least annually.

Suggested Avenues of Co-operation

The following shall guide but not limit the International Council in its future work:

(1) Meetings

To facilitate the interchange of experience between members of the two societies, the International Council will explore all opportunities for useful joint meetings and further the participation of members of each society in meetings of the other.

(2) Member Organizations

(a) Each society will continue to encourage co-operation through joint meetings and other activities between neighboring ASME Sections and EIC Branches. The International Council will review such activities and make suggestions.

(b) The International Council will review proposals for the establishments of organizations of one society in the field of influence of the other and seek agreement between the two societies as to the solution in the best interest of the professions of the two nations, after consulting the engineers in the locality of the proposed organizations.

(3) Student Organizations

(a) Each society will continue to encourage co-operation, through joint meetings and other activities, between neighbouring ASME Student Branches and EIC Student Sections. The International Council will review such activities and make suggestions.

(b) The International Council will review proposals for the establishment of organizations of one society in the field of influence of the other and seek agreement between the two societies as to the solution in the best interest of the professions of the two nations, after consulting the engineers in the locality of the proposed organization.

(4) Secretary Membership

Each organization shall elect the secretary of the other to membership without dues.

(5) Membership Privileges

The International Council will develop plans for interchange of membership privileges with a combined rate of dues.

(6) Technical and Program-making Activities

The International Council will review annually the plans and programs of the technical and program-making activities of each organization and make recommendation for (a) broadening the activities of one so that they may be of greater value to the members of the other, (b) participation by members of one in those activitities of the other which may be useful to either or both, and (c) joint projects that may be mutual to the engineers of Canada and the United States.

Recorded Agreements

I. Representative of ASME on EIC Council

A By-Law of The Engineering Institute of Canada provides that organizations having a co-operative agreement with the Institute may appoint a representative to the Council of the Institute, such representative must be a member of both organizations.

On January 24, 1947 ASME Council authorized such an appointment.

II. Attendance at Meetings

Members of each organization enjoy the privileges of attendance at meetings of the other on the same basis. (Approved: EIC December 11, 1948—ASME January 27, 1949.)

Student members of each organization enjoy the privilege of attendance at meetings of the other on the same basis as student members of the other. (Approved ASME September 20, 1950—EIC November 18, 1950.)

III. Transfer of Students to Junior

ASME has incorporated the list of Canadian engineering schools as a part of the ASME list of approved schools and graduates of these schools who were Student Members of EIC will be admitted to Junior Membership in ASME under the same procedures that govern the transfer of graduates who were Student Members of ASME.

EIC will admit to Junior Membership graduates who were Student Members of ASME under the same procedures that govern the transfer of graduates who were Student Members of EIC.

IV. Special Student Rates for Society Journals

ASME has authorized a bulk rate of \$3.50 (plus postage) per annum for *Mechanical Engineering* to students in Canadian Engineering Schools where EIC has student members but where ASME does not have Student Branches.

EIC has authorized a rate of \$2.00 per annum for the Engineering Journal to ASME Student Members.

Ira P. Macnab,
President,
The Engineering Institute of Canada.

J. Calvin Brown,
President,
The American Society of Mechanical Engineers.

October 26, 1951.

ECPD Meets in Boston

Guidance and Training Featured in 19th Annual Meeting

The *Journal* is indebted to George A. Stetson, editor of *Mechanical Engineering*, for this report, the original of which has appeared in that publication.—ED

Guidance and Training were featured at the 19th Annual Meeting of the Engineers' Council for Professional Development held at the Hotel Statler, Boston, Mass., Oct. 19 and 21, 1951. A panel of guidance directors from the Boston area constituted the first of a series of similar sessions to be sponsored by the ECPD Guidance Committee in various parts of the United States in connection with its recently formulated program. The Training Committee, which made a well-remembered presentation last year of its report "The First Five Years After Graduation," put on a panel to review the high-light of the six-point program that was outlined in the report. The Education Committee submitted a report on adequacy and standards of engineering education that deserves careful study and comment by educators and practising engineers. Addresses by Harold B. Richmond and James R. Killian, Jr., at the luncheons, and by Eugene W. O'Brien, at the annual dinner, further emphasized the importance of guidance and training.

H. S. Rogers Re-elected Chairman

At the administrative session of the Council, held on Friday morning, Harry S. Rogers, president, Polytechnic Institute of Brooklyn, was re-elected chairman, and Lt.-Col. L. F. Grant, field secretary, The Engineering Institute of Canada, was re-elected vice-chairman. Secretary for the year 1951-1952 will be E. H. Robie, secretary AIME, and the assistant secretary will be C. E. Davies, secretary ASME. The Executive Commitee will be composed of the foregoing officers and V. T. Boughton (ASCE), C. E. Lawall (AIME), G. R. Cowing (ASME), M. D. Hoover (AIEE), W. J. W. Reid (EIC), H. T. Heald (ASEE), C. G. Kirkbride (AIChE), and C. S. Crouse (NCSBEE).

For the luncheon on Saturday, the speaker was James R. Killian Jr., president, Massachusetts Institute of Technology, and L. Austin Wright, general secretary, The Engineering Institute of Canada was chairman. Other head table guests from left to right as shown above were H. P. Hammond, dean of engineering, Pennsylvania State College, member of ECPD Committee on Guidance; William F. Ryan, vice-president, Stone and Webster Engineering Corporation, Boston, ASME councillor on ECPD; Dr. Harry S. Rogers, president, Polytechnic Institute of Brooklyn, chairman ECPD.

Head table for the annual ECPD dinner. Left to right, J. P. H. Perry, past-chairman of ECPD; Philip N. Rugg, president, New England Engineering Society; T. H. Chilton, president of American Institute of Chemical Engineers; R. J. S. Piggott, president of American Society of Mechanical Engineers; Eugene O'Brien, guest speaker; and L. F. Grant, vice-chairman, ECPD.

Chairmen of ECPD Standing and Special Committee elected at the Boston meeting are: Guidance, B. G. A. Skrotski; Education, Thorndike Saville; Training, A. C. Monteith; Recognition, R. H. Barclay; Information, John Beall; Ethics, William F. Ryan; and Student Development, Walter J. Seeley.

ECPD Financial Statement

At the administrative session of the Council on Friday morning the financial statement for 1950-1951 and the report of the auditors were accepted. The financial statement showed a balance as of a year ago of $21,958.07 receipts during the year of $41,233.80, expenditures of $28,930.11, and a balance as of Sept. 30, 1951, of $34,261.76. The balance sheet showed reserves of $47,859.76 which includes the publications surplus (cash plus inventory) of $15,005.00, and monies received and earmarked for the Special Training Program of $8,901.00. A budget for 1951-1952 was adopted.

1952 Meeting to be Held in Chicago

It was voted to hold the 20th Annual Meeting at the Hotel Sherman, Chicago, Ill., Sept. 11-12, 1952, in conjunction with the Centennial of the American Society of Civil Engineers.

Accreditation Activities

At a closed session of the Council the Education Committee rendered its report on accreditation of undergraduate engineering curricula and programs of technical institute type in the United States. With the publication of the complete ECPD report for 1950-1951 the newly accredited curricula and programs will be made public.

Harold B. Richmond Addresses Luncheon

Dr. Rogers presided at the luncheon on Friday and introduced the speaker, Harold B. Richmond, chairman of the board, General Radio Company, Cambridge, Mass., whose topic was "Observations on Co-operative Course Training as Viewed by a Manufacturer." Graduates of co-operative courses are a full year ahead in industrial know-how over engineering graduates from conventional engineering courses, Mr. Richmond asserted. The reason for this advantage, he claimed, lies in the fact that such graduates are "house-broken," in so far as industry is concerned, by their part-time experience as employees during their college years.

For successful operation of such type of engineering education, both the college and the employer must exercise intelligent supervision. He had found that undergraduate co-operative students were likely to prefer a piece-rate job during their training period because of the higher income they could derive from it. Candidates for master's degrees, however, were more interested in the experience their co-operative courses afforded them.

In summarizing his general conclusions, Mr. Richmond stated that graduate course co-operative programs are better than undergraduate ones because of better planning. Employers should have well-organized programs for all co-operative students. Better co-ordination should exist between the employer and the college authorities. It might be necessary to establish some scholarship qualifications as requirements for undergraduates undertaking co-operative courses. The college should put its best man in charge of its co-operative program, one able to convince the manufacturer that the opportunity to participate in the program is beneficial to him. Constant communication between the college and the employer is essential to the success of a program. In his opinion the best job of student training is being done by the large companies. Although a manufacturer may not be able to get the man he needs today, he concluded, the present is a good time to plan for the future when he will be able to get them.

E. W. O'Brien Addresses Annual Dinner

The annual dinner of the Council and its guests was held on Friday evening, and was preceded by a reception. Lt. Col. L. F. Grant, vice-chairman ECPD and field secretary E.I.C., presided. He introduced past-chairmen of the Council, the presidents of participating societies present, and representatives of local engineering societies. Dr. Rogers presented his 1951 report as chairman of the Council, "Service, Motivation, and Support."

Eugene W. O'Brien, vice-president W. R. C. Smith Publishing Company, Atlanta, Ga., and past-president, ASME, spoke on the topic, "What Junior Engineers Find Important." Mr. O'Brien said that he had been carrying on a personal survey among young engineers as he met them in his travels in an effort to find out what factors in their success and progress appealed to them as being most important. In analyzing the 428 replies he had received in the course of his inquiries, he found that he could group them into nine classifications. The most frequently mentioned factor Mr. O'Brien captioned as "people". Next came the influences of "friendships and wives." What was termed "personality" fell into third place, and "articulateness," "practical experience," "basic engineering fundamentals," "loyalty to the job or company," "planned objectives," and "self-analysis" followed in the order named. Mr. O'Brien added that he had been impressed with the fact that "a fair number (of the men interviewed) mentioned that they were engaged in some sort of civic or public activity."

J. R. Killian, Jr., Speaks at Luncheon

L. Austin Wright, general secretary, The Engineering Institute of Canada, presided at the luncheon on Saturday at which James Rhyne Killian, Jr., president, Massachusetts Institute of Technology, spoke on Student Counseling in an Engineering School. President Killian outlined some novel and interesting work being carried on in this field by his institution and among M.I.T. alumni.

Panel on Training

At the 1950 ECPD Annual Meeting held at Cleveland, a high point of interest and enthusiasm was the presentation of a six-point programme of training to bridge the gap between college and industry by developing programmes for the first five years after graduation. A voluminous report, prepared by the ECPD Training Committee, of which A. C. Monteith is chairman, was dramatically presented by the chairmen of sub-committees who had directed the six principal phases of the proposed plan. To implement the plan the Committee recommended the employment of a field secretary or co-ordinator who would assist and advise communities in which the plan might be tried. It was estimated that the expense of this implementation would amount to $20,000 a year for a period of five years, in which time, it was felt, the value and practicability of the plan could be demonstrated.

Following the 1950 meeting, efforts to raise the needed funds, while partially effective, gave rise to a number of questions, as a result of which the Training Committee decided to make a further presentation at Boston. With H. N. Muller, Jr., secretary of the Training Committee presiding, a panel of six speakers discussed various phases of the plan after Dr. Rogers sketched the history and present status of the committee's work. Mr. Muller spoke briefly on implementation of the six-point programme, and introduced each member of the panel in turn. H. P. Hammond, dean emeritus, Pennsylvania State College, spoke convincingly of the great need for the proposed plan. J. K. Walter, training supervisor, West Penn Power Company, covered the orientation and training phase; J. C. McKeon, manager, university relations, Westinghouse Electric Corporation, showed how the plan afforded opportunities for continued education, K. B. McEachron, Jr., manager, Technical Education Division, General Electric Company, stressed the need for integrating the young graduate and his family into the life of the community in which his job was located. C. S. Crouse, head, department of mining and metallurgical engineering, University of Kentucky, spoke on professional registration, and F. N. Entwisle, Testing and Guidance division, Newark College of Engineering, on the importance to young men of self-appraisal.

A general discussion followed the formal presentations by members of the panel. Col. L. F. Grant reported successful initiation of the plan on a modest scale in Canada. Dr. Rogers reverted to the need to implement the programme and made it very clear that the problem of implementation is a problem of money. He urged engineers present to locate in their communities companies who would be willing to provide at least $1,000 each per year for a period of five years so that a demonstration of the practicability and value of the plan could be made.

Dr. Rogers then introduced S. C. Hollister, dean, college of engineering, Cornell University, who presented the report of a special committee on Adequacy and Standards of Engineering Curricula. This report will be published in the Engineering Journal at a later date.

Panel on Guidance

The session on Saturday morning was devoted to the work of the Guidance Committee. Dr. Rogers presented a brief resume of ECPD's interest in guidance, recalling the work carried on in a field of the pre-engineering inventory and aptitude testing. He then turned the session over to Willis F. Thompson, chairman of the Guidance Committee, vice-president, Westcott and Mapes, Inc., New Haven, Conn., vice-president-elect ASME, who outlined the Committee's current program in a paper entitled, "Wanted—Engineers." This paper will appear in a later issue of the Journal.

Ernest Hartford, executive assistant secretary ASME and secretary of the Guidance Committee, outlined what the Guidance Committee hoped to accomplish by the program which was to follow his talk, a panel discussion of the high school's point of view on guidance. Members of the panel were: Frederick A. Small, principal, School Department, Norwell, Mass.; Thomas D. Ginn, director of vocational guidance, Boston School Committee; and Aaron Fink, guidance director, School Department, Stoughton, Mass. All these speakers gave objective and stimulating accounts of the work carried on by them, with comments on the Guidance Committee's program and organization and practical suggestions from the viewpoint of the high school. A lively discussion had to be cut off because of lack of time.

Committee Reports

The afternoon session was devoted to presentation of reports of the Education, Recognition, Information, Ethics, and Unity Committees and to the reports of the constituent organizations. Resolutions of thanks were presented and adopted.

The Institute was represented by L. F. Grant, who was re-elected vice-chairman, E. V. Buchanan, a member of Council and representative of the Institute on the Committee on Professional Recognition; Geo. W. Moxon, on the Committee on Student Selection and Guidance; W. B. Wilson, Committee on Engineering Schools; R.

C. Flitton, Committee on Professional Training; J. F. Harris, Student Development Committee; and L. Austin Wright, Committee on Information.

News of Other Societies

The tenth annual conference of the **Society of the Plastics Industry (Canada) Ltd.,** will take place at the Royal York Hotel, Toronto, Ont., February 21 and 22, 1952.

The **Canadian Good Roads Association** recently announced the election of the Hon. M. D. Rawding, Minister of Highways and Public Works of Nova Scotia, as president of the Association taking office at the 32nd annual convention at Toronto November 1-3, 1951.

The **American Institute of Electrical Engineers** (33 West 39th St., New York) will hold the winter general meeting at the Hotel Statler, New York, January 21-25, 1952.

The 20th annual meeting of the **Institute of the Aeronautical Sciences** (2 East 64th St., New York 21) is scheduled for January 28 to February 1, 1952, at the Astor Hotel, New York City.

The Plant Maintenance Conference, and Plant Maintenance Show, at Convention Hall, Philadelphia, Pa., Jan. 14-17, 1952 is sponsored by the **American Society of Mechanical Engineers,** and the **Society for the Advancement of Management.**

The University of Toronto has announced that the Fifth Wallberg Lecture, Tuesday, January 22, (Convention Hall, 8.30 p.m.) will be delivered by the Hon. C. D. Howe, HON. M.E.I.C. The subject of his address will be "The Engineer and Government".

Elections and Transfers

At the meeting of Council held at the New Sherbrooke Hotel, Sherbrooke, P.Q., on Saturday, November 10th, 1951, a number of applications were presented for consideration and on the recommendation of the Admissions Committee the following elections and transfers were effected:

Members:

E. Bodmer, *Montreal.*
H. W. Boles, *Hamilton.*
C. D. Borror, *Asbestos.*
J. R. Currie, *Hamilton.*
W. G. Ferrier, *Hamilton.*
J. E. Flynn, *Vancouver.*
J. N. Franklin, *Corner Brook.*
E. Halischuk, *Asbestos.*
G. H. Heyn, *Toronto.*
F. J. B. Humphrys, *Danville, Que.*
W. J. Johnson, *Vancouver.*
J. J. Laffin, *New Waterford.*
E. J. S. Lang, *Quebec.*
H. I. MacPherson, *Welland.*
H. A. Messervy, *Charlottetown.*
S. Mitescu, *Arvida.*
G. Penney, *Corner Brook.*
G. A. Piche, *Asbestos.*
M. N. Tallman, *Hamilton.*
H. Wittnich, *Montreal.*
J. A. Zalite, *Montreal.*

Juniors:

L. D. Almack, *Toronto.*
W. J. Brooy, *Montreal.*
H. H. Dofka, *Edmonton.*
D. Smith, *Hamilton.*
G. C. Warren, *Niagara Falls.*

Transferred from the class of Junior to that of Member:

J. Adams, *Saskatoon.*
F. A. Bell, *Toronto.*
W. T. Bothwell, *Toronto.*
F. H. Brennian, *Montreal.*
D. R. Brown, *Montreal.*
B. W. Burgess, *Montreal.*
C. H. R. Campling, *Kingston.*
C. H. Clay, *South Burnaby.*
R. C. Cline, *Windsor.*
P. V. Covo, *Montreal.*
R. A. Davidson, *St. Catharines.*
T. G. Edgeworth, *Shawinigan Falls.*
M. Filion, *London, Eng.*
G. Gareau, *Chicoutimi.*
J. G. German, *Montreal.*
H. Hole, *Edmonton.*
R. W. Hole, *Vancouver.*
W. H. Kasperski, *Flin-Flon.*
F. Lareau, *Montreal.*
P. E. Lefebvre, *Montreal.*
C. A. Loden, *Regina.*
D. A. MacLean, *Victoria.*
J. M. McBride, *Edmonton.*
J. F. McKay, *Sarnia, Ont.*
A. H. Mendel, *Montreal.*
T. A. Miller, *Norwood, Man.*
W. A. Runge, *Kitchener.*
C. K. Rush, *Ottawa.*
J. E. B. Sawyer, *La Tuque.*
D. V. Schmidt, *Hornepayne, Ont.*
J. S. Slater, *Vancouver.*
W. H. Sweet, *Belleville.*
S. H. Ujjainwalla, *Isle Maligne.*
J. M. Wallace, *Vancouver.*
G. Wesa, *Toronto.*
J. A. Webb, *Calgary.*
D. A. Welsh, *Prince George.*
C. H. Worembrand, *Montreal.*

Transferred from the class of Student to that of Junior:

F. S. Gue, *Hamilton.*
P. D. Spector, *Hartford, Conn.*
R. H. Tooley, *Niagara Falls.*
W. M. Walker, *Winnipeg.*

The following Students were admitted:

W. P. Antoniw
J. G. Aldrich
D. W. Almon
J. R. Anderson
W. K. Armour
A. C. E. Baker
Z. Bakun
C. Banka
R. W. Bartholomew
G. P. Berthin
M. E. E. Bedford
R. C. Blackman
J. W. Blakeman
G. Boivin
H. G. Bowes
M. Bozozuk
C. O. Brawner
E. Bridges
D. A. Brooks
W. A. Brown
G. Brunet
C. Burgoyne
R. S. Butcher
W. Byskal
E. P. Carther
J. M. Caron
R. D. Carpenter
R. J. Chapman
A. Charenko
O. Chaykowsky
C. G. Chenier
R. H. Choate
R. Christofides
T. F. Clahane
L. F. Collier
J. L. Cormier
G. Y. Coulombe
H. G. Cox
W. B. Currie
W. E. Currie
S. Cymbaluk
P. C. Dahan
R. N. Dalby
M. I. Danielson
H. K. Davis
W. R. Dawson
R. Demers
J. H. Dick
D. M. Dingwall
J. W. Dlugos
G. R. Drummond
W. Dudnewich
J. Dumanchuk
L. R. Dunn
D. E. Eby
D. D. Elliott
P. T. Estlick
B. Ethier
M. J. Ferguson
T. Ferley
M. B. Ferman
D. J. Ferries
R. J. Flinn
G. Forsberg
R. C. Galbraith
D. A. Geldart
G. L. Genest
A. L. Gilbert
T. R. Giovannetti
A. J. Gould
F. A. Grant
M. D. Grand Maitre
K. H. Hawkins
R. W. Heine
T. Henriksen
D. Hendrick
R. E. Hennigar
H. Henshall
J. R. Hicks
H. S. Hoe
C. M. Horne
J. W. Hryciow
R. B. Jackson
J. Jacobs
R. J. Karras
D. B. Kennedy
N. G. Kennedy
R. A. King
D. Kremmidis
C. H. Lien
N. A. Longson
W. Lunick
J. M. MacAulay
J. D. M. MacDonald
M. A. Machacek
J. B. McColm
J. H. McGuirk
C. R. McIntyre
O. R. McManus
N. F. McLean
C. J. Main
P. J. Maingot
W. V. Mason
J. E. Miller
L. H. Mensforth
J. Murphy
G. C. Nelson
W. R. Newton
H. L. Nicoll
A. Norris
R. E. Nugent
L. H. Olsen
G. J. Palmer
H. E. Palmer
C. Page
J. P. Pagnutti
G. Perreault
P. O. Petursson
R. Y. Pogontcheff
E. Polnicky
J. K. Pulfer
D. H. Pyne
K. F. Randall
J. J. Ring
R. A. Robertson
J. R. Roach
D. L. Sarantos
J. A. Smeltzer
R. L. Somerville
J. E. Spring
J. H. Stuart
D. G. Stoneman
A. Sus
G. A. S. Sweeney
J. H. Thomson
A. Tober
S. A. Vaudry
J. W. Ward
R. E. Walker
R. A. Welin
B. R. Wile
F. E. Wood
F. D. Young
J. P. Zanyk

Applications Through Associations

By virtue of the co-operative agreements between the Institute and the Associations of Professional Engineers, the following elections and transfers have become effective:

SASKATCHEWAN

Member:

G. W. Lee.

Students:

A. P. Foster.
R. E. Pelkey.
J. D. Tudor.

Junior to Member:

R. H. Cook.

Student to Member:

J. D. Reid.

REGISTRATION IN ENGINEERING AT CANADIAN UNIVERSITIES

University	Year	General Course	Aeronautical Engineering	Agricultural Engineering	Ceramic and Non-metallic Minerals	Chemical Engineering†	Civil Engineering	Electrical Engineering	Engineering and Business Administration	Electro-Mechanics	Forest Engineering	Geology and Mineralogy Engineering	Mechanical Engineering	Metallurgical Engineering	Mining Engineering	Engineering Physics	Total
Dalhousie University	1st	45															45
	2nd	29															29
	3rd	13															13
Total		87															87
Saint Mary's College	1st	28															28
	2nd	17															17
	3rd	13															13
Total		58															58
St. Francis Xavier	1st	39															39
	2nd	43 (1)															43 (1)
	3rd	48 (2)															48 (2)
Total		130 (3)															130 (3)
N.S. Tech. College	4th					9	47 (7)	19 (4)					39 (5)		3		117 (16)
	5th					10 (3)	58 (23)	31 (11)					27 (15)	3 (1)	4 (3)		133 (56)
Total						19 (3)	105 (30)	50 (15)					66 (20)	3 (1)	7 (3)		250 (72)
Acadia University	1st	26															26
	2nd	19															19
	3rd	15 (1)															15 (1)
Total		60 (1)															60 (1)
Mount Allison University	1st	35															35
	2nd	36 (1)															36 (1)
	3rd	23 (4)															23 (4)
Total		94 (5)															94 (5)
University of New Brunswick	1st					3	19	12					14		3		51
	2nd					2	26 (1)	20					14		1		63 (1)
	3rd					2	23 (4)	13 (1)					8 (1)				46 (6)
	4th						19 (2)	13 (2)					4 (2)				36 (6)
	5th						35 (11)	23 (11)									58 (22)
Total						7	122 (18)	81 (14)					40 (3)		4		254 (35)
Laval University	1st	87															87
	2nd	97															97
	3rd					4	28	12				3	4	3	3		57
	4th					10	20	12				2		3	2		49
	5th					9	22 (1)	11				4 (2)		2	5		53 (3)
Total		184				23	70 (1)	35				9 (2)	4	8	10		343 (3)
Ecole Polytechnique	1st	136															136
	2nd	130 (1)															130 (1)
	3rd	77															77
	4th						37			36 (5)		7		3			83 (5)
	5th						49 (3)			25 (3)		2		2			78 (6)
Total		343 (1)					86 (3)			61 (8)		9		5			504 (12)
McGill	1st	240 (1)															240 (1)
	2nd	245 (1)															245 (1)
	3rd					17	31	39					49	5	8	11	160
	4th					27 (1)	69 (2)	42 (7)					56 (2)	4	7 (1)	10 (1)	215 (14)
	5th					28 (7)	65 (15)	46 (16)					64 (17)	11 (4)	7 (5)	3 (1)	224 (65)
Total		485 (2)				72 (8)	165 (17)	127 (23)					169 (19)	20 (4)	22 (6)	24 (2)	1084 (81)
Ottawa University	1st	3				2	3	3				1	3		3		18
	2nd					2	10	3					6		1		22
Total		3				4	13	6				1	9		4		40
Carleton College	1st	21															21
	2nd	22															22
Total		43															43
Queen's University	1st	199 (2)															199 (2)
	2nd	165 (6)															165 (6)
	3rd					23	39 (7)	26 (2)				5 (1)	28 (4)	7	8 (2)	7	143 (16)
	4th					26 (5)	28 (6)	23 (4)				9 (3)	34 (10)	8 (3)	8	15 (1)	151 (32)
Total		364 (8)				49 (5)	67 (13)	49 (6)				14 (4)	62 (14)	15 (3)	16 (2)	22 (1)	658 (56)
Toronto	1st		27			84	94	62	59			24	73	14	10	38	485 (3)
	2nd		3		1	52	53	47	51			8	67	4	3	18	307 (12)
	3rd		5			69	64	65	31			5	66	3	9	18	335 (41)
	4th		8		6	71	96	80	48			10	100	17	14	28	478 (148)
Total			43		7	276	307	254	189			47	306	38	36	102	1605 (204)
Manitoba	1st	111 (4)															111 (4)
	2nd	84 (6)										3				3	90 (6)
	3rd						43 (5)	19 (6)				6	31 (6)				99 (17)
	4th						47 (16)	20 (5)					37 (9)				104 (30)
Total		195 (10)					90 (21)	39 (11)				9	68 (15)			3	404 (57)

NOTE.—The figures shown in brackets indicate, in each case, the number of veterans included in the figure immediately preceding.

