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INDEX

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SUBJECT

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THE ENGINEERING INSTITUTE OF CANADA FOUNDED 1887

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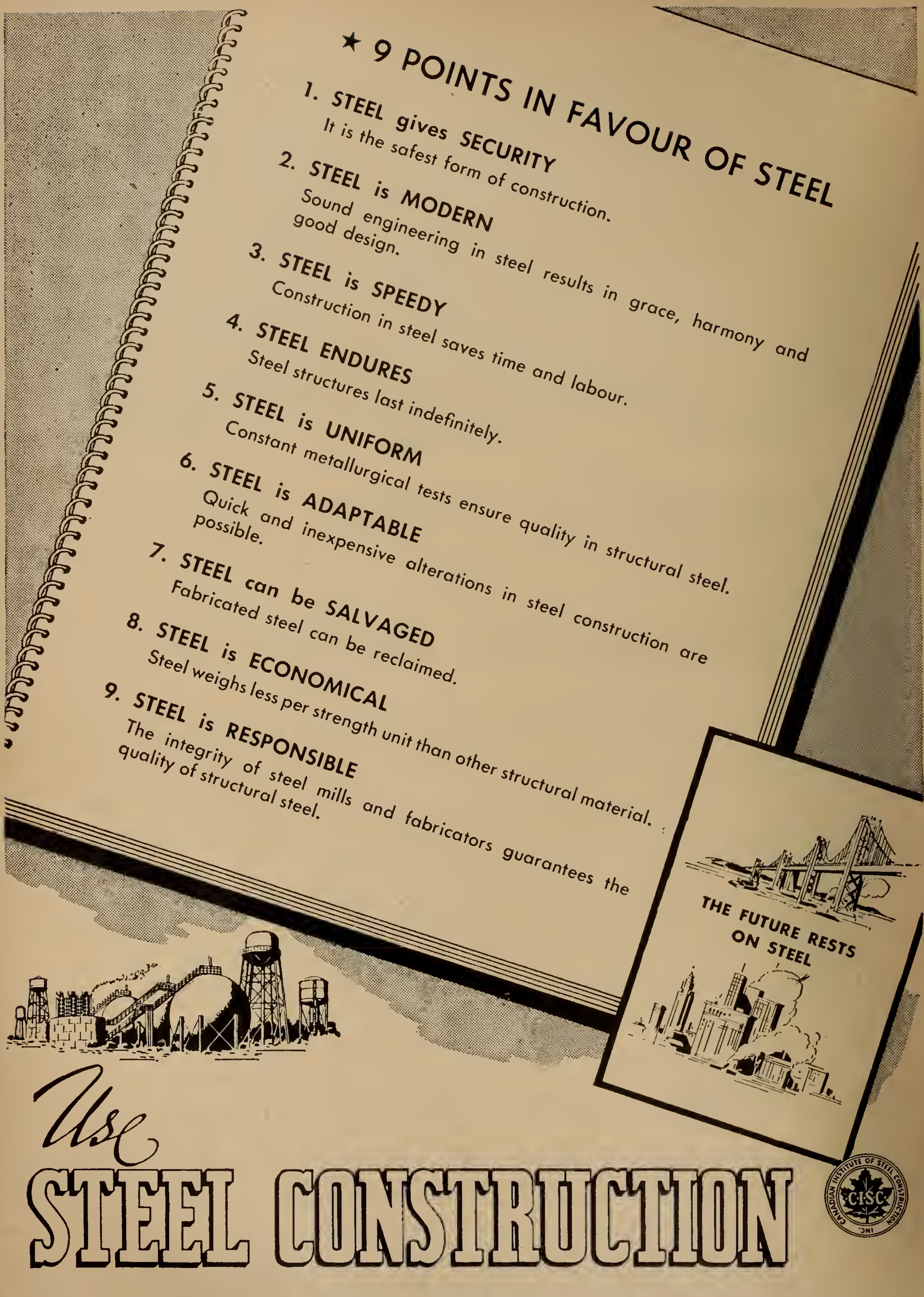
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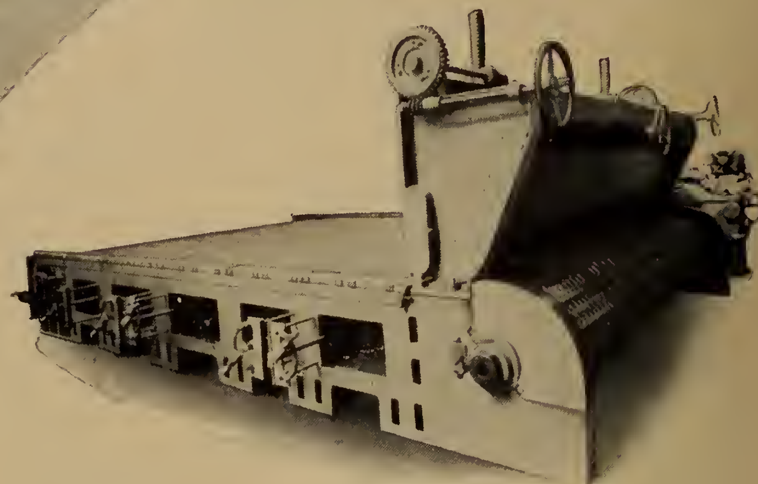

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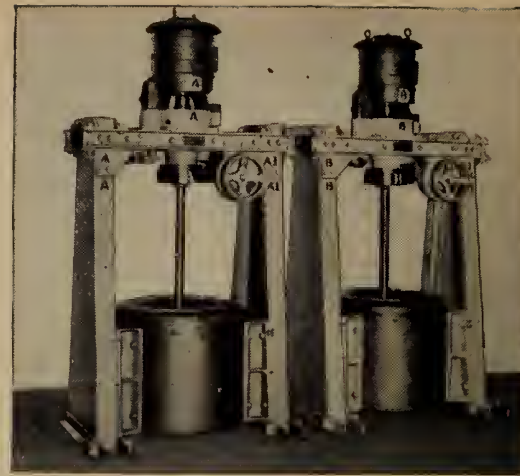

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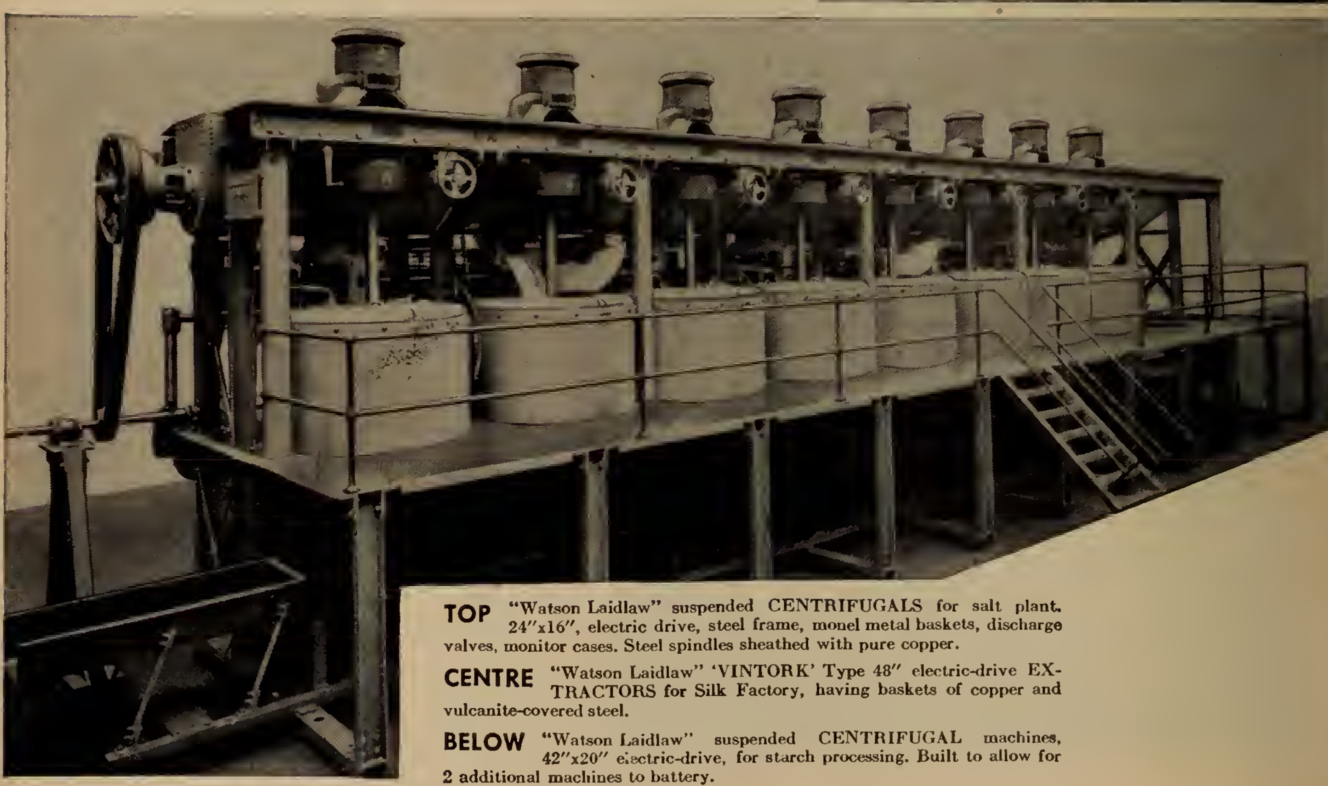

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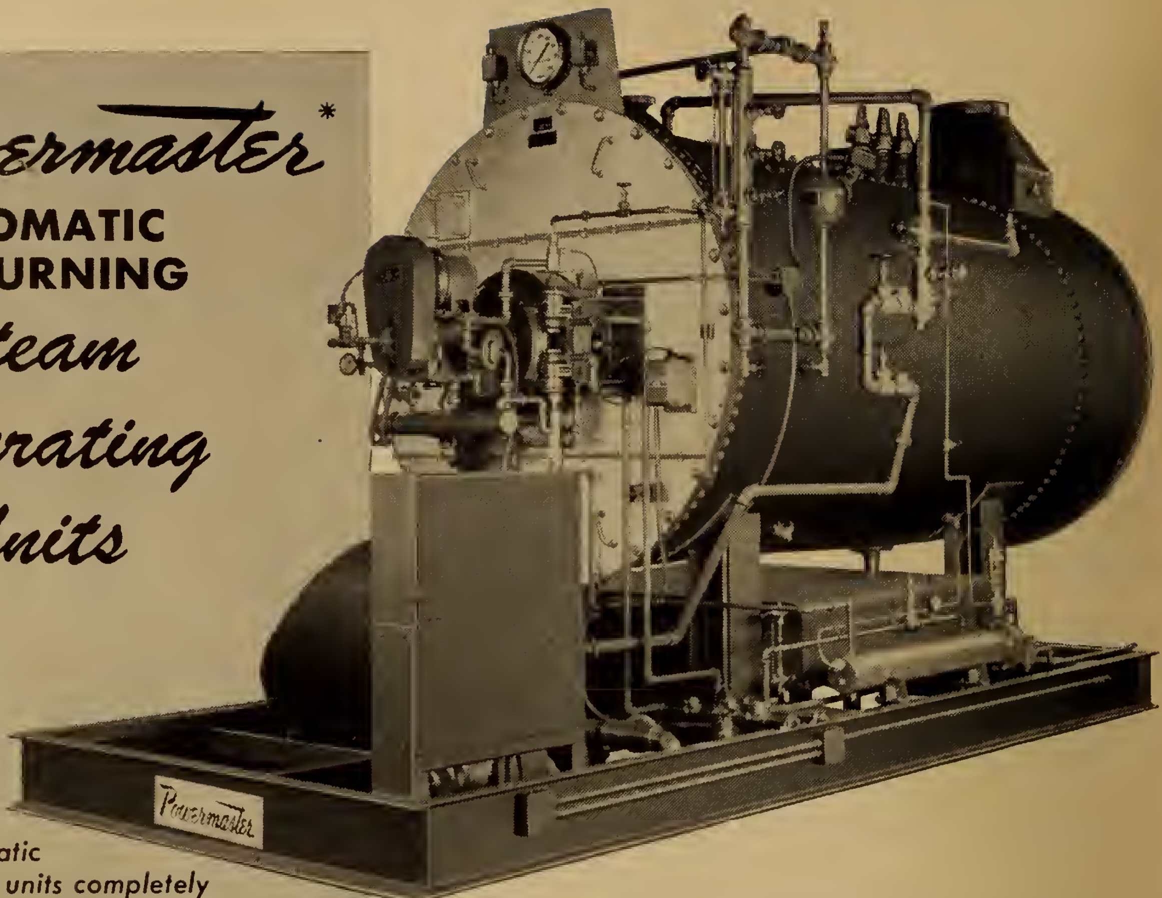

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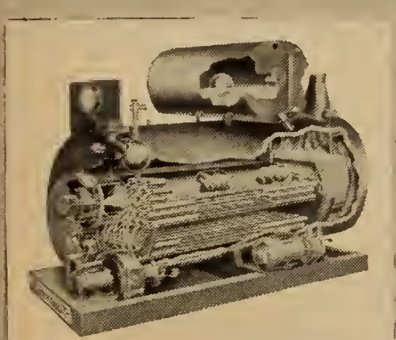
EFFICIENT DESIGN—This "phantom view" shows the Powermaster's rugged construction and other advantages: its "spinning flame" which promotes complete combustion; its forced-draft operation which eliminates a costly stack, requiring only a small vent to carry off combustion gases; its built-in condensate return system which automatically feeds reclaimed hot water—reducing fuel consumption and prolonging boiler life.



Cut-away of light oil unit

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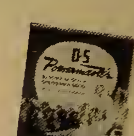

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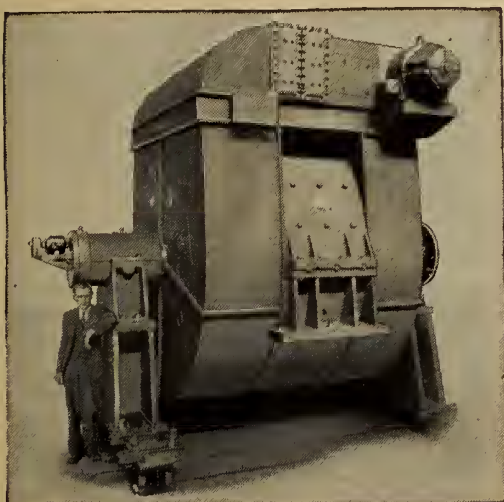
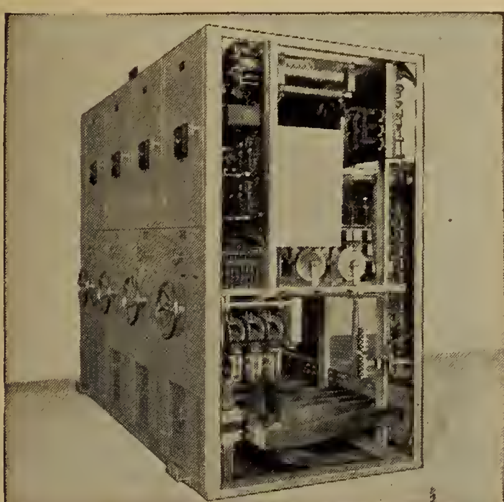
Breaking Train Ferry



Each of the four propellers, two forward and two aft is driven by a G-E 3850 hp 128/155 rpm propulsion motor.

One of the eight G-E main generator sets each of whichis rated 1050 kw—325 volt and is driven by a 12 cylinder diesel engine.



Section of the main propulsion control panel which permits unusual flexibility of operation in that power may be concentrated on any one propeller in an emergency.

Additional control apparatus allows remote control of motors from three different stations aboard the Abegweit—the two bridges and a third station below deck.

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250,000-Imp. gallon standpipe installed at the National Research Council, Ottawa, Canada. It is 30 ft. in diam. and 56 ft. high.