University	Year	General Course	Aeronautical Engineering	Agricultural Engineering	Ceramic and Non-metallic Minerals	Chemical Engineering†	Civil Engineering	Electrical Engineering	Engineering and Business Administration	Electro-Mechanics	Forest Engineering	Geology and Mineralogy Engineering	Mechanical Engineering	Metallurgical Engineering	Mining Engineering	Engineering Physics	Total
Saskatchewan	1st	132 (2)															132 (2)
	2nd	69 (1)				10										2	81 (1)
	3rd			1		7	40 (1)	9				2	25 (3)			8	92 (4)
	4th			4(1)	4(1)	5	31 (5)	13 (2)				8	25 (7)			9 (1)	99 (17)
Total		201 (3)		5(1)	4(1)	22	71 (6)	22 (2)				10	50 (10)			19 (1)	404 (24)
Alberta	1st	150 (4)															150 (4)
	2nd					38 (1)	48 (2)	13 (1)					1		8		108 (4)
	3rd					30 (3)	33 (1)	11 (3)				1			9	3	87 (7)
	4th					44 (9)	41 (10)	19 (2)							9 (4)	2 (1)	115 (26)
Total		150 (4)				112 (13)	122 (13)	43 (6)				1	1		26 (4)	5 (1)	460 (41)
British Columbia	1st	183									9						192 (3)
	2nd	143									6						149 (4)
	3rd			2		19	32	25			7	8	53	6	6	6	164 (8)
	4th			3		19	57	48			12	14	49	7	10	5	224 (67)
Total		326		5		38	89	73			34	22	102	13	16	11	729 (82)
Canadian Services Colleges																	
Royal Roads	1st	50															50
	2nd	40															40
Total		90															90
Royal Military College.	1st	60															60
	2nd	40															40
	3rd	59				9											68
	4th					7	12	8					17				44
Total		159				16	12	8					17				212
Grand Total		2972	43	10	11	638	1319	787	189	61	34	122	894	102	141	186	7509(676)
Prospective 1952 Graduates			8	7	10	212	529	314	48	25	12	47	336	50	57	62	1717(472)

†Alberta includes Petroleum Engineering, 2nd Year 18(1), 3rd Year 18(3), 4th Year 23(7).
NOTE—The figures shown in brackets indicate, in each case, the number of veterans included in the figure immediately preceding.

It should be noted that the registration list of engineering students this year includes, for the first time, those in attendance at the Canadian Services Colleges, Royal Roads and The Royal Military College. Courses in Civil, Chemical, Electrical and Mechanical Engineering are now being given and on completion of the fourth year at The Royal Military College, students may take their final year for an engineering degree at one of the universities.

While the total enrolment of engineering students is down again this year from 8,329 last year to 7,509, the trend has been reversed and the number of first year registrations is 2,105 as compared to 1,874 in 1950. On the basis of non-veteran enrolment in first year the figures are 2,086 for 1951 and 1,831 for 1950, giving a net increase this year of 255 or 14 per cent over the 1950 figure.

As was to be expected, the number of prospective 1952 graduates is down considerably from 1951. The prospects for employment of young graduate engineers next spring should be excellent. The shortage is not likely to be eliminated for quite a number of years unless the present level of engineering employment drops very appreciably in the meantime. It is interesting to note that the number of prospective graduates for 1951 was 2,450, 1952 is 1,717, and 1953 will be approximately 1,450.

When it is considered that Canada has been absorbing engineering graduates at a rate of more than 3,000 per annum for the past four years, the fact that fewer than 1,500 per year are likely to be available during the next four years is bound to have an appreciable effect on the economic use of engineers by industry. That there will be a continuing shortage of engineers to meet the demand in the next few years seems practically certain.

The relative proportion of total registration in different courses shows very little change from that of the previous two years.

An Amendment to the By-laws Proposed by Council

In accordance with Sections 19 and 80 of the by-laws, the Council presents for the consideration of corporate members the following proposal for the amendment of Section 55 of the by-laws.

This proposal will in due course be submitted for discussion at the annual general meeting on May 7th, 1952, in Vancouver, and will subsequently go out to ballot of the corporate membership. The proposal now submitted was approved by Council on November 10th, 1951.

Section 55 — The first sentence

now reads: "The council shall meet at least once each month, from the beginning of October to the end of April, and at such other times as may be deemed necessary."

The proposed new wording is—

"Council shall meet at least once every two months from October to May. Additional meetings that may be necessary to conduct properly the business of the Institute shall be held at the call of the president."

Personals

News of the Personal Activities of Members of the Institute

Dr. R. C. Wallace, HON. M.E.I.C., who retired earlier this year from the position of principal and vice-chancellor of Queen's University, has been named executive director of the Arctic Institute of North America.

The Arctic Institute announced recently that his work will be on a part-time basis, since he has accepted other responsibilities from the Ontario Government.

Dr. Wallace was principal of Queen's

R. C. Wallace, Hon.M.E.I.C.

University from 1936. He had previously been the president of the University of Alberta, 1928 to 1936. He was professor of geology and mineralogy at University of Manitoba from 1912 to 1928.

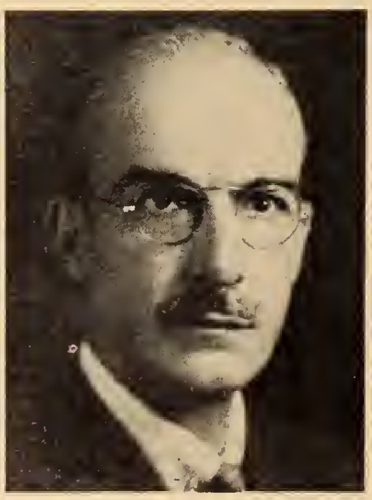
Dr. Wallace was commissioner for Northern Manitoba from 1918 to 1921. He was commissioner of Mines and Natural Resources for Manitoba from 1926 to 1928. His contributions to professional societies have included service as president of the Canadian Institute of Mining and Metallurgy (1924-1925); president of the Manitoba Educational Association (1925-1926); president of the Association of Canadian Clubs (1930-1932); president of The Royal Society of Canada (1940).

He has been the author of various papers on economic geology, natural resources, and educational subjects.

J. H. Parkin, M.E.I.C., director of the National Aeronautical Establishment at Ottawa has been granted an award in recognition of his contribution to the advancement of Canadian Industry and Science. The Engineering Alumni Medal was bestowed upon Mr. Parkin at the 14th Triennial Reunion of the University of Toronto Engineering Alumni Association in October.

Mr. Parkin's award was for his part in the advancement of Canadian aeronautics A graduate of the University of Toronto, and a professor there when he constructed Canada's first experimental wind tunnel in 1917, he spent 12 years, 1917-1929, developing the University of Toronto course in aerodynamics before being appointed to the National Research Council, Ottawa. He became director of the Division of Mechanical Engineering, National Research Laboratories, in 1937. The citation accompanying the medal states that Mr. Parkin pioneered Canada's basic aerodynamic research.

This is not the first of such honours for Mr. Parkin; he holds the Gzowski Medal



J. H. Parkin, M.E.I.C.

of the Engineering Institute for the year 1937 and was awarded the C.B.E. in 1945.

W. Taylor-Bailey, M.E.I.C., has been appointed president and managing director of the Dominion Bridge Company Limited. and vice-president of Dominion Engineering Company Limited. He has been a director of Dominion Engineering Company since 1940.

Mr. Taylor-Bailey joined the Dominion Bridge Company in 1908 and has been closely associated with the organization since then, being successively draughtsman, designer, vice-president in charge of sales, vice-president and general manager. His service with the Dominion Bridge Company was interrupted only during World War I, when he served from 1916-1919. He graduated in civil

W. Taylor-Bailey, M.E.I.C.

engineering from McGill University in 1916.

He is also a director of Dominion Hoist and Shovel Company Limited, Royal Bank of Canada, Robert Mitchell and Company Limited, National Breweries Limited, National Drug and Chemical Company of Canada, Wabasso Cotton Limited and Steel Company of Canada.

A. H. Cowie, M.E.I.C., has been appointed vice-president, general manager and a director of the Dominion Bridge Company Limited.

Mr. Cowie received his education in England and a degree of M.Eng. at Liverpool University. He joined the Dominion Bridge Company on arrival in Canada in 1910, serving in the drawing office, design and contracting departments. He was appointed assistant to general manager in 1925, assistant general manager in 1929 and manager of the eastern division in 1934.

He served in World War I from 1914-1919, being awarded the Military Cross and Bar. He later joined the Grenadier Guards and was in command of the unit from 1929-1931. During World War II, he was general manager of Wartime Merchant Shipping Limited at the time of its organization period, and was subsequently its vice-president.

He was a member of the Executive Committee of the Canadian Standards Association for a period of 15 years and was recently appointed an honorary life member. He was one of the organizers of the Administrative Board of the Canadian Welding Bureau, and

Chairman from its inception in 1947 until the end of the last year.

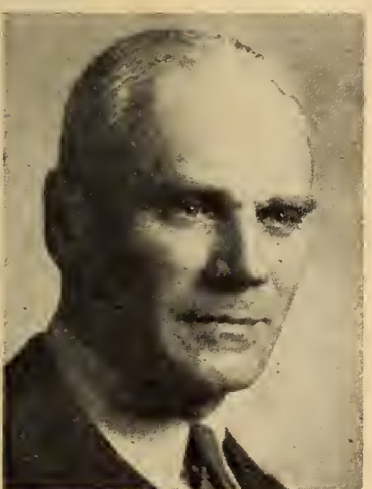
In addition to his duties at Dominion Bridge Company Limited, Mr. Cowie is

A. H. Cowie, M.E.I.C.

a director of Dominion Hoist and Shovel Company Limited, Eastern Canada Steel and Iron Works Limited and Robb Engineering Works.

Hubert G. Welsford, M.E.I.C., was recently appointed the president and managing director of Dominion Engineering Works Limited and Dominion Engineering Co. Ltd.

Mr. Welsford is also vice-president and director of Dominion Bridge Company, Limited; president and managing director of Dominion Hoist and Shovel Company Limited; and president of Continuous Wood Grinder Company Limited. He is a director of Canadian Pratt-Whitney Aircraft Co. Ltd.; Shawinigan Water and Power Company; and Consolidated Mining and Smelting Company.



H. G. Welsford, M.E.I.C.

Mr. Welsford joined the Dominion Bridge Company in Winnipeg, Man., in 1910. He returned to the Company in Winnipeg in 1919, after service with the R.F.C. and the R.A.F., for which he was awarded the M.B.E. (Military). He was a sales engineer with Dominion Bridge Company in Montreal (1921-1923). He was appointed assistant general manager of Dominion Engineering Works, Montreal, in 1923; and general manager in 1926.

H. S. Van Patter, M.E.I.C.

H. S. Van Patter, M.E.I.C., vice-president of Dominion Engineering Works Limited, and chief engineer of the hydraulic division, has been elected a director of the Company. Mr. Van Patter is a graduate of Queen's University (M.A. 1912, mathematics; B.Sc. 1915, civil engineering).

After overseas service with the Third and Fifth Divisions of the Canadian Field Artillery and a year as lecturer in mathematics at Queen's University, he joined the engineering staff of Dominion Engineering in 1920, shortly after the company had embarked in the hydraulic turbine business with initial orders for the Cedars and Laurentide power plants.

Since 1925 Mr. Van Patter has been in charge of the hydraulic division of the Company as hydraulic engineer and chief engineer, and recently as vice-president and chief engineer.

A. Russell, M.E.I.C., a mechanical engineer with Imperial Oil Ltd., at Sarnia, Ontario, has been appointed to serve on a committee on Unfired Pressure Vessels, a subcommittee of the Boiler Code Committee, of the American Society of Mechanical Engineers.

P. K. Farmer M.E.I.C., district manager of the English Electric Company, Winnipeg, is the national president of the Junior Chamber of Commerce.

Mr. Farmer has been active in Junior Chamber of Commerce for many years and was active also in municipal groups at St. Catharines, Ontario, where he was the acting manager of industrial sales of English Electric until 1950. There he was president of the regional Junior Chamber of Commerce; a member of the board of governors of the municipal airport; a governor of the St. Catharines General Hospital; a director of the Advertising and Sales Club; vice-chairman of the Hospital Council; and vice-chairman of the industrial control section, Canadian Electrical Manufacturing As-association. He is a member of the Canadian Institute of Mining and Metallurgy.

D. W. Bews, M.E.I.C., who was Councillor of the Belleville Branch of the Institute, has joined the staff of Queen's University as an assistant in the department of drawing. He was for many years at Belleville Technical School as draughting instructor.

V. J. Bakanowski, M.E.I.C., is a senior assistant project engineer with the Canadian Industries Limited in Montreal.

Mr. Bakanowski was previously a calculator and designer in the Deisel Electric Locomotive Division of the Montreal Locomotive Works Limited.

Lt.-Col. D. Waldock, M.E.I.C., has returned from England to Army Headquarters (D.A.D.) in Ottawa. In 1950, he went to England to the Military College of Science at Shrivenham in Wiltshire. He had previously been the assistant director of armament development Army Headquarters, Ottawa.

T. A. G. Beeching, M.E.I.C., has joined the Kaiser Engineers, a division of the Henry J. Kaiser Company, as an electrical designer. He is working at Oakland, California.

W. L. Govan, M.E.I.C., who has been the chief engineer of Canadian Arsenals Limited, at Longueil, Quebec, since 1949, has now joined the Hydropress Incorporated in New York City.

From 1934 to 1944, Mr. Govan worked successively as maintenance engineer with the Buffalo Ankerite Gold Mines Limited, as design engineer for Colville's Steel Works Ltd. at Motherwell in Scotland and design engineer with the Dominion Engineering Works Limited. He was a Lieutenant in the R.C.E.M.E from 1944-1945 and was special lecturer in mechanical engineering at the University of Toronto from 1945-1946.

Before joining the Canadian Arsenals Ltd., he was power engineer with Canadian Celanese Ltd., Drummond, Quebec, from 1946-1947 and chief engineer for Waterous Limited in Brantford, Ontario.

He graduated with a B.A.Sc. from the University of Toronto in 1934.

G. A. Caldwell, M.E.I.C., has been transferred to Montreal from Toronto where he was exchange plant engineer with the Bell Telephone Company.

Mr. Caldwell has been with the Bell Telephone Company since he came to Canada in 1925, working as assistant to the foreign wire relations engineer from 1925-1929. He was the foreign wire relations engineer in the Western Area and was appointed transmission engineer in 1934, toll line engineer in 1938, and exchange plant engineer in 1942.

He graduated in electrical engineering from Glasgow University in 1925.

Colonel G. M. Carrie, M.E.I.C., has returned to Canada from an appointment with the Canadian Joint Staff, London, England, for duty with the Department of National Defence. He has been named to command a division of the Defence Research Board that will make him responsible for the research and development requirements of the army.

A veteran of both wars who rose to the rank of colonel, he will "be closely associated with the operations of certain defence research laboratories".

A graduate in civil engineering from the University of Toronto in 1913 with a B.A.Sc. degree, he served in France, Italy, Egypt, Palestine, Syria, Iraq and Iran in World War I. In 1922, he retired from the army and returned to Canada. He took over the active management of Scottish-Canadian Magnesite Company Limited and after the amalgamation of this company with the North American Magnesite Producers Limited in 1933, he proceeded to organize Canadian Refractories Limited of which he became general manager, and in 1939, president.

At the outbreak of World War II, he returned to the army and commanded an artillery regiment and proceeded overseas. In 1943, he was appointed director of artillery at Headquarters of First Canadian Army in England. With the rank of colonel he was named Canadian Armed Forces representative on the Ordnance Board in the United Kingdom in 1944, an appointment he held until his second army retirement in 1947. Since 1948 he has been in England with the Canadian Joint Staff.

T. E. Price, M.E.I.C., of Winnipeg, who retired from Canadian Pacific Railway Company in November 1951, is now residing in Vancouver, B.C.

Mr. Price graduated from McGill University with a B.A. in 1907 and received a B.Sc. degree in civil engineering in 1910.

He was associated with Canadian Pacific Railways as a student, and remained with the organization, returning to C.P.R. after service overseas in World War I in the Canadian Railway Troops. For years he was C.P.R. division engineer in Vancouver. He went to Winnipeg in 1941, and was later appointed engineer, Maintenance of Way for Western Lines.

T. B. Smith, M.E.I.C., has joined the Shell Oil Company at Calgary, Alberta, as gas plant supervisor.

Mr. Smith previously held the position of petroleum engineer with the Imperial Oil Ltd., and earlier was with the International Petroleum Company Limited, in Peru, South America.

He studied at Queen's University and graduated in chemical engineering in 1942.

F. W. Buckley, M.E.I.C., project engineer for the Bathurst Power and Paper Limited, in New Brunswick, has been appointed with Mr. Howard Crutchfield, to design the new Village Bridge in place of the present outmoded and unsafe structure. This decision was taken at a special September meeting of the Bathurst Board of Trade. The plans will be submitted to the department of Public Works, New Brunswick and, if approved, the project will be under way early in 1952.

Mr. Buckley graduated in electrical engineering from the Nova Scotia Technical College in 1938, was thereafter an assistant engineer at the Head Office of the Nova Scotia Power Commission, at Halifax. He joined the Bathurst Power and Paper Company Limited as a designing engineer in 1947.

P. E. Douville, M.E.I.C., has joined the Roads Department of the Province of Quebec as a resident engineer at Quebec City. Previously, Mr. Douville was assistant manager of the Acton Rubber Comapny in Actonvale, Quebec. He joined the staff of this Company soon after graduating in chemical engineering from Ecole Polytechnique, Montreal in 1943.

G. Y. Dow, M.E.I.C., of Saint John, New Brunswick, has rejoined the Army with the rank of major and is stationed in Halifax, N.B.

Major Dow held the rank of captain in the Royal Canadian Engineers in 1941. After his war service, he returned to the Refrigeration Service Company in Saint John, as service manager and became vice-president of the Company in 1947.

A. L. Gourley, Jr.E.I.C., has joined Thermax Limited at Orillia, Ontario, as chief engineer, after working as an engineering assistant with C.I.L. in Kingston, Ontario. Mr. Gourley graduated in mechanical engineering from Queen's University in 1946.

J. J. Hudson, Jr.E.I.C., graduate of the University of New Brunswick in electrical engineering in 1949, is now employed as a junior motor engineer with the Reliance Electric and Engineering (Canada) Ltd., Welland, Ontario. Previously he was a service engineer with the Canadian General Electric Co., Ltd., in Toronto.

W. G. MacLaren, Jr.E.I.C., who was a job engineer for the Foundation Company of Canada, Limited on the extension of the powerhouse at Kananaskis, Alberta, which is now completed, has been appointed resident engineer for the Company on the construction of a refractory brick plant at Marelan, P.Q., for Canadian Refractories Ltd.

Mr. MacLaren graduated in 1950 from McGill University.

J. W. Powers, Jr.E.I.C., is assistant to the divisional engineer of Consolidated Paper Corporation at Grand'Mere, P.Q.

Mr. Powers joined the Company in 1946, after graduating in mechanical engineering from Nova Scotia Technical College.

W. S. Donald, Jr.E.I.C., is a civil engineer in design with C. D. Howe Company Limited, in Montreal. He graduated in 1949 from the University of New Brunswick and received the degree of M.S. from Massachusetts Institute of Technology this year.

Raymond Barette, Jr.E.I.C., has joined the Underwriter's Adjustment Bureau, Ltd., in Montreal. He previously worked for J. S. Hewson, Ltd., and Collet Freres Ltd.

Mr. Barette graduated with a B.A.Sc. in civil engineering from Ecole Polytechnique in 1947.

C. G. Simms, Jr.E.I.C., has joined the Aluminum Company of Canada in Montreal. He worked previously with Stadler, Hurter and Company in Montreal.

He graduated in civil engineering from McGill University in 1949.

W. C. Smith, Jr.E.I.C., of the Square D Company Canada Ltd., has been transferred by the Company from Toronto to Winnipeg. He joined the sales staff of the Company in Montreal in 1948.

He was the secretary of the Junior Section of the Montreal Branch of the Institute in 1949.

L. E. Rodway, Jr.E.I.C., has joined the Canada Cement Company Ltd., in Toronto, as an engineer in the sales department.

Mr. Rodway previously worked as Reinforced Concrete detailer and designer for the Dominion Bridge Company in Winnipeg. He graduated in civil engineering from the Manitoba University in 1949.

Z. L. Szeliski, Jr.E.I.C., is working as a junior structural engineer with the Canadian National Railways in Montreal, after holding the position of designer draughtsman in the Chief Engineer's office of the British Railways in London, England.

Mr. Szeliski graduated as an engineer from the Polish University College in London in 1951.

K. H. Williamson, Jr.E.I.C., has left Canada on an Athlone Fellowship and is now on the staff of Messrs. Siemens in London, England, where he will remain for two years.

Mr. Williamson was previously a telephone transmission engineer with the Manitoba Telephone System. He graduated in electrical engineering from the University of Manitoba in 1949.

A. C. Chadwick, Jr.E.I.C., is assistant plant manager with British Titan Products Company Limited at Billingham-on-Tees in County Durham, England.

Previously, Mr. Chadwick was a chemical engineer in the Technical Service Department of the Anglo-American Oil Company, at Fawley in Hampshire, England. He graduated from the University of Toronto in 1950.

G. A. Pritchard, S.E.I.C., (University of British Columbia, B.A.Sc., mechanical, 1951) is an engineer-in-training with A .V. Roe (Canada) Ltd., of Malton, Ontario.

H. L. Archibald, S.E.I.C., (Nova Scotia Technical College, B.Eng., electrical, 1951) is working in Halifax for the Nova Scotia Power Commission.

B. Petley, S.E.I.C., (McGill University, B.Eng., chemical engineering, 1951) is a cadet engineer in the Chemical Division of Koppers Company, Inc., at Kobuta, Pa.

J. E. Durocher, S.E.I.C., (McGill University, B.Sc., civil, 1951) is employed by the Aluminum Company of Canada, Limited, as a civil engineer in the hydraulics department at the Shipshaw Power Devolpment, Arvida, Que.

R. H. Scott, S.E.I.C., (University of British Columbia, B.A.Sc., mechanical, 1951) is on the student training course at Canadian Westinghouse Limited, Hamilton, Ontario.

R. Guimond, S.E.I.C., (Ecole Polytechnique, B.A.Sc., civil, 1951) is an engineer with the Marine Industries Limited in Sorel, P.Q.

N. D. Heaslip, S.E.I.C., (University of British Columbia, B.Sc., chemical, 1951) is a chemist with the Canadian Industries Limited at James Island, British Columbia.

Bernard Beaton, S.E.I.C., (Nova Scotia Technical College, B.Eng., civil, 1951) is a civil engineer with Canadian National Railways in New Brunswick.