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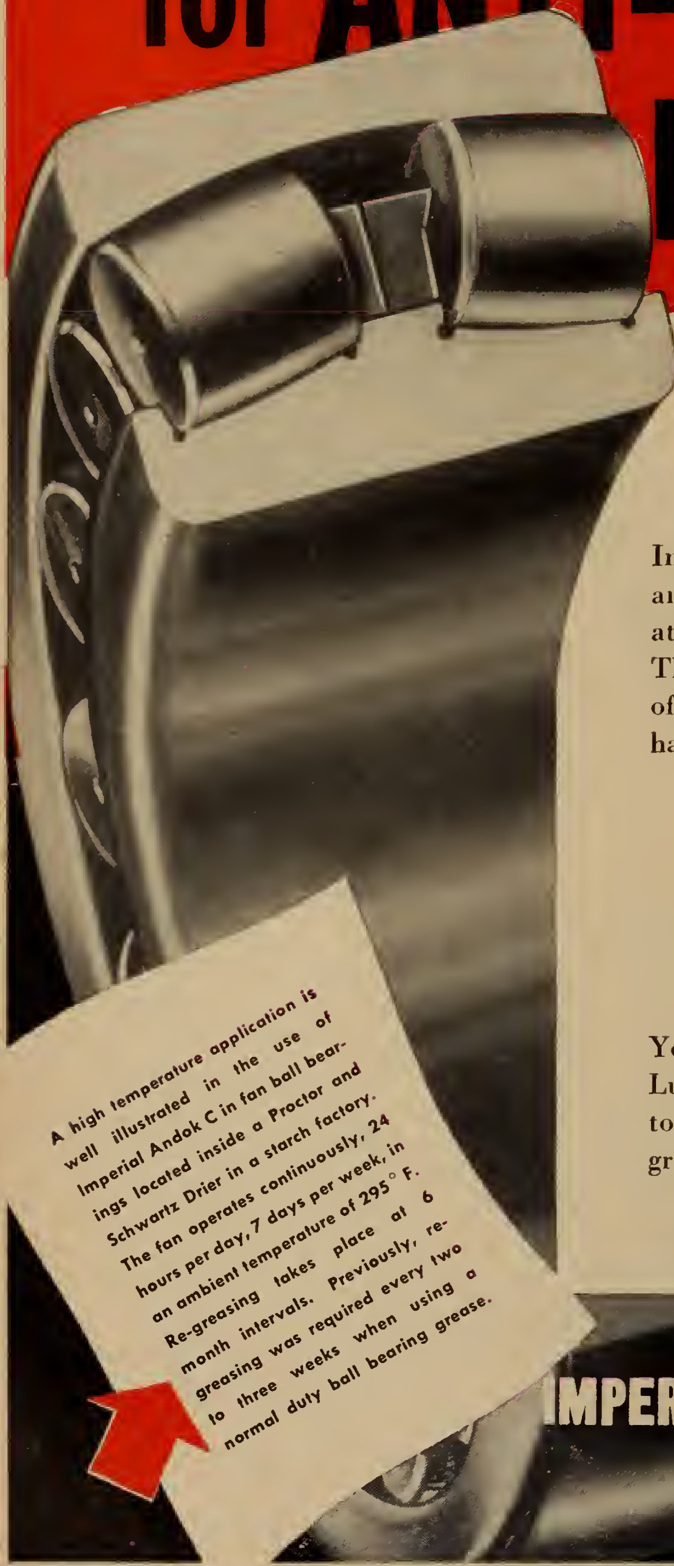

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THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOLUME 31 | MONTREAL, JANUARY 1948 | NUMBER 1

"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

COVER PICTURE

M.V. *Abegweit*, in profile. This vessel was specially designed for the train, car, and passenger ferry service between Cape Tormentine, N.B., and Summerside, P.E.I.

See the paper on page 2 of this issue for details of this unique craft.

M.V. "Abegweit"

Prince Edward Island Car Ferry

by

H. H. German, M.E.I.C.

German and Milne, Naval Architects and Marine Surveyors, Montreal

A paper delivered before the Montreal Branch of The Engineering Institute of Canada on December 4, 1947

This paper records an outstanding achievement on the part of Canada's Shipbuilding Industry. Touching on the history of earliest ferry services to the "Island", the author discusses the requirements that had to be met in designing the new car ferry. Passenger accommodation, propellers and shafting, hull, freight car and auto cargo, heeling, trimming and steering equipment, safety and control equipment, engines and propulsion equipment, and electrical, switchboard and control equipment are described in turn. In conclusion credit is given to the builders and the various suppliers and inspection organizations concerned.

The invitation from your Council to present a paper on the Icebreaking Car Ferry *Abegweit* was an honour indeed, although the difficulties in determining the form such a paper should take were realized. There are unusual technical features in this ship which would be interesting to a gathering of naval architects and marine engineers, but which perhaps would lack interest for the members of this Institute. However, after due consideration and some advice from fellow members, it was decided that the paper should be more descriptive than technical.

H. H. German, M.E.I.C.
German and Milne, Montreal.

As the history and development of the Prince Edward Island service was dealt with in a paper on the *Charlottetown*, given before the Institute in 1932, it is not proposed to repeat this, except as is necessary to give those present a clear conception of the strides made in the communication and transportation systems between the Island and the rest of Canada since the days of the early settlers.

History of Early Ferry Service to "The Island"

The initial venture to establish communication with the mainland was undertaken in birch bark canoes which plied between Wood Island and Pictou as far back in 1775. Later came the flat bottomed dories operated by two men, and fitted with runners which enabled them to be pulled over the ice. The next step was an adaptation of the Norwegian " pram " or ice-boat, used as late as 1916, despite other means of communication evolved.

In 1832 the first attempt was made to put a steamer into service, and the *Pocahontas,* a vessel of wooden construction, made the trip between Charlottetown and Pictou twice a week, followed by the *Albert* in 1873, and the *Northern Light,* a steam icebreaking vessel of wood construction in 1877. The *Northern Light* did not prove as successful as was hoped and she was superseded by the *Neptune,* a wooden Newfoundland sealer, after which the *Lansdowne* entered the service.

In 1888 the Federal authorities, who were now responsible for maintenance of service as a result of the stipulation in the Island's agreement to enter Confederation, placed the newly constructed steel icebreaker *Stanley* in service, to be succeeded eleven years later by the *Minto* and in 1909 by the *Earl Grey*. Each of these was an improvement on her predecessor, although frequent and prolonged interruptions in the winter service were still experienced. The type of icebreaker so successful in operation in fields of sheet or solid ice, having a sloping icebreaking bow, proved quite ineffective under the ice conditions. The *Stanley* was built along such lines, but the shape of the bow merely assisted her to cut a channel through the obstruction. On such occasions it was a major operation to get the ship back into the water.

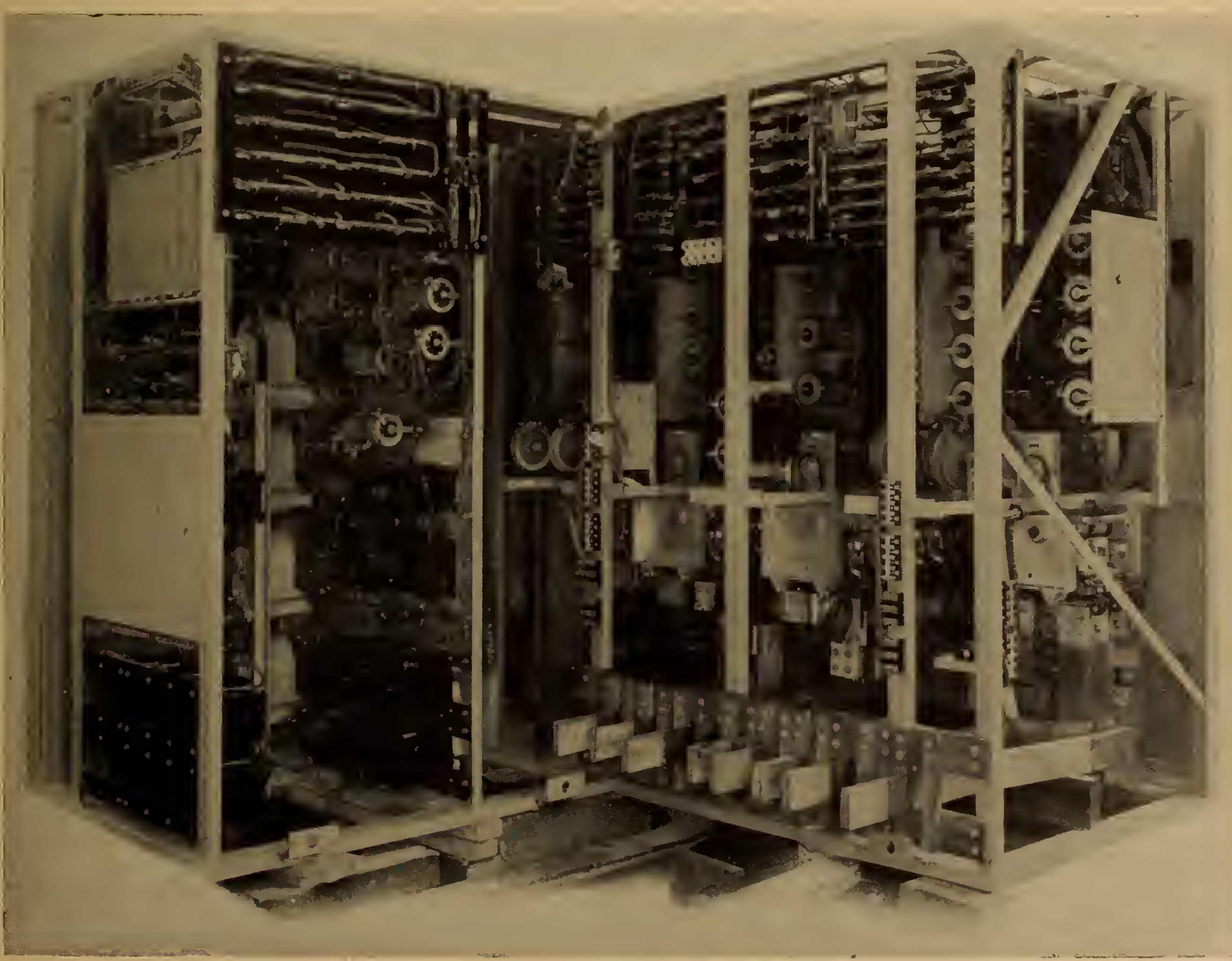
The *Minto* had a different type of bow, designed with the idea of trying to overcome the defects of the *Stanley*. The same difficulties were encountered, however, as despite the increased power, great trouble was experienced in freeing her from the ice, the operation sometimes taking as long as two days.

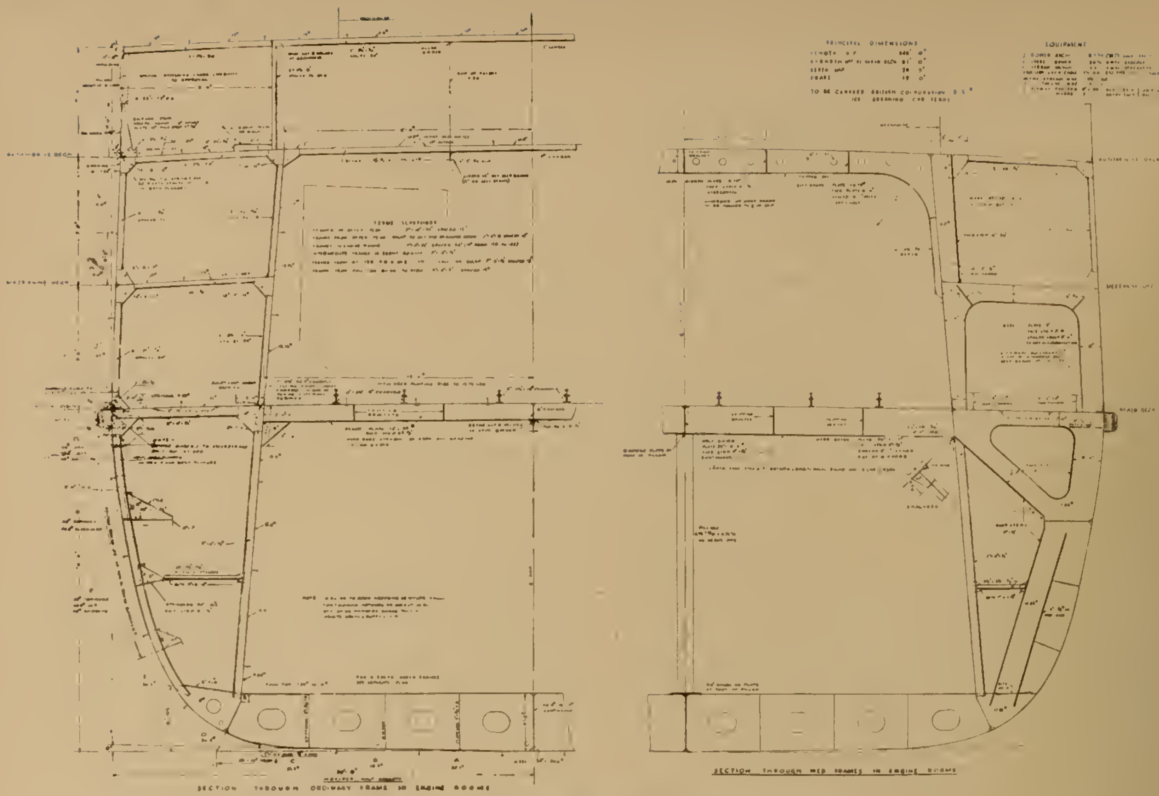
The *Earl Grey* proved to be a decided improvement; she was fitted with rounded sides and her increased power gave her greater flexibility in backing and filling, at the same time permitting her to work with speed in and out of the icefields. Although the rounded sides made it difficult to dock at the terminals, all in all she proved to be a good icebreaker for this service. She was, however, not the final answer to the problem as a whole. The time required for the trip was too long, and considerable produce was spoiled while held up at the terminals and on account of the unsuitable carrying conditions on the ship.

The chief factors responsible for the development of the service from 1915 onwards were the perishable nature of the Island's produce and the impossibility of developing and maintaining trade relations with the outside world under the then existing conditions. Careful and exhaustive study by the Federal authorities of the many and varied problems attendant on the service finally resulted in a steel icebreaking railway car ferry, the *Prince Edward Island*, in 1915, to operate between Port Borden and Cape Tormentine, a distance of approximately eight miles. The new vessel was not as efficient as the *Earl Grey* as an icebreaker. Although she was built with about the same power per ton of displacement, she lost efficiency by being more wall-sided.

The *Charlottetown*, built in 1930-31, was a manifest improvement over the *Prince Edward Island*. Her sides were rounded, and her steam installation was as powerful as possible consistent with the size of her hull. The design of this ship was also influenced by the rapid growth of the automobile trade, which exerted a profound effect on the development of the service. The unfortunate loss of this ship in 1941 occurred at a crucial time and, despite the wartime

An oblique rear view (looking to forward port) of the main propulsion control panel. This is C.G.E. equipment.





MIDSHIP SECTION—M.V. *ABEGWEIT*

curtailment of shipbuilding for other than naval purposes, plans were made to relieve the crisis which would confront the Islanders when commerce and travel would revert to a pre-war basis with every possibility of rapid growth. The ultimate result was the construction of the *Abegweit*, which entered the service in August 1947.

Requirements to Be Met by Designs

The essential qualifications for a ship operating in Northumberland Straits and maintaining year round communication are iceworthiness, speed, dependability and rapid, efficient manoeuvrability.

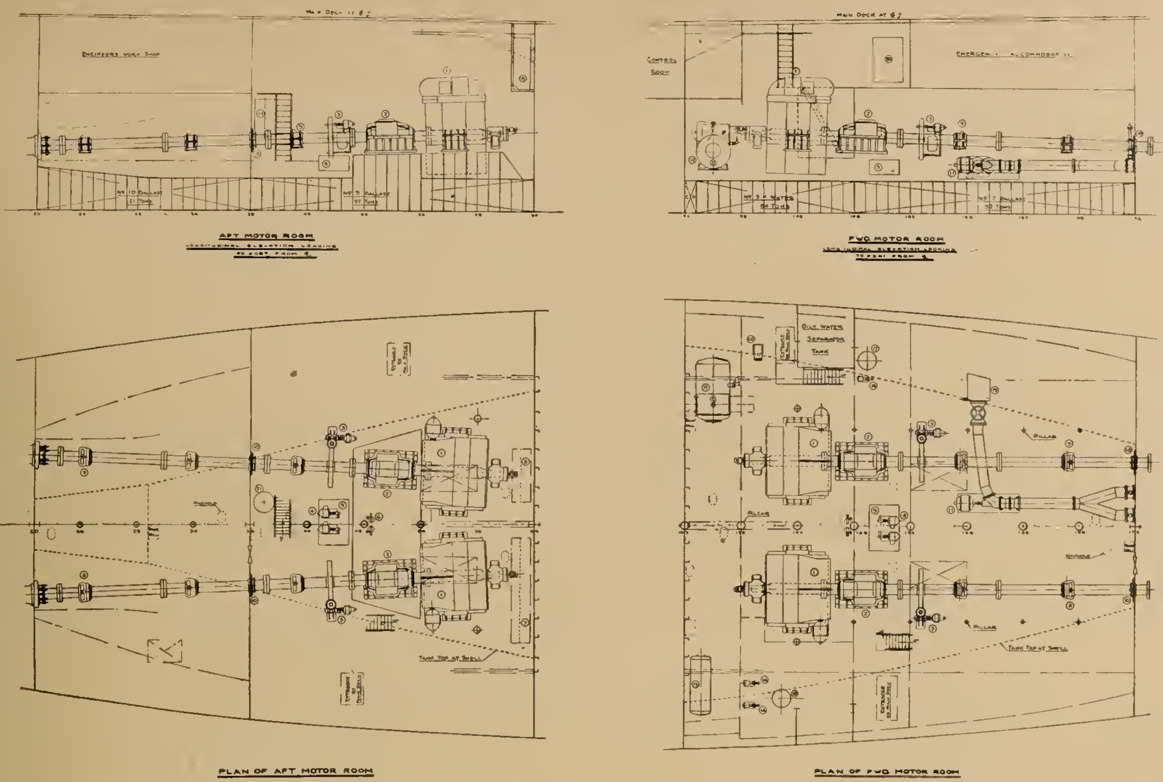
There were many interesting but perplexing problems to be faced in determining the size and general characteristics of this ship. The situation was rendered more difficult since she had to fit the existing terminals, which restricted her length, breadth and operating draft. Consideration was given to the building of new terminals to suit the most efficient design of ship. When it became evident, however, that any changes to existing terminals would mean a long period without safe and adequate service, it was decided to design to suit the existing terminals, as this could be done without much loss of time, at the expense, however, of obtaining the ultimate in ship design.

The harbours at Cape Tormentine and Port Borden are extremely difficult to approach and navigate with such a large ship, but the operation to date of the *Abegweit* indicates that the fitting of four propellers has proved to be a great success, and docking is decidedly easier than with her predecessors.

Little reliable information is available on ice conditions. There are many variables to contend with. Ice formations encountered in the St. Lawrence River, Northumberland Straits, the various harbours of Canada, Hudson's Bay and the Arctic vary to such a degree that an efficient icebreaker for one service would be useless elsewhere. The strength of ice varies from a maximum for clear solid ice to practically zero for slush or frazil ice. In our Canadian lakes, bays and harbours we have sheet ice to contend with, varying from minor thicknesses to as much as three feet in the Great Lakes. For such conditions the design of a ship is simple, but with the broken ice that is swept up and down Northumberland Straits by winds and tides, and packed at times solid to a depth of thirty feet, the characteristics of an icebreaking car ferry for this service must be quite different to those of the average icebreaker.

An analysis of the service from the time of its inception indicated the desirability of packing as much power into the hull as practicable. It called for a type of power which would permit the greatest flexibility of operation. Other requirements were maximum horsepower per cubic foot, and minimum weight per given power. Also needed was an increase of the torque of the propellers, with a decrease in revolutions to permit the maximum propeller thrust with the ship operating in heavy ice. Conversely the greatest thrust was demanded with the ship operating at zero speed. Lastly, rapid transference of power from the bow to the stern propellers, and vice versa, was essential. The answer to all these requirements was unquestionably diesel electric machinery.

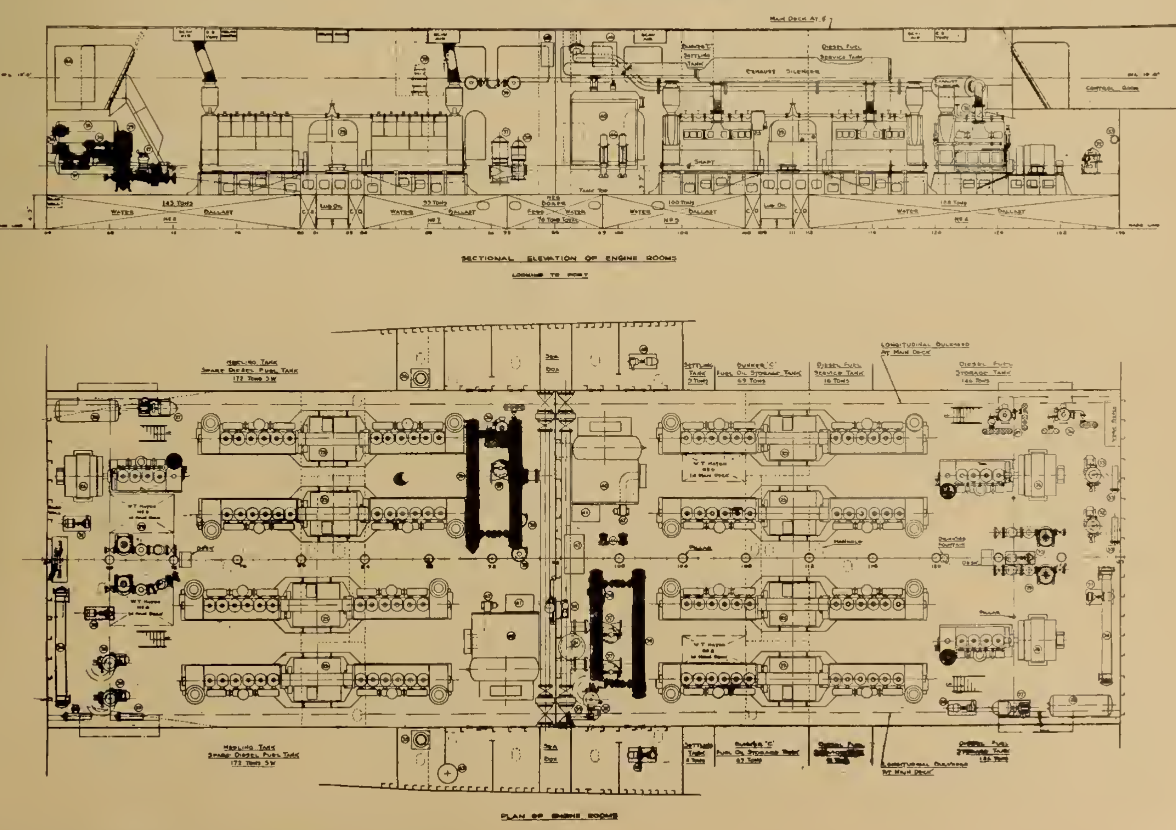
The design of the *Abegweit* parallels the develop-



MOTOR ROOM MACHINERY ARRANGEMENT

Left—Plan and section, aft motor room. *Right*—Plan and section forward motor room. Note—one of the features of this vessel is the fact that there are propellers at the forward and after ends.

ENGINE ROOM ARRANGEMENT



ment of U.S. Coast Guard Service vessels patrolling the ice lanes. Practically all these vessels are equipped with diesel electric machinery. The latest mammoth units in this service are powered with multiple diesel engines operating three propellers in lieu of four as on the *Abegweit*. As these vessels have to operate in the far north, far from repair bases, where utmost reliability is required, it is significant that they are fitted with multiple diesel engines with electrical transmission.

Passenger Accommodation

In addition to housing a complement of sixty-five officers and crew with adequate lounge spaces, all in accordance with latest I.L.O. requirements, the public rooms will seat about 250 day passengers, while emergency sleeping accommodation is provided for about 100 passengers. Seats are also provided on decks. The ship has a Passenger Certificate from the Canadian Board of Steamship Inspection for 950 persons. A higher than average standard of comfort has been provided, first to attract tourist travel to the Island, and secondly to offset the discomfort to passengers if the vessel becomes icebound for any length of time.

Accommodations have been fitted out to a standard comparable to modern passenger liners. The layout of the restaurant meets with the special requirement of serving one hundred passengers in half an hour in the space available. The most modern equipment and labour saving devices have been installed for this purpose, and the restaurant is fitted with stainless steel counters and shelves. Refrigerated compartments for perishable foods are installed, the refrigeration being of freon direct expansion type throughout in association with pipe coils.

Propellers and Shafting

The development of the bow propeller is a point of interest. In the case of the *Saurel* and *Ernest Lapointe,* two icebreakers engaged in the St. Lawrence service, it was discovered that they were more efficient at times when operating astern, backing into the ice with the two stern propellers, than when going ahead. This fact, and the success in service of the bow ice-breaking propeller on the *Prince Edward Island* and the *Charlottetown*, led to the decision to fit four propellers on the *Abegweit*—two forward and two aft.

The greatest precautions were taken in the design of the propeller and shafting installations, particularly the bow propellers, which are subject to severe shock when entering either solid or broken ice. Allowance was made when the thrust blocks were designed for a generous margin of safety, over the normal thrust to be expected in the shafts when working in open water. When considering the shock resulting on entering an ice jam, it was decided the thrust block should be capable of absorbing a direct thrust of 125 tons, in association with propeller revolutions of 25 per minute. These blocks are comparable in size to those fitted on a vessel of approximately the same power as the *Queen Elizabeth*. Shafting was specially designed to take this thrust and journals were fitted to suit.

The propeller design was complicated, and an efficient compromise had to be arrived at in order to achieve the following results: That the pitch, diameter and area would be such that the full developed power on any one shaft could be absorbed in the propellers at full speed in open water; that the propellers would prove efficient in cutting ice; that the propellers would be sufficiently strong to absorb the impact and pressure when operating in ice, but not so strong that the blades would not be broken rather than the main shafting when operating at low revolutions against heavy resistance of ice, all within the limits of torque pre-arranged by the amplidyne settings; that the propellers be of sectional type with an arrangement for adjustment of pitch; and that the propellers be efficient in both directions, the pitch being the same on both sides of the blade, which permits machining and a nearer approach to statical and dynamical balancing.

The propellers are of cast nickel steel—two percent nickel. The intermediate shaft diameters forward and aft are 16 in., and the shafting material is high grade forged steel, which is necessary to keep the tailend or propeller shafts to a minimum diameter. This in turn permits a minimum propeller diameter for the same efficiency, which is somewhat contrary to normal ship propeller design. This is a necessary compromise in this case, as it puts the propellers at the lowest possible point below the waterline, away from the region where blades are most likely to be damaged when striking blocks of ice. The propeller tips have been kept a minimum distance from the shell of the ship. The distance is necessary to prevent jamming of ice blocks between the tips of the propeller and the hull of the ship.

The Hull

The conditions prevailing in Northumberland Straits call for a more efficient service than is usually required of the average icebreaker. An uninterrupted service on an exacting schedule is the prime requisite. Such service entails serious wear and tear on a ship's structure, and it was not uncommon in previous vessels on this run to find them at times literally being kept afloat at the end of the winter season by their internal watertight subdivisions. Many years ago the policy of repairing by welding rivets and seams was adopted which decreased maintenance cost. This, together with the outstanding performance by smaller icebreaking vessels of all-welded construction, dictated the policy of designing an all-welded structure. Maintenance of the hull of the *Abegweit* will cost considerably less than that of her predecessors on this account. Parts of the shell plating are $1\frac{1}{8}$ in. thick and the size and weight of the ship greatly in excess of any vessel previously built in Canada.

Shell plating was fitted flush on the moulded or inner surface, and varying thicknesses of plates were taken up on the outside. All seams and butts of shell surfaces were specially prepared for welding, the thickest plates requiring more than twenty passes with 3/16 in. welding rod. No welding was carried out at temperatures below 10 deg. F. Pre-heating was resorted to at all temperatures below freezing. About a million feet of welding was done, involving 260,000 man hours of labour and 250,000 lbs. of Stelco welding rod. The efficiency of the welding was tested and constant use made of radiography to determine the quality of the work.

To meet requirements of iceworthiness the ship was designed and constructed to withstand contact with ice when using maximum power under way. Horizontal compression loading was taken at not less than 24 tons per linear foot at the waterline. The ship was constructed on the transverse framing system. Substantial transverse web frames were fitted throughout, with longitudinal deck girders and stringers to support the transverse frames. All framing was reinforced by a system of bulkheads, sufficiently strong to serve as main compression units. The scantlings were determined on the basis of the bulkheads being adequate to withstand flooding to 8 ft. above the main deck, added to compression loads due to the railway car deck carrying its full complement of cars.

The maximum of subdivision has been provided for, even beyond the legal requirements for passenger ships. Protection of the machinery spaces is increased by double bottom compartments and full depth side tanks below the car deck. At the fore and after ends of the engine rooms and between the engine and motor room spaces, watertight doors are fitted in bulkheads for protection against flooding. All necessary openings have watertight doors with local and wheelhouse control for their automatic operation in an emergency. All openings in the shell were kept to a minimum. Overboard discharges have been specially designed for a ship operating in ice. The main circulating seachests are fitted with hot water returns from the main engines, so that frazil ice can be kept clear by the hot water. Complete de-icing arrangements have been fitted, and all important outlets have hot water or steam connections. A supply of hot water is provided for hosing down the decks.

Railway Equipment and Automobile Cargo

Of almost equal primary importance to icebreaking efficiency is the ability to carry railway passenger and freight cars, motor trucks, automobiles and passengers. Railway officials, bound as they are by normal railway schedules, are not altogether sympathetic to the tourist whose object is to get his automobile on and off the ship. The passenger who wants comfort in his living quarters is usually more concerned with the restaurant service. On the *Abegweit* a successful compromise appears to have been effected between these somwhat conflicting services.

The railway car deck was designed to withstand live loads incidental to the carrying of a light T4A Canadian National engine with an allowance for impact. Due to the varying deck spans, apertures, pillar supports, etc., strength calculations were made for every deck beam. A great variety of sections was used so uniformity of strength could be maintained without sacrificing too much material. The automobile deck was calculated to withstand the loading of large trucks and buses with maximum live wheel load plus an additional allowance for impact.

As well as electrically driven capstan windlasses for the normal operation of the anchors, the ship is fitted with two electrically driven capstans on the main car deck for hauling railway cars to the car buffers. Two additional capstans are fitted aft to handle the lines while docking. These after capstans are also used to haul the ship close to the shore apron. Electrically operated screen doors are fitted at the after end of the car well, for use during winter operations.

Heeling, Trimming and Steering Equipment

Large capacity heeling pumps are installed, capable of handling 423,000 gallons per hour, to transfer water between wing tanks on either side with despatch. Transference of this water will heel the ship 10 degrees each side of the vertical in one and one-half minutes. A trimming tank is also provided, and a pump having a capacity of 3,130 gallons per minute is fitted in the forward end of the ship. This permits adjusting the depth of the forward propellers below the waterline to suit prevailing ice conditions. The pump and tank are connected with an 18 in. pipe, all valves being motor operated with remote control in the navigating bridge. Large air relief valves are needed to avoid excessive pressures on the divisional bulkheads and crowns of the tanks.

The operating staff use the engines almost exclusively for manoeuvring in the harbour, yet there are occasions when this has to be supplemented by the rudder. The weight of the rudder is over ten tons, and it can be locked in the centre position when the ship is backing and filling in ice. It is activated by an electro-hydraulic four-ram steering gear specially built for icebreaking service, operated by a 45 hp. d.c. motor which will put the helm from hardover to hardover in twenty-four seconds with the vessel at full speed. It can be operated by the quartermaster through a telemotor system either from the navigating bridge forward, or from the docking bridge aft.

Safety and Control Equipment

Nothing has been spared to guard against fire hazards; the machinery spaces can be flooded throughout by carbon dioxide in the event of fire, and the battery of storage bottles can be operated locally, or by remote control from the bridge. A complete fire detection system is operated from the bridge. Lifesaving arrangements and equipment are complete in every respect and in conformity with the latest Canadian Steamship Inspection requirements.

The vessel is heated by auxiliary steam boilers automatically controlled, one in each engine room. On all exposed surfaces of the spaces requiring heat, adequate insulation, generally in the form of asbestos sprayed on the steel structure, has been applied to keep the expense of maintaining a warm ship to a minimum and to eliminate excessive heat in summer. A system of ducts permits the ship to be heated by heat recovered from the machinery spaces. Ventilation is of the latest type on the forced air supply system, controllable both as to quantity and temperature by the engineer.

The most modern navigational aids have been installed, including gyro and magnetic compasses, echo sounding machine, ship-to-shore radio-telephone and radar. Remote control of the propelling motors is fitted both in the navigating and docking bridges. All operating controls have been combined in neat compact console-type control cabinets. It is not necessary to ring telegraphs from the bridge to attract the attention of the engineer, as with previous ships. Direct operation of the motors is carried out by the navigating officer, during the delicate operation of docking and undocking, and in attacking ice formations. This feature should result in a lower maintenance cost in the elimination of errors in judgment, or delayed operation between the master and the engineer.

Numerous protective devices and alarm controls have been incorporated, to render the ship as safe and trouble-free as possible, such as water and lubricating oil alarm and control, fuel oil control, overspeed control, maximum motor field strength control, overload control of engines, watertight door control and fire protection; all have been made as foolproof as the most up-to-date practice permits. Modern and complete engineers' and electricians' workshops and stores are provided to facilitate routine repairs and adjustments without recourse to shore repair shops.

Engines and Propulsion Equipment

The arrangement of machinery on this ship is somewhat unusual, inasmuch as each main propulsion set consists of a twelve-cylinder 1,500 B.H.P. engine, divided into two banks of six cylinders each with the generator mounted between them, and the whole is supported on a common welded steel bedplate of specially fabricated design. This bedplate is in turn welded to the tank top of the ship, since it was decided that any deflection in the tank top, even though transmitted through bedplate to crank shafts, would come within the allowable deflection for crankshafts, and would not prejudice the safe performance of the machinery.