Erratum

In a personal about Mr. J. H. Scovil, Jr.E.I.C., which appeared in the October issue of the *Journal*, there was an error, and a corrected item is as follows:

J. H. Scovil, Jr.E.I.C., of Shawinigan Engineering Company, has been transferred from Montreal to Chute-à-la Savane, Que., where the Company is doing the design work for the Peribonka No. 2 development.

Mr. Scovil graduated from the University of New Brunswick in civil engineering in 1947.

N. W. Bunn, S.E.I.C., has joined the Alberta Transit Mix and Concrete Constructors Limited, in Calgary. He was previously sales manager for Truscott Products Limited in Edmonton, after graduating in civil engineering from the University of Alberta in 1950.

G. S. Langman, S.E.I.C., has returned to Ottawa, Ontario, from topographical survey work in British Columbia. He is with the Topographical Branch of the Department of Public Works, Ottawa.

Mr. Langman graduated in civil engineering from the University of Alberta in 1950.

P. J. Dowling, S.E.I.C., (University of Toronto, B.A.Sc., civil, 1951) is working for the Franki Compressed Pile Company in Montreal, Que.

K. Madsen, S.E.I.C., (University of Alberta, B.Sc., civil, 1950) has joined the staff of Haddin, Davis and Brown Limited, consulting engineers, Calgary.

J. A. Spittle, S.E.I.C., holds the position of field engineer with the North American Cyanamid Limited in Niagara Falls, Ontario. He was previously associated with the Steel Company of Canada at Hamilton, Ontario, following the Company's training course.

Mr. Spittle graduated from Queen's University in civil engineering in 1950.

P. P. Yeh, S.E.I.C., (University of Toronto, B.A.Sc., electrical, 1951) is an electrical engineer with James R. Kearney Corporation of Canada Limited in Toronto, Ontario.

A. M. Conley, S.E.I.C., is a Flying Officer with the Royal Canadian Air Force in Ottawa.

He graduated in mechanical engineering from McGill University in 1950, and entered the R.C.A.F. soon after.

S. J. Warder, S.E.I.C., is working with the consulting engineers, Underwood and McLellan in Saskatoon.

Mr. Warder graduated in civil engineering from the University of Saskatchewan this year.

A. T. Wason, S.E.I.C., (University of British Columbia, B.A.Sc., mining, 1951) has been appointed senior surveyor attached to the Public Works Department at St. Lucia, in the British West Indies.

D. B. Williamson, S.E.I.C., is an engineer in the electronics departments of Canadian Westinghouse Company in Hamilton, Ontario.

Mr. Williamson graduated in electrical engineering from McGill University in 1950.

S. J. Miller, S.E.I.C., is in Saint John's, Newfoundland, with the Department of Public Works of Canada. He joined the department in 1950 after graduating from Nova Scotia Technical College in civil engineering.

W. S. Veale, S.E.I.C., is in Charlottetown, P.E.I., with the Department of Public Works of Canada. He joined the department in 1950, after graduating in civil engineering from the Nova Scotia Technical College.

G. F. Mader, S.E.I.C., is in Halifax with the Department of Public Works of Canada. He joined the department in 1950 after graduating in civil engineering from the Nova Scotia Technical College.

R. S. Wile, S.E.I.C., is with the Department of Public Works of Canada, at Halifax. He graduated from Nova Scotia Technical College in 1950, after which he joined the department.

N. Mangione, S.E.I.C., is with the Department of Public Works of Canada, at Ottawa. He graduated in civil engineering from McGill University in 1950, after which he joined the department.

Visitors To Headquarters

J. McMillan, M.E.I.C., Calgary, Alberta, October 17, 1951.

N. Metcalf, M.E.I.C., Dundas, Ontario, October 18, 1951.

P. E. Fuller, S.E.I.C., Winnipeg, Manitoba. October 20, 1951.

R. E. Jess, M.E.I.C., Bedford, P.Q., October 25, 1951.

H. T. J. Young, Manchester, London. October 25, 1951.

E. P. Muntz, M.E.I.C., Hamilton, Ontario. October 25, 1951.

W. J. Bailey, Christchurch, England. October 25, 1951.

G. T. L. Andrews, M.E.I.C., Kingston, Ontario, October 26, 1951.

P. E. Buss, M.E.I.C., Thorold, Ontario, October 29, 1951.

E. Vinet, M.E.I.C., New York, November 1, 1951.

R. M. Hardy, M.E.I.C., Edmonton, Alberta, November 1, 1951.

R. C. McMordie, M.E.I.C., Ontario, November 5, 1951.

Obituaries

The sympathy of the Institute is extended to the relatives of those whose passing is recorded here.

A. G. Jacques, M.E.I.C., formerly general manager of the St. Lawrence Paper Mills Company Limited and Lake St. John Pulp and Paper Company Limited, died in hospital in Montreal on October 12th, 1951.

Mr. Jacques retired from active participation in the affairs of the paper companies in June of this year due to ill health.

Born in Montreal in 1896, he was educated at Quebec High School and studied at McGill University where he graduated in chemical engineering in 1917. He served in the First World War with the 12th Battalion of the Canadian Garrison Artillery.

In 1919, he joined Price Bros., Co., Ltd., as an assistant chemist. He became technical superintendent of the East Angus mill of Brompton Pulp and Paper Company in 1923 and was made paper mill superintendent of the Company in 1927. In 1929, he went to the International Power and Paper Company in Corner Brook, Newfoundland as paper mill superintendent and later general superintendent. He returned to Quebec in 1934 when he joined the Lake St. John Power and Paper Co., Ltd., at Dolbeau, Que., as general superintendent; he was promoted to mill manager there in 1935.

When the Lake St. John Mill and the St. Lawrence Paper Mills Co., at Three Rivers merged in 1938, he moved to Three Rivers as resident manager of the St. Lawrence newsprint mill. In 1946, he moved to Montreal as assistant general manager and was later appointed general manager of the two newsprint mills of the St. Lawrence Corporation Limited. He retained the latter position until his retirement.

Mr. Jacques joined the Institute as an Associate Member in 1936 becoming a Member in 1940.

Information has only just been received that **E. G. MacKay,** M.E.I.C. of MacKay and MacKay of Hamilton, Ontario, died on February 17th, 1950.

Mr. MacKay was born at Braemar in the County of Oxford in 1888. He studied engineering at the University of Toronto where he graduated with a B.A.Sc. degree in 1912. He later qualified as an Ontario Land Surveyor and as a Dominion Land Surveyor.

Before graduation, he had worked in Ontario and Manitoba, and he became a member of the firm MacKay, MacKay and Webster, engineers and surveyors, in Hamilton in 1912. He enlisted in 1914 for overseas war service with the Allied Armies and served until 1919, becoming a Lieutenant Colonel. He returned to Hamilton as a member of his firm and thereafter carried on a general engineering and surveying practice until the time of his death.

Mr. MacKay joined the Institute as an Associate Member in 1921 and became a Member in 1940.

M. J. Rutledge, M.E.I.C., manager of the city of St. Lambert, Quebec, died at his home on October 22nd, 1951.

Mr. Rutledge was born at Brighton, Massachusetts, in 1887. He studied at the University of New Brunswick and graduated in civil engineering in 1905.

He then joined the Hudson Bay Railway. He was an instrumentman with the Canadian Pacific Railway for two years. In 1912 and 1913, he was on the staff of the Dominion Bridge Company after which he was engaged on subway design with the Public Service Commission of New York for three years. He returned to Montreal in 1916 as chief draughtsman connected with the design of the Mount Royal Tunnel. In 1918, he was employed as an assistant to Henry Holgate, M.E.I.C., consulting engineer until he was appointed town manager of Woodstock, New Brunswick, in 1923. He resigned this appointment in 1926 when he became city manager of St. Lambert.

Mr. Rutledge joined the Institute as a Junior in 1916, became an Associate Member in 1919 and Member in 1923, he was also a Member of the United States Engineers Institute.

Employment Service

THIS SERVICE is operated for the benefit of members of the Engineering Institute of Canada and for industrial and other organizations employing technically trained men—without charge to either party. It would be appreciated if employers would make the fullest use of these facilities to list their requirements—existing or estimated.

Notices appearing in the SITUATIONS WANTED column will be discontinued after three insertions. They will be reinstated, on request, after a lapse of one month.

Personal interviews with the Institute Employment Service, 2050 Mansfield Street, Montreal—Telephone PLateau 5078—may be arranged *by appointment.*

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER required for an expanding chemical industry in Western Canada. Prefer applicants with some experience and/or interest in cost analysis, plant economics and market studies. Challenging opportunity for someone leaning towards the economical phases of business operations. Age range 25 to 35 years. Apply to File No. 4116-V.

CIVIL

CIVIL ENGINEER, for town located in New Brunswick. Applicant should be well qualified. Reply in writing giving full particulars as to experience, qualifications, references and salary expected. Apply to File No. 4099-V.

JUNIOR CIVIL ENGINEER to follow basic design of structures. An excellent opportunity to understudy a highly qualified senior engineer. Mathematical aptitude essential. Location Maritime Province. Apply to File No. 4103-V.

CIVIL ENGINEER to act as estimator in contractor's office located in Montreal. Applicant should have 5 to 10 years experience. Apply to File No. 4114-V.

ELECTRICAL

TWO ELECTRICAL ENGINEERS required with some experience in design and testing of electrical appliances and equipment. by specialized laboratories in Toronto. Applicant should have preferably at least two years experience in the field. Apply to File No. 4100-V.

ELECTRICAL ENGINEER required by manufacturer in Montreal for design of and supervision of manufacture of miscellaneous electrical panels for fire alarm systems, clock systems, etc. Correspondence re details of orders for special material. Company operates on a five day week, employs just over 100 persons, has a company subsidized sickness and accident plan. Apply to File No. 4107-V.

A JUNIOR ELECTRICAL engineer to assist in design and installation of electrical switching and control equipment. Location Maritime Province. Apply to File No. 4106-V.

ELECTRICAL ENGINEER of 5-8 years experience in the design and installation of transmission, substation and control equipment commonly associated with 4 to 132 K.V. systems. Must be qualified to take responsibility for variety of electrical construction. Location Maritime Province. Apply to File No. 4108-V.

ELECTRICAL ENGINEER required for the design and sale of electrical panelboards, switchboards. Applicant must be bilingual. Location Province of Quebec. Apply to File No. 4112-V.

ELECTRICAL ENGINEER required by Ontario works to act as works engineer. Duties would include heading up a small manufacturing department, customer contact, initiating and handling internal routine of sales orders, directing production and material control and manufacturing planning. Applicant should be a graduate electrical engineer with at least five years' experience preferably on motor control, switchboard or similar apparatus. He should be familiar with modern manufacturing methods as applied to this type of equipment. This position will provide an excellent opportunity for any young engineer to establish himself in a new division of one of the largest companies on the continent. Apply to File No. 4117-V.

MISCELLANEOUS

ASSISTANT MANAGER required by progessive manufacturer for over a quarter of a century in a small town in the Province of Quebec. Applicant must have experience in office management, metal stamping and sheet metal work. Must be bilingual. Excellent opportunity for the right man to become General Manager in a few years. Apply to File No. 4101-V.

CHEMIST OR CHEMICAL ENGINEER required by public utility in Maritime Province. Work consisting of directing the control of water conditioning in the steam station, the control and conditioning of transformer and lubricating oils, and the preservation of wood poles and structures. Salary based on experience and qualifications. Apply to File No. 4102-V.

CIVIL OR MECHANICAL ENGINEER required for design office of organization in Ontario. Salary commensurate with qualifications. Living accommodation available. Apply stating experience in structural and general plant design to File No. 4103-V.

TWO JUNIOR RESIDENT ENGINEERS required by public works in Newfoundland for work on highway and bridge construction. Recent graduates or engineers graduating in 1952. The posts are permanent and pensionable on the salary scale of $2,700.00 to $3,800.00 per annum in addition a cost of living bonus of $570.00 per annum for salaries below $3,100.00 and $480.00 for salaries $3,100.00 and over is applicable. Apply to File No. 4105-V.

YOUNG MAN WITH ENGINEERING, landscaping training required by expanding Memorial Gardens Cemetery Company, based in Toronto. Knowledge of construction, drafting and costing required. Also knowledge of large scale landscaping and planting is desirable. Some travel. Excellent opportunity for right man. Apply to File No. 4106-V.

A MECHANICAL OR CHEMICAL engineer required by public utility in Maritime Province familiar with high pressure steam power plants and the fundamentals of boiler water conditioning. Apply to File No. 4108-V.

CHEMICAL AND MECHANICAL engineer for instrumentation control and development in newsprint mill. Should have some pulp and paper experience. Apply to File No. 4109-V.

AMERICAN MANUFACTURER of industrial pumps requires engineer to act as sales engineer. Working from Montreal headquarters, territory would be Eastern Canada where products have already been introduced. Applicant should be recent graduate with some experience in the oil industry or pulp and paper and be preferably bilingual. Apply to File No. 4110-V.

CIVIL OR MECHANICAL ENGINEER to act as estimator in Montreal office of construction company. Apply to File No. 4111-V.

ENGINEERS required for rapid expansion programme in aircraft industry. Apply to File No. 4115-V.

The following advertisements are reprinted from last month's Journal, not having yet been filled.

CHEMICAL

FIVE CHEMICAL ENGINEERS required by large chemical organization in Ontario to act as Sales Engineers. Chemical Engineer or Chemist from any Canadian University. Selling experience is preferred but not necessary. Preferably young men with a definite aptitude for selling. Apply to File No. 4060-V.

CHEMICAL ENGINEERS with 2 to 4 years operation experience in the chemical industry. Successful applicants will be given 6 months special training period in the U.S.A. before being permanently located in Central Alberta by a major organic chemical industry in the production department. Apply to File No. 4075-V.

CHEMICAL ENGINEERING department of a large Canadian University will have a vacancy in the staff at the professorial level in the 1952-53 session. Major qualifications: ability to teach and direct research in the unit operations field, a good background in physical chemistry. An interest in the petroleum field would be useful though not necessary. Apply to File No. 4076-V.

CHEMICAL ENGINEERS required by a paper company located in Province of Quebec. Time and motion study engineers with at least 2 years experience in time and motion study methods, plant layout, machine loading and operation write up. Time and motion engineers should be free to travel. Apply to File No. 4082-V.

CHEMICAL ENGINEER or chemist, recent graduate, to undergo training for a supervisory position in the fabric dyeing and finishing department of organization in Province of Quebec. Salary according to qualifications. Apply to File No. 4093-V.

CHEMICAL ENGINEER required with 3 or 4 years experience preferably in the pulp and paper industry. Location Province of Quebec. Apply to File No. 4096-V.

CIVIL

CIVIL ENGINEER required to act as junior office engineer in Western Canada. Duties to include draughting, plotting, topography design, development of minor concrete and timber structures, computation of quantities for earthwork, rock excavation and concrete. and similar work required in the office of such a project. Apply to File No 4041-V.

CIVIL ENGINEER required for the permanent staff of city engineers' department in Ontario. Work includes the design, layout and supervision of roads, sewers, sidewalks etc. The salary is dependent on qualifications and full employee benefits are available. Apply to File No. 4046-V.

A CIVIL ENGINEER required by firm of consulting engineers in Toronto with practical experience covering the design and installation of sewage disposal systems. Salary according to qualifications. Apply to File No. 4050-V.

CIVIL ENGINEER required with extensive experience in Canada or United States in water main, water pumping plant, sewer and sewage treatment plant layouts. Duties will include preliminary survey, design, draughting, and supervision. Permanent position with large organization in Toronto with generous pension, sick leave, and vacation privileges. Salary can be arranged to suit qualifications of successful applicant. Apply to File No. 4052-V.

THREE GRADUATE CIVIL ENGINEERS with at least four years experience in design of reinforced concrete structures for work in Montreal. Apply to File No. 4056-V.

EIGHTEEN CIVIL engineers required in head office, Tel Aviv, for surveying, designing and planning of roads, for construction planning and structural design of water and sewage works. Length of service a minimum of 2 years. Permanent position to begin as soon as possible. Qualifications academic diploma or membership in a recognized professional organization with at least 2 years experience. Knowledge of Hebrew is desirable but not essential. Apply to File No. 4070-V.

TWENTY-SEVEN CIVIL engineers for supervision and field work of road work, bridges, buildings, water works, sewage and other public works. Location Tel Aviv and surrounding districts. Length of service a minimum of 2 years. Qualifications, academic diploma or membership in a recognized professional organization. Experience, at least 2 years. Specialized knowledge in equipment necessary for public works. Knowledge of Hebrew desirable but not essential. Age 24 to 40 years. Apply to File No. 4070-V.

CIVIL ENGINEER required for general contractors office in Montreal. Work consists of estimating, quantity take-offs, purchasing, materials and construction design. Applicant should have 2 or 3 years experience. Salary commensurate with experience. Apply to File No. 4072-V.

CIVIL ENGINEER required by construction company in Province of Quebec preferably recent graduate who would be interested in building construction work as assistant to job engineer. Apply to File No. 4080-V.

CIVIL ENGINEERS required for large construction programme in Northern Canada, various locations. Six field engineers, chief of survey party, instrumentmen and draughtsmen. Head offices located in Montreal. Apply to File No. 4091-V.

CIVIL ENGINEER required for construction of service stations by petroleum marketing company located in Montreal. Applicant should be recent graduate and preferably bilingual. Apply to File No. 4094-V.

THE HYDRO-ELECTRIC POWER

COMMISSION OF ONTARIO

Requires:

Assistant Design Engineer (Civil)

A professional engineer with at least 2 years' experience in transmission line design to assist on design work on transmission lines, conductor mechanics and fittings, steel and wood structures, footings, foundations, etc.

Apply in writing stating age, education, details of past experience and salary expected to the employment office, 620 University Ave., Toronto, Ontario.

ELECTRICAL

ELECTRICAL ENGINEER to take charge of switchgear estimating department. Qualifications required are that the applicant should have a sound general knowledge of electrical engineering fundamentals and should have a specialized knowledge of medium and high voltage switchgear. He should have experience in the preparation of specifications, tenders and cost-estimates. Salary would depend on qualifications. Cost of living bonus and pension scheme. Location Montreal. Apply to File No. 4051-V.

ELECTRICAL ENGINEER required, young university graduate with research outlook, to join a team working on aircraft de-icing. The work is mainly in the electrical field, with some observational flying. Some experience with aircraft electrical power systems is desirable. Initial salary up to $3900.00 depending on age qualifications and experience. Apply to File No. 4054-V.

ELECTRICAL ENGINEER required by public utility in Ontario. Graduate with general knowledge of public utility operations. Apply by letter stating age, qualifications, experience and salary expected. Apply to File No. 4079-V.

APPLICATIONS ARE invited for the post of professor and head of the department of power engineering in the India Institute of Science, Bangalore (India). The candidates should possess a degree in electrical engineering and should possess very high academic qualifications and experience, associations with engineering and technical institutions and teaching experience are necessary qualifications. For further information apply to File No. 4086-V.

ELECTRICAL ENGINEERS required to act as field service engineers for the overseas operations of Montreal manufacturer of specialized instruments. Duties include trouble shooting and supervision of installations of equipment. Age 26 to 35 years. Apply to File No. 4087-V.

TWO ELECTRICAL or electronic engineers required by specialized industrial plant in Montreal area. Applicants should have 5 to 10 years experience in production control. Apply to File No. 4088-V.

ELECTRICAL ENGINEER to act as sales engineer for Montreal manufacturer of electrical meters, fans, pumps and hoists. Applicant should be preferably recent graduate and must be bilingual. Territory Montreal. Apply to File No. 4089-V.

ELECTRICAL DESIGN ENGINEER with experience in lighting and power distribution in commercial and industrial buildings required by large consulting engineering firm located in Montreal. Apply to File No. 4097-V.

MECHANICAL

THREE MECHANICAL engineers required by firm in Newfoundland, for process and general engineering duties. Single men are preferred who have experience in the pulp and paper industry. Salaries open. Apply to File No. 4055-V.

YOUNG MECHANICAL ENGINEER required by manufacturer in Ontario for time study and methods work. Salary depending on qualifications and experience. Apply to File No. 4068-V.

MECHANICAL ENGINEER required in Province of Quebec with approximately 5 to 10 years experience. Duties include general plant operations and to offer constructive ideas regarding operating problems in conjunction with process equipment, piping power drives, heat transfer fans and building structure, etc., to assume responsibility in designing and putting the above ideas into effect and be capable of working effectively with master mechanic tradesmen and other plant personnel. Apply to File No. 4074-V.

THE HYDRO-ELECTRIC POWER

COMMISSION OF ONTARIO

Requires:

Junior Location Engineer (Civil)

A professional engineer with at least 2 years' experience on field surveys and location. To supervise surveys for overhead and underground transmission lines, inspect field construction work, etc.

Apply in writing stating age, education, details of past experience and salary expected to the employment office, 620 University Ave., Toronto, Ontario.

MECHANICAL ENGINEER required in Montreal in a shop producing small assemblies. The applicant should have several years experience and a reasonable knowledge of draughting is desirable. Salary based on qualifications and experience. Apply to File No. 4083-V.

MECHANICAL ENGINEER required to act as assistant plant engineer for new operations in Ontario. Applicant should be capable of supervising installation of plant machinery, plant layout and building structures, air, water, steam and sewer lines. Apply to File No. 4085-V.

METHODS ENGINEER required by Montreal manufacturer of fine instruments. Applicant should be preferably mechanical engineer capable of supervising groups of engineers engaged in drawings, etc. Apply to File No. 4087-V.

MECHANICAL ENGINEER required by specialized industrial plant located in Montreal area. Applicant should have 5 to 10 years experience in production. Apply to File No. 4088-V.

MECHANICAL ENGINEER required to act as sales engineer by Montreal manufacturer of all types of sheet metal work. Applicant should have definite sales ability and be preferably a Montrealer. Apply to File No. 4090-V.

MISCELLANEOUS

ENGINEER REQUIRED by organization in Ontario with good knowledge of Marine radar with training and ability to handle service and installation crews. Considerable travelling involved. Apply to File No. 4042-V.

ENGINEER TO ACT AS assistant, to deal with technical and administrative work and to do some outside sales work for organization in Ontario, manufacturing radar and navigation equipment. Travelling involved. Apply to File No. 4042-V.

SENIOR DRAUGHTSMAN required by firm located in Ontario. Must have several years all-round experience in plant layout and special machinery and equipment. Salary commensurate with experience. Application with sample of work to File No. 4043-V.

PLANT ENGINEER for textile mill in Province of Quebec. Applicant should be about 35 years of age with three to five years' experience in plant maintenance, preferably a textile mill. Salary open. Apply to File No. 4044-V.

TWO PROFESSORSHIPS to the faculty of mechanical engineering at Hebrew Institute of Technology, Haifa. Duties to commence in October 1952 or earlier. One of the above two positions requires special knowledge of applied thermodynamics. In due course instruction to be conducted in Hebrew. Salaries will be fixed in relation to the highest grade of the Israel Civil Service. There will be a pension scheme. The Haifa Institute of Technology will pay transportation expenses and will also undertake to provide housing. Apply to File No. 4045-V.

TWO FULL PROFESSORSHIPS and two associate professorships to the faculty of electrical engineering, Hebrew Institute of Technology, Haifa. Duties to commence about October 1952. Instruction in the fields of telecommunications and power engineering, in due course instruction to be conducted in Hebrew. Applicants must have specialized professional and academic qualifications in telecommunications and power engineering. Salaries fixed in relation to the highest grade of the Israel Civil Service. There will be a pension scheme. The Haifa Institute will pay transportation expenses and will also undertake to provide housing. Apply to File No. 4045-V.

RESEARCH DIRECTOR of Israel Rubber Research Assoc. Research in improving production methods as well as quality of products. Instruction in the plants. Length of service 2 years. Degree preferably in field of chemistry of rubber. Age 35 to 50 years. Hebrew is desirable but not essential. Reading knowledge of English, German and French is desirable. Apply to File No. 4045-V.

RESEARCH DIRECTOR of the Israel Ceramics Research Assoc. for research in improving production methods, as well as quality of products. Research in the conservation of imported raw materials and the utilization of local raw materials. Length of service 2 to 3 years. College degree preferably in the field of ceramics. Candidate should have some practical experience in the manufacture of ceramics and be familiar with the semi-automatic equipment used, especially dishes, electrical ceramics, building and sanitary ceramics, and should be familiar with tunnell kiln process. Knowledge of Hebrew is desirable but not essential, also knowledge of English, French and German. Age between 30 and 45 years. Apply to File No. 4045-V.

INDUSTRIAL ENGINEER to act as leader and instructor of industrial engineering teams in applied field work. Will be required to instruct various teams of engineers in methods for increased productivity and plan the activities of these groups of engineers. This will be mainly practical work and will require much travel. Responsible to the industrial consultant of the ministry of labour. Travel throughout Israel. Length of service one year. Experience should possess experience in the field of industrial engineering in general, and particularly practical experience in serving as consultant to industrial projects. Hebrew desirable but not essential. Age 35 to 55 years. Apply to File No. 4045-V.