The engines, generators, motors, shafting and propellers on the starboard side form one complete propelling system, while similar equipment on the port side constitutes another complete system. The main propulsion is of diesel electric direct current type with amplidyne voltage control of field excitation, speed and reversal of the propulsion motors. The propulsion equipment comprises four shafts and propellers, two forward and two aft, each with their own propelling motors capable of transmitting individually 3,850 shaft horsepower aft or forward, or, when operating uniformly, giving a distribution of 2,500 shaft horsepower per propeller. Motors are remote controlled from the navigating bridge, the docking bridge or the engine control room. Either one of the port propelling motors can be connected to one, two or three of the port generating sets, and similarly for the starboard units.

The main power supply is from eight twelve-cylinder Dominion Sulzer TS-29 type fresh water cooled diesel engines, direct connected to a generator. The engines are rated to drive the generator at full output continuously, with ten percent overload for two hours, and twenty percent overload for fifteen minutes. The engines are of the vertical compression ignition air-starting full diesel type. Air for combustion can be drawn from the engine compartment, or from the atmosphere. Thus better control of engine room temperatures can be maintained, an important item for electrical equipment, particularly when wide ranges of atmospheric temperatures are encountered. Standard starting controls were furnished with each engine and fuel control stops were provided to prevent dangerous overloading. Governors and governor control equipment were furnished, an independently driven overspeed governor was fitted to each engine.

The temperature of the engine cooling water is thermostatically controlled on each engine. Fresh water is used, and the heat exchangers can operate efficiently with sea water at a maximum temperature of 65 deg. F., while the maximum temperature of the fresh water leaving the engine water jackets is arranged not to exceed 130 deg. F. Thermocouples were furnished for each individual cylinder exhaust outlet for use with permanently installed temperature dial indicators.

The engines are equipped with a barring device for turning the engines by hand. Indicator cocks are provided on each cylinder for attaching a maximum pressure indicator, so that proper adjustment of engines can be readily maintained. Engine controls are mounted on each engine, including an emergency shut-down device.

Electrical Equipment

Three 330 kw. auxiliary engine generator sets are provided for the auxiliary machinery, two in the forward and one in the after engine room. Air is drawn from the engine compartment. Also, for emergency and port use, two 60 kw. diesel generating sets are provided in a compartment above the load water-line at the railway car deck level. All auxiliary services are supplied at 225 volts direct current.

The electrical equipment consists of two separate systems or installations; that pertaining to the main generators, propulsion motors, switchboards and controllers for propulsion and manœuvring of the ship; and that for supplying power for the exciters, motors, pumps, lighting distribution, switchboards, etc.

The main propulsion generators are rated at 1,050 kw., maximum voltage of 325, at a speed of 360 rpm., designed for continuous duty at 35 deg. C. ambient air temperature, for a temperature rise by thermometer of 75 deg. C. in the core and windings, 85 deg. C. bare copper windings and 90 deg. C. commutator. They are totally enclosed with separate ventilation and separate excitation, built on a split frame with a forged flanged shaft having shunt wound commutating windings. The insulation is class " B ", suitable for 1,000 volts to ground. They are cooled by air forced through an enclosed system with precautions against damage through leakage in the air cooler. The air cooler medium is salt water. Alarm circuits are provided in case the generator gets too hot.

The propulsion motors are of the single armature type, designed to absorb the rated horsepower of the shaft at any speed between 128 and 155 rpm. propeller speed, and to be capable of delivering 150 per cent full load torque momentarily at creeping speeds, with a suitable protection device to prevent commutator damage in the event of actual stalling. Each propulsion motor has the following characteristics:

Shaft Horsepower - -	3,850
Speeds - - - - -	128 to 155 rpm.
Voltage - - - - -	960 Maximum

The other characteristics are identical to those of the generators.

The motor bearings are of the pedestal self-aligning type, arranged for flood lubrication with adequate oil seals to prevent the rotor fouling the starter if the bearing is wiped. The motors are provided with carbon dioxide fire extinguishing systems to permit the flooding of the interior air circulating systems in the event of fire.

Switchboard and Controls

The control platform, located on an elevated soundproof enclosure in the forward engine room, contains the propulsion control systems. The control panel boards consist of two L-shaped deadfront semi-steel enclosed units, housing the various distribution and control switches. A number of relays for transfer and signal purposes are used, but the main speed and reversing control does not require any moving parts, static devices being used throughout. Main field and protective contactors do not operate except when generators are being switched. All arrangements are designed to operate the control systems without any moving parts as far as practicable, to minimize maintenance.

Propulsion generator and motor speed controls are maintained by an amplidyne system, operating on the general fields, with five amplidyne sets, one being a spare. Each set includes a motor, generator and amplidyne exciters and is driven by a direct current motor. Protection is provided in the circuits against overloading the engines. A number of other protective features are incorporated, such as electric overload and short circuit protection. The speed controllers have ahead and astern motions. Reversing is accomplished by reversing the amplidyne field connections on the amplidyne controlling the generators. This is done without breaking the circuit, by means of a potentiometer connection.

All connections between the propulsion generators and the switchboards are made with solid copper busbars in lieu of cables, in view of the high voltages and the uncertainty of the ambient temperatures of the engine room. The installation of these connections to suit the practical layout of the ship happens to be in the hottest part of the engine room, with no predetermined means of arriving at possible temperatures to be expected. This feature was the cause of much thought while design details were being worked out, and it is believed to be the first time such an extensive busbar installation has been used in a ship.

The horizontal runs are made of two 4 in. x ½ in. copper bars per polarity spaced ½ in. apart. They are enclosed in a wire mesh trunk having a mesh sufficiently fine to exclude rats, and mounted in slotted arborite boards with clearances to allow for possible deflection of the car deck. To permit longitudinal movement resulting from expansion or contraction due to temperature changes, laminated copper joints are provided, with suitable glands at watertight bulkheads. Vertical runs from the generators are made from two 6 in. x ½ in. copper bars per polarity, insulated for 1,000 volts. Busbars carry 3,200 amps at 960 volts continuously, or 6,400 amps for short periods.

Feeders from the switchboards to the propulsion motors consist of four single core 1,250,000 circular mills basket weave armoured steel braided cables per polarity, suitable to permit free air circulation.

The auxiliary power is distributed from a three-panel generator switchboard to a twenty-circuit enclosed distribution panel, both located in the control room. All air circuit breakers installed on feeders are capable of interrupting 2,500 amps. available under short circuit conditions.

The operating controls are basically developed around the amplidyne system controlling the motor speeds. At each of the three control stations, duplicate control cabinets are installed, one for the motors of each side. These cabinets are fitted with Selsyn telegraphs, indicating lights, speed indicators and alarm systems, and are arranged to make the necessary changes in the motor generator set-up, and automatically allow these changes to be confirmed. By means of transfer switches the greatest flexibility is provided, so that either one of the control positions can be used without fear of signals being transmitted from the other stations. With this complete installation the ship can be operated in a variety of ways in service, and with several combinations of engines. She is thereby equipped for the four very diverse but major operations of running in free water, manoeuvring at the terminals in open water, manoeuvring at the terminals under ice conditions, and operating between ports in any ice conditions.

The electrical work throughout the ship is extensive for, in addition to the motors described, there are one hundred and thirty-five auxiliary motors complete with all necessary power and lighting systems. Approximately 100,000 feet of electrical cables of different sizes, varying from two to sixteen conductors per cable were installed. In all there were about 200,000 man hours of electricians' labour worked into this ship, which may be termed a ship operated by push buttons.

A Credit to Canada's Shipbuilding Industry

The vessel was built to obtain the British Corporation Register of Shipping and Aircraft's highest class for an icebreaking railway car ferry, operating in field and pack ice. She had also to comply with the highest requirements of the Canadian Board of Steamship Inspection. Her size, her design, and the material and labour problems attendant on her construction were a severe test of Canadian initiative and ability.

TABLE 1

CHARACTERISTICS OF VARIOUS ICEBREAKERS

Name	Mikula Seliani-novitch	Saurel	N.B. McLean	Prescot-ont.	Chartotte-town	Ymer	J. Stalin	Raritan	Ernest Lapointe	North Wind	Abegweit
Year built	1916	1929	1930	1930	1930	1932	1937	1939	1940	1944	1947
Where built	Canada	Canada	Canada	Canada	Canada	Sweden	Russia	U.S.A.	Canada	U.S.A.	Canada
Length Overall	292′-0″	200′-0″	277′-0″	117′-6″	324′-0″	257′-10″	350′-0″	110′-0″	172′-0″	269′-0″	372′-6″
Maximum Beam	57′-5″	42′-0″	60′-4″	27′-0″	59′-0″	63′-4″	76′-0″	26′-5″	36′-2″	63′-6″	62′-0″
Depth Mld. to Weather Deck	32′-0″	19′-3″	31′-0″	13′-6″	25′-0″	33′-0″	30′-0″	14′-11″	25′-5″	37′-9½″	24′-9″
Maximum Draft	....	....	....	12′-0″	19′-3″	....	29′-8″	11′-0″	.	29′-1″	19′-0″
Max. Displacement—Tons	....	....	....	489	6100	4350	11,000	354	..	6515	7600
Speed, Knots	15½	....	....	13 mph.	14	14/16	15½	12¼	...	16	16½
Propelling Machinery	Steam Recip.	Steam Recip.	Steam Recip.	Diesel Elect.	Steam Recip.	Diesel Elect.	Steam Recip.	Diesel Elect.	Steam Unaflow	Diesel Elect.	Diesel Elect.
No. of Shafts	2	2	2	1	3	3	3	1	2	3	4
No. Forward	....	....	....	....	1	1	....	....	....	1	2
No. Aft	2	2	2	1	2	2	....	1	2	2	2
Forward Motors:											
Horsepower						3000 shp.				3333/0	2-3850
Rpm. (Shaft)						155				140/210	128/155
Aft Motors:											
Horsepower	8000	3600 ihp.	6500	2–500 bhp.	...	6000 shp.	10,000	1000 shp.	2000 ihp.	6666/10,000	2–3850
Rpm (Shaft)	100	155	105	105/135	....	140	125	236	140	105/145	128/155
Total (Normal) Horsepower	8000	3600 ihp.	6500	1000 bhp.	...	9000 shp.	10,000	1000 shp.	2000 ihp.	10,000	15,400
Thickness Ice Belt Plating, Inches	....	⅞″	....	⅝″	....	1″	1″	¾″	13/16″	1⅝″	1⅛″
Frame Spacing	....	24″	....	18″	....	24″	20″	20″	23″	16″	15″-24″

The successful achievement has no doubt raised the prestige of Canadian shipbuilding. It is a matter of pride to all concerned with the *Abegweit* that she is practically one hundred percent a Canadian accomplishment, excepting a few auxiliaries from Britain, and the amplidyne control equipment manufactured in the United States.

Great credit is due the shipbuilders for their willingness to undertake such an important and exacting contract, which from the welding point of view alone would have taxed the facilities and resources of any large British shipyard. Credit is due also to the manufacturers of the machinery and electrical equipment, to the Canadian Board of Steamship Inspection, to the operating staff of the Canadian National Railways, the British Corporation Register of Shipping & Aircraft, the suppliers of the various items of equipment, and to the operating personnel of the ship, particularly Captain J. R. B. Maguire, and to Commander C. R. Edwards of the Department of Transport who took the responsibility for providing the best and most modern ship possible for the service, and who is to be sincerely commended for his vision and co-operation.

APPENDIX

EQUIPMENT SPECIFICATIONS

Engine and Motor Rooms

Four Propulsion Motors—C.G.E. Co. Ltd.—3,850 hp., 128/155 rpm.

Eight Main Generator Sets—2-6 cyl. 1,500 bhp.—360 rpm. Dom. Sulzer TS29 diesel engines driving 1-1,050 kw., 325 v. C.G.E. Generator.

Three Auxiliary Generator Sets—1-4 cyl. Dom. Sulzer TS29 diesel engine driving 1-330 kw., 225 v. C.G.E. generator.

Two Emergency Generator Sets—1-6 cyl. 1,200 rpm. Gen. Motors model 6-71 diesel engine driving 1-60 kw. G.E. generator.

Five Motor Generator Sets—1-30 hp. d-c. 220 v. 1,800 rpm. motor. Two amplidyne generators, one for generator and one for motor excitation, each rated 25 kw., 1,750 rpm., 250 v. C.G.E. Co. Ltd.

Two Alternator Motor Generator Sets—C.G.E. Co. Ltd.:
- 1-15 hp., 220 v. d-c., 1,800 rpm. motor.
- 1-12.5 kva., 115 v., 3-phase 60 cycle a-c. alternator.
- 1-1,000 watt 125 v. exciter.

Two Air Compressors—C.I.R. Co. Ltd.—5″ x 2½″ x 4″. Type 20-30 cu.ft./min. at 400 psi., 15 hp. at 900 rpm.

Four Air Bottles—D.E.W. Co. Ltd.—W.P. 400 psi. 38 cu.ft. capacity.

Four Lub. Oil Pumps—C.F.M. Co. Ltd.—835 imp. gal. per min. at 75 psi., 75 hp. at 1,750 rpm., vertical centrifugal.

Two Aux. Gen. Lub. Oil Priming Pumps—C.F.M. Co. Ltd., 50 imp. gal./min., 3 hp. at 1,750 rpm.

Three Lub. Oil Purifiers—Alfa-Laval Co. Ltd.—500 imp. gal./hr., 3 hp. at 1,450 rpm.

Two Diesel Fuel Oil Purifiers—Alfa-Laval Co. Ltd., 500 imp. gal./hr., 3 hp. at 1,450 rpm.

Two Heeling Pumps—16″ Fig. 6310A propeller pumps—C.F.M. Co. Ltd.—7,050 U.S. gals./min. at 22 ft. head, 50 hp. at 1,160 rpm.

Two Fire and Bilge Pumps—Vertical centrifugal self-priming—C.F.M. Co. Ltd.—200 imp.gals./min. at 100 psi.—also 300 imp.gals./min. at 35 psi.

Three Salt Water Circ. Pumps—Vertical centrifugal—C.I.R. Co. Ltd.—3,000 imp.gals./min. at 36 ft. head. 40 hp. at 1,260 rpm.

Three Fresh Water Circ. Pumps—Vertical centrifugal—C.I.R. Co. Ltd.—1,000 imp.gals./min. at 75 ft. head. 30 hp. at 1,900 rpm.

Two Heating Boilers—Water tube—Dom. Bridge Co.—6,000 lb. steam/hr. at 100 psi. W.P.

Two Forced Draft Fans—Clarage—2,598 cfm. at 70° F.—1.46 bhp., 1,150 rpm.

Two O.F. to Boiler Pumps—Viking ZGPH—2 hp. at 1,200 rpm.

Two Boiler Feed Pumps—Carruthers-Darling—6 x 4 x 12 vertical Simplex—10,000 lb. of water per hr.

Two Bunker "C" Transfer Pumps—C.F.M. Co. Ltd.—Waterous HD-456 rotary gear pump—60 imp. gals./min., 5 hp. at 1,750 rpm.

One General Service Pump—Vertical centrifugal self-priming C.F.M. Co. Ltd.—200 imp. gals. per min. at 100 psi.—also 300 imp. gals. per min. at 35 psi.

One Diesel Fuel Transfer Pump—Waterous HD-643 rotary gear pump—C.F.M. Co. Ltd.—200 U.S. gals./min. 5 hp. at 1,750 rpm.

One Automatic Make-Up Pump—Burks A 2C-4—240 U.S. gals./hr. 1/6 hp. at 1,725 rpm.

Four Turning Gear—D.E.W. Ltd.—2 hp., 220 v. 1,200 rpm. C.G.E. motors.

Four Motor and Thrust Lub. Oil Pumps—No. 4 B & S. pump, 2 hp., 220 v. d-c., 900 rpm. motor.

Two Motor and Thrust Lub. Oil Tanks—300 imp. gal. each.

Two Lub. Oil Storage Tanks—1,500 imp. gal. each.

Two Dirty Lub. Oil Tanks—750 imp. gal. each.

Two Expansion Tanks—90 imp. gal. each.

One Trimming Pump (reversible)—16″ propeller pump Fig. 5320X horizontal—C.F.M. Co. Ltd.—Capacity 3,130 imp. gals./min. at 15 ft. head. 40 hp. at 1,150 rpm.

One Oily Water Separator—Coast-Guard—10 tons/hr.

One Whistle Air Bottle—D.E.W. Ltd.—W.P. 400 psi. 38 cu. ft. capacity.

Two Domestic F. W. Pumps—Burks A5C—Cap. 550 U.S. gals./hr. 1/3 hp. at 1,725 rpm.

One Domestic F.W. Pump Tank—180 imp. gals.

One Sanitary Pump—Burks A5C—Cap. 550 U.S. gals/hr. 1/3 hp. at 1,725 rpm.

One Sanitary Pump Tank—180 imp. gals.

Four E. R. Vent Fans—Sirocco—6,000 cfm. at 1¼ S.P., 2 hp. at 1,720 rpm.

Two Control Room Supply Fans—Thermotank—5,000 cfm. at 2″ S.P., 3 hp. at 900 rpm.