PROFESSOR OF INDUSTRIAL engineering to teach both undergraduates and graduates in the field of indusrial engineering. Responsible to Ministry of Labour. Hebrew Technion, Haifa. Length of service indefin.te. Previous experience as professor in the field of industrial engineering at an accredited university. Knowledge of Hebrew is desirable but not essential. Age 25 years and over. Apply to File No. 4045-V.

INDUSTRIAL ENGINEER instructor for field engineers and advanced industrial engineering methods. Will instruct groups of field engineers in methods for increased productiv.ty. Time and motion studies etc. Work of industrial engineer would be both theoretical and practical and would require direct contact with projects in the field. Will supervise approximately ten engineers. Responsible to industrial consultant of M nistry of Labour. Travel throughout Israel. Length of service one year. Knowledge of Hebrew is desirable but not essential. Age 40 and over. Apply to File No. 4045-V.

SUPERINTENDENT REQUIRED by gold mining Co. in Western Canada. Salary range $500.00 and a new house may be rented at a very nominal price. Apply to File No. 4048-V.

RECENT GRADUATE required by Hamilton organization for training as sales engineer on sheet metal building and industrial products. Qualifications: graduate civil engineer or architect, age 20-25 years preferred, knowledge of industrial building construction an asset, to locate in Toronto or Hamilton area. Excellent opportunity for career in sales. Apply to File No. 4053-V.

ENGINEER REQUIRED in B.C. for research work on hydraulic model laboratory, to examine the nature of water currents in the vicinity, and to determine what alterations will be necessary to accomplish certain industrial requirements. Besides these possibilities of industrial and research experience, there is the privilege of using the research as a thesis material for advanced degrees. The position offers a full-time salary at a level in keeping with the qualifications of the candidate. Apply to File No. 4057-V.

THE MANUFACTURING and assembly department of the overseas operations division of a large automotive industry in Canada is offering to the engineering graduate extremely valuable experince in all lines of automotive engineering endeavour. The work is essentially one of liaison in Australia, India, New Zealand and South Africa. Men for this department should have a broad inquisitive interest in everything automotive (as opposed to those with specialized interests). As they will deal with both directors and labours alike, a personality neither forceful or reluctant is desirable. Should the need arise they should also be willing to serve in India and Malaya. Apply to File No. 4059-V.

RECENT GRADUATE ENGINEERS required by manufacturer in Ontario of steel chains, conveying and power transmission equipment for the expansion of their engineering and sales department. Applicants will be given thorough training and then be placed in key positions where they are most suitable. Apply to File No. 4061-V.

METALLURGIST, RECENT GRADUATE required by large transport company in Montreal. Duties include microscopic and physical study of various metallurgical problems. Apply to File No. 4063-W.

UNIVERSITY GRADUATE DESIGN ENGINEER required in Toronto, Ontario, capable of designing hydro-electric equipment and in particular hydraulic turbines and auxiliaries. Apply to File No. 4064-W.

ENGINEER WITH SOME experience in sewer design and construction and also experience in sewage treatment, required by public utility in Western Canada. The latter experience is more essential as plans are being made for the rehabilitation of the sewage treatment plant. Salary according to qualifications. Apply to File No. 4065-V.

RESPONSIBLE OPENING IN engineering department of firm manufacturing industrial gases and welding equipment. Applicant must be a graduate engineer and should have experience in a metal fabricating plant. After suitable training the individual will perform consulting engineering duties in the use of our equipment and products. Excellent opportunity along technical administrative lines for suitable person. Salary will be commensurate with qualifications. Apply to File No. 4066-V.

ENGINEER REQUIRED by organization in Toronto for new division be.ng established. This position will present excellent opportunity for advancement in a fast growing company. It will also carry considerable responsibility. The man selected will temporarily work along product and tool design lines, but will be given training in mechanical and foundry fields. Previous experience in mechanical lines would be useful but this position could be filled by any young engineer with a mechanical bent who has a keen adaptable mind. Apply to File No. 4067-V.

MECHANICAL AND ELECTRICAL engineers for planning and supervision of airconditioning and power plants in build.ngs, supervision of technical equipment for buildings and public works, planning and installing heating and hot water systems for cooling systems in buildings, required in Tel Aviv. Length of service a minimum of two years to begin as soon as possible. Qualifications: academic diploma or membership in a recognized professional organization with 3 to 10 years experience. Knowledge of Hebrew desirable, but not essential. Age 25 to 40 years. Apply to File No. 4070-V.

ENGINEER REQUIRED in the office of city engineer in Western Canada with experience on reinforced concrete structures and building design, for the design of an incinerator and building and provide such accessory services as may be required. Apply to File No. 4071-V.

ASSISTANT FACTORY MANAGER required by internationally known manufacturer of power equipment. Applicant must have a good technical background and extensive experience including several years management in the mechanical or preferably the electrical engineering field and be familiar with labor relations, employee training, cost estimating and accounting, factory organization and maintenance, modern production methods and equipment and be preferably bilingual. Please include photograph. Apply to File No. 4073-V.

AN ONTARIO MANUFACTURING company with sales offices across Canada making and marketing heating equipment used in all types of buildings requires an experienced business sales and advertising executive. He should have contacts with architects and the construction industry and have proven executive abilities. An opportunity for a young man 35 to 40 years old, married, ambitious, temperate in habits. All applications will be treated confidentially. Send complete details regarding age, marital status, education etc. with at least two business and character references. Apply to File No. 4077-V.

SALES ENGINEER required by manufacturer of machinery tools and supplies to cover central and western Canada. Apply to File No. 4078-V.

INDUSTRIAL ENGINEER required by large manufacturer in Toronto. Applicant should be a recent graduate with one to two years experience in time-study, budgetary control, cost reduction, preferably in the metal industry. Apply to File No. 4084-V.

PRODUCTION CONTROL SUPERVISOR required by Montreal manufacturer of specialized instruments. Applicant should be a graduate engineer with some experience in production planning and scheduling. Age about 35 years. Apply to File No. 4087-V.

CHIEF ENGINEER required by manufacturer in Montreal of specialized instruments. Applicant should be preferably mechanical or electrical engineer with some experience in tool design and the light metal working industries. Age 30 to 35 years. Apply to File No. 4087-V.

JUNIOR ELECTRONIC engineer required by specialized industrial plant in Montreal for research laboratory work. Experience not essential. Apply to File No. 4088-V.

ENGINEER REQUIRED to head up newly formed engineering department of

PUBLIC UTILITY WANTS
FOUR ENGINEERS

(a) An Electrical Engineer of 5 - 8 years' experience in the design and installation of transmission, substation and control equipment commonly associated with 4 to 132 KV systems. Must be qualified to take responsibility for variety of electrical construction.

(b) A junior Electrical Engineer to assist in design and installation of electrical switching and control equipment.

(c) A Junior Civil Engineer to follow basic design of structures. An excellent opportunity to understudy highly qualified senior engineer. Mathematical aptitude essential.

(d) A Mechanical or Chemical Engineer familiar with High Pressure Steam Power Plants and the fundamentals of Boiler Water Conditioning.

Salary in each case to be commensurate with qualifications and experience.

Apply direct to: MR. NORMAN T. SMITH, Mgr.
Nova Scotia Light and Power Co., Ltd.,
Halifax, N.S.

large group of chain stores. Applicant should have broad industrial background and would be self directing. Prepared to live in Toronto and travel considerably in Ontario, Quebec and the Maritimes. The purpose of the department will be to explore present methods of procurement and handling of merchandise from a scientific point of view aimed at reducing costs through improved methods of handling. The field will cover both distribution plants and retail stores and transportation. Apply to File No. 4095-V.

MECHANICAL OR ELECTRICAL engineer, 1951 graduate required by pulp and paper industry n Province of Quebec. Real opportunity offered to young man who desires to enter a pulp and paper industry from the engineering side. Salary open. Interviews in Montreal or Toronto. Apply to File No. 4098-V.

Situations Wanted

CIVIL ENGINEER, 1949 graduate, age 27. Experience in highway construction and concrete construction. Desires responsible position with construction company or consulting firm in Ontario or Western Canada. Apply to File No. 202-W.

GRADUATE CIVIL ENGINEER AND LAND SURVEYOR with proven ability to carry out responsibilities. Available on short notice. Over 23 years of wide experience on four continents. Experience includes design layout and field supervision of roads, dams, buildings, drainage, irrigation works. Veteran C.R.E. and E.A.E. married, bilingual. Situation held in Canada: chief of survey parties, resident engineer, abroad: as district and assistant chief engineer for over 19 years in the British, Turkish, Iraqui, government services. Apply to File No. 489-W.

ELECTRICAL ENGINEER, M.E.I.C., P.Eng. (Que.) University of Alberta 1936, age 38, small family. Desires position n Western Canada, preferably Alberta or B.C. Fourteen years varied experience in the electric wire and cable manufacturing field, with emphasis on Power Cable. Experience includes considerable application engineering involving extensive studies of cable rating and impedance calculations, considerable overhead conductor design calculation laboratory experience covering a wide range of electrical measurements, general and high tension cable testing techniques, laboratory apparatus design; knowledge of manufacturing methods; some plant layout. Considerable practical experience with electronic apparatus in the measurement and audio fields. Available on reasonable notice Apply to File No. 1460-W.

TOWNSITE ENGINEER, capable of taking complete charge of the administration, design and construction of Townsite developments or extensions, including planning, roads, drainage, sewers, water supply, Hydro distribution, buildings. Qualifications include fourteen years experience in Canada and abroad. C.E. (Toronto), P.Eng., M.E.I.C., A.I.E.E., A.S.C.E., A.W.W.A., C.I.S.S. Apply to File No. 2468-W.

ENGINEER, MECHANICAL, interested in position offering opportunity as representative, plant or assistant engineer Experience includes twelve years design, construction and maintenance with pulp and paper industry. Age 40, married. Apply to File No. 2642-W.

WELL QUALIFIED ELECTRICAL and mechanical engineer, 31, with ten years experience in equipment manufacturing, chemical plant operation and design of large industrial steam and power generation and distribution systems would welcome change of employment leading to increased responsibilities. Aggressive, efficient and capable of handling complete projects. Cost conscious. Could be available at 30 days notice. Please address enquiries to File No. 2912-W.

CIVIL ENGINEER Jr.E.I.C., Bilingual, with 1½ years experience with consulting engineer firm and three years with steel fabricating company. Work consisting mostly on design of reinforced concrete structure. Desires position in Montreal area in architect's office or with consulting engineering firm as structural engineer. Apply to File No. 2947-W.

CIVIL ENGINEER, M.E.I.C., desires to obtain part time work (evenings and Saturdays) design and detailing in reinforced concrete and structural steel, in Montreal. Apply to File No. 3315-W.

MECHANICAL ENGINEER, M.E.I.C., P.E. Quebec, seeks position with progressive organization where training and experience could be best utilized in administration or production. Experience includes 5 years as works manager of large engineering plant and covers inspection, design, manufatcuring and administration. Apply to File No. 3335-W.

ENGINEER, M.E.I.C., wide experience design, construction, operation and maintenance of plants making coal and synthesis gasses and bye products, kraft pulp and sugar. Thorough knowledge of all classes of refractories, settings and coke ovens, steel and concrete structures, piping, tanks and vessels, mechanical handling equipment, boiler plant hydraulics and associate equipment; also experience in Naval architecture and shipyard routine, age 46, married, free to travel. Available early January. Apply to File No. 3505-W.

MECHANICAL ENGINEER, M.E.I.C., A.M.I. Mechanical Engineer, Chartered Engineer. 1st. class B.O.T. (Steam and Motor) Stationary Engineer A.B. Certificate. Management administration, construction, power plant operation. Desires more progressive position at senior executive level. Apply to File No. 3420-W.

CIVIL ENGINEER, University of Toronto, 1949, Jr.E.I.C., P.Eng. Experience has been mainly on heavy construction, three years as resident engineer on diversified hydro-electric work, also 2 years of office design and administration. Desires position in construction or work closely allied thereto. Apply to File No. 3604-W.

GRADUATE ELECTRICAL ENGINEER, S.E.I.C., Manitoba, 1951. Married, one child, R.C.A.F. veteran presently employed. Desires to gain experience in Electronic design. Willing to work for moderate salary during training period. Montreal or Toronto area preferred. Available on two weeks notice. Apply to File No. 3651-W.

CHEMICAL ENGINEER, McGill 1951 graduate, 24 years old, single. Worked two summers for large Pulp and Paper Industry in Ontario. Desires position in production organization. Would prefer working in the Province of Quebec, but would accept work at any other location. Apply to File No. 3579-W.

ELECTRICAL ENGINEER. Jr.E.I.C., 1949 graduate. Age 26 married, bilingual, desires employment in Montreal. Test course experience with a large electrical firm; design and sales training. Would like position preferably with consulting engineers firm or electrical sales firm. Any interesting position with opportunity for advancement will be considered. Available in two weeks notice. Apply to File No. 3699-W.

ELECTRICAL ENGINEER specializing in permanent magnet applications, open for engagement. Apply to File No. 3700-W.

U.K. ENGINEERING EXECUTIVE M., I.E.E., contemplates immigration to Canada. University Engineering Degree and 25 years industrial experience in mechanical, electrical and electronic engineering. Wide knowledge of commercial and government research and development including aircraft accessories, guided misseles, naval equipment, electronic and television work. Knows Canada well and speaks French. Apply to File No. 3701-W.

EXPERIENCED STRUCTURAL ENGINEER, M.E.I.C., A.S.C.E., seeks employer wishing to delegate responsibility for design (and erection) of structures and foundations for buildings and industrial plants. Trained in England (Field and Office); 15 years experience on mill buildings, warehouses, chemical plants, etc. Sound theoretical approach, employed for past three years in Canada as senior design engineer with Hydro-electric utility. Interested only in position of responsibility. Apply to File No. 3702-W.

EXPERIENCED BUYING ENGINEER. Higher National Certificate in Mechanical Engineering, age 31, married, one child. At present employed by a large industrial organization in the U.K. intends to immigrate to Canada early in 1952 and wishes to obtain a similar post in Canada. Apply to File No. 3727-W.

CIVIL ENGINEER (British, London, England), University Graduate. Age 36 with practical experience in road construction, surveying, steel structures and mainly reinforced concrete (framed structures for blocks of flats, industrial buildings, heavy foundations for power stations, steel mills and gas works). used to work on own initiative and responsibility, attending to correspondence, site meetings, etc., at present leading a team of designer-detailers, draughtsmen and tracers, wishes to emigrate to Canada and desires responsible position with construction company or consulting firm. Apply to File No. 3749-W.

BRITISH ENGINEERING Executive. D.L.C. (Hons.), Grad.I.E.E., M.Inst., B.E..

Professional Engineer WANTED

CITY OF LONDON, ONTARIO

SEALED APPLICATIONS addressed to the undersigned will be received up to 5 p.m. on Friday, December 28, 1951, for the position of DEPUTY CITY ENGINEER OF THE CITY OF LONDON.

This position calls for a fully qualified municipal engineer of at least five years' experience in municipal engineering, with the ability to organize and direct garbage collection and disposal, sewage plant operations and local improvement design, estimates, construction and maintenance.

Salary will depend on qualifications and experience, but applicants will note that the members of the civic staff have:

(a) Pension Plan.
(b) Sick leave credits.
(c) Standard holidays with pay.

This is an extraordinary opportunity for early advancement for the right man.

R. H. COOPER,
City Clerk.

seeks opening in Canada. At present Chief Engineer to medium sized company operating several factories and making electronic products. Also acting as manager of one of these production units. Wide experience in all phases of management and in technical supervision of laboratories and workships. 31 years of age, single and able to travel at short notice. Apply to File No. 3755-W.

CHEMICAL ENGINEER. Jr.E.I.C., married. Presently employed. Four years service in paper industry. Supervisory experience and ability to organize. Familiar with control statistics and instrument maintenance. Would like responsible position in process control with opportunity of advancement. Apply to File No. 3772-W.

PART TIME WORK: Graduate Civil Engineer Jr.E.I.C. desires part time work in Montreal for evenings and weekends. Some experience in design of steel, reinforced and prestressed concrete structures and bridges. Apply to File No. 3773-W

CIVIL ENGINEER, Jr.E.I.C., Montreal, 1946, age 29, married, bilingual. 5 years experience on road construction projects; some knowledge but no experience in metallurgy. Would like to acquire more varied experienced in either construction or metallurgy. Apply to File No. 3774-W

ENGINEER, Jr.E.I.C., B.A.Sc., University of B.C. M.Sc. Civil Engineering Utah State Agricultural College 1951. Special training in Hydraulics and soil mechanics. 27 months experience in drainage, irrigation work involving survey, small dam construction, wash-bore drilling. Present position responsible for field and office work 3 survey crews. Desires research, teaching or extension work. Consider foreign appointment. Experienced public speaker and research report writer. Ex-navigator R.C.A.F. 4 years overseas. Married. Age 30. Apply to File No. 3776-W.

YOUNG MECHANICAL ENGINEER, Jr.E.I.C., P.Eng., single, 5 years design experience in process industries, power and construction, desires a position as a group leader, plant engineer or any related position offering a genuine opportunity for initiative and advancement. Personal interview by appointment. Available on two weeks notice to present employer. Montreal preferred. Apply to File No. 3777-W.

GEOLOGICAL ENGINEER, S.E.I.C., recent graduate, 24 years old, single, bilingual, with experience in geological exploration and valuation of ore deposits desires position as production or industrial engineer. Available on short notice. Apply to File No. 3778-W.

CIVIL ENGINEER, 27, B.Eng., McGill, 1949, Jr.E.I.C., P.E.Q., P.E.O. Presently employed with a steel construction firm, 3 years experience prior to university and 3 years of design experience. Type of experience in design work covers: design of bridges, factory buildings, apartment buildings, transmisison towers and structures, guyed and self-supporting radio masts. Interested in working with a construction firm or general contractor, preferably with the option of becoming a junior or full partner. Apply to File No. 3779-W.

ELECTRICAL ENGINEER, Jr.E.I.C.-Prof. Engineer (Que.), graduated 1944, 34 years old, married, two children. Six years of sound practice with construction crews of pole lines. Good knowledge of pole line wires and hardware, and of wiring material for buildings. Can prepare layouts, specifications, estimates. Sound practice on metering outfits, and special substations. Mathematician and author of many short cuts for calculating regulations, power loss of a line. Can work anywhere preferably in Eastern Canada for a progressive company or contractor. Apply to File No. 3783-W.

CHEMICAL ENGINEER, 1950, University of Toronto, desires production or process work in Ontario or Western Canada. Age 28, single. Presently engaged in development work and production problems. Apply to File No. 3784-W.

RETIRED SENIOR executive, M.E.I.C., requires full or part time employment. Personnel, public relations, administration or supervision or inspection of construction. Apply to File No. 3785-W.

AMBITIOUS YOUNG MAN, age 26, 3 years study in chemical engineering (1947-51), desires permanent position where hard work and initiative will lead to advancement. No location preference. Available on short notice. Apply to File No. 3786-W.

CIVIL ENGINEER, S.E.I.C., B.Eng., McGill, 1951. Age 29 years, married, one child. Veteran 5½ years R.C.N. Speak and write French. One summer machine operator on punch press, screw machine. Three summers municipal engineering in surveying, design and construction of sewerage system, watermains, streets. Presently employed in railway maintenance of way. Desires position in design and construction field or in plant engineering. Available on two weeks notice. Apply to File No. 3788-W.

INSTRUMENT ENGINEER, B.Sc., Civil Engineering, 1947, M.E.I.C., P.Eng., Age 26, married. Practical knowledge of flow measurement, process control applications and instrument maintenance as well as varied construction experience. Seeks employment in field of instrumentation where hard work and initiative will lead to advancement. Apply to File No. 3789-W.

CIVIL ENGINEER, D.L.S., M.E.I.C., age 61, and too active to stay in retirement after 35 years government service, desires responsible position. Background of 37 years field engineering and administration, surveys, highway construction and design, bridges, sewage disposal, water supply, reinforced concrete structures. Would consider position as municipal engineer with town in Ontario or Maritimes or as resident highway engineer in Ontario or Eastern Province, or office engineer with private company. Apply to File No. 3790-W.

CIVIL ENGINEER, B.Sc. (Dalhousie 1948), B.E. (N.S.T.C.) 1951, S.E.I.C., age 23, married, no children. Interested in Hydro-Electric work, design and construction of reinforced concrete, steel and timber structures. Would like to work for large company with opportunity to work into managerial or administration position. Experience includes one summer with DOSCO as junior engineer, two summers with R.C.E. studying military engineering, one summer at Churchill, Manitoba, supervising construction, six months with Dyking Board in B.C. supervising construction of reinforced concrete flood box, six months R.C.S.M.E. instructing demolitions. Available on one month's notice. Apply to File No. 3791-W.

City Planner
for the
City of Vancouver, B.C., Canada

DUTIES: To be responsible to Council for the development and administration of the new City Planning Department; in conjunction with a Planning Board of civic officials, to initiate and conduct studies; to promote, supervise and coordinate the planning and technical work, with particular reference to zoning and subdivision control; to assist in formulating long-term improvement programmes and, through the above Planning Board, to act as a technical consultant and advisor on matters affecting the growth and physical development of the city.

QUALIFICATIONS: University graduation in Civil Engineering, Architecture or related field, supplemented by courses in city planning; considerable planning experience, including some supervisory responsibility; successful public relations, and administrative experience in municipal government, or an equivalent combination of training and expeience.

Salary: $7,000.00 to $9,000.00 per annum, depending upon qualifications. Apply to Personnel Director, City Hall, Vancouver 10, B.C., not later than January 31, 1952.

News of the Branches

Activities of the Thirty-five Branches of the Institute and abstracts of papers presented at their meetings

Border Cities

J. C. Aitkens, M.E.I.C.
Secretary-Treasurer

W. R. Mitchell, M.E.I.C.,
Branch News Editor

November Meeting

Responsibilties of an engineer in the industrial world were outlined on November 9 to the combined membership of the Windsor branch of the Engineering Institute of Canada and the Association of Professional Engineers of Ontario.

Guest speaker J. Herbert Smith, Toronto, vice-president of the professional association, said that it is no longer sufficient for an engineer to devote his talents to the specific things for which he is trained.

He said the engineer will continue to supply new tools, improved methods and improved designs in his own field. Above and beyond that, however, industry expects more. "It expects a broad philosophical understanding of the function of industry in our democratic economy and an active support of industry against those subversive forces which would destroy its efficiency."

To civilization and industry, the engineering mind is to contribute vision made up equally of imagination and faith, for without this quality, the engineer is blind, a capable servant, a somewhat less than automatic machine.

Mr. Smith said, that industry is today a "house" in which dwells every man and woman who is involved in any way in the development, production and distribution of goods and services. It is made up of both management and labour. It is not just a small, selfish rich and aged group of capitalists.

With this idea of industry, he said, it becomes evident that industry also includes the individual and the community. So, in applying his talents to industry, the engineer is also contributing to the social and economic well-being of the community.

Calgary

D. C. Jones, M.E.I.C.,
Secretary-Treasurer

Frank Tempest, M.E.I.C.,
Branch News Editor

First Fall Meeting October 12

The fall activities of the Calgary Branch of the Institute were inaugurated by a regular meeting held in the East Room of the Palliser Hotel. The good attendance at the meeting was indeed a compliment to the speaker, Mr. J. S. Van Camp, who is well known for his interesting talks on forestry and reforestation.

Mr. Van Camp painted a dreary picture of a future devoid of trees and rivers, and streams without a steady flow of water. He spoke of prairies and farm lands turned into a desert, or at least with little or none of the rich crops which we now enjoy. This unhappy and disastrous condition may well be an outcome of the wasteful and thoughtless destruction of our forest heritage.

The speaker pointed out the necessity of positive control of all water and forest reserves. He also stressed that a sensible management should be established of all agricultural lands to encouarge owners to protect their woodlots and forests from destruction and overgrazing by livestock.

Equally important, he said, was that every effort should be made to avoid the needless destruction of forests and brush lands by fires. These fires are usually caused by careless smokers, campers and hunters.

Timber operators should also plan their cutting operations, inaugurate a programme of reforestation, and clean up the debris resulting from their activites.

Meeting and Plant Visit

At a regular meeting of the Calgary Branch held in the West Room of the Palliser Hotel at 8.00 p.m. on October 25, 1951, Mr. E. F. J. Clarke gave a most interesting talk in connection with the Wet and Dry Process of the manufacture of Portland Cement. Illustrated slides were shown during Mr. Clarke's talk, which assisted greatly in making the process clear to the listeners.

Mr. Clarke is district sales manager for the Canada Cement Company, and thoroughly interested his audience in his subject. To be sure, however, that all members interested in the manufacture of cement could really understand the process, he announced that all members were invited to visit the Exshaw Plant of the Company where Mr. Alexander, the Plant Superintendent, had made arrangements to conduct a tour through the Plant on Saturday, October 27th.

Approximately sixty members accepted this invitation. The party assembled at the Westinghouse Company Building in Calgary at 8.30 a.m. and were assigned to automobiles provided by willing members. The party arrived at Exshaw about 10.00 a.m.

On arrival Mr. Alexander, the superintendent, welcomed the members, who formed groups of eight, each group under the supervision of various plant officials.

A complete tour of the plant was made, and the entire process of the manufacture of cement was very thoroughly explained to all groups.

After the inspection was completed Mr. Alexander invited the members to remain for lunch as guests of the Company. The invitation was readily accepted, and greatly appreciated by all the visitors, who agreed that it was a very enjoyable climax to the trip.

The Calgary Branch greatly appreciates the kindness shown by these officials on behalf of the Canada Cement Company.

Cornwall

John A. Sarjeant, Jr.E.I.C.,
Secretary-Treasurer

A. A. B. McMath, M.E.I.C.,
Branch News Editor

Cornwall Meeting October 29

Twenty-five men assembled at Howard Smith Paper Mills Limited, to hear J. R. Law, of Canadian Industries Limited. Mr. Law, being with the technical sales department of C-I-L's Paint and Varnish Division, was a very able speaker on the "Surface Coating Industry".

After tracing developments over the past 30 years, Mr. Law outlined the main ingredients in paint, with a brief description of the function of each. He then described the action of primers. Using a model of a car and part of a refrigerator for demonstration, the speaker next traced the treatment of such articles. This treatment includes surface cleaning, priming, then finishing with a baking enamel. Plans for the future include bright colours for furniture, faster air dry and heat dry products, as well as a fool-proof finish that will not blister or peel off under poor conditions.

A discussion period followed, during which Mr. Law described fire retardent paints, and a product that can be applied successfully to wet surfaces. A. S. Holder introduced the speaker, and the appreciation of the group was expressed

by R. H. Wallace. Chairman H. W. Nickerson conducted the meeting.

Meeting With President, Ottawa

To meet President Ira P. Macnab, a small group of Cornwall members travelled to Ottawa on November 8th. After an excellent dinner at the Research Council Building on Sussex Street, a large audience heard a fine address by Dr. Macnab. Earlier in the day, three members of the Cornwall executive met with the President, Dr. Wright, and members of the Ottawa executive for a luncheon at the Richelieu Club. During the afternoon, a lively discussion on Institute affairs covered such topics as a possible increase in fees, a proposal to hire a full-time editor for the *Journal*, ideas to boost meeting attendance, etc.

Chairman, B. G. Ballard, and members of the Ottawa executive were most cordial hosts during this pleasant event.

Halifax

W. E. Jefferson, m.e.i.c.,
Secretary-Treasurer

M. F. Dean, m.e.i.c.,
Branch News Editor

Smoker, November 2

On this occasion the Branch entertained the Senior Class of the Nova Scotia Technical College.

Speaker of the evening was Dr. D. J. MacNeill, vice-president of the Association of Professional Engineers of Nova Scotia, president of Nova Scotia Mining Society, and professor of geology at St. F. X. University. Dr. Cullen delivered an interesting talk on the broader aspects of the engineering profession.

The meeting was also addressed by Dr. L. F. Grant, field secretary of E.I.C., who spoke on the development of post graduate lecture courses for young engineers started in Ontario last year. The Branch chairman announced that a similar course was to be started in Halifax this winter.

After the meeting was adjourned, the students and members were served refreshments.

Hamilton

G. L. Schneider, jr.e.i.c.,
Secretary-Treasurer

Bernard Warren, jr.e.i.c.,
Branch News Editor

October Meeting

Over 200 members and guests of the Hamilton Branch of the Institute heard the inside story of "Television in Canada", on October 18, in McMaster University's Mills Library Auditorium.

Mr. J. A. Ouimet, chief engineer and co-ordinator of television for the Canadian Broadcasting Corporation was the speaker who brought the gathering of engineers up to date on progress and possibilities in the field of Canadian Television. J. T. Thwaites, manager of the research and development laboratory of the Canadian Westinghouse Company introduced him.

Because of a complete lack of priority for materials which the C.B.C.'s television branch requires, Mr. Ouimet hazarded a rough guess that it might be a year or more before T.V. broadcasting becomes an actuality.

The speaker illustrated his talk with excellent slides showing the developments which the C.B.C. has made in Toronto and Montreal; which are to be home-towns to the first Canadian stations. Everything is to be located in one building in Toronto whereas Montreal's studios will be down town with transmitter aerials on Mount Royal.

"Canadian stations, to relay American programmes, must broadcast on 525 lines as the Americans do," claimed Mr. Ouimet. In France, television is broadcast on 819 lines. One would suspect that an increase in the number of lines would provide a clearer image, as is the case in teletyped newspaper photos. This is not essentially true, however. since an increase in the number of lines is accompanied by an increase in vibration, often reducing the clarity of the image.

Giving some interesting statistics, Mr. Ouimet stated that in the U.S.A. there are fifty million receiver sets with 108 broadcasting stations. Canadians own fifty thousand sets with no broadcasting stations as yet, while France has two stations with twenty-five thousand sets in the country.

The speaker also showed a sound movie, which pictured a television programme in the broadcasting. This proved very interesting to those in attendance; and following this, there was a brisk question and answer period.

W. A. Whetan, the superintendent of the industrial engineering department of the Canadian Westinghouse thanked Mr. Ouimet for his extremely fine presentation of the case for Canadian Television.

Mr. J. S. R. Beck, chairman of the Students and Juniors Papers Committee, spoke briefly on the plans for the coming season in this important part of the Branch activities. The Annual

Papers Competition was to be held on March 20, 1952.

Mr. W. A. Dawson welcomed eight new Branch members, asking them to acknowledge their introduction. Mr. Dawson, Membership Committee Chairman for the Hamilton Branch announced that the membership of the branch stood at 430.

Panel Discussion, November

The well-attended meeting of the Hamilton Branch, held on November 15, took the form of a panel discussion, the subject being "The Purposes, Powers, and Relationship to Each Other, of the Engineering Institute of Canada, and the Association of Professional Engineers of Ontario".

Mr. W. J. W. Reid, M.E.I.C., the moderator, was recently a vice-president of the E.I.C. and was at one time president of the Association of Professional Engineers of Ontario. He is the president of the Otis-Fensom Elevator Co. Ltd., in Hamilton.

Past-president of the Engineering Institute of Canada, Mr. James Vance, M.E.I.C., presented the case for the Institute; while Mr. O. D. Johnson, president-elect of the A.P.E.O. spoke on behalf of that association.

The moderator's opening remarks dealt first with the E.I.C., its history, and its purpose, which is primarily to facilitate the exchange of knowledge. He then discussed the A.P.E.O. which is the Ontario body, with clear legal powers, dictating who can practise engineering in the Province.

Mr. O. D. Johnson, in congratulating the Branch for holding such a panel, said that there is no clash of ideas between the two organizations.

He spoke of the four basic elements common to licensing groups. These are Organization, Education, Experience, and Exclusion. Mr. Johnson traced the growth of the engineering profession from the twelfth century, when it was customary for religious orders to perform engineering works, mentioning London Bridge as an example.

He closed with the thought that even as Canada's great industrial advance is a responsibility to her engineers, so the Association of these men must be strong to help bear the responsibilities.

Mr. Vance mentioned that he was glad to be back to visit the Hamilton Branch and spoke briefly on why he was a member of the E.I.C. The Institute is an organization, national in scope, with 35 branches from Coast-to-Coast, which is not yet enough. The purpose of the E.I.C. is to meet, exchange papers and knowledge, and provide a source of organizing experience for some 500 men annually. These men are the ones directing the affairs of the Institute and its branches.

A graduate of an engineering school has greater than average opportunities; therefore he has greater than average responsibilities to society. He must do his share in community affairs and also help in the opening of Canada's great hinterlands.

In closing, Mr. Vance spoke of the advantage of the E.I.C. which enables a man to leave one community and to become much more readily established in another through the local branch of the E.I.C.

At the conclusion of the speakers remarks, a literal barrage of written questions was fired at the Moderator. These questions dealt with a diversity of relevant topics ranging from the prosecution of non-members of the A.P.E.O. practising engineering, to the system of presenting of the iron ring. A question asking what the Association was doing to help raise the standard of living of the engineer, was answered to the effect that the current publicity campaign of the Association was directed to making the public, and industry more aware of the worth of the engineer.

Formal discussion, cut off because of the lateness of the hour, was carried on informally when, after Mr. W. E. Brown, Branch councillor had thanked the panel, Mr. E. T. W. Bailey, Branch chairman adjourned the meeting in favour of donuts and coffee.

Lethbridge

R. D. HALL, JR.E.I.C.,
Secretary-Treasurer

Dinner Meeting, October

Fifty-five members and guests of the Lethbridge Branch of the Institute assembled at the Marquis Hotel on Saturday, October 20th, for the first dinner meeting of the season. P. E. Kirkpatrick presided as chairman.

Dinner music was supplied by the Brown Instrumental Trio, followed by community singing ably led by G. S. Brown and vocal selections by George Brown accompanied by Mrs. Katherine Brown.

Mr. W. L. Foss introduced the speaker for the meeting, Mr. M. W. MacDonald, P.F.R.A. resident engineer at the St. Mary Spillway. His talk covered the methods and problems encountered during the spillway construction. The spillway is a reinforced concrete structure, 335 feet wide at the crest, or inlet, consisting of 12 stop log openings 20 feet wide. In the next 400 feet of the channel narrows down to 120 feet wide, this section being called the transition section. For the next 600 feet it continues at a very gradual slope after which it drops into a chute section having approximately a slope of 2 horizontal to 1 vertical The excavation of the structure involved the drilling, blasting and hauling of 370,000 cubic yards of rock.

The excavation on the steep slope section was barely finished when the June flood came down the St. Mary river spilling over the spillway and cascading down the slope, literally eating the rock away and gouging huge holes in the surface. At this time the bridge over the crest section was being constructed and for two months the carpenters had to wade in hip deep water constructing forms and falsework.

Due to the damage done on the steep chute section the floor and walls had to be set on sleeper walls extending throughout the entire section instead of directly on the rock foundation as previously planned.

Mr. MacDonald showed slides of various phases of the work including placing concrete, excavating and depicting working conditions during the flood.

R. D. Livingstone moved a vote of thanks to Mr. MacDonald for his interesting talk.

Moncton

V. C. Blackett, M.E.I.C.,
Secretary-Treasurer

R. A. Park, M.E.I.C.,
Branch News Editor

Business Meeting and Smoker

On October 26 the Moncton Branch met at Cy's Sea Food Restaurant. The meeting was presided over by Chairman E. M. Nason.

The Chairman called for nominations for various committees and the following appointments were made: Credential Committees: G. S. Peabody, B. E. Bayne, W. T. Hargreaves; Reception Committes: The whole executive and D. H. Green (Chairman), R. A. Park; Branch News Editor, R. A. Park; Attendance Committee: L. E. Trynor (Chairman), R. R. Colpitts, K. A. Mellish, G. A. Peck, R. M. Wickwire, R. T. Sansom, G. S. Peabody.

Future meetings were announced, including a branch meeting to be held in Bathurst, N.B., in December.

In January, a paper on "Power Possibilities of the Bay of Fundy Tides" will be presented by F. S. Small at a branch meeting in Moncton. Mr. Small was the winner of the 1950 "Gzowski Medal" of the Institute.

J. Christie, superintendent of construction of the new Moncton Hospital for the George Hardy Construction Company, was a guest at the meeting and extended to the members a cordial invitation to join him for a conducted tour of the project.

Supper Meeting, October 30

The need for a broadened outlook for young engineers was stressed at an October meeting of the Moncton Branch. Guest speaker was Lieutenant Colonel L. F. Grant, of Toronto, who spoke on the "Engineers' Council of Professional Development".

The meeting was held in Cy's Sea Food Restaurant, and was presided over by E. M. Nason, chairman of the branch.

The speaker was introduced by H. J. Williamson, and spoke of the preparation of a syllabus and series of lectures for young engineers. This, Col. Grant pointed out, met the desire of young engineers to further their professional development in subjects other than engineering.

The lectures, he said, include such topics as public speaking, inflation, labour relations, letter writing and reports, salesmanship , the international situation, and economics. A question and answer session follows each of these lectures.

This programme, Colonel Grant stated, is being received with eagerness and is being adopted in centres other than Toronto, and he expressed a hope that it would spread to all branch centres.

Colonel Grant suggested that branch members undertake to contribute to branch activities, as this creates greater interest and aids in fostering self-confidence.

Continuing education, if it is only a stimulus, is a good thing, he stated.

Engineers located in out of the way districts should remain in contact with the Branches. Neighboring branches should visit them, and hold meetings in these localities.

At the conclusion of Col. Grant's remarks W. D. Stratton, vice-chairman of the Moncton branch, expressed the thanks of the gathering for the interesting address.

The chairman, Mr. Nason, announced the transfer of a number of Moncton branch members to the newly-formed Prince Edward Island branch and the gathering extended best wishes to the new organization.

It was reported also that a meeting had been held in Amherst on Monday, with the executive of the Moncton Branch in attendance. At this meeting it was decided to form an Amherst branch and the Moncton Branch extended congratulations also to this new group.

A meeting of the Moncton Branch would be held in Bathurst on December 10, Mr. Nason announced. Among those who would be in attendance at the meeting in Bathurst, he said, would be: president of the Bathurst Power and Paper Mill, Mr. Weldon; Dr. I. P. Macnab, Halifax, president of the Engineering Institute of Canada; Dr. L. Austin Wright, Montreal, general secretary of the Engineering Institute of Canada; Dr. H. W. McKiel, of Mount Allison University, and Dr. J. B. Sterling, president of the E. G. M. Cape Company.

Presidential Visit

On September 26, Moncton Branch received an official visit from the President of the Institute, Dr. Ira P. Macnab. The President was accompanied by Mrs. Macnab, Dr. L. Austin Wright, Dr. J. B. Stirling and Mrs. Stirling.

In the afternoon, the visitors and the branch executive motored to "The Hills", at Hillsboro, where they were entertained at tea by the wives of the executive. Mrs. E. M. Nason and Mrs. V. C. Blackett were convenors and Mrs. W. D. G. Stratton, Mrs. N. B. Eagles and Mrs. R. T. Sansom served.

In the evening, a dinner meeting was held in the Moncton Curling Club attended by members and their ladies. E. M. Nason, chairman of the branch, presided and introduced the president. Dr. Macnab's address was inspirational in character, a call to community service outside the bounds of the Profession. Engineering, he said, is largely responsible for civilization as we know it today. Having built it up, we must now have a hand in operating modern civilization.

The president was followed by the general secretary, Dr. Wright, who told of his recent trip to Britain and Europe where as a member of a government mission he aided in the screening of engineers who wished to come to Canada. Dr. Stirling was the final speaker.

A pleasing feature of the meeting was the presentation, by the president, of the Gzowski Medal to Mr. F. S. Small, for the best paper presented in 1950. The title of Mr. Small's paper was "A Plan for the Development of the St. Lawrence-Lachine Section".

During the course of the dinner, H. J. Williamson, in Highland costume, entertained with a number of Scottish songs.

Montreal

R. B. Wotherspoon, m.e.i.c.,
Secretary-Treasurer

Student Section

McGill Undergraduate News

The McGill Engineering Undergraduate Society is well on its way towards another successful session. Socially, a Gen Nite, the fall informal dance, and a couple of smokers, have already taken place, but the highlight of the social season at McGill is scheduled for Friday, January 11th. On that night, the celebrated "Plumbers' Ball" will take place in Sir Arthur Currie Gymnasium, and all engineers are welcome. Tickets and table reservations may be obtained from Ross Smith, PL. 2073, at five dollars a couple.

In the professional field, films, debates, and plant tours are presented regularly. A drive for new student members of the E.I.C. will take place shortly. In athletics, the Engineers are well on their way to winning the Intramural Sports Trophy again. In the recent Red Cross Blood Donor Clinic, the Engineers made a high percentage of donations.

Phi Epsilon Alpha, the honorary engineering society, has had two meetings. Guest speakers were Dean Fieldhouse, of Arts and Science, who spoke on diplomacy; and Dean O'Neill, of Engineering, who spoke on "Canada Limited or Unlimited", his presidential address to the Royal Society of Canada.

Niagara Peninsula

G. W. Ince, jr.e.i.c.,
Secretary-Treasurer

J. S. Ellis, jr.e.i.c.,
Branch News Editor

October Meeting

At the October meeting of the Branch the members were privileged to hear two excellent addresses by Dr. I. P. Macnab, president of the Institute, and by Dr. L. Austin Wright, general secretary. The meeting was held on October 29th at the Red Casque Inn.

Dr. Macnab spoke of the historical background of the engineering profession. He cited engineering accomplishments mentioned in the Bible and in Chinese and Egyptian historical works. He paid tribute to the practically-minded inventors who advanced engineering during the industrial revolution and he enumerated many of our modern achievements which have been gained during the past half century by the combined efforts of engineers and scientists. Dr. Macnab said that engineers and scientists must take a greater responsibility in the running of the modern world.

The president voiced the sound opinion that the "right to be kept" idea is killing initiative and production and that engineers should be wary lest reliance on social security lessen their desire to work industriously.

Dr. Macnab remarked on the professional status of the engineer; he lauded the efforts of the Provincial Associations for their work concerning professional status, but he deprecated any tendency of the Provincial Associations to invade the field of the voluntary societies. He stated that whereas the Associations are essentially concerned with legal problems and the registration of engineers, the voluntary societies deal mainly with engineering education, advancement of technical knowledge and social activity. The president expressed the hope that the Institute and the Associations would develop close co-operation in all provinces; such co-operation now exists in Nova Scotia and several other provinces. In concluding his address Dr. Macnab emphasized that the essentials for professional status are training and service.

Dr. Wright, the general secretary, spoke about his recent trip to Europe where he learned at first hand of the great problems which confront European engineers. Dr. Wright was asked by the Canadian Government to go overseas to screen engineers who wish to come to Canada. During his short visit he interviewed three hundred engineers in Great Britain and some two hundred on the continent. Dr. Wright urged the members of the Branch to welcome these overseas engineers and help them in every way possible.

Mr. J. Miller, branch chairman, expressed the vote of thanks to Dr. Macnab and Dr. Wright which was heartily endorsed by the members of the Branch. Following the addresses a buffet supper was served.

Peterborough

J. P. Watts, M.E.I.C.,
Secretary-Treasurer

M. V. Powell, M.E.I.C.,
Branch News Editor

First Fall Meeting, October 18

The Peterborough Branch held a smoker at the Kawartha Golf Club on October 18th. Four members gave short chalk-talks on the subject, "A Modern Hydraulic Generating Station". Mr. A. J. Bonney was chairman and the meeting was exceptionally well attended.

Mr. A. Drynan opened the discussion with a general description of a typical hydro-electric station and then discussed some of the general problems encountered in supplying suitable switchgear for it. This includes problems in connection with circuit breaker application and design, protective relaying, automatic control, automatic synchronizing and metering. Methods of obtaining reliable station service were also mentioned.

Mr. H. R. Sills commented on the various aspects that affect design of generators to best fit the power plant design. The appearance of the machines including colour schemes as well as the basic electrical and mechanical design are quite important as the power plants are the show places of the system. Some modern stations have the floor approximately flush with the top of the stator. This leaves only the upper bracket and the exciters visible and puts parts such as brushes which need servicing in an accessible position. Locating the upper bracket arms parallel to the power house saves height by allowing the shaft coupling of another machine to pass when shaft and rotor are being carried by crane. In a station of say eight machines, one machine can be shut down for short periods of repair without serious loss. Modern machines are arranged so that rotor field poles may be removed without disturbing any major parts after which stator coils may be replaced. Thrust and guide bearing parts are arranged so that they can be replaced in a matter of hours.

Mr. J. Lucas gave a brief talk on notable features of modern voltage regulators and the part they play in a modern plant. There are no moving parts and a pilot exciter is not required. An amplidyne is used in series with the exciter field to buck or boost the exciter field excitation and the forcing action thus obtained results in higher rates of response. There is no dead band and these regulators are not frequency sensitive.

The final talk was given by Mr. Forrest Rankine who described modern circuit breakers and their application in the power plant. Approximately 80 per cent of the faults are self-healing and breakers are designed to close again in 20 cycles. This means that a large percentage of line faults occur, are cleared and the circuit closed again without even a noticable flicker of light bulbs. Any pole of the breaker will operate separately and the unfaulted phases will help to hold the system together. Compressed air operating mechanisms which have a high speed of response and low inertia are used in high speed reclosing breakers.

Mr. Roy Bogle thanked the speakers and the very successful meeting closed with a buffet luncheon.

President's Visit, November

The President's official visit to the Peterborough Branch took place on November 7th. A dinner meeting was held at the Kawartha Club and later in the evening, the members attended a mixed reception at the home of Mr. H. R. Sills. The members' wives attended a dinner with Mrs. Macnab at the Empress Hotel.

At the dinner meeting, Mr. A. J. Bonney, the chairman, introduced Dr. Macnab, Dr. Austin Wright and a representative from the Belleville Branch, Mr. Charlie Lusk of the H.E.P.C. who brought greetings from the Belleville Branch. Dr. Wright brought a message from Headquarters in his usual humorous manner.

Mr. Frank Pope in introducing the president, pointed out that he was not only a successful engineer but was a distinguished native of Nova Scotia and a good citizen of Halifax, serving as chairman of the Community Chest. The theme of Dr. Macnab's address was that engineers are playing such a vital role in the world today that they must realize their responsibilities to society. He said that only after travelling across Canada, including Newfoundland, in his official capacity, had he realized that the development in our country is almost beyond belief. After seeing Arvida and its power stations, the Niagara development, the Windsor power station etc., he felt proud to be an engineer. The world would scarcely go on without engineers but we must not forget our duty as citizens also. The average student pays only 40 per cent of the cost of his education and in return, it is his duty to apply his brains and energy to serving society. The chairman thanked Dr. Macnab for his message.

It need hardly be mentioned that the main course was the traditional "Peterborough Baked Hams" served at the table. Due to the poor weather conditions, the Belleville Branch had only one representative and the dinner was not too well attended by local members, but those present enjoyed an exceptionally fine meeting.

Sarnia

G. R. McMillin, m.e.i.c.,
Secretary-Treasurer

C. M. Stewart, jr.e.i.c.,
Branch News Editor

Dinner Meeting, November

At the November dinner meeting of the Sarnia Branch, a group of over fifty engineers and their guests, the representatives of local industry, including Mayor Nelson, heard a very interesting and informative talk by Professor E. A. Allcut, head of the Mechanical Engineering Department, University of Toronto. The Professor's topic was "Air Pollution".

Air pollution by definition is the contamination of the air which results in injury to property, health or comfort. This problem is not a new one, it dates back to the 13th century when the penalty for infraction of the original law was death. The problem is most complex, depending upon the type of industry, rate of combustion, climate and topography. It may be divided into two phases: the emission rate which is the rate at which contaminants are poured into the locality, this can be controlled by local ordinances; and the rate of dispersion which controls the speed at which the contaminants escape from the area, this is dependent upon atmospheric conditions, the contaminants accumulated rather than dispersed, with the resultant loss of 20 lives. The city of Detroit has an atmospheric contaminant output of 680 tons per square mile per year, which illustrates the magnitude of the problem faced.

It is impossible to eliminate atmospheric pollution entirely, the object of these civic programmes is to reduce it to a reasonable level which is not too burdensome to industry and which meets general public approval. The best way to combat this pollution problem, is not to produce it — this can be done by proper combustion chamber design and by use of the correct amount of combustion air.

Cities which have adopted smoke abatement ordinances have found that best results are obtained by education and persuasion rather than coercion. Every offending firm is warned several times before court action is instituted. Fines may be levied on conviction, and after the third such fine a court order may be obtained which closes down the offending business for a period of time. Those cases which have gone to court in the city of Toronto have resulted in 80 per cent convictions, which indicates that the Courts are well aware of the seriousness of this problem.

This problem should be solved on the regional basis, which distributes the costs and prevents contaminants from adjacent areas from neutralizing the efforts of a locality's smoke abatement campaign.

The speaker was introduced by Mr. F. F. Dyer and thanked by Mr. C. P. Sturdee, chairman of the Sarnia Branch.