Two Control Room Exhaust Fans—½ hp., 1,200 cfm.

Four Lub. Oil Coolers—Ross No. 1414 CP.

Four M.E. C.W. Heat Exchangers—Ross No. 1714CP.

Four Motor and Thrust Lub. Oil Coolers—Ross No. CP607.

Two Motor and Thrust Lub. Oil Storage Tanks—200 imp.gal.

Five Steam Heaters for Purifiers—Alfa-Laval Co.

A Transportation Paradox

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An address delivered before the Montreal Branch of The Engineering Institute of Canada on January 16, 1947.

The author contends that free right-of-way and inadequate regulation for highway transport are not the basic reasons why high cost highway transport has largely captured the door-to-door field in freight transportation from its low cost rail competitor.

Rail rates were originally regulated to curb monopoly. Then they were adjusted for purpose of widening market opportunities and opening up new territory. Haul of bulk commodities such as coal and grain, at low rates, was compensated for by high rates on processed goods. Railways, therefore, operate in a "planned economy" of their own. Highway transport, operating in its "free economy", captures the high-rate haul on processed goods moving over short distances, thus upsetting the "planned economy" of the railways.

The answer, he believes, lies not in raising rail rates on bulk shipments, but in an exhaustive study to determine the best means of assuring that each form of transportation contributes its maximum of service at a minimum of cost. Open competition might be permitted where rail costs are limited by highway costs, but how can this be done and still permit low cost haul of bulk commodities? Assistance to transportation by the state is not a new principle, and such assistance to railways by subsidies on low cost bulk freight is suggested as one possible solution.

The situation with which I propose to deal is one of those cases where facts and logic seem to have parted company. The transportation paradox presents a situation where economic principles seem to operate in reverse, a situation where the usual laws of the market-place do not control supply and demand, a strange topsy-turvy situation which would be amusing if if were not serious. The elements of the paradox are these:

Railway transportation is the cheapest form of land transport for all but short distances. Therefore by the laws of economics railway transportation should be immune from competition except in the short haul field. Conversely, highway transport, except in the short haul field, is from three to five times as expensive as railway transport. Consequently, highway transport should find it impossible to expand its services in the face of its lower price competitor.

The facts, however, belie the logical inference. Competitive highway services have seriously eroded railway traffic. Highway competition has ruined many railways and has brought others to the verge of it. The high cost producer, in apparent defiance of basic economic principles, has captured a market from the low cost competitor, both producing an identical commodity, viz., door-to-door transportation. Hence the paradox! Of course, like all paradoxes, the puzzle results from pertinent factors having been omitted, ignored or misunderstood, and when these are discovered and properly evaluated, the paradox becomes understandable, though the absurdity may remain.

Free Right-of-Way and Unregulated Trucking Rates Not the Main Causes

I suppose, that following these introductory remarks you will expect me to expose the unfairness of the railway having to furnish its own right-of-way, while the State furnishes the highway for the truck; to show that vehicle taxes are inadequate to pay highway costs; that highway commercial operators receive a large bonus through the medium of taxation of pleasure vehicles; that there is inadequate regulation of highway operators, and other such items. Such, however, is not my purpose, because while I agree that these factors do aggravate the condition, they are not the basis and underlying cause of the paradox.

Even if the field were to be cleared of all such factors, stripping from both highway operators and the railway the special considerations one or the other has received, or is receiving, (and the advantages are not necessarily all one-sided), no significant change in the relative costs of transport by the two agencies would result. All that would happen would be that the statement of fact would have to be re-stated, so that instead of saying that highway transport, except for short haul distances, was from three to five times as expensive as railway transport, one would have to state that it was, say, from four to six times as expensive. In other words, these factors which are commonly talked of are not sufficient to explain away the paradox.

Rail Service Not Sold in a Free Market

As is not unusual, the factor which has been overlooked is a commonplace one, so obvious that we marvel that it had not been thought of immediately. It is simply this: The marketing system by which a railway sells transportation differs profoundly from the free market-place, which is predicated by economists as being the true measure of value. Hence the ordinary laws of economics do not operate, and highway operators find a fertile field of opportunity produced by artificial conditions introduced into the marketing of railway transportation. Railways, in fact, do not sell their commodity, transportation, at prices related to cost, not in individual cases at least. Instead they sell transportation on the basis of a rate incorporated in a rate schedule, and the price the consumer pays is compounded of many factors, of which the cost of service in many cases is the least important. The controlling factor is frequently the value of service, a loosely defined term which is given significance only to the extent that the railway had a functional monopoly.

I am leading up to what to some may be a startling conclusion. We have heard much lately of "planned economy", meaning by that a regulated economy, which refuses to be controlled by the vagaries of the laws of supply and demand operating in the free market-place. How many would recognize that in our railways we have an example of a planned economy which was evolved early in the history of the industry, and which has grown to be such an accustomed part of our life that we look upon a railway rate as being a price for a commodity in much the same way as we look upon the price of any other commodity or service?

Our thinking on economic matters is unconsciously controlled by a presumed relationship between price and cost. We normally infer that because a commodity is low in price, the cost of production of it must be low. We are normally justified in assuming a margin of profit between the selling price and the production cost of a commodity, and we tend to fit things together according to this pattern. We assume that if price and cost should vary from this pattern, the situation would be quickly and automatically adjusted. Any attempt, however, to carry this kind of reasoning into the price and value relationship of railway transportation is a fallacy. The essential premise of a free and competitive market is in this case lacking, and the begging of this premise leads to confused thinking. This confusion in thinking is costing Canada not less than $75 millions per year.

Rail Rates Set With View to Widening Markets

Before dealing with that side of our paradox, however, I should like to deal with the history and economic justification of the planned economy of the railway rate structure. It had its genesis in the monopolistic nature of a railway. The railway had a functional monopoly which was not amenable to automatic control by functional competition. Only railways could compete with railways and then only between common points. The inevitable happened! Monopoly exploited its opportunity and railway rate regulations came into being to curb the monopolist. The principle of rate regulation revolved around two ideas, that of a reasonable rate and that there should be " absence of discrimination ".

You will note, however, the complete absence of reference to cost of service. Apart from a none too clearly recognized necessity of balancing over-all costs in relation to over-all revenues if solvency is to be preserved, little attention was paid to costs. The test of an individual rate was merely that it should be reasonable and non-discriminatory.

In the process of controlling the monopolistic features of railroads, another feature of profound importance gradually evolved. Railway rates were adjusted to widen market opportunities by overcoming geographical disabilities, to bring the benefits of settlement and development to remote areas. It is doubtful if in the beginning there was any consciousness of this as a deliberate policy. It was a development which arose from circumstances and had pragmatic sanction. It was a development, however, which made the railway an economic tool of the State, a tool to be used for national development. The mechanics by which the railway rate structure was used to accomplish this purpose are quite interesting. It costs the railway company practically no more to haul a carload of silk one mile than it costs to haul a carload of wheat one mile, the cost in either case is of the order of one cent per ton per mile, but in the case of shipment of wheat it is considered reasonable that the rate charge shall be half a cent per ton mile, whereas in the case of the silk it is considered reasonable that the rate shall be perhaps twenty cents per ton per mile. This is a far cry from the economics of the market-place. It is a planned economy with a vengeance.

Loss on Bulk Haul Made Up on Hauling Processed Goods

A little study will show that to encourage the development of natural resources in far places the reasonable level of rates had been worked out so as to allow of the widest possible expansion in the development of the country, even if in doing so railway rates have to be quoted which are only a fraction of average railway costs. So true is this, that fully 50 per cent of all commodities transported by railway in Canada moved at rates which are less than average railway costs. It is axiomatic that if all rates were on this basis, railway expenses would exceed railway revenues, but the gap was normally bridged by allowing as reasonable, rates which were many times the cost of service, as applied to commodities which are considered able to absorb the cost and still be widely marketed. There is a smaller volume of such commodities than of lower grade commodities, and not more than 25 per cent of the commodities transported by railway in Canada pay more than average cost.

To summarize, the railway moved 50 per cent of commodities at less than average cost, 25 per cent of commodities at average cost and 25 per cent of commodities above average cost. We are faced here with a composite economy. One part of the requirement of the composite economy is that the average revenue, as represented by the average traffic, would equal the average cost of service. The other part of the composite economy is a complex internal system of bonus and taxation, taxes being levied on some commodities far above the cost of service and bonuses given to other types of traffic which are moved below cost of service. This planned economy was beneficial alike to the State and to the railway, because the railway, being a functional monopoly, participated in the growth of the wealth and importance of the State. It is the old story of the circus operator who made up on the swings what he lost on the roundabouts, a satisfactory state of affairs so long as the roundabouts and swings are controlled by one owner. The arrangement, though satisfactory, was none the less artificial, in that it did not conform to the laws of the market-place, and this artificiality became a matter of importance when the railway lost a degree of its functional monopoly, lost it through the development of highway transport.

Highway Transport Disturbs " Planned Economy " of Railways

Let us revert to our earlier statement that the cost of highway transport is from three to five times that of rail transport. This means that if we take the cost of railway transport at an average of one cent per ton mile, highway transport is from three to five cents per ton mile. It follows that all railway traffic moving at rates per ton mile above these figures is vulnerable to highway competition. Now it so happens that the high valued and high rated commodities, which bear a concealed transportation tax, mostly move between the populous centres and over not too great distances. Therein lies the explanation of the rapid growth of highway transport. The smooth-working planned economy has been torn wide open. Revenues which under the planned economy were destined to be used for a bonus to shippers of marginal commodities have been diverted to the pockets of highway operators, who naturally exploit the artificial field of opportunity to the fullest possible extent.

Let us pause to see how the balance sheet adds up, as compared with the previous state of affairs. The shippers and consignees of the goods shipped by highway are happy because they have effected a reduction in freight charges. The highway operator is happy in the growth and profit of his new venture. The railway finds itself stripped not alone of normal profits but also of money needed to balance its outgo on traffic moved at less-than-average cost. The shipper of marginal goods at first is not primarily affected, but soon he may notice, if he is located on a branch line, that the quality of railway service has deteriorated, that railways are unable to supply adequate equipment and, even in extreme cases, that the branch line which serves his farm or his lumber mill is abandoned. It is abandoned for the simple reason that the railway, being unable to balance its books through the handling of traffic, must attempt to do so by curtailing its expenditures.

Paradox Costs Us $75 Millions a Year

Finally, we find society as a whole absorbing in one form or another the extra cost of handling the traffic by highway, as compared with handling it by railway; because the cost to society as a whole must be judged by the cost of service which the planned economy has ignored in detail. The reduction in transportation charges which the shipper or consignee of the high-valued commodity sees is therefore no true economy. On the contrary, since the cost of service by highway has been from three to five times that by railway, there has been an economic loss of from two to four cents per ton mile incurred. This is a penalty for running counter to economic laws, namely the cost of our paradox amounting to $75 millions per year. A curious conditions, is it not? But one not easily remedied.

It might be thought than an obvious solution would be for railways to assert their dominance and reduce their top rates to the cost of service by highway. This would have the effect of destroying highway competition, because no truck could operate and live at these rates, while the railway would still be making a comfortable profit. But do not forget that the rates which are proposed to be reduced have been loaded with the bonuses designed to allow marginal commodities to move to market, and for the railway to reduce the rates on high-valued commodities to a point where highway competition would be destroyed would also eliminate the bonuses. The railway would still be faced with the necessity of moving low-grade commodities at lower than average cost, but would lack the means of doing so.

As an alternative, then, let us adopt the principle that commodities must bear their cost of service, and freight rates must be assessed accordingly. That would surely cure the situation, as the bonus would no longer be necessary. Admittedly so, but it would be the same sort of cure as cutting off a man's head to stop a headache. Do not forget that the railway has been used to extend marketing as widely as possible, and any differential rise in the freight rates on low-grade commodities must be reflected in lowered marketing and a reduction in production, hardly a satisfactory solution of our difficulties. Nor is strict regulation of the highway operator a solution, although such regulation is commendable from the point of view of public convenience and necessity and public safety.

Freight Transport Half Controlled and Half Free

It would not, however, solve the difficulties arising from our paradox, because the operation of highway vehicles on the public highway must in the last analysis be considered as a 'laissez-faire' economy, so long as it is legal for an individual to transport his own goods on the highway in his own vehicle. Under these circumstances an attempt to force rates above cost of service by highway would simply mean that shippers would own their own vehicles. An equally unjustifiable solution would be for the State to prohibit the shipment of goods by highway beyond a prescribed theoretical economic haul. This solution has all the charm of armchair economics, but it is quite impractical and would jeopardize the country in securing the advantages of improvements in the art of highway transport, as determined by experience.

The paradox, in essence, results from a clash between a planned economy and a 'laissez-faire' economy, and as has been shown, other interests than the railway are damaged in this clash. The underlying causes have not been understood, and therefore a rather deplorable condition has been permitted to arise, deplorable, because railways must remain the main factor in land transport. The premise that railways are needed, when viewed in the perspective of the late War, needs no further proof. If such proof were needed, it could be furnished by considering the percentage of the national income which has now to be allotted to railway transport with the percentage which would result if the same service were performed by highway transport. The cost of railway freight transport in 1945 amounted to 5.8 per cent of the national income. Had this same transportation service been performed by highway carrier, the cost would have amounted to 23.2 per cent of the national income. Canada could not possibly afford such a bill of expense for basic transportation, and it is manifest that the preservation of railways as the backbone of the land transportation system is a sheer economic necessity.

Low Rates for Bulk Haul Must Be Maintained

Likewise, it would appear that railways must continue to transport marginal commodities at figures lower than average railway costs, because we are so committed to the benefits of a planned economy, which extends marketing assistance in this manner, that it is unthinkable that the policy should be reversed. The shippers of marginal commodities must continue to receive the benefits of railway service. For reasons mentioned above, however, the top level of railway rates must necessarily have regard to cost of service by highway. The rate structure of the railways must then conform to the value of service for marginal commodities and the cost of highway service for other commodities. The situation which is thereby created is one of economic instability. The cornerstone of the planned railway economy has been shattered. This has been the main contributing factor to the financial difficulties of railways in all countries in the decade before the late War. All countries have been forced to give consideration to this problem, and in one country or another most of the measures I have mentioned have been experimented with without a solution being found.

Must we therefore conclude that the problem is an insolvable one? Must we be reconciled to a condition of continuing economic instability of railways? I do not think so, but it does appear to me that much deeper and closer study of the problem is needed than has so far taken place. There has been a tendency to be misled by the more obvious forms of disparity in the competition of railway and highway services, and to reach a conclusion that if these are adjusted by appropriate regulation, all will be well. The real purpose of my address is to set forth my views that this is not true. I hold that further study is necessary, and that this study should encompass the whole field of the social usefulness of the two forms of transport. The next step would be the devising of ways and means to see that each form of transport should contribute its optimum of service. Here again careful study is necessary, because it is quite possible to do more harm than good if short-sighted or arbitrary policies are adopted.

Subsidies for Handling Bulk Commodities a Solution?

It seems, however, there is some merit in introducing the principle of open competition within the sphere where railway rates are necessarily limited by highway costs. In other words, we might put an end to the artificial field of opportunity and let the normal laws of economics determine the price and value of service, as between railway and highway. The puzzle is how to do so without destroying the ability of the railways to handle marginal commodities. Here is must be recognized that the State has a lively interest in the matter and that possibly the only solution would be a realization that this is so. The State would normally deal with such a situation by assistance in one form or another. Assistance to transportation is not a new principle as applied to railways, waterways or highways. The problem is more one of introducing a degree of logic into the situation and of apportioning the assistance so that the optimum benefit to society would result.

I hold it to be true that the test of a sound transportation economy is the provision of a maximum of service at a minimum of cost when all factors are taken into account. In a modern economy an approximation to this condition cannot be taken for granted. Already, as I have pointed out, artificial conditions have resulted in increasing transportation costs by $75 millions per year in Canada. Careful study should make it possible to recoup much of this loss.

I hope I have made it clear that the clash of the regulated railway economy and the 'laissez-faire' highway economy affects many more interests than the highway operator and the railway. We are not in this case dealing with the struggle between commercial competitors, where the battle will ultimately go to the worthier contestant, with benefit to society as a whole; we are rather witnessing a mutually destructive struggle, where those who seem to gain an advantage do so at the expense of the total economy. The situation is one which calls for an understanding based on careful study and analysis, and it is to be hoped that a solution will be found, which will permit each form of transportation to live and prosper.

Progress of The Electric Locomotive

On its 73-mile electrified section between Wenatchee and Skylomish in the State of Washington, the Great Northern Railway handles heavy freight loads with the worlds' two largest single-cab electric locomotives. These 360-ton giants are 101 ft. long and develop 5,000 hp. with 119,000 lb. tractive effort at 15.75 mph. and up to 180,000 lb. for starting and acceleration.

The 12 axles of each locomotive are arranged in two 4-axle main trucks and two 2-axle guiding trucks. All axles are driven, the twelve 300/600 volt d-c series wound motors being mounted on the axles and rated at 500 hp. each for traction. Regenerative braking to a maximum of 5,750 hp. is provided and allows very heavy trains to be handled on grades without the use of the train air brakes.

Primary power from the trolley is supplied through a single transformer, to two 5-unit motor generator sets one set being mounted in each end of the apparatus compartment. The driving motor of each set is a 25-cycle, 1,350-volt, 750 rpm., single-phase synchronous type and the sets deliver d-c power at 300/600 volts to the 12 traction motors. The two main motors also drive exciters for the traction generators and the traction motors when they are being used for braking. The two motor generator sets are started by applying reduced d-c voltage to the generators to use them as starting motors. The generators may be used in parallel for heavy freight work at low speed or in series-parallel for high speed passenger service.

Auxiliary power is provided by two three-unit motor alternator sets located in the nose compartments of the double-ended cab. The 85-hp. single-phase induction motors of these sets each drive a 62.5 kva. alternator and a 75-volt d-c generator. The d-c generators supply control power, start the main sets by motoring their traction generators and charge batteries. The alternator powers the cooling blowers which supply 2,300 cfm. of air to each of the traction motors.

Also located in the nose compartments, two 2-stage a-c motor driven air compressors have a displacement of 150 cfm. at a reservoir pressure of 130 psi.

The streamlined, double-end superstructure is of all-welded construction, fabricated from steel shapes and plates. The operators' cabs are insulated and fitted with safety glass in all windows.

Main truck axles are side equalized by semi-elliptic springs with additional cushioning provided by helical springs. Additional controlled lateral motion is provided on the two inner axles of the main trucks with spring loaded retaining devices to increase stability on tangent track. A motor-element pantograph relay and ground switch system provide primary circuit protection. Thermal overload relays and thermal trip breakers protect auxiliary circuits with temperature detectors in the synchronous motor windings and the transformer Pyranol coolant.

The Suspended Monorail

for Rapid Transit

A paper presented before the Montreal Branch, Engineering Institute of Canada, on November 6, 1947

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Tracing the growth of urban transportation, the author discusses the advantages and disadvantages of mass transportation systems, surface, elevated and underground. By comparison, the advantages of a monorail system are shown. An example of a monorail system successfully used in Germany for 50 years, is given.

The modern conception of the suspended monorail has progressed considerably, and would embody many advantages inherent in the present day P.C.C. streetcar. Simplicity of the structures required for a monorail system is emphasized; the advantages of accessibility, safety and silence of the truck assembly are pointed out. Car body design and construction is outlined; methods of switching and of arrangement of stations are described.

During the 250 years following the founding of Montreal, even the most forward-looking citizen could not foresee the movement of traffic present in the city today. Early street planning was, of course, largely predicated on the movement of small horse-drawn vehicles, and much fewer in number than the vehicles now seen on most of the streets. Naturally, the use of streets for all-day parking was also not foreseen. Yet the basis for street routing and street widths was being formed during this early period.

It is therefore not surprising that the community is now faced with a traffic problem of the first magnitude. Nor is Montreal alone in its difficulties. The same condition obtains today in many cities of Canada and the United States. However, it is not the intention to attempt an analysis of the local situation, but rather to trace generally the nature of these fairly universal problems, and to describe somewhat briefly the Suspended Monorail System of Rapid Transit and its advantageous features as a possible solution.

Surface Transportation

As cities grew and expanded over unforeseen distances, the need for public transportation arose. Various forms of horse cars and horse-drawn stages gave way to the electrically-driven street car. For many years, the tramway lines served the communities' needs satisfactorily. Eventually, however, a demanding competitor for "elbow room" on the streets arrived in the form of the private automobile. Moreover, the passenger who abandoned the street car to drive his own automobile occupied more street space in movement. He also appropriated space at the curb —anywhere from five minutes to all day. Presently, the original electric street car was left behind. The introduction of modern street cars with "agility" of movement comparable to that possessed by competitive automotive traffic did not come any too soon. Possibly some of the older cars were constructed too well. Anyway, they have been a long time wearing out.

But even with the PCC car, with all its fine points of speed, rapid acceleration and braking, the problem was not completely solved. The best tramcar in the world can go no faster than the trailer-truck directly ahead of it. Therefore, where street cars and dense auto traffic must share narrow streets, which are also being used as public garages, something more than a fast street car is desirable.

The auto bus and trolley bus have both put in their bids for consideration. As far as manoeuvrability is concerned, they theoretically improve on the street car, through their ability to load and discharge passengers at the curb. Thus a safety zone, itself a restriction to traffic flow, need not be established. However, the lesser passenger capacity of the bus increases the number of vehicles on the street. Furthermore, curb loading is accomplished at the expense of frequently blocking two lanes of traffic. The driver approaches the curb at a sharp angle leaving the rear of his vehicle out in the second lane, at least partially blocking it. Curb loading also fails if "no parking" restrictions are not strictly observed.

As a solution to the problem of moving large numbers of people into a central district, the private automobile is decidedly a poor answer. The automobile is extremely prodigal of street space. Unlike public conveyances, it must be stored somewhere until the return journey. There is little question but that it is a community responsibility to provide street space for the necessary flow of vehicles, but it is open to question whether parking space should also be provided at public expense. In any case, it is costly to establish adequate parking space. Unfortunately, too, experience has shown that provision of express traffic arteries and other facilities for the automobile tends to defeat its own purpose. The reservoir of potential automotive traffic is so great that partial removal of inconveniences damming its flow only releases a greater movement, and the acute parking problem is still to be solved.

The maximum capacity of a single tramway line with reasonable freedom of movement is about 15,000 passengers per hour, nearly ten times a single lane of automobile traffic. The operation of trains of surface cars helps little as the competitive congestion is still present and even two car trains so extend the required loading spaces that the secondary congestion may well be aggravated. Removal of the tramcar from the street to a completely private right of way increases the load-carrying capacity to approximately 20,000 passengers per hour. The expense of such removal is disproportionate to the resulting gain.

In the face of these conditions, decentralization of activity has been advanced as a solution. Outlying shopping centers are common developments around modern cities. If carried to extremes, this results in drying up much of the life stream of commercial activity required to nourish existing business areas resulting in their decrease in value and tax return to the community. Similarly, the establishment of outlying industrial centers on the outskirts of a large city creates a problem. Either semi-independent communities grow up, or the volume of cross-city traffic is increased.

It is not implied that decentralization in some degree is not desirable, but it is emphasized that decentralization resulting in starving established business areas is undesirable if it can be avoided, and that decentralization, when otherwise justified, often is accompanied by altered, but none the less serious, transportation problems.

Elevated Railway

If a solution cannot be found on the surface the alternatives are to go overhead or underground. The conventional elevated railway appears to have run its course and to be falling into disfavour. The objections to it lie principally in the multiplicity of supporting columns, impeding surface traffic. But far more serious has been the depreciation of abutting property values due to the practical flooring over of the street, shutting off light and air, and to the accompanying noise of operation. Notably in New York City, unsightly elevated structures are being removed as rapidly as other facilities can be provided.

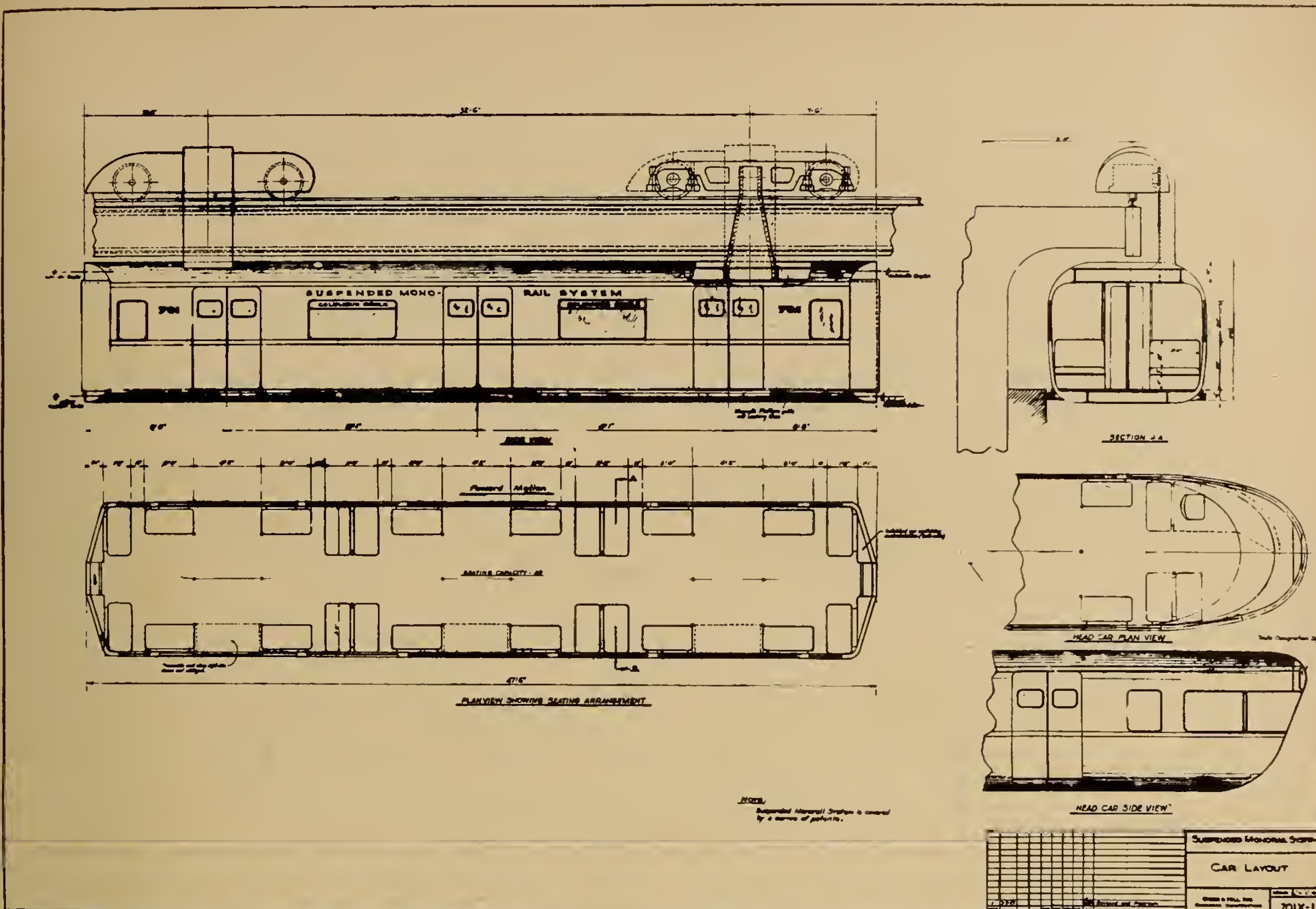
Underground Railway

Technically, the subway presents a good solution. Train operation is possible without offending structures above ground, and little noise-nuisance to abuttors. From the standpoint of noise, air and light, however, the ride cannot be considered attractive.

Economically, the subway is a problem child. The cost of construction is a heavy burden and subterranean operation presents new problems, such as pumping of seepage and flood waters and the handling of possibly panicky crowds on trains in case of accident. It is doubtful whether sufficient potential traffic density exists in any area, including multistoried apartment house areas of New York, to make an entirely self-sustaining subway fare feasible. If the community provides the required structure, there remains the problem of how this burden should be distributed, that is, generally, or to abutting property owners presumably benefiting, or any number of alternatives. Unfortunately, in the last analysis someone must pay heavily, but this problem is political rather than technical. It is practically certain that few, if any, moderate-sized cities can afford the expensive luxury of a subway.

Suspended Monorail

The Suspended Monorail System of Rapid Transit has been offered as a possible solution to many of the more bedeviling problems just outlined. It provides true rapid transit train operation free of competitive traffic interference, and as normally used, an attractive open-air ride, a minimum of overhead structure, and at a cost substantially less than subway construction. Being a mass transportation tool obtainable at reasonable cost, it can provide practical arterial transportation from outlying districts to and through the congested central area of a city, so avoiding the need for that decentralization of business born of desper-



Monorail car layout. Reproduced from a drawing prepared by Gibbs and Hill, Inc.

ation. It is fast enough to provide cross-city rides within reasonable elapsed time.

The Monorail, in common with subways and elevated systems, provides rapid mass transportation away from areas of concentration, thus reducing congestion incident to the requirements of existing large business centers. In this way such a system benefits other traffic movement, as well as providing a quicker journey. An incidental, but important, advantage is the absence of any snow-removal problem. This is equally true of a subway, but not of any form of surface line.

The Monorail is also versatile in that, when desired, it can be operated underground. Therefore, a precipitous hill or a location which justifies such construction presents no impossible problem. Except for platform level the underground construction would be very little different from that of any subway.

Monorail Prototype

In its fundamental form the Suspended Monorail type of operation is not new and untried. Trains of two to five cars, each suspended from two, two-wheeled trucks running on a single overhead rail, have been in operation on the Barmen-Elberfeld-Vohwinkel Railway in Germany since 1901. Over the first 33 years of operation this installation carried an average of 13 or 14 million passengers per year on its 8¼ mile route. The overhead rails are carried by trusses, in turn supported by A-shaped or arch-type bents. An interesting feature of these supports is the fact that for a part of the route the structures span the Wupper River, so utilizing a right of way not otherwise available for wheeled traffic.

Considering that this installation was designed nearly 50 years ago, the maximum regular operating speed of 25 miles per hour is creditable. It was the original conception of the designer, later proven by experience, that safety of operation and possibly passenger comfort would be improved by leaving the cars free to swing sideways and thus assume a position of equilibrium on curves, which are numerous and severe on the route.

It is difficult to say why, with such a successful prototype, the principle has not been seized upon sooner. Probably this is due to the natural human tendency to progress one's own ideas first, and because, until recently, the necessity of obtaining true rapid transit off the street has not been sufficiently pressing.

Modern Suspended Monorail

The modern conception of Suspended Monorail has progressed considerably without the loss of any of the fundamental advantages. Many improvements have been adopted from progress in structure and equipment designs of analogous systems, for example, from the PCC car.

The running rail is supported by a simple box girder of sufficient strength to obviate the necessity of cross bracing between the two rail supports of a double track line. The supporting structure may be an arch-type bent as formerly, or where more suited to the conditions, a single column with suitable cantilever brackets. Thus, any semblance to a floor above the street has been entirely removed.

The car body and electrical equipment are a logical adaptation of the PCC car development. Modern high-strength, light-weight materials are used to the fullest extent found to be economical. All cars are equipped with four modern, high-speed motors, operated in multiple from a single control point for each train. Motorizing all four axles per car not only permits the use of smaller motors, but makes the entire weight available for rapid acceleration and braking rates within conservative values of adhesion. Balancing speeds on level tangent track as high as 50 miles per hour, and corresponding higher maximum safe speeds, are feasible.

Because the center of gravity of the car is well below the point of support, any transverse oscillations tend to dampen out, although on curves outward swinging of the car as a unit is allowed nearly to a position of equilibrium between gravitational and centrifugal forces. This feature increases passenger comfort.

Structures

The supporting structures are susceptible to a variety of treatment, but extremes of decorative treatment are not necessary because the design has been reduced to simple and clean lines. To avoid endless possibilities, only a simple type will be described.

The structural design is based upon an unbalanced loading, consisting of a train of 15-ton cars, each carrying a passenger load of 200 people, amounting to an additional 15 tons, or a total of 30 tons per loaded car, plus an impact of 30 per cent of the total. The horizontal loadings consist of wind load of 30 pounds per square foot on both structures and cars and of the centrifugal force, on a nominal 100-foot radius curve, produced by a constant speed around the curve of 20 miles per hour. Longitudinally the loading corresponds to the force produced on tangent track by an acceleration of 3.4 miles per hour per second, or braking of 3.5 miles per hour per second.

The 100-foot radius curve structure is also designed for the tangential force of acceleration or deceleration at 2.5 miles per hour per second, from a speed of 15 miles per hour combined with the corresponding centrifugal force.

A total temperature range of 140 deg. F is taken in determining the expansion. The basic stress allowed is 20,000 pounds per square inch, increased to 25,000 under maximum wind conditions and to 30,000 pounds per square inch for the combination of maximum wind and greatest expansion.

Except on extremely narrow streets, supporting structures are simple columns approximately 36 inches in the cross-street dimension, by 20 inches; or alternatively of octagonal section 36 inches across flats. The first, or rectangular, columns are suitable for spans of 60 feet; while the octagonal type permits spans up to 78 feet. The rectangular column supports a transverse bracket 20 inches wide by 30 inches deep. For the longer spans, possible with the octagonal columns, the simple transverse bracket is replaced by a spider, having four arms 15 inches wide and 30 inches deep, set at 45 degrees to the street center line. Irrespective of the type of structure, the rail is carried on a sound and vibration-dampening member supported by a 15¾-inch box girder 36 inches deep. The power rail, frequently by force of habit called the "third" rail, is carried upon bracket-supported insulators on the outside of the box girder between the latter and the car hanger arm, from the truck to the car.