Sudbury

W. S. Black, m.e.i.c.,
Secretary-Treasurer

Dennis McKinty, jr.e.i.c.,
Branch News Editor

October Meeting at Espanola

The Sudbury Branch held its first general meeting in Espanola as guest of the Kalamazoo Vegetable Parchment Company.

Members from Sturgeon Falls and North Bay motored to Sudbury, then travelled by bus with the Sudbury members to Espanola. A well organized tour of the plant was arranged, staff members conducting groups of five on a three hour tour.

Refreshments were served before the dinner meeting in the Espanola Hotel. J. F. McCallum was in the chair for the meeting. The secretary announced that a special meeting of the branch would be held Oct. 22 at which Sudbury's civil defence director would outline the part which the branch could play in the defence organization. The next general meeting would be held Nov. 3 on the occasion of the President's visit.

The chairman introduced Mr. B. F. Avery, president of KVP, who welcomed the branch members and paid tribute to the part played in industry by engineers. Mr. R. H. Moore thanked Mr. Avery on behalf of the branch, for an outstanding visit.

Mr. D. P. Best, manager of manufacturing, outlined the history of Espanola since operations began there in 1899. The KVP taking over during the last war, rebuilt the plant, enlarging it to its present size. Mr. Best was thanked by Mr. J. S. Cooper expressing the appreciation of the group to Mr. Best.

Visit of President Macnab

The Sudbury branch was honoured by a visit from the President on November 3. Dr. Macnab and Dr. Wright met with the executive for luncheon at the Nickel Range Hotel. A post-luncheon chat was so interesting that it lasted until 5 p.m.

A general dinner meeting was held in the evening with the members entertaining their ladies. The toast to the ladies by W. F. Miller was eloquent. In replying, Mrs. Russ Eaton adequately expressed the high regard which members' wives have for the Institute.

A musical interlude featuring a male quartet was very well received.

Councillor Eaton introduced the president, paying high tribute to Dr. Macnab's contributions to engineering and to society. Dr. Macnab briefly traced the history of engineering from ancient times, pointing out the contribution of the engineer, in co-operation with the scientist, toward our present high standard of living. He outlined developments during his own engineering career up to the present time when we are entering the atomic age. In view of the tremendous forces controlled by man, he warned that engineers should devote more thought to citizenship.

Dr. Macnab expressed his belief that Canadian engineers have a definite responsibility to see that the resources of Canada are fully developed. In speaking of Canada and the future of engineering in Canada, he made everyone feel proud to be living in this great land.

C. O. Maddock thanked the president and presented him with a copper ashtray made at the Copper Cliff refinery.

The branch chairman, R. H. Moore, introduced Dr. Wright, who gave a highly interesting account of his trip to the British Isles and Europe to interview engineers who were interested in Canada. He presented facts which show the alarming shortage of engineers in Canada and the United States and pointed out the advantage to Canadian engineers of bringing new engineers to the country. He urged the members to assist these new engineers in any way possible.

Dr. Wright was thanked by R. H. Moore and the meeting was adjourned.

Toronto

F. E. Wellwood, M.E.I.C.,
Secretary-Treasurer

Junior Section

Kenneth A. Brown, Jr.E.I.C.,
Secretary-Treasurer

Field Trip, October 20

A large group of Toronto Branch Junior Members met for this season's first field trip on Saturday morning October 20th at the Toronto Stock Exchange building.

After a short talk by Mr. W. L. Somerville, the Exchange's assistant manager, in which the organization of the Toronto Stock Exchange and its operations were described, a guided tour of the building began. The first stop was the very heart of the business—the trading floor where stocks were being bought and sold for investors throughout this continent and Europe. After watching the transactions for some time, the group went to the basement and watched the mechanical recorders which tabulate transactions and send reports of sales and current quotations to brokers from coast to coast.

The good attendance at the meeting was probably due to the general interest of Junior Members in subjects of a financial nature.

Vancouver

S. S. Lefeaux, M.E.I.C.,
Secretary-Treasurer

H. T. Libby, M.E.I.C.,
Branch News Editor

Annual Meeting, November 17

Ninety-one members and guests turned out to the annual meeting of the Vancouver Branch in the Spanish Ballroom of the Hotel Georgia on the evening of November 17th. In the absence of Chairman J. E. Macdonald, who was unable to return in time from a business trip to Toronto, the meeting was conducted by Mr. S. H. deJong, vice-chairman.

After cocktails and a very enjoyable supper, the meeting was called to order. The acting chairman extended the chairman's regrets for his absence and read the chairman's report. The Branch, he explained, was completing a very active year which included some fine speaker meetings and several exceptionally good field trips, including those to Powell River and Trail. The membership was down very slightly over last year, owing to the reduction in enrolment of engineering students and student members at the U.B.C.

The following slate of officers was proposed by the nominating committee and were elected by acclamation: Chairman, S. H. deJong; Vice-Chairman, H. Libby; Executive Committee, A. Williamson, P. Frattenger, R. Maartman, W. L. Inglis, J. A. Webster; Secretary, S. S. Lefeaux; Treasurer, P. S. Jagger. Remaining as members of the 1952 Executive by virtue of their election for a two year term at the last annual meeting are E. L. Hartley and C. Scrymgeour. Sandy Walker and Chris Webb were elected joint auditors for 1952.

The meeting was honoured by the presence of Mr. Sherman Green, programme chairman of the Seattle Section of the American Society of Civil Engineers. Mr. Green said that he hoped that the Vancouver Branch and his group would be able to get together for one or two joint meetings during the coming year. Tentative plans have already been made toward that direction.

The feature speaker was Dr. W. W. Simpson, Ph.D., M.D., F.A.C.P. The topic of Dr. Simpson's address was "Medicine and Machines" and in explaining the selection of his title, he said that in reviewing in his mind how engineers and doctors could work together, he came to realize what a huge part engineers and technicians have played and are playing in the world of medicine. He then reviewed numerous pieces of apparatus employed by modern clinics for the diagnosis and treatment of numerous ailments and diseases. Dr. Lyle Trorey moved a vote of thanks which was heartily endorsed by the meeting.

E.I.C. Employment Service

The E.I.C. EMPLOYMENT SERVICE maintains a file of the qualifications and engineering experience of members who are seeking positions and a list of firms offering employment.

Through the service many members and firms have made highly satisfactory contacts. All applications are considered to be confidential unless specific instructions are received to make known the name of the person or firm concerned.

In addition to publication in THE ENGINEERING JOURNAL, *Situations Wanted* and *Situations Vacant* advertisements are published in a special bulletin which is sent out, on the first of each month, to prospective employers and employees.

These services, including classified advertisements, are available without charge. Display advertisements in the Employment Section of THE ENGINEERING JOURNAL are restricted to matters dealing with employment, and are sold at the current advertising rates.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

Report of the Royal Commission on National Development in the Arts, Letters and Sciences 1949-1951 Ottawa, Department of Public Printing and Stationery, Division of Documents, 1951. 517 pp., $3.50. (Massey report).
Royal Commission Studies. 430 pp., $3.00.

Commonly known as the **MASSEY REPORT,** this much discussed volume is now available on loan from the library, as well as the Special selected studies volume.

The object of this Royal Commission on National Development in the Arts, Letters and Sciences, was for the members to examine and make recommendations upon:

a) The principles upon which the policy of Canada should be based, in the fields of radio and television broadcasting;
b) Such agencies and activities of the government of Canada as the National Film Board, The National Gallery, The National Museum . . . methods by which research is aided . . . , the eventual character and scope . . . or activities of these agencies . . . and other matters relevant thereto.
c) Methods by which the relations between Canada with the UNESCO . . . should be conducted.
d) Relations of the Government of Canada . . . with various national voluntary bodies operating in the field . . .

Considerable discussion is devoted to the influence of the United States on our educational and cultural institutions, and to the problem of the large number of Canadians in the several professions being attracted south of the border to more attractive and more lucrative places of employment.

The film, radio, and periodical "invasion", as it is very aptly termed, from the United States, has now become a very serious consideration, and is, in many ways, undesirable for our different concept of living.

The problem of the CBC and commercial and private broadcasting is then considered, and the various problems are reviewed in part II of the Report.

Voluntary Societies, Museums, Archives, Galleries, Libraries etc., are discussed in some detail, from whence the reader continues to the world of learning, in the Universities, The Scholar and the Scientist, the Artist and writer, and the "Projection of Canada abroad".

Part II details the above questions, and includes the committee recommendations. Notes to the Chapters refer to further information in the unabridged original versions on file with the documents of the Royal Commission.

Special reports and data presented by various committees to the Commission form the eighty-three pages of Appendix.

The index, while relatively adequate, is inconsistent in its entries, and annoyingly confusing to use at times.

Selections from the special studies include twenty-eight papers, reprinted in form abridged by the authors themselves from their original manuscripts as presented to the Commission.

These are necessarily selected, as all the reprints originally prepared by Canadian specialists in all the fields concerned could not feasibly be reprinted. However, they cover a broad field, both in French and English speaking Canada, and are written by well known figures in the field of Canadian Arts, Letters and Sciences. E.K.

BOOK NOTES

Prepared by the Library
The Engineering Institute of Canada

CCH Canadian Master Tax Guide, 7th ed. Toronto, CCH Canadian Limited, 1951. 314 pp., $3.00.

This 7th edition of the Canadian Master Tax Guide is an authoritative yet easily readable presentation of the complicated Canadian tax law. The law is clearly and concisely explained in the language of the layman without the long, involved history of the legal struggles forming the background of today's tax pattern. It is based on the Income tax act, the rulings and regulations of the Department, and the decisions of the Income tax appeal board, and covers all taxes imposed by the Dominion Government.

Development of Supervisory Personnel. W. E. Fisher. Pasedena, California Institute of Technology, 1951. 36 pp., $1.00. (Industrial Relations Section, Bulleting No. 20).

It is not just a coincidence that the better-managed companies are spending a great deal of time and money in developing their management personnel at both the supervisory and executive levels. The reasons which have led top management to introduce such programs vary from company to company. The purpose of the author is to summarize the more important factors and conditions which make such action highly desirable. Emphasis is put on the selection of management personnel, and the training and development of supervisors.

Drainage and Sanitation: a practical exposition of the conditions vital to healthy buildings . . . 10th ed. E. H. Blake and W. R. Jenkins. London, Batsford; Toronto, Clarke Irwin, 572 pp., illus., $3.00.

A portion of subtitle has been included with this heading, to emphasize the very practical treatment the authors have given to their subject.

The building is considered from every aspect, i.e. environment, planning, ventilation, warming and lighting, water supply, in fact, every conceivable subject heading one could think of seems to be included among these chapter headings and sub-headings. Another useful item is page by page headings of the particular branch of the subject under consideration being treated on that page. This makes for easy and pleasant reference use.

Plans, and black and white figure illustrations throughout the book serve further to clarify the text, and there are eleven pages of index.

One would rather expect some bibliographical or reference lists to other publications on the various subjects treated necessarily cursorily in a volume of this size, but unfortunately these are completely lacking.

This 10th edition is revised by Leonard B. Gumbrell.

Executive Talent: Its Importance and Development. F. W. Pierce. Pasadena, California Institute of Technology, 1951. 31 pp., $1.00. (Industrial Relations Section, Bulletin No. 19).

This publication contains two separate papers: "Executive Talent — Its Importance and Development", by F. W. Pierce, and "Executive Development", by G. B. Corless. Mr. Pierce's paper deals with the need for management, management as becoming a profession, organization, etc. Mr. Corless' paper covers organization planning, replacements, appraisals, company courses, etc.

Introduction to the Design of Underground Openings for Defense. Colorado School of Mines. Golden, the School, 1951. 304 pp., illus., $3.00. (Quarterly of the Colorado School of mines, V. 46, N. 1, January, 1951).

The group of papers presented in this volume deal with the design and construction of underground openings subject to bomb bursts, and may be considered to be a progress report. Five of these six papers have been written by candidates for advanced degrees in mining engineering. Their purpose is to show what has been done in the field of underground openings, and to indicate the problems encountered in their construction or in the conversion of present mine tunnels.

Law of Grading for Concrete Aggregates: Investigations upon Discontinous Aggregate gradings and the Development of Laboratory techniques for Vibratory Compaction, Accelerated Curing, and Permeability. L. B. Mercer, Melbourne, the Author, 1951. 113 pp., illus. (Melbourne Technical College, Technical Paper No. 1).

The full text of this publication embraces two papers: "The Law of Grading for Concrete Aggregates", and "Gap Grading of Aggreg•es". Its purpose is to remove all mystery from the influence of aggregate grading upon concrete control, and by so doing, to conserve material supplies and save labour and materials.

Man, Society and Environment. Brian Hackett. London, Percival Marshall; Toronto, British Book Service, c1950. 316 pp., $6.00.

"The primary aim of history study should be to gain a comprehensive and accurate knowledge of the past, so as to be better able to prepare for the future;" and "The purpose of the study of history . . is not to chronicle events, but to isolate and interpret controlling tendencies".

These two quotations, taken from the preface of this volume, adequately prepare the reader for the contents which follow. History as a gradual development in civilization, of ways of living, of towns and cities, communication systems, town planning, and general aesthetic aspects of living with the emphasis on people, rather than events, form the refreshing nucleus of MAN SOCIETY AND ENVIRONMENT.

Bibliographical footnotes come pleasantly often, but not so often as to make the reading of the text heavy.

A six-page bibliography, divided into civilizations is both useful and interesting. Twenty-two black and white plates, arranged by chapter, follow this, and the usefulness of this volume is further enhanced by thirteen pages of index.

Report on the Proposed Extension of Irrigation in the Jordan Valley. London, Sir M. MacDonald and Partners, 1951. 68 pp., maps, £1 10s. 0d.

Sir M. MacDonald & Partners, civil engineers, present herewith a four-stage plan for the development and extension of irrigation in the Jordan Valley. 1) Diversion of the River Yarmuk; the proposed diversion canal would run on the east side of the Jordan plain, and would be about 70 km. long. 2) Lengthening by 26 km. of the afore-mentioned canal, so as to draw on the winter flow of the River Yarmuk. 3) Diversion of the River Jordan, which would extend area covered by stages 1 and 2. 4) Storage of the winter flow of the River Yarmuk.

Science French Course. C. W. P. Moffatt. New York, Chemical Publishing Co., 1951. 332 pp., $4.75.

The purpose of this book is to enable students, who do not have any previous knowledge of the French language, to read French scientific and technical literature. It contains a necessary minimum of grammar, and a large number of extracts carefully selected from recent scientific books and periodicals. These extracts have been taken mainly from papers in scientific journals. A wide range of subjects is covered, and the material used is of the type which the scientist is often called upon to read.

Television Tube Location Guide: Enables Preliminary Diagnosis Without Chassis Removal. H. W. Sams. Indianapolis. H. W. Sams & Co., 1951. illus.

With the help of this guide, immediate tube identification is possible. Time-consuming chassis removal are held to a minimum, while the expensive transfer of the complete receiver to the shop, with its re-installation, is frequently forestalled. Both sound and sight are used as diagnostic aids. Speedy repairs are made by referring to top chassis views showing type and function of tubes.

STANDARDS

ASTM Special Technical Publications, American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania.

No. 111—Symposium on Methods of Measuring Viscosity at High Rates of Shear. $1.35.

This symposium consists of the following three papers: "Viscosity-shear behavior of two non-Newtonian polymer-blended oils" (this method uses capillaries); "The Kingsbury tapered-plug viscometer for determining viscosity variations with temperature and rate of shear"; and "The comparison of viscosity-shear data obtained with the Kingsbury tapered plug viscometer and the PRL high shear capillary viscometer".

No. 113—Symposium on the Identification and Classification of soils. $1.65.

This publication contains five papers and a general discussion. Its purpose is to present a group of papers describing the most widely used procedures in the identification and classification of soils for engineering purposes.

British Standards, British Standards Institution, 24/28 Victoria Street, Westminster, London, S.W.1. British Standards are available from the Canadian Standards Association, National Research Building, Ottawa, Canada.

B.S. 1761:1951 — Single Bucket Excavators of the Crawler-Mounted, Friction-Driven Type. 6/-.

This new standard deals with crawler-mounted, friction-driven single-bucket excavators covering face shovels, drag lines, drag shovels, skimmers, grabbing cranes, cranes and pile drivers, the shovel or bucket capacity ratings being from ¼ to 2½ cubic yards. These excavators are illustrated and defined, and definitions of the terms used in connection with these machines are also included.

B.S. 1768:1951 — Unified Precision Hexagon Bolts, Screws, Nuts (UNC and UNF Threads) and Plain Washers — Normal Series. 3/-.

This publication relates to the Normal series of unified precision hexagon bolts, screws and nuts having Unified screw threads in a range of nominal sizes from ¼ in. to 1 in. inclusive. The tolerances prescribed are those appropriate to engineering work where a good standard of dimensional accuracy and performance is necessary. Dimensions and general re-

LIBRARY REGULATIONS

Hours

Mon., Tues., Wed., Fri. . 9 a.m. - 6 p.m.
Thursdays . . . . . 9 a.m. - 8 p.m.
(For Montreal branch meetings)
Saturdays . . . . 9 a.m. to 12 noon

Bibliographies and Literary Searches

Short subject bibliographies are compiled on request.

Extensive searches will be made at a charge of $3.00 per hour to members, and $5.00 per hour to non-members.

Please give as much detail as possible when requesting information of either type.

Borrowing and Purchasing

Books, periodicals, photostats, translation, etc. may be borrowed for two weeks at a time. **A fine of 25c. per day will be charged for each day borrowed items are retained beyond this period.**

A library deposit of $5.00 at par in Montreal is required for which two items may be borrowed at one time. Books, periodicals, etc. may be ordered by members through the library. All carrying charges are payable by the individual concerned. Except in the case of library deposits, please make **no payments in advance.**

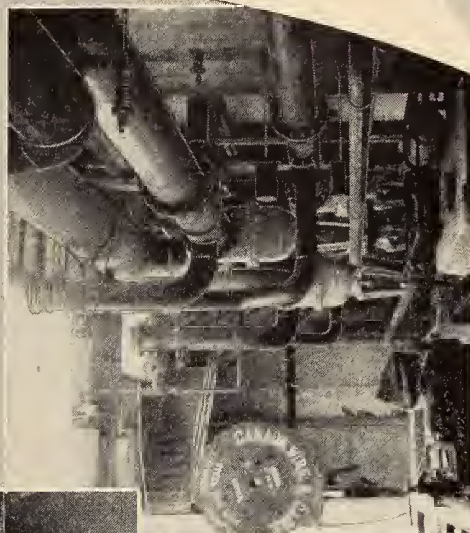
Non-members may consult the library, but may not borrow material.

FOR HIGH PRESSURE HIGH TEMPERATURE *PIPING*

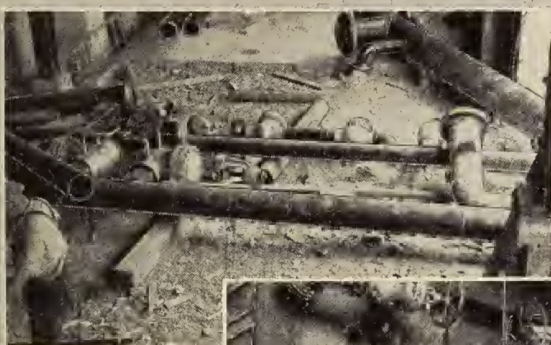
In the Power Plant of the new Columbia Cellulose Mill at Prince Rupert, B. C.

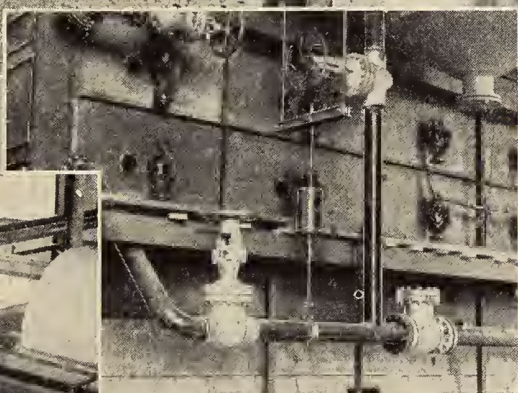
AT THE SITE—On this page ore shown some of the Crone assemblies ot the site. The photographs are unretouched and were purposely token before or during erection, when the actual equipment could best be seen before being obscured by insulation, etc.

A piping aggregation in close quarters in the turbine roam. ▶



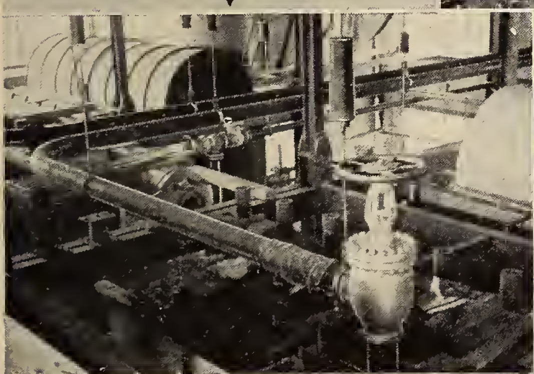
▶ Assemblies laid out ready far erection.

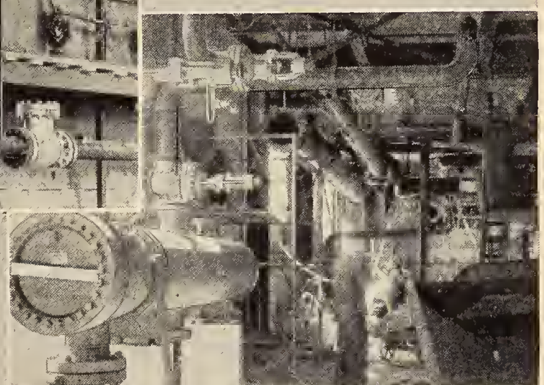




◀ Clase up af assembled units including cast steel gate and check valves.

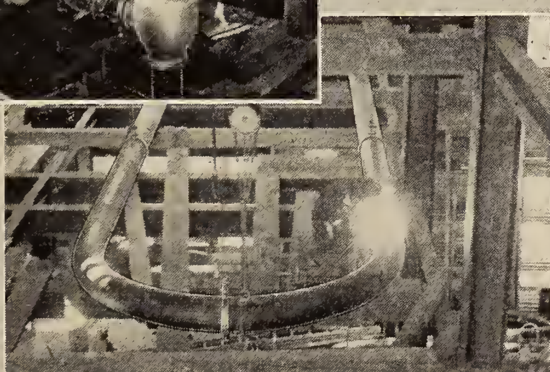
Cast steel angle valve assembly installed in positian. ▼





▲ Feed water heat exchanger and piping units under erection.

600 lb., 12" dia. main steam header expansian laap being welded. ▶



In addition to the wide variety of fabricated piping ossemblies ond volves of all kinds provided for the boiler plant, Crane Limited has also supplied the Prince Rupert mill with plumbing fixtures, drinking water coolers and many other items for which Crone has long been recognized os the dependable—"ONE SOURCE OF SUPPLY".

CRANE

CRANE LIMITED: *General Office: 1170 Beaver Hall Square, Montreal* quirements are given for hexagon bolts and screws and ordinary nuts, lock nuts, slotted nuts and thick slotted nuts.

B.S. 1769:1951 — Unified Black Hexagon Bolts, Screws and Nuts and Plain Washers — Heavy Series. 2/6.

B.S. 1769 relates to the Heavy series of Unified hexagon bolts, screws and nuts in a range of nominal sizes from ½ in. to 2 in. inclusive. The tolerances are somewhat wider than those for the Normal series. Formulae for the calculation of dimensions for bolt and screw heads and nuts in intermediate sizes and sizes larger than 2 in. are given in an appendix.

B.S. 1770:1951 — Pipe Flanges for Use on Internal Combustion Engines and Installations. 2/-.

This is a new British Standard for flanges for use on systems connected with internal combustion engines, such as: coolant systems, exhaust and induction systems, oil pipe systems. Tables of dimensions of flanges for use on a range of pipes ½ in. to 4 in. nominal diameters are included. Details of materials are also given.

B.S. 1775:1951 — Steel Tubes for Mechanical, Structural and General Engineering Purposes. 3/-.

The standard covers plain carbon steel tubes not exceeding 16 in. outside diameter, of the following types: hot finished welded, hot finished seamless, cold drawn seamless, electric resistance butt-welded, cold drawn electric resistance butt-welded, oxy-acetylene butt-welded.

Canadian Standards. Canadian Standards Association, National Research Building, Ottawa.

CSA B103.2:1951—Power Take-Off and Drawbar Hitch Locations. 50 cents.

Compliance with these specifications, in the design of power take-off drives, will enable any power take-off driven machine to be readily connected to any make of tractor. Illustrations are included.

CSA B103.3:1951 — Tractor Belt Speed and Tractor Testing Code. 50 cents.