Because columns, brackets and girders are made of simple plates and structural shapes, they lend themselves to automatic shop welding. This procedure permits extensive prefabrication which combined with a standard foundation cap results in rapid field erection. In fact, the time of construction is determined largely by the number of foundations constructed simultaneously, as the superstructure erection is simple. Foundations, structures and stations of the Suspended Monorail involve less temporary or permanent interference with existing construction than either a subway or conventional elevated system. They also require less elapsed time for construction.

Truck Assembly

Each of the two trucks supporting a car has two 25-inch wheels and a wheelbase of nine feet, two inches. In addition to the wheel, the short axle somewhat over two feet long carries a brake drum and the driving gear and gear box for one motor. The axle runs in two roller bearings carried by a subframe, which in turn is restrained by pedestal guides and a driving link, and supports the main truck frame through springs. The principle of the truck is similar to the PCC car truck, but adapted to two wheels instead of four.

The wheelbase, being somewhat longer than that of modern street car trucks, warrants some explanation. It permits staggered tandem mounting of the motors with two drive shafts, one passing on either side of the center pin. It provides a long guiding arm leading to low flange pressures and good tracking characteristics. Another important result is the wide distribution of the car weight over the supporting structure.

The motors are of conventional high-speed design driving through shafts and high-ratio, right-angle reduction gears on the driving axles. They are attached to the truck main frame by bolts and hook-shaped safety brackets. All motor weight is thus springborne. Their rating is, of course, dependent upon service requirements, more than ample space being provided in the truck for the maximum probable rating.

The truck is designed to accommodate conventional clasp-type air brakes operating on a special brake drum, with an individual brake cylinder for each axle and mounted on the truck frame. There is no reason, however, why all-electric braking could not be adopted as on the latest projected PCC cars, eliminating compressed air entirely from the car.

One of the important advantages of Monorail equipment is the accessibility of apparatus for maintenance and inspection work. By providing a working platform in the shop, slightly below track level, work on all component parts of the truck can be performed without interference from the car body. Motors are extremely accessible for inspection and maintenance, or may be removed from the truck directly by a low-capacity hoist, without the use of a drop pit moving the truck from under the car body, as required for the street or subway car. Brakes, brake rigging, and drives may be inspected and the latter lubricated without interference from the car body or the danger of getting "an eyeful of dirt." These features not only lead to substantially reduced maintenance costs, but result in the performance of better maintenance work.

The supporting member between the truck center pin and the car body is one of the unusual parts of the equipment. First, by means of a vertical center pin, it provides for rotation, in a horizontal plane, of the truck relative to the car body, thus accommodating horizontal curves. Second, it also permits similar rotation of the truck in a vertical plane to pass through vertical curves of the track. This is accomplished on a cylindrical trunion rather than by a rocking center bearing. Having only one running rail, there is no cross-track rotation for which provision must be made.

The chances of truck derailment are slight, due to the easy guiding characteristics of the truck, and to the absence of an overturning moment, while the tendency of a flange to mount the rail on a curve is also reduced. Despite all this, the car hanger arm is carried over the rail and forms a safety hook designed to catch on the rail in case derailment should occur.

The car hanger arm and truck frame also support a hood over the truck, which serves the dual purpose of sound-deadening and protection of the motors from the weather. In the latter respect, the motors are pampered compared to street car motors which are exposed to wheel wash, high water over the tracks, and the mixture of dirt and water carried into the air under the body by the motion of the street car.

Car Design

The car body of all except the leading unit, to which a streamline nose is added, is approximately 48 feet long, and nine feet six inches wide. The exact weight, although dependent upon the materials used, e.g., stainless steel or aluminum, is approximately 15,000 pounds. The "inverted" construction presents an advantage which might be overlooked. The body is essentially a hollow, nearly tubular beam, suspended at two points on the top. Between these points the relatively heavy backbone provided to absorb buffing stresses from couplers above the end doors, is in compression. The lower side, being in tension, can be relatively light. In the conventional car supported from below, either the main sill is made strong enough to take the entire bending, or if the roof is incorporated into the truss, it must be specially constructed to withstand forces of compression.

The seating arrangement provides for 48 seated passengers per car, 12 riding forward, 12 backward and 24 on longitudinal seats, together with a maximum of standing room. It will be noted there is no aisle space subject to congestion between any seat and the nearest door. Three large, double doors are provided in each side to facilitate the rapid loading and unloading essential to high-speed rapid transit. Communicating doors are provided in the ends of the cars for the small or unusual amount of passing from one car to the next.

The center of gravity of the car body and its supporting members is directly below the center line of the rail. Due to this fact, the car tends to restore itself to its normal position if caused to swing for any reason, cross wind or passage around a curve. A theoretical sideways swing of approximately 20 degrees is permitted by the structure and car body dimensions, which is considered ample for permissible operating speeds on curves, even with cross wind conditions. Where greater swing might be produced by conditions of application, a gyroscopic stabilizer can easily be installed in each car to restrain the swing.

In approaching the platform at a station, the cars must be held in the vertical position. For this purpose, skates are provided on the side at each end of a car which, acting against the forward edge of the platform, supply the necessary guiding. In addition, these skates are electrically energized prior to opening of the car doors, magnetically locking the car against the platform to eliminate swinging of the car if the movement of passengers should otherwise cause such a motion of the car.

Heating and ventilating are combined into a common system. Motor-driven blowers and duct systems, arranged for variable control of the proportion of recirculation and introduction of outside air, deliver all the air required for ventilating the car, suitably heated when the season requires. The air is delivered through outlets below the seats, supplied by under-floor ducts. As window opening is not required for ventilation, each window consists of a single fixed pane of shatter-proof glass.

To keep all air piping and cable runs as short as possible, the air compressor and tanks together with the electrical control equipment are mounted between the roof and the ceiling of the car. Standard PCC car type electrical control is applicable with little or no modification.

A European application. ***Left*—Suspended train going up the main street of Vohwinkel. *Right*—Another section of the same route over the Wupper River in Barmen, Germany**

Track Switching

Due to the presence of the car hanger arm between the trucks and car body, route-switching of trains differs somewhat from conventional railroad practice. The switch for a right hand turn-off consists of a rotating block instead of a switch point. This power-operated block can be locked in either of two positions, the first providing a continuous, straight-through, running rail and space between the tangent and turn-off girders to permit passage of the car hanger arms; while the second position establishes a continuous running rail on the turn-out.

While a somewhat similar rotating block was considered, in place of conventional crossing special-work, when turning left across the opposing track, the fundamental undesirability of grade crossings in rapid transit operation, led to the adoption of grade separation by means of a right hand turn-off and an over or underpass for such movement.

Signal System and Station Arrangement

Block signals are provided, having the proper number of aspects for the operating speeds, similar to those in the most modern subway work.

The stations consist of a combined enclosed waiting room and loading platform, thereby providing much greater passenger comfort than older type elevated station platforms, especially in severe climates. Sliding doors corresponding in size and location to the train doors remain closed until the train is stopped and ready to receive or discharge passengers. Thus, no hazard exists of a passenger falling off a platform.

Because the car floor is less than one foot above the necessary traffic clearance line, the height of the station platform is correspondingly low. Numerous stairways for descent directly to the street level are located along the length of the station. Opposing upward-moving escalators converge at the change booth and turnstile area on a mezzanine level in the center of the station, from which escalators give access to the main platform. Two stations can be located on the outsides of the route or, by spreading the normal spacing between opposing trains, one platform located between the two trains can serve both directions.

At the crossing of two Suspended Monorail routes convenient transfer stations are required. The lower level platform arrangement is much the same as the regular station, with suitably increased capacity to handle passengers for two lines. For part of its length the lower level platform is covered by a mezzanine with numerous access stairways from the lower level platform, provided with escalators, if necessary. This mezzanine can be somewhat wider than the loading level below it, to provide for the concentration of traffic at its center where up and down stairs give access to the crossing upper level platform. The upper level platform can be provided with escalators from the street and with its own change booth and turnstile arrangement if it is desirable to provide for larger crowds than can be handled in common with the turnstiles of the lower level. In any case, direct descent stairs or escalators to the street level are provided.

At points of interchange with other forms of transportation, for example, tramcar or bus feeder routes, the stations are located to fully coordinate the two operations. In general, the surface transportation discharges passengers near the foot of station stairways, while the station platforms provide convenient waiting-room space.

Summary

By virtue of its lower cost, compared with other means of providing true rapid transit, the Suspended Monorail offers the possibility of obtaining needed facilities within the limits of available financing. Such Suspended Monorail facilities can be more rapidly constructed than other similar systems. Although only one previous installation has been made, the technical basis of the construction is sound. The safety record of the one operating installation has been excellent. There have been no accidents on the line, and the few which have occurred at stations would have been effectively prevented by the present improved design. Scheduled speeds of operation are as high as any available rapid transit rendering the same service. Both from the standpoint of patrons and occupants of adjacent property, Suspended Monorail operation is quieter than other systems, and its appearance can be made attractive.

As there are no fundamental technical objections to Suspended Monorail, its consideration as a solution of transit problems is proper. Attention is directed to the fact that the scope of this description has been entirely general. This reflects no uncertainty regarding any particular application, but simply the fact that any specific use must be studied individually, and that details of design, based upon accepted underlying principles, must be developed for each application.

Passenger Service Requirements *for* North Atlantic Operations

by

J. W. Schwab

Trans-Canada Air Lines, Dorval, Que.

A paper presented at the Semi-annual Meeting of the American Society of Mechanical Engineers, at Chicago, Ill., June 15-19, 1947

Pointing out that trans-ocean airline passengers now expect comfort and service comparable with other means of travel, and will choose the airline that gives it, the author deals successively with the questions of seating, air conditioning, noise, lighting, styling, wash rooms, entertainment, catering, safety devices and selection of cabin attendants, based on the experience with trans-Atlantic operations of Trans-Canada Air Lines.

There are two schools of thought existing today among trans-Atlantic passenger air carriers: to carry the maximum number of passengers with the necessary limited passenger service, or to carry a reduced passenger load in luxury airliners. During the past year trans-ocean transportation has been at a premium, so that maximum loads could be obtained under almost any conditions. However, air-minded travellers are already beginning to choose the airline that will give them *service*. Flying has now lost its glamour, and passengers will expect comfort and service comparable to other modes of transportation, and rightly so. If these amenities can be provided with the addition of speed, air travel will be on a solid footing.

Service to the passenger commences the moment a prospective customer walks into the ticket office, and does not finish until he is delivered to his destination. Many departments and personnel are involved in providing this service. This paper, however, will deal with the service requirements aboard the aircraft itself.

Seating and Passenger Comfort

Obviously the most important item in long haul transportation, and the one the passenger comes into the most direct contact with, is his seat. At the present time no airline chair manufacturer has in our opinion developed a satisfactory chair. To properly tackle this problem it should start back àt the aircraft design stage and be developed with one view in mind; passenger comfort. Extensive research has been conducted, and figures are available on the mean seating dimensions necessary for adequate chair support. This work has been well covered by the SAE, and by Professor Ross A. McFarland in his book "Human Factors in Air Transport Design."

In laying out a passenger carrying aircraft, the designer should calculate his interior fuselage diameter by allowing 22 inches per chair plus a three inch arm rest for each chair, and at least an 18 inch aisle space. This would result in a 130 inch diameter machine for a twin double seating arrangement, which has been found to be the most satisfactory.

The ideal chair must be as comfortable in the reclined position as it is in the upright position. To prevent the occupant's clothes from riding up when reclining, the back should pivot about the hips. The front of the seat should drop simultaneously, and provision should be made to raise the feet.

The upholstery chosen must be readily washable with soap and water during flight and be quickly removable in the event of air sickness. The material should not soil, should be porous enough to allow breathing, yet sturdy to withstand hard wear. An important contribution to chair comfort is the pillow, which should be filled with a soft down and be slightly concave to support the head in rest. The arm rests must be free from vibration. This may be accomplished by mounting them with shock rubber. Chairs must be quickly removable units, light weight and strong enough to support a weight of 1,000 pounds. The carpets and mats must be cut in small sections, so that they are quickly removable in the event of an airsick passenger.

Air Conditioning

Much may be done for these unfortunate victims by proper ventilation. The most beneficial results may be achieved by a direct flow of fresh air on the passenger's face. This should be feasible in the upright or reclined position, and available in either a normal or pressurized aircraft. Ventilation ducts must be designed so that they cannot create a draught on the back of a passenger's neck. There must be no recirculation of air in either the normal or pressurized fuselage.

Present day machines with their recirculating air systems develop an objectionable odor which activates air sickness. A properly controlled temperature gradient, both fore and aft and vertical, is necessary and should not permit a variation of more than three or four degrees. However, present day non-pressurized aircraft are difficult to control, due to the natural circulation of air from aft forward. The temperature gradient in a pressurized aircraft will not be disturbed by air leaks, and thus a planned gradient is more feasible. Better sealing methods will be necessary however, to obtain ideal conditions, as the existing rubber seals on doors take a permanent set at low temperatures, permitting air leaks.

To maintain a normal room temperature of from 65 to 70 degrees, heat should be dissipated by both convection and radiant heat from the cabin walls. Wall heating is a necessity in order to prevent heat conduction from the passenger's arm and shoulder, resulting in stiffness or rheumatic pains. Cabin heat may be obtained from either unit heaters or heat exchangers. At the present time electrical heating is not practical, due to the other large loads on the electrical system. In a pressurized aircraft heat is generated by the compression of air and skin friction to such an extent that cabin cooling during the summer months is more of a problem than cabin heat.

Cabin Pressurization

Cabin pressurization has not yet been developed to a satisfactory degree, and will not be until sea level conditions can be maintained at altitudes up to 30,000 feet. Until such time aircraft will be required to carry portable oxygen equipment to supplement this system. All passenger-carrying airliners should be pressurized, both for long and short haul work. They should be able to quickly climb above the weather, reach their destination in smooth air and descend quickly through the rough strata. This rapid climb and descent will only be possible when sea level pressurization has been realized. This type of operation will reduce passenger sickness and discomfort to a minimum.

Because of the small cubic volume of aircraft per passenger, humidification has not been a problem to date. However, with the advent of jet propelled aircraft flying at high altitudes, it will be necessary to supplement the cabin moisture content. This may be accomplished by storing an adequate water supply aboard before take-off, which will involve a costly weight penalty, or by the installation of an exhaust water recovery system. Results obtained by the Consolidated Vultee Aircraft Corporation have proven that a condensing unit is definitely practical when employed on long range flights.

Noise and Vibration

The noise level in all existing aircraft is higher than that desirable for ideal passenger comfort, and the problem is becoming more and more difficult as the power of engines increase. This feature of flight has been under study for some years, the first systematic studies in the United States having been made by Bassett and Zand of the Sperry Gyroscope Company. During the war the Office of Scientific Research and Develoment produced sound level standards for military aircraft, as developed by the Electro-Acoustic Laboratory at Harvard University. An analysis of the noise sources in aircraft has shown that the propeller, exhaust, engine, aero-dynamic and miscellaneous noises are the main contributing factors to cabin noise.

Although great strides have already been made by the industry in noise reduction, we feel that the manufacturer and designer have not truly appreciated this problem. Today we are busy trying to suppress cabin noise caused by existing installations. This problem should be tackled by investigating the trouble at the source. It must be remembered that sounds increase in logarithmic progression, so that to effect an appreciable reduction there must be an equivalent suppression of all contributing factors. Another very important contribution to noise suppression is the sound-proofing installed around the cabin walls. In recent years this has become very effective by the use of fibre glass or " Kapok " sheets, which also act as a heat insulation.

The Consolidated Vultee Company have carried out extensive research along these lines, and have produced some very satisfactory results. By proper sound shielding, cabin noise reduction up to 20 db. may be realized. A concentrated effort should be made to reduce the noise level at voice frequency, having a range of from 12,000 to 24,000 cps. Noise accentuates the feeling of vibration, just as vibration accentuates the noise level.

An all out effort should be made by aircraft designers to reduce the uncomfortable feature of vibration. This may be best accomplished by dynamically balancing all rotating parts of the power plants. Propellers should be statically, dynamically and aerodynamically balanced. All features of the air frame, and accessory equipment attached thereto, should be flight-tested for possible vibration. The engines should be located as far from the fuselage as is aerodynamically possible, and should be rubber shock-mounted. All interior fittings must be fastened securely to the frame, bulkheads and/or floors. An absorption mat of rubber or equivalent should cover all parts of the floor that may come in contact with the passengers, feet. Vibrations may be very easily felt through the soles of thin shoes. Not until recriprocating engines and propellers have been superseded with turbo jets, may we expect a truly satisfactory solution to this problem. However, much may be accomplished if adequate attention is given to this subject.

Lighting Arrangements

Cabin lighting is another very important feature in passenger service requirements. We have found that the most desirable results may be obtained by the installation of indirect dome lights. A rheostat is installed in the circuit which permits the Steward to dim the lights when the majority of passengers wish to sleep. Individual lights must be provided for night reading.

The reading light should be so directed that it illuminates a passenger's reading material either in the upright or reclined position. This light must not interfere with the person sitting alongside, forward or behind. This might possibly be accomplished by a light installed in the seat back, or a narrow beam light from the baggage rack.

Styling and Cabin Arrangements

The subject of cabin styling and cabin arrangement has not yet been developed to a satisfactory measure. Not enough attention has been paid to color dynamics in choosing the materials for cabin interiors in long range aircraft. By proper choice of colors both claustrophobia and fatigue can be reduced. New plastic materials, both of the imitation cloth and leather variety, are proving very satisfactory. This material has good wearing characteristics, is easy to clean and is light in weight. It has been found that dark colors below the window level are the most practical as they do not show heel marks and other defacing action as readily as do the lighter colors.

There are two schools of thought most prevalent on the subject of cabin arrangement. The usual method of a continual seating arrangement is the most generally accepted at the present time. However, this layout tends to lead to monotony and tunnelphobia on long flights. We have found it more advisable to break the compartment up into two sections, the galley and coat room being placed amidships. The aft section has a club seating arrangement with removable tables for card playing, food service, etc. It is advisable to furnish the club area in different colored materials to provide added variety. Passengers find it a pleasant break on long trans-Atlantic flights to be able to walk to a different section of the aircraft for a drink or a game of cards.

At the present rate of traffic demands, this type of layout may not be considered necessary. From a passenger service standpoint, however, this feature of cabin layout is most desirable, and we feel that this arrangement will be a necessity in future long range aircraft. Baggage racks can be improved in many of the present day machines. Care must be taken to insure that the passenger sitting by the window can stand up without hitting his head on the baggage rack.

There is also a difference of opinion with regard to the desirability of sleeping accommodation for long overnight flights. It is questionable if travellers will be willing to pay the increased premium for a berth, as it will be necessary to make up the difference of almost a 50 per cent passenger load reduction. With the event of jets and the resulting increase in speed it is doubtful if trans-Atlantic flights will be of sufficient duration to warrant berths. There may be a period between the present day high traffic demands and the widespread use of jet aircraft, in which it would appear that berths are desirable.

Backward Seating

It is anticipated that in future aircraft a backward seating arrangement will be used. This has the double advantage of affording passengers a better view and an added protection in the event of a forced landing. Contrary to expectations, the results of tests conducted by both the R.A.F. and A.A.F. Transport Commands, showed that passengers do not object to sitting backwards. This is no doubt due to the fact that nothing is going past the windows except at take-off and landing.

With the spine and head supported throughout its length, the body can withstand terrific forces of deceleration. It is possible to bring a body from 200 m.p.h. to a full stop in nine feet without injury when so seated. This seating arrangement is impractical in most existing aircraft, due to the location of the windows. The next best arrangement would therefore be a chair which would fail on one side permitting rotation in the event of an accident. The angular rotation thus employed would absorb a large percentage of the forward deceleration.

Lavatory Facilities

The lavatory facilities, as we have known them in the past, have been strictly of the " out house " variety. However this feature of air travel is at last showing signs of improvement. It is essential that the toilet should be in a separate room from the wash basin or powder room. The ladies' powder room should be equipped with a full length mirror, a cosmetic table with a Kleenex dispenser handy, and with a baby-changing table. The men's washroom should be equipped for shaving.

A continual problem in North Atlantic operations is that of preventing wash water basin drains from freezing. For approximately ten months of the year our aircraft are flying in below-freezing temperatures, often well below zero. All operators on this route are experiencing the same difficulty. Some have solved the problem by installing tanks to retain the waste water, others are providing no water at all. We are now experimenting with polythene plastic tubing in the drainage system, in lieu of aluminum tubing. During the last month of operations, aluminum tubing coated with anti-freeze grease has frozen up, while the plastic tube has remained free. An added feature is that this tubing will expand and then return to its normal diameter if freezing does take place, whereas aluminum tubing will fracture.

Entertainment

Much remains to be done in the field of entertainment. Magazines and newspapers are of course an essential item. Individual music, either canned or radio, should be supplied by a head rest speaker. A control selection installed in the chair wing will enable the traveller to make his own selection. Moving pictures are practical in the long seating arrangement, but we feel that the benefits are controversial, as some passengers do not like pictures. Moreover they may interfere with passengers who wish to sleep or read. If motion pictures are shown they will have to be the best obtainable, in order to be appreciated by the majority of travellers.

Playing cards is an enjoyable pastime and a club seating arrangement with table, cards and score pads should be provided. Writing tables at individual seats are also recommended, to eliminate the " balance-on-the-knee-and-try-to-write " variety. Most trans-Atlantic air lines are serving alcoholic drinks, either free or at a small charge. We have found from our limited experience that cocktails are not popular, and are planning to serve high ball drinks only. The weight of mixes may be appreciatedly reduced by boarding soft drink syrups and preparing them as required.

Catering

Catering has become a major item in air line service. Consideration of cabin layout in the design stage must involve a decision as to the type of food service to be provided. The duration of flying time, that is, the route for which the aircraft is being designed, will determine to a certain extent the type of food service. For a trans-Atlantic flight, air line engineers must provide a galley sufficiently large to stow two main meals and snacks.

There are many types of food service in use today, some providing hot meals, while others of short flight duration provide merely a cold salad menu. For long flights over cold areas of the world a hot meal service is most desirable. Three types of hot meal services now in use over the North Atlantic route are as follows: the " In Flight Cooking System "; the " Hot Casserole System "; and the " Pre-cooked Frozen Meal System ". There are advantages and disadvantages to each of these systems which will be reviewed briefly.

The " In flight cooking " system consists of fresh or partially cooked ingredients, boarded and prepared for service during flight. The taste, texture and appearance of any meal is at its best if served immediately after cooking. Another advantage is that with certain basic ingredients available, various meal combinations can be achieved and prepared according to the individual preferences of a passenger. However, this type of service presents certain disadvantages, and the weight and volume of galley equipment are considerable. Such a service requires from two to four hours to prepare and serve, which makes it almost impossible for all but extremely long flights. The employment of such a meal service also requires that the steward in charge of meal preparation be highly skilled in the culinary arts, which would be reflected in high salaries and would directly affect operating and food costs.

The casserole system is designed to provide precooked meals maintained hot until serving. The heat is retained in a thermos designed to hold a number of nested casseroles, each containing one hot meal, or the casseroles may be kept hot in an insulated electrically heated box which is maintained at a constant temperature. This type of service provides a hot meal at a moment's notice, is easily transported to the aircraft and stowed within the galley structure. However, there is a very definite loss factor involved in this type of service. Meals are cooked prior to departure for a predetermined number of passengers. If the flight should be delayed at the last moment for three or four hours the meals must be replaced with fresh ones. Also, if passengers do not board as expected the meal is wasted. Unless these meals are served a few hours after departure they become most unattractive.

Advantages of Frozen Meal

The third and most recent type of food service, frozen foods, are in the process of replacing the older types of food systems in the airlines. The Maxson Food Systems is one of the pioneers in frozen food for airline use. During the war this company supplied many types of Army and Navy aircraft with pre-cooked flash-frozen meals. Their meals are made up of a potato, vegetable and meat dish, pre-cooked and then quickly frozen into individual portions. The meal is then maintained at 10 below zero degrees Fahrenheit until ready for service. When required, the frozen food pack is placed in an electrically heated oven in the aircraft galley, and when sufficiently hot is served with the other meal ingredients. A large variety of meals may thus be provided, and high quality food is insured. With a 12 plate oven 40 meals an hour may be prepared and served.

The most attractive feature of this food system to the airline operator is the saving that may be effected by retaining meals in the frozen state unless actually required. Any meals left over from a flight may be placed in cold storage and used on subsequent flights. This feature alone results in a saving of many thousands of dollars a year for the airlines.

Safety Devices

Just as all passenger-carrying ships ars required to carry life boats and hold drills, so trans-atlantic aircraft are required to carry emergency equipment and instruct their passengers in its use. Three 15 man life rafts are located in the passenger section of our aircraft. Two in the baggage rack immediately above the window exits, and one in a stowage by the main entrance door. These are of twin tube nylon construction; round type raft, equipped with ditching and survival equipment.

All this equipment is included in the raft package with the exception of one AN/CRT-3 "Gibson Girl" in the rear stowage. At each passenger station is a nylon pneumatic inflation life jacket, enclosed in an easily removable plastic stowage bag. A booklet describing the exits, life jackets, rafts, and action to be taken in the event of an emergency, is available at each seat. Soon after departure the purser steward makes a tour of the aircraft, demonstrating the life jacket and providing such other information as may be deemed necessary.

To ensure the positive notification of all passengers and cabin crew that a ditching is imminent, an emergency warning bell has been installed in the cabin which can be easily activated from the Captain's seat. Flight crews receive regular emergency instructions and carry out monthly evacuation drills.

Cabin Attendants

A most important aspect of passenger service requirements is the flight crew personnel assigned to the passengers, i.e. the cabin attendants. We have found that the most satisfactory service may be obtained from a steward stationed in the galley and bar, and a stewardess in the cabin. All cabin attendants have had years of flying training, either on domestic or trans-Atlantic routes. They are picked from our domestic operations for their tact and efficiency. This has been found advisable due to the number of "first flighters" coming from the old country and the added nervous tension of "flying the Atlantic". During flight the attendants may accomplish considerable "paper work" to speed the passengers' egress through customs. Weekly meetings are held between the stewards and stewardesses and the engineering department, to iron out operational weaknesses in the passenger service equipment.

An attempt has here been made to review the most important aspects of passenger service from a design and operational standpoint. It has been pointed out that of the eleven requirements discussed, few present day aircraft come up to the ideal standards. However, air line companies are beginning to realize the importance of pleasing the public with comfort and service, as well as with a fast and on-schedule operation. Today the reconverted military machines, such as the DC3, have become obsolete, and with the advent of new aircraft specifically designed as luxury passenger carriers we may anticipate great progress towards a truly comfortable and well equipped cabin.

By train, plane and motor — engineers will be going to....

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JUNE 2-5, 1948

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Why not talk to other engineers about getting together?

A Message
from
The President

THE COMING YEAR will impose new conditions upon Canada and upon Canadian engineers. The restriction on the importation of many articles, which has become necessary because of the serious economic situation, will force us either to do without such articles or to produce them ourselves. Herein lies both a challenge and an opportunity to Canadian industry and to Canadian engineers. Let us meet the challenge and make the most of the opportunity, so that these present difficulties may make Canada stronger and more self-sustaining than she is to-day.

During the past twelve months the standing of our profession, in the eyes of our fellow citizens, has advanced; though not so fast as we could wish. There are still too many people who cannot see in the engineer anything more than a technician, and who are unwilling to concede him the ability to administer, and to direct, as well as to design. Too many of our industrialists, our governments and our other public bodies do not place in Canadian engineers the confidence to which their achievements entitle them. By diligently seeking his own improvement, and by supporting actively those organizations through which he is represented to the general public, the engineer will be making a contribution which should do much to ensure that his profession will, eventually, be accorded the full and complete recognition which its responsibilities and accomplishments deserve.

The Institute continues to show a steady growth, but there are still many engineers who are not members. Our goal should be to have every engineer a member of the Institute and every member of the Institute also a member of his own provincial association. When this has been achieved, the profession will truly be able to speak with a single authoritative voice which will command the fullest respect right up to the national and even the international level.

To all our members, wherever they may be, I wish a happy and a useful year in 1948.

L. F. Grant.

President

—From Month To Month—

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

A New and Useful Publication

A review of current world literature in applied mechanics will be inaugurated in January as a monthly to be known as *Applied Mechanics Reviews*.

It will be offered on a subscription basis and will contain comprehensive reviews of new papers as they appear in 500 of the world's scientific and engineering journals.

It is a non-profit co-operative project. Seven national scientific and professional organizations in the United States and some outside will guide the editorial policy through representation on an Advisory Board. The Engineering Institute of Canada is one of the co-operative societies outside of the United States. The Institution of Mechanical Engineers (England) is another.

The American Society of Mechanical Engineers is the publisher. Dr. L. H. Donnell of the Illinois Institute of Technology wll be the editor and Dr. Stephen Timoshenko will be chairman of the Editorial Associates.

The complete list of societies co-operating with the A.S.M.E. is as follows: The Office of Naval Research, the American Institute of Physics, the American Society of Civil Engineers, the Institute of Aeronautical Sciences, the American Mathematical Society, the Society for Experimental Stress Analysis, the Institution of Mechanical Engineers, and The Engineering Institute of Canada.

Subscription rates are $12.50 per year—with a special price of $9.00 per year to members of the co-operating societies. Orders should be sent direct to The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N.Y.

Letter from the General Secretary

Dear Friends

Admittedly it is an unusual procedure for an editor to write letters to his own publication but in this instance it is hoped he may be forgiven. I know of no other practical method of reaching the great host of officers and members who have been so kind and thoughtful during my long illness. Each communication that I have received deserves a personal reply, and it would be my greatest pleasure to so acknowledge it, but my own reserves of strength do not yet permit the effort, nor are the stenographic facilities available.

In my ten years of service with the Institute I thought I had learned all there was to know about it, but my recent experience has shown me that I am totally ignorant of what well may be one of its greatest characteristic—humaneness. The interest of so many people from so many places, their wishes to be of help, their deeds of kindness offered and performed, have moved me deeply. I cannot find words to express my appreciation and my gratitude. To each and every one I proffer simply my warmest thanks. Their concern over my affairs was no uncertain factor in my recovery.

May I report that after four months' confinement to home and hospital, I am now able to be back at Headquarters. It will be some time before I have shaken off all signs of the illness, but with the gradual return of my strength and weight, now well under way, I hope to drive out the remaining inconvenient manifestations of a very unpleasant experience.

It is a happy feeling to be back in the office with all the members of the staff who have carried on superbly in my absence, and to see on my desk the familiar signatures of members and officers from all over Canada, who are collectively making the Institute "tick".

May I express the hope that this new year will afford us all further opportunities to work together in the interests of the profession.

Fellowships in School of Mines

Columbia University announces that through the bequest of the late William Campbell, for many years Howe Professor of Metallurgy at Columbia University, several fellowships have been established. They are awarded primarily for graduate study and research in the field of metals.

The stipend of each Campbell Fellowship is fixed at the time of award by recommendation of the Campbell Fellowship Committee and will normally be an amount sufficient to meet the necessary living expenses of the incumbent of the fellowship.

Applications accompanied by certified transcripts of academic records, statements of proposed research projects, proposed fields of graduate studies, and supporting letters of recommendation should be filed with the Secretary of the University before March 1, 1948. Application blanks and announcements will be forwarded to interested persons by the Secretary of the University on request. For further information write to P. B. Bucky, Executive Officer, School of Mines, Columbia University, New York 27, New York.

=The Presidential Tour=

Ajax Division of U. of T.; St. Maurice Valley & Quebec City Branches

Ajax Division

On the 26th of November Colonel Grant with the assistant general secretary visited the Ajax Division of the University of Toronto under the auspices of the Toronto branch and then went directly to the Saint Maurice Valley branch and the Quebec City branch which marked its fortieth anniversary on November 28th and 29th. At Ajax the president surpassed even his own very high standard and his

At the Ajax meeting. Seated—President Grant, Dean C. R. Young. Standing—T. R. Loudon, E. P. Muntz, Edgar A. Cross.

remarks were received with great enthusiasm by some seven hundred first and second year engineering students.

The meeting had been painstakingly arranged by the executive of the Toronto Junior Section with Harvey Self and Ivan S. Widdifield steering the proceedings to a very satisfactory conclusion. The visitors were entertained at dinner in the staff house and the general meeting was held in the recreation hall

Part of the student audience at Ajax.

adjoining. The aging but no less spectacular film depicting the Tacoma Narrows bridge disaster opened the programme. The speeches which followed were designed to give the students an idea of what they should expect from the profession and its voluntary and licensing organizations, and were undoubtedly highlighted by the president's address. Because of his long and active association with the Institute, President Grant is particularly well qualified to speak of its activities and he has a faculty which we understand is shared by the more popular professors of seeming to know exactly when the moment has arrived to inject a note of humour into his remarks.

Members of other Ontario branches who attended —and participated in the discussions—were Edgar A. Cross, Toronto, E. P. Muntz, Hamilton, H. R. Sills, Peterborough and Professor T. R. Loudon and Dean C. R. Young of the Faculty of Applied Science of the University.

Toronto Branch members at the dinner preceding the Ajax Meeting.

Saint Maurice Valley Branch

From Ajax the president and the assistant general secretary journeyed to the land of power and paper —specifically the meeting of the Saint Maurice Valley branch at Grand'Mère on the evening of November 27th. In passing through Montreal they were joined by Mrs. Grant and Mrs. Laird, Vice-President and Mrs. R. S. Eadie