This code applies to both agricultural and industrial tractors. It was prepared in order to establish a testing procedure resulting in uniform methods of acquiring and reporting data. Belt tests include: maximum belt horsepower test, varying load belt horsepower test, torque test. Drawbar tests include: limber-up test, maximum drawbar horsepower test, drawbar fuel consumption test.

CSA B103.4:1951 — Tractor and Implement Disc Wheels. 60 cents.

The purpose of this standard is to provide interchangeability between 15 and 16 in. agricultural implement wheels and tractor wheels. Differences in wheel diameter, offset, weight, and rim size are covered.

CSA B103.5:1951 — Marking of Plow shares. 50 cents.

This specification covers plow shares made of the following materials: soft center steel, carburized steel, solid steel, cast iron.

CSA C10:1951 — Large Incandescent Tungsten Lamps, 3rd ed. $1.75.

This publication provides a method of determining lamp quality with respect to physical characteristics, efficiency, lumen maintenance, life performance, etc.; it also provides tables of dimensions and of electrical and photometric characteristics.

The following book notes appear here through the courtesy of the Engineering Societies Library of New York. The books may be consulted at the Institute Library.

ASTM Standards on Rubber Products (with Related Information). Philadelphia, American Society for Testing Materials, 1951. 640 pp., illus., $5.00.

Of interest to both producers and consumers of rubber products, this special compilation includes 100 standard and tentative test methods and specifications on rubber and rubber-like materials. Among the tests covered are processibility tests, physical and chemical tests of vulcanized rubber, aging and weathering tests, low-temperature and electrical tests. Specifications are given for such items as automotive and aeronautical rubber, hose and belting, tape, electrical protective equipment, etc. Emergency alternate provisions to the specifications are included.

Algebra of Vectors and Matrices. T. L. Wade. Cambridge, Addison - Wesley, 1951. 189 pp., illus., $4.50.

Elementary expository presentation of matrix and vector algebra, use being made of basic concepts of modern algebra, i.e., group integral domain, field, ring, basis, dimension, and isomorphism concepts; book serves as prerequisite for work in matrix and tensor calculus and is intended for students, engineers, statisticians, psychometricians and other scientists.

Diesel Engine Catalog, Volume 16, 1951, Los Angeles, Diesel Engines, Inc., 408 pp., illus., $10.00.

Presents detailed descriptions of American Diesel engines, equipment and accessories. All types are covered, including two- and four-cycle and dual fuel, for stationary, automotive or marine use. A classified buyers' guide of engines and accessories is provided. As usual the new edition has been revised to include new designs developed during the intervening twelve months.

Elementary Problems in Engineering. H. W. Leach and G. C. Beakley. Toronto, Macmillan, 1951. 269 pp., illus., $3.50.

The subject matter and problems have been selected to bridge the gap between high school and college levels. Sections are included on slide rule manipulation, logarithms, elementary trigonometry, motion equations, and basic principles of mechanics to parallel and supplement the first year college courses in algebra, trigonometry, engineering drawing, chemistry and shop work. The problems are designed to illustrate basic principles and to stimulate interest through engineering applications.

Fuel Oil Manual. P. F. Schmidt. New York, Industrial Press, 1951. 160 pp., illus., $3.50.

Intended for both the seller and user, this manual provides a working knowledge of the characteristics of fuel oil and guidance in its effective use. A chapter is devoted to each of the various important properties with information concerning its relation to the selection, handling and burning of the oil. Impurities, standard treatments, transportation and storage are covered. The presentation has been kept as simple as possible, with a minimum of technical explanation and terminology.

Galvanizing (Hot-Dip). H. Bablik, translated by C. A. Bentley, 3 ed. London, Spon. 1950. 502 pp., illus., 70s.

The first third of this standard work deals successively with the characteristics of scale, pickling theory and practice, and fluxes. The remainder of the book provides a detailed treatment of galvanizing theory and practice. Diagrams and photographs are used extensively to illustrate the practical aspects of the operations covered.

Hot-Working of Non-Ferrous Metals and Alloys. Institute of Metals Monograph and Report Series, No. 9. London, Institute of Metals, 1951. 208 pp., illus., $2.50.

The monograph consists of eight papers, with discussion, reprinted from the Journal of the Institute of Metals, which formed a symposium on the subject. In these papers the metallurgical aspects of hot working, its applications, and problems encountered in its processes are generally discussed. The metals dealt with are aluminum, magnesium, copper, tin, lead and zinc.

Irrigation Engineering, Volume I, Agricultural and Hydrological Phases. I. E. Houk. New York, Wiley; London, Chapman, 1951. 545 pp., illus., $9.00.

Engineering aspects are emphasized in this comprehensive work which presents basis principles, facts and practice. Special attention is paid to recent advances in such subjects as soil moisture, runoff forecasting, quality and constituents of irrigation water, and improved methods of applying water. Variable factors involved in irrigation work are discussed. Pertinent technical and statistical data are quoted extensively throughout the book. Project planning and structures are presumably to be dealt with in a separate volume.

Nature of Polyphase Induction Machines. P. L. Alger. New York, Wiley; London, Chapman, 1951. 397 pp., illus., $9.15.

The first three chapters of this text give familiar principles of analysis of circuits and magnetic fields. The next three include material on induction machine analysis, including design characteristics. In the following four chapters there is a good deal of new information on the calculation of resistance, torque relations, and magnetic noise. The rating and application of polyphase induction motors are discussed, and the final chapter explains Kron's generalized method of analysis and applies it to the solution of various induction machine problems.

Preparation of Programs for an Electronic Digital Computer. M. V. Wilkes, D. J. Wheeler and S. Gill. Cambridge, Addison-Wesley, 1951. 167 pp., illus., $5.00.

This book contains a detailed description of the library of subroutines used in the Mathematical Laboratory of the University of Cambridge in England in conjunction with the EDSAC (Electronic Delay Storage Automatic Calculator) and of the way in which programs can be constructed with its aid. Considers the best way to construct subroutines for numerical quadrature, the integration of differential equations, and other processes, but omits more theoretical problems in numerical analysis.

Principles of Electrical Engineering. W. H. Timbie, V. Bush and G. B. Hoadley. 4th ed. New York, Wiley; London, Chapman, 1951. 626 pp., illus., $8.25.

Written for electrical engineering students, this book is intended as a text for a first course on the basic principles upon which modern electrical engineering rests. Some of the more important topics and methods stressed in this fourth edition are: advanced methods for analyzing electric and magnetic problems, powerful methods of circuit analysis, the fundamental problems of the electric and magnetic fields and the relation of these problems to circuit analysis.

Restless Universe. M. Born. New York. Dover, 1951. 315 pp., illus., $4.95.

Intended to provide the layman with a simple, yet consistent, account of modern physics, this book deals with the nature and action of gases, with atoms, electrons, and ions, with wave mechanics and particles, and with the laws and developments of nuclear physics. Specially designed illustrations are included. In this new edition a "postscript" has been added discussing at considerable length the interaction between politics and science.

Soil Testing for Engineers. New York, Wiley; London, Chapman, 165 pp., illus., $6.25.

Filling a need for a text for the teaching of soil testing in the laboratory, this book is also of value as a reference for practising engineers and for personnel in soil laboratories. Following an introductory chapter on general laboratory procedures are chapters devoted to the individual laboratory soil tests which are commonly employed. Apparatus, supplies, recommended procedures, discussion of procedure, calculations, results, and numerical examples are provided for each test. Brief derivations of formulas and explanations and discussions of calibration procedures and special techniques are given in the appendix.

Thermodynamics of Irreversible Processes. S. R. de Groot. New York Interscience Publishers; Amsterdam North-Holland Publishing Co., 1951 242 pp., illus., $4.00.

A review of the thermodynamic aspects of a recently developed macroscopic theory of irreversible processes based substantially on non-equilibrium thermodynamical function. The first two chapters give an introduction to the various treatments of irreversible processes and an account of the foundations of thermodynamic theory. In the following seven chapters a number of examples covering important applications in physics and chemistry are treated. In conclusion certain general questions are considered from a more advanced point of view.

Vibration and Shock Isolation. C. E. Crede. New York, Wiley; London, Chapman, 1951. 328 pp., illus., $6.50.

This book is written to provide the practising engineer with a rigorous, yet practical, reference work on the design and application of resilient mountings. It is concerned with the basic mechanics of isolation and includes practical discussions on the design and application of isolators. Chapter 1 is devoted to basic mathematical and physical concepts; chapters 2 and 3 to fundamental principles of vibration and shock isolation; chapter 4 to non-linear and damped systems, practical aspects of damper design, and sound isolation; chapter 5 to the properties of materials used as isolators and to the design of isolators that employ these materials; the last chapter discusses many specific applications of isolators, both industrial and military.

BOOKS RECEIVED

Advanced Treatise on Physical Chemistry. V. 2: The Properties of Liquids J. R. Partington. Toronto, Longmans Green, c1951. 448 pp., illus., $9.00.

Astronomy of Stellar Energy and Decay. Martin Johnson. New York, Dover, n.d., 216 pp., illus., $3.50.

Basic Electrotechnics. B. L. Goodet. Toronto, Longmans Green, c1951. 247 pp., illus., $4.20.

British Electricity Authority. Third Report and Statement of Accounts for the Year Ended 31st March, 1951. London, H.M.S.O., 1951. 239 pp., 8s.

CCH Canadian Sales and Excise Tax Guide. Toronto, CCH Canadian Limited, 1951. 240 pp., $2.00.

Canadian Oxford Atlas. Ed. by Clinton Lewis and others. Toronto, Oxford University Press, 1951. 116 pp., illus., $7.50.

Canadian Woods: their Properties and Uses. Ottawa, Department of Forestry, c1951. 368 pp., illus., $3.00.

Electroplating and the Engineer. Alan Whittaker. Manchester, Emmott, c1951. 87 pp., illus., 4s. (Mechanical World Monograph, No. 64).

Engineering Profession. 2nd ed. T. J. Hoover and J. C. Fish. Stanford, California, Stanford University Press, c1950. 486 pp., $7.50.

Highway Research Board Proceedings of the Thirtieth Annual Meeting, Washington 1951. Ed. by R. W. Crum and others. Washington, the Board, c1951. 532 pp., illus., $7.50.

Industrial Furnaces. V. 1, 4th ed. W. Trinks. New York, Wiley, c1951. 526 pp., illus., $12.50.

Introduction to the Gas Turbine. D. G. Shepherd. Toronto, Longmans Green, c1950. 387 pp., illus., $5.30.

Mechanical Engineers' Handbook, 5th ed. L. S. Marks ed. Toronto, McGraw-Hill, 1951. 2,236 pp., illus., $19.75.

Rockets, Missiles, and Space Travel. Toronto, Macmillan, 1951. 436 pp., illus., $5.95.

Stateman's Year-Book: Statistical and Historical Annual of the States of the World for the Year 1951, 88th Annual Publication. S. H. Steinberg, ed. Toronto, Macmillan, 1951. 1,624 pp., maps, $7.50.

Tables of the Exponential Function e^x. Washington, U.S. Department of Commerce, National Bureau of Standards, 1951. 537 pp., $3.25. (Applied Mathematics Series, No. 14).

Technology of the Machine Shop. H. C. Town. Toronto, Longmans Green, c1951. 366 pp., illus., $4.20.

U.S. National Bureau of Standards, Annual Report. Washington, the Bureau, 1950. 109 pp., illus., 50 cents. (Miscellaneous Publication, No. 20).

Year Book of the Heating and Ventilating Industry. London, Technitrade Journals Ltd., 1951. 284 pp., illus., 8/-.

TECHNICAL BULLETINS RECEIVED

American Concrete Institute. Standards:

No. 318-51 — Building code requirements for reinforced concrete. No. 617-51 — Specifications for concrete pavements and bases. No. 805-51 — Recommended practice for the application of mortar by pneumatic pressure. No. 616-49 — Recommended practice for the application of Portland cement paint to concrete surfaces. No. 604-48 — Recommended practice for winter concreting methods. No. 711-46 — Minimum standard requirements for precast concrete floor units. No. 714-46 — Recommended practice for the construction of concrete farm silos. No. 613-44 — Recommended practice for the design of concrete mixes. No. 704-44 — Specification for cast stone. No. 319-42 — Recommended practice for the use of metal supports for reinforcement. No. 614-42 — Recommended practice for measuring, mixing and placing concrete.

American Standards Association. Standards (Prepared by American Standards Association under American Welding Society Sponsorship):

No. Z49.1-1950 — Safety in electric and gas welding and cutting operations.

American Water Works Association. Tentative Standard Specifications:

No. 5W1.70-T, 1950 — Powdered activated carbon.

Bituminous Coal Research, Inc. Aids to Industry:

No. 500-300 — Application of overfire jets to prevent smoke from stationary plants. (Revision of Technical Report, No. 7).

British Society for Research in Agricultural Engineering. Agricultural and Horticultural Engineering Abstracts: v. 2, No. 1, Spring 1951. V. 2, No. 2, Summer 1951.

. . . Reports on tests:

No. RT/50069 — Templewood mark 1 grass drier. No. RT 37/50054 — The Ford-Ransome 3-furrow mounted plough. No. RT 38/50072 — Wolseley bell shape electric fencer and strip grazing equipment. No. RT 40/50049 — Hanomag KV50 tracklaying tractor. No. RT 42/50086 — Scotmeg hammer mills. No. RT 43/50067 — "Savu" 2-row potato planter. No. RT 44/51003 — Barford Atom tractor and equipment. No. RT 45/51022 — Hedge cutting machine "The Bomford Hedge-Maker". No. RT 46/51026 — Ferguson tractor model TE-A20 (85 mm. bore petrol engine). No. RT 47/50005 — Twose mounted fertilizer distributor. No. RT 48/51016 — The N.I.A.E. prototype one-way two-furrow mounted plough.

. . . Reports:

No. CS. 8/1178 — The Willet and Robinson dust gun. No. C.S. 9/1194 — Electrically heated grass dryers with low specific consumption. No. C.S. 10/1187 — Equipment for fertiliser placement with (a) potatoes planted by hand and (b) row-crops, grown on the flat and in ridges.

Canadian Construction Association. Membership Rosters: July 1, 1951.

Civil Engineering Codes of Practice Joint Committee. Civil Engineering Code of Practice:

No. 1-1950 — Site investigations. No. 5-1950 — Drainage (sewerage).

Institution of Structural Engineers. Reports:

First report on prestressed concrete.

. . . Year Book and List of Members: 1951, corrected to 1st August, 1951.

Quebec Streams Commission. Annual Report. No. 39 — 1950.

Tin Research Institute. Reprints:

Electrodeposited tin-nickel alloy coatings. Electrodeposition of bright tin-nickel alloy plate.

U.S. Bureau of Mines. Information Circulars:

No. 7610 — Tunnel construction by peripheral sawing at the Fort Randall reservoir, Pickstown, South Dakota, by W. E. Lewis. No. 7614 — Froth-flotation practice in coal-preparation plants of western Europe and Great Britain, by B. W. Gandrud and others. No. 7615 — Roof bolting and dust control, by James Westfield and others.

. . . Reports of Investigations:

Oil-shale operations in New South Wales, Australia, by A. J. Kraemer and H. M. Thorne.

U.S. Highway Research Board. Bulletins:

No. 39 — Precasting highway bridges and structures.

U.S. National Bureau of Standards. Building Materials and Structures Reports:

No. 125 — Stone exposure test wall. No. 126 — Self-siphonage of fixture traps.

PAMPHLETS RECEIVED

Housing Progress Abroad . . . France, Belgium and Norway: a quarterly Review. V. 6, No. 2, June 1951.

Ottawa, Central Mortgage and Housing Corporation.

Office Library of an Industrial Relations Executive. Helen Baker and H. C. Benjamin. Princeton University, 1951.

Underwriters' Laboratories in Canada — A Step Toward Canadian Self-Sufficiency. E. F. Tabisz. 1951.

★ Completely flexible and adaptable to rapidly changing traffic conditions.

★ Sectionally-built . . . all parts interchangeable without special fittings.

★ Keeps replacement parts inventory to a minimum.

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Long-range, high-intensity lens provides clear and unmistakable attention-demand signals in all kinds of weather . . . Special super-brilliant parabolic reflector of silver-coated clear pot glass . . . Exceeds standards of Institute of Traffic Engineers.

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1049-4

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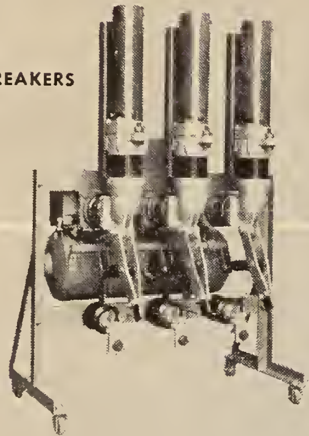
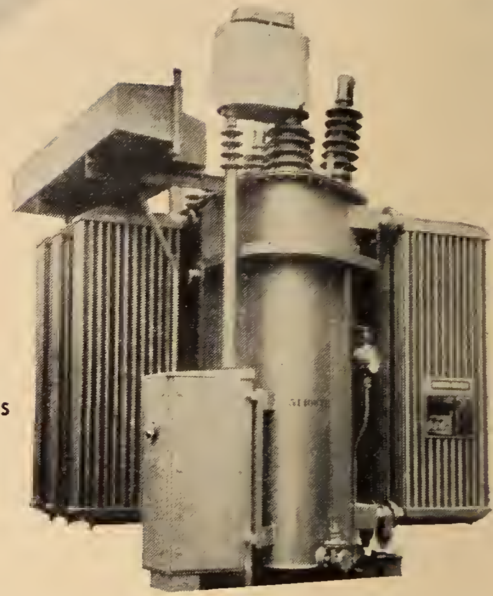


AIR-BLAST
CIRCUIT-BREAKERS



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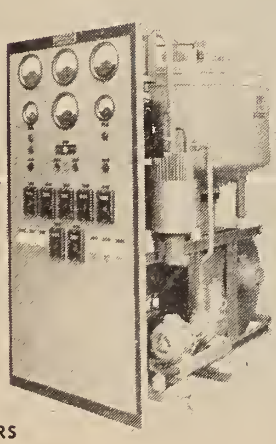
...power equipment for every industry!

Brown Boveri manufactures a wide range of equipment for the generation distribution and application of power. In the near future, airblast breakers, switchboards, power and distribution transformers will be produced in Brown Boveri's new plant at St. Johns, Que.

Behind every Brown Boveri product stands more than 60 years of research and worldwide experience. This, plus Brown Boveri's unexcelled service, is your guarantee of modern power equipment engineered for long life and low operating cost.

Specialized Engineering and Service at your disposal in Canada.



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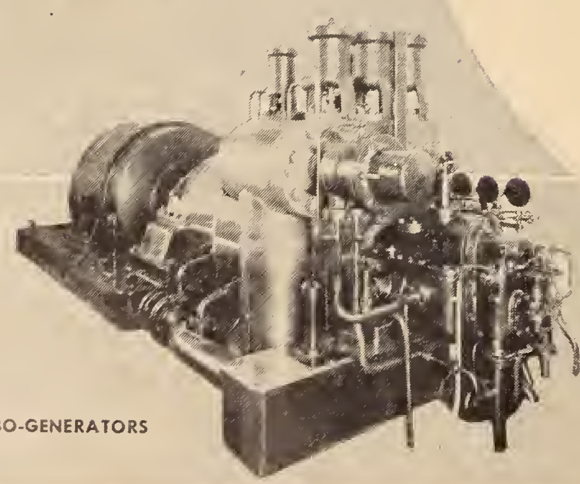
Mine Equipment Co. Ltd.,
Kirkland Lake, Ont.

Gordon Russell Ltd.,
Vancouver, B.C.



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another Canadian industry . . .

boilered by BABCOCK

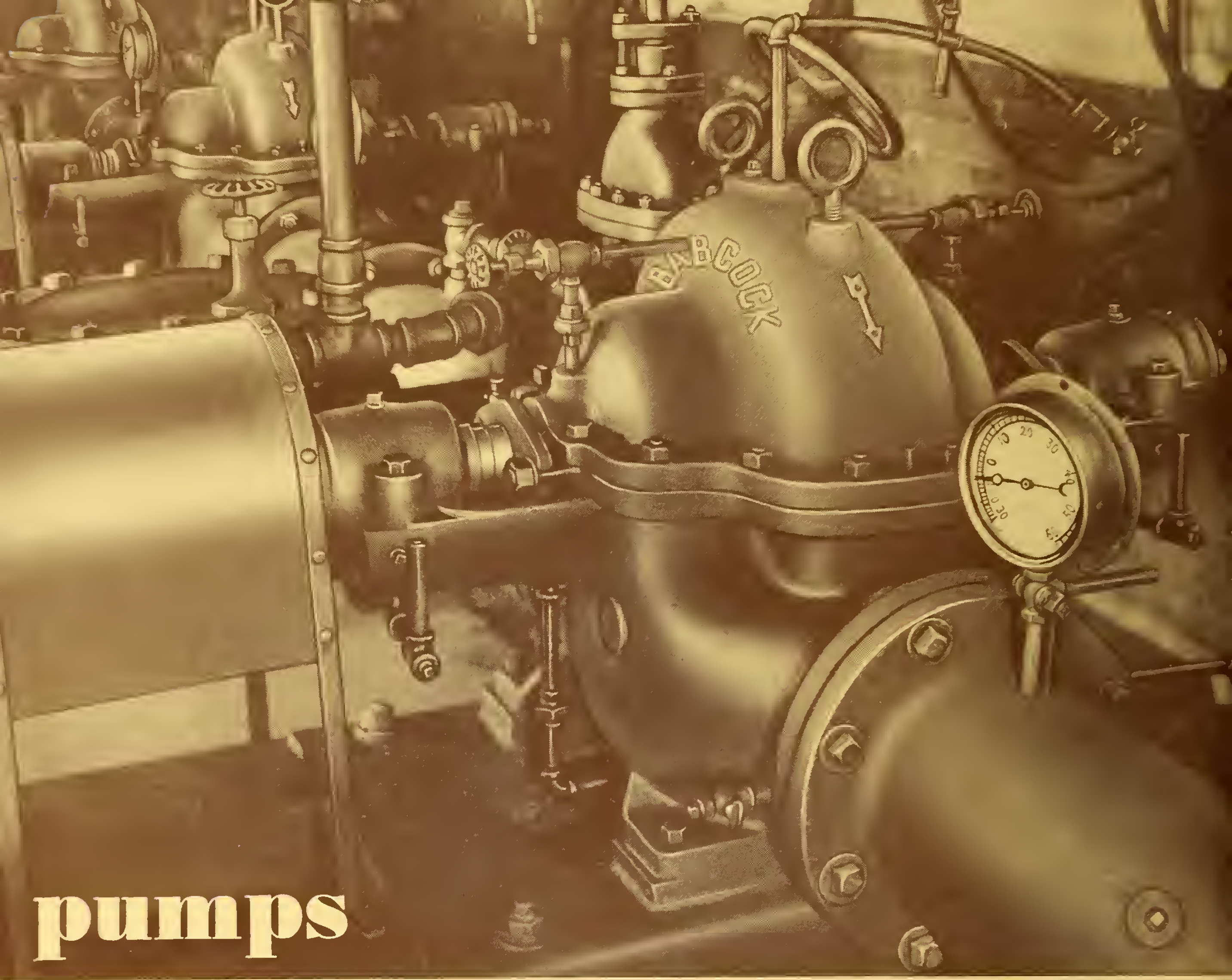
Hamilton By-Product Coke Ovens Ltd., Hamilton, Ontario, employ Babcock boilers to help guarantee 24-hour delivery of their products.

The latest addition to the Babcock boilers on their line is a type "G" "INTEGRAL-FURNACE" boiler, delivering 15,000 lbs. of steam per hour super-heated to 550 degrees total temperature. This is fed by a Style 33 Chain-grate stoker and is designed to burn "Coke Breeze". Maintaining a constant steam pressure over long periods of time and subject to the extreme abrasiveness of the "Breeze", the boiler and stoker are required to give very exceptional service. That this company re-invests in Babcock equipment shows the confidence that the installation has developed.

BABCOCK-WILCOX & GOLDIE-McCULLOCH
GALT LIMITED ONTARIO
MONTREAL TORONTO CALGARY VANCOUVER

See other side for further details of this installation.

BABCOCK
"INTEGRAL-FURNACE"
BOILERS



Business & Industrial Briefs

A Digest of Information received by The Editor

Appointments and Transfers

Toronto Iron Works.—The Toronto Iron Works Limited has announced the appointment of G. E. Ellsworth as president and general manager and D. A. Y. Colquhoun as assistant general manager. Mr. Ellsworth was formerly vice-president and assistant general manager. He replaces T. F. Rahilly, who remains a director of the Company. Mr. Colquhoun has been with the Company for twenty-five years and was formerly chief engineer.

K. J. Farthing.—K. J. Farthing, formerly sales promotion manager of Canadian Westinghouse Co. Ltd., has been appointed manager, general advertising department. He will take charge of all company advertising activities including general, radio and television.

New John Inglis President. — At a meeting of the board of directors of John Inglis Co. Limited, held on November 15th, Major James E. Hahn resigned as president of the Company and as chairman of the board, English Electric Company of Canada Limited. He is succeeded by Humphrey B. Style, who was connected with the Montreal Engineering Company for eight years as general manager of the Bolivian Power Company. Mr. Style was chief executive officer of the Brazilian Traction, Light and Power Company in Brazil from 1940 to 1945.

Alaska Pine Appointments.—Five new appointments, within its woods division, are announced by Alaska Pine and Cellulose Limited.

Superintendent of log production is George Percy, who will make his headquarters in Vancouver. T. K. Huddart has been named logging development superintendent and Walter Bowden, chief logging engineer. In an affiliated company, Western Forest Industries, J. G. Stothers has been appointed resident manager and Gordon Dods logging superintendent.

Russell J. Barrett

J. G. H. Banks

R. J. A. Behan

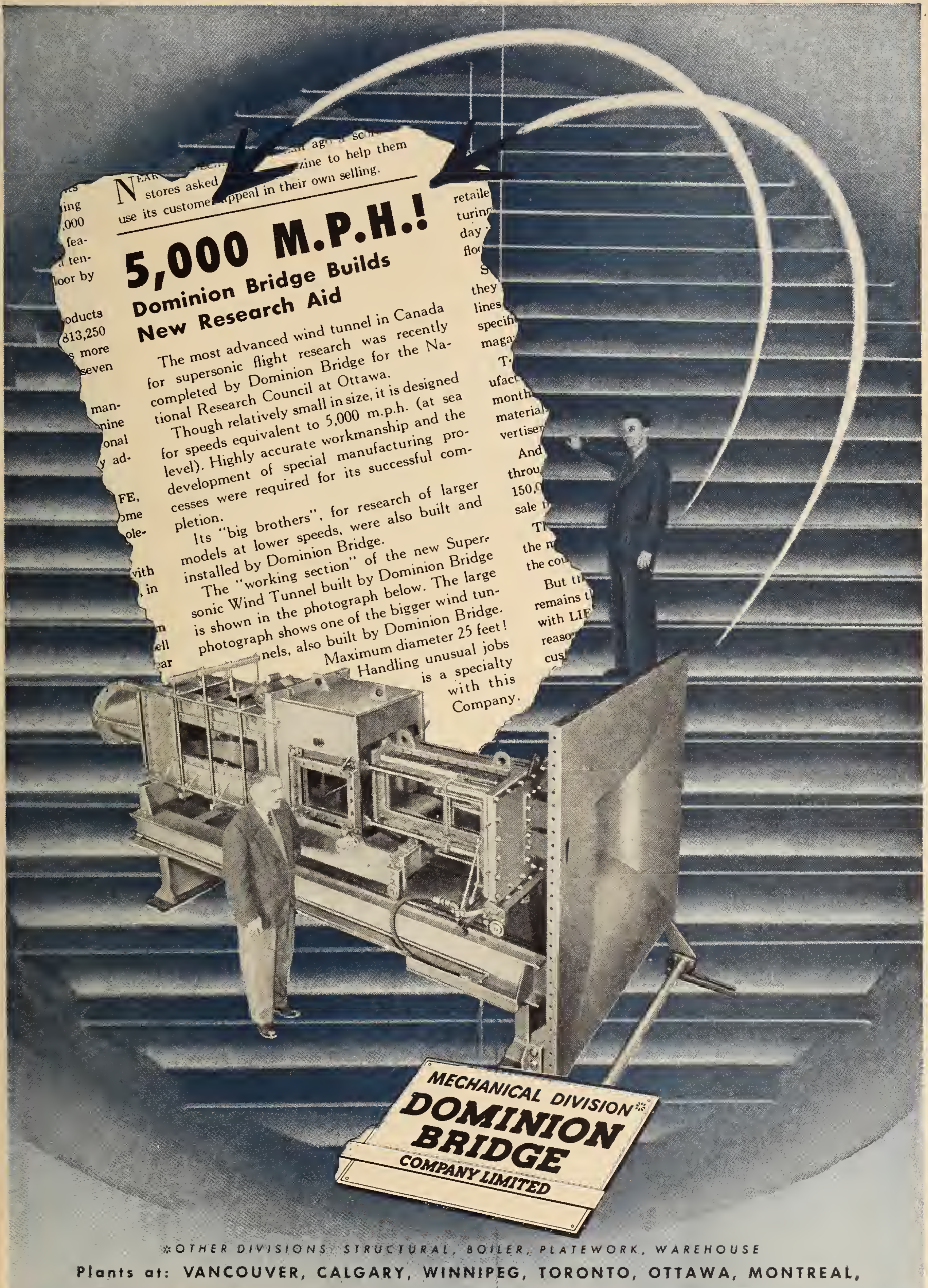
R. J. Barrett.—Russell J. Barrett has been appointed vice-president and assistant to the president of Dominion Engineering Works Limited.

Defence Production. — Kenneth O. Grant has succeeded J. M. Cochrane in the directorship of the mechanical transport division of the Department of Defence Production. Mr. Grant has been deputy director of the Division since July. Both Mr. Cochrane and Mr. Grant have been loaned to the Department by the Ford Motor Company of Canada.

English Electric Appointments.—The English Electric Company of Canada Limited recently appointed two new members to its head office sales staff—R. J. A. Behan and J. G. H. Banks. Both men come to the Canadian firm from the English Electric Company of Great Britain.

Mr. Behan has joined the Canadian organization as a fuse and fusegear specialist. Mr. Banks will serve on the staff in the capacity of industrial drive specialist.

Mr. Behan will have duties in connection with the Canadian Standards Association, and other approval agencies, and he will assist the head office staff on the technical and commercial sides of N.R.C. fuses and associated equipment. Mr. Banks will work directly with the Company's district sales office where first hand assistance is necessary in discussion with customers, and will keep the Company's staff up to date on the latest developments in electrical apparatus in his field.


5,000 M.P.H.!
Dominion Bridge Builds New Research Aid
The most advanced wind tunnel in Canada for supersonic flight research was recently completed by Dominion Bridge for the National Research Council at Ottawa.
Though relatively small in size, it is designed for speeds equivalent to 5,000 m.p.h. (at sea level). Highly accurate workmanship and the development of special manufacturing processes were required for its successful completion.
Its "big brothers", for research of larger models at lower speeds, were also built and installed by Dominion Bridge.
The "working section" of the new Supersonic Wind Tunnel built by Dominion Bridge is shown in the photograph below. The large photograph shows one of the bigger wind tunnels, also built by Dominion Bridge.
Maximum diameter 25 feet!
Handling unusual jobs is a specialty with this Company.
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DOMINION BRIDGE
COMPANY LIMITED
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Plants at: VANCOUVER, CALGARY, WINNIPEG, TORONTO, OTTAWA, MONTREAL,
Assoc. Companies at: EDMONTON, SAULT STE-MARIE, QUEBEC, AMHERST, N.S.

T. S. McCrae.—Thomas S. McCrae has been appointed general manager of Avro Canada's Gas Turbine Division. Mr. McCrae is a well-known aero-engine engineer.

●

J. A. I. Kidd.—J. A. I. Kidd is now manager of the application engineering division of Canadian General Electric Company's Supply Department.

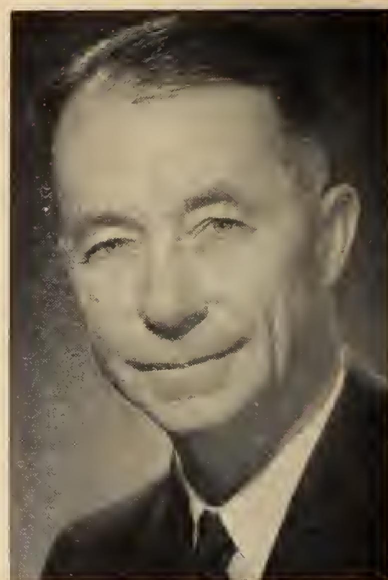
In 1946 he was appointed manager of the exterior lighting section of the Company and, five years later, was made assistant manager of the application engineering division.

●

Naugatuck Chemicals.—James C. E. Fuller has been appointed sales representative of industrial chemicals, for Naugatuck Chemicals, Elmira, Ont., division of Dominion Rubber Company Limited.

Edward W. May has been appointed sales representative of industrial chemicals, for Naugatuck Chemicals, Elmira, Ont., division of Dominion Rubber.

●



D. McColl

Don McColl.—Don McColl has joined the staff of C. D. Schultz and Company Limited, 811 West Hastings Street, Vancouver, B.C., in the capacity of logging and logging management consultant. Mr. McColl was formerly logging manager for the H. R. MacMillan Export Company Limited.

●

J. G. MacDougall.—J. Gordon MacDougall has been appointed Ontario sales engineer for Conveyancer Fork Trucks (Canada) Ltd. of Toronto. He was formerly with the industrial publication division of the MacLean-Hunter Publishing Company Limited.

●

J. S. O'Leary.—J. S. O'Leary has joined the chemical division of the Davenport (Toronto) Works of Canadian General Electric Co. He will be responsible for application engineering, with particular reference to synthetic wire enamels and insulating materials.

●

H. C. Rosenberg.—Dearborn Chemical Company, Limited, Toronto, has appointed Dr. Henry C. Rosenberg to its research staff.

●

Firm Name Changed.—The firm formerly known as Sir George Godfrey & Partners (Canada) Limited has been changed to Godfrey Engineering Company Limited.

This Company designs and manufactures aircraft pressurization and cooling equipment, aircraft ground servicing equipment, industrial blowers and vacuum pumps and other specialty engineering work. The head office and plant are located at Lachine, Quebec.

●

Defence Production. — Major-General A. E. Macrae, C.B., O.B.E., has been appointed director of the Gun Division, Production Branch, of Defence Production. He succeeds I. F. McRae whose services were temporarily loaned to the Department by the Canadian General Electric Company to organize the gun division. Mr. McRae is returning to C.G.E. to resume his former duties.

●

E. W. Hollingum.—E. W. Hollingum has been named manager of the Montreal District of General Electric X-Ray Corporation Limited. He will be located at the Company's offices at 5525 Western Avenue, Montreal.

Mr. Hollingum has been associated with the x-ray industry for thirty-five years, most recently as regional manager of G.E. X-Ray Corporation's coast-to-coast organization in Canada.

●

A. Locke

J. M. Martin

Saguenay Power Co.—Alton Locke has been appointed manager and J. M. Martin, treasurer of the Saguenay Power Company Limited. Prior to his appointment as manager Mr. Locke was superintendent of properties and assistant secretary and treasurer of the company.

•

K. V. Lindell.—Karl V. Lindell has been appointed vice-president of Canadian Johns-Manville Company Limited and general manager of the Company's asbestos fibre division.

In his new position as general manager of the asbestos fibre division, Mr. Lindell succeeds Mr. Fisher, who in addition to being president of the Company, has been acting as general manager of this division. Mr. Lindell will make his headquarters in Asbestos, Que.

•

John M. Craig.—John M. Craig, assistant to the works manager, has been transferred from General Motors Diesel Limited to the Company's electro-motive division at La Grange, Ill. His successor in Canada has not been named. The move is in accordance with the Company's policy to eventually have all key positions filled by Canadians.

•

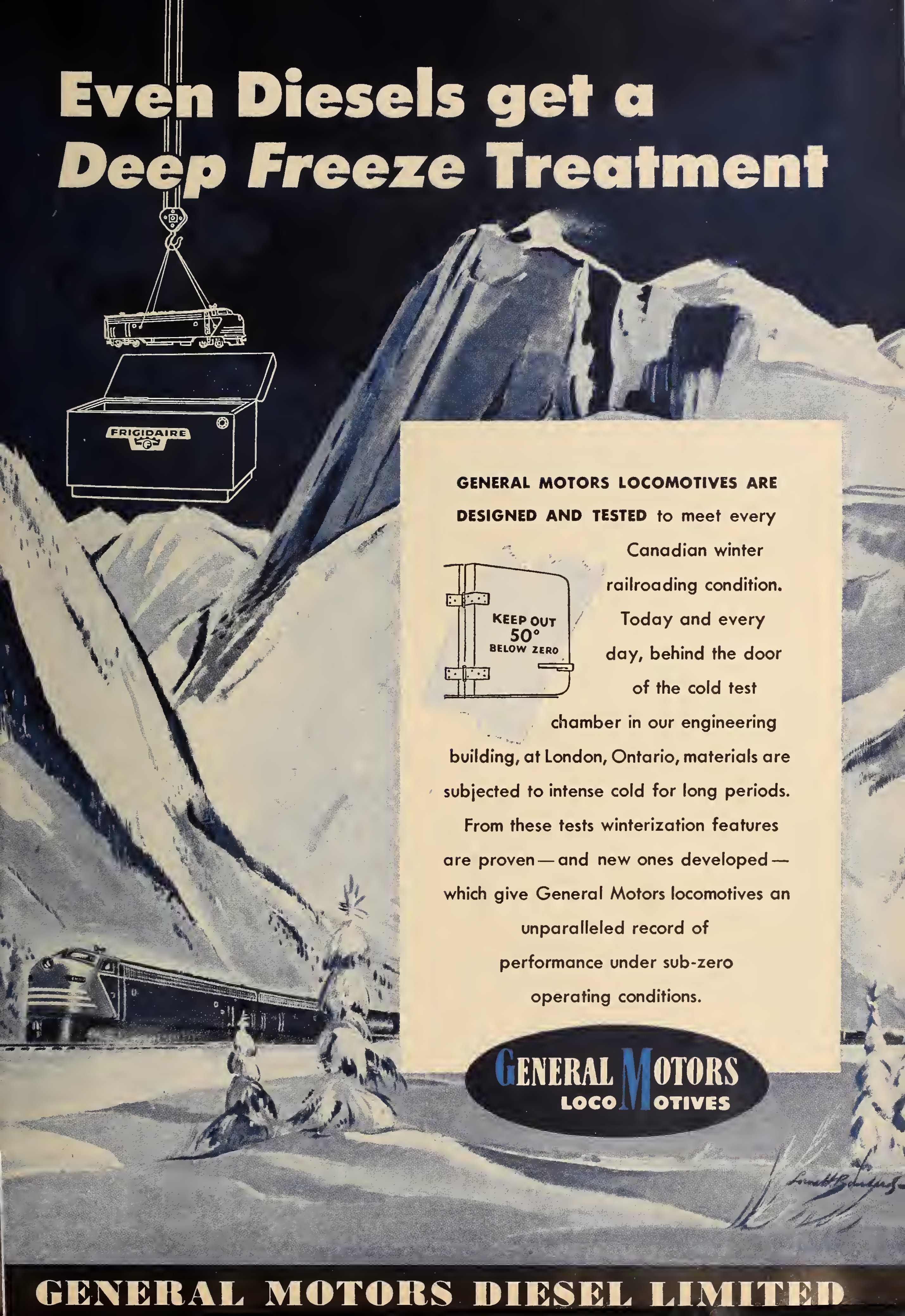
C-I-L Purchasing Appointment.—C. R. Asher has been appointed assistant general purchasing agent of Canadian Industries Limited.

•

Canadian Locomotive Appointment.—F. Weiffenbach has been named vice-president in charge of manufacturing of Canadian Locomotive Company, Limited, Kingston. He succeeds J. J. Jarrell who has retired following forty-five years of service with the Company.

Mr. Weiffenbach brings to his new position wide experience in the engineering and manufacture of Diesel products.

•


Even Diesels get a
Deep Freeze Treatment
FRIGIDAIRE
GENERAL MOTORS LOCOMOTIVES ARE DESIGNED AND TESTED to meet every Canadian winter railroading condition. Today and every day, behind the door of the cold test chamber in our engineering building, at London, Ontario, materials are subjected to intense cold for long periods. From these tests winterization features are proven — and new ones developed — which give General Motors locomotives an unparalleled record of performance under sub-zero operating conditions.
KEEP OUT
50°
BELOW ZERO
GENERAL MOTORS
LOCOMOTIVES
GENERAL MOTORS DIESEL LIMITED

New Equipment and Developments

Concrete Air Entrainment Meter. — Announcement is made of the availability of the Stebbins air meter which is a compact, light weight meter for measuring the amount of entrained air in concrete. This meter which is available in ¼-cubic-foot and ½-cubic-foot sizes, is being distributed by Soil Testing Services Inc., 4520 West North Avenue, Chicago 39, Ill.

Other items of equipment available from this Company, are the Harvard Compaction apparatus, the Colman soil moisture unit, Field density apparatus, and Iwan soil augers. They also have available many miscellaneous pieces of new and used equipment for use on soil testing work.

•

D-C Magnetic Testing Desk. — For making routine d-c magnetization and hysteresis tests, and simple flux measurements, the Canadian General Electric Company have available a new testing desk containing all the major components and necessary auxiliary equipment.

The desk is designed to be used in conjunction with various permeameters and magnetic devices which make possible the testing of nearly all types of magnetic materials. These include soft magnetic sheet, strip materials, and high-coercive-force compositions, such as alnico, silmanal and cobalt platinum magnet alloys.

Complete enclosure of instruments in the modern light-weight aluminum desk adds greatly to the safety of the testing device and protects the equipment from dust and physical abuse. The sloping-desk top places all controls within easy reach of the seated operator.

The unit operates on any moderately steady 125-volt d-c supply and 115 volts, 60 cycles a-c. Its normal range of current control extends from zero to 40 amperes.

•

Timestandards Discussion. — Recently a considerable number of industrial engineers from Quebec and Ontario met at the Royal York Hotel in Toronto to participate in a meeting for the discussion of timestandards which was sponsored by the Work-Factor Company of New York and arranged by Robert C. Shaw, their Canadian representative, of 392 Bay Street, Toronto 1.

The meeting began with a presentation of the history, research and background of the Work-Factor System of moving timetables, which was delivered by James H. Duncan, managing partner of the Work-Factor Company. A. E. Cooper, chief engineer for the Minneapolis Honeywell Regulator Company, Limited, Toronto, demonstrated basic motions in manual tasks by means of a peg board and described the application of Work-Factor to a simple operation.

Practical demonstrations of Work-Factor in various industrial tasks were performed and a motion picture was presented which showed how a rate had been set from a film made in a Radio Corporation of America plant. In this connection, J. A. Malcolm, Jr., industrial

(*Continued on page 1247*)

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Professional Cards

Professional Cards (*Continued*)

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 1242*)

engineer for the Radio Corporation of America, Camden, N.J., delivered a paper explaining how standard data may be compiled through the application of the Work-Factor System.

•

New Winding-Insulation Tester.—The Special Products Section of the Canadian General Electric Company Ltd., now has available a new d-c winding-insulation tester for d-c armatures, series field coils, and low-impedance a-c stator coils.

This new device which was developed by G-E's General Engineering Laboratory will detect and aid in locating faults in turn-to-turn, coil-to-coil and winding-to-ground insulation in d-c armatures of any size and rating. It is designed for testing large motors and generators such as those in railroad, marine, and steel industries.

The d-c armature winding-insulation tester consists of a repeating type surge-voltage generator which operates 60 times a second and a cathode-ray oscilloscope, all in one cabinet. A fixture is provided for applying test voltage to the commutator of the armature being tested.

•

New Housing for Malton Area.—Resources Minister Winters recently announced more favourable terms under the National Housing Act to provide homes for defence workers through the Central Mortgage and Housing Corporation. Crawford Gordon, Jr., president and general manager of Avro Canada at Malton, Ont., stated that this action by the Government would be of "immense help" to his Company in obtaining the necessary workers to produce CF-100 fighters and Orenda jet engines for the Royal Canadian Air Force.

•

Nylon Plant Extension. — Work has started on an expansion of the Kingston, Ontario, nylon plant of Canadian Industries Limited to make possible the doubling of its present production of filament and staple fibre. This construction work is being carried out by the C-I-L organization and it is estimated that the new production facilities will come into operation in 1953 when raw materials from C-I-L's new Maitland Works, presently under construction at Maitland, Ontario, will become available.

•

New Thermostatic Radiator Valve.—A new improved thermostatic radiator valve is now available from Heat-Timer Corporation, 520 Broadway, New York, N.Y.

Replacing the ordinary radiator valves, this new thermostatic valve is treated to provide for quicker heating of cold rooms and saving waste of heat in rooms already warm, while at the same time allowing desired temperature variations from room to room.

Heat-Timer valves are applicable to any low pressure one-pipe steam system without interference or alteration to existing boiler controls. The body of the valve is brass with chrome finish and the temperature-sensitive phosphor bronze bellows and other features remain the same as in the former model which is already in wide use throughout the United States.

•

C.G.E. Test Course Reunion.—On September 15 last, 400 members of the Canadian General Electric Company's "Test Alumni Association" attended the annual reunion of the Association at the Kawartha Golf and Country Club in Peterborough. The members of this association who are now employed by many companies in all parts of Canada, spent a very enjoyable day of sports and good-fellowship together on this occasion.

The honorary president of the Association is L. D. W. Magie, M.E.I.C., while the president for 1951-52 is D. J. Emery, M.E.I.C., and the secretary-treasurer is A. R. T. Hailey, M.E.I.C. More than 80 new members have been added to the Association from the 1951 "Test" course, and this number includes engineering graduates of universities throughout Canada as well as from England and Rumania.

•

New Kimberley Fertilizer Plant.—The Consolidated Mining & Smelting Company of Canada Limited, Trail, B.C., announces the award of a 9-million-dollar contract to Stone & Webster, Canada, Limited, for the construction of a new fertilizer plant at Kimberley, B.C. The site selected for this plant is located about three quarters of a mile south of the Sullivan Concentrator which treats the ore from the Company's Sullivan mine, and clearing and grading operations began early in October.

Work on a railway spur and switches to serve the plant and the construction of service buildings will commence shortly. The buildings will include an office, warehouse, central shop and pump house. The construction of production units consisting of roasters and a gas cleaning plant, sulphuric acid plant, phosphoric acid and phosphate fertilizer plant and storage together with shipping buildings will begin in the spring. It is expected that the project will be completed early in 1953.

High analysis ammonium phosphate chemical fertilizer will be produced at this new plant at the rate of 70,000 tons per year.

•

Acid Resisting Coating. — Announcement is made by Downing & Company, 6 Church Street, Toronto, Ontario, that they have recently been appointed Canadian representatives of Prufcoat Laboratories Inc., of Cambridge, Mass. The latter Company manufactures a liquid coating in several colours which is claimed to have exceptional resistance to concentrations of acids, alkalis, oils, water and heat. In conjunction with this coating they also supply a primer for use in pre-treating rusty metal surfaces. This primer, called P-10, contains an acid which counteracts the rust action during its application.

•

Pipe Line Expansion.—T. S. Johnston, president of Interprovincial Pipe Line Company, Toronto, announced recently that his Company is adding five pumping stations to its system as well as building an additional 2,600,000 barrels of storage at Superior, Wis. This will raise the total available tankage at the terminal to 4,400,000 barrels, and the work will be completed by the opening of navigation on the Great Lakes in 1952. Construction being carried out this year will provide ample capacity to take care of a peak summer movement out of Edmonton of about 113,000 barrels per day. Since pumpings are reduced during the closed season of navigation, the year-round average throughout will amount to approximately 100,000 barrels per day out of Edmonton.

It is expected that in 1951, its first year of operation, Interprovincial will deliver about 13,000,000 barrels of crude to Superior for tanker movement to the Ontario markets and that in 1952 this will be increased to about 18,000,000 barrels.

The balance of the 1952 expansion programme provides for the looping of 100 miles of the 16-inch section of the system between Regina and the International Border. One additional pump station will be added to the American section at Deer River, Minn., and further storage will be built at Superior to bring the total available tankage up to 7,000,000 barrels. The entire programme is scheduled for completion by the time navigation starts in 1953. These further additions to the system will increase the summer capacity from Edmonton to a maximum potential of 146,000 barrels per day with a delivery into Superior of approximately 95,000 barrels per day.

•

New Gel-Time Meter.—Canadian General Electric Company Limited now have available a new gel-time meter designed to measure the time required for fluid thermosetting compositions to reach a point of rapid viscosity change during polymerization.

According to engineers of the Company it will be an aid in the evaluation of thermosetting compositions used in the manufacture of monomers resins, varnishes, and other protective coatings. It can also be used in studying the effects of such variables as reaction temperatures, catalysts, inhibitors and quality of the main reactants. The device measures the gel time by means of a rotating spindle suspended from a torsional spring.

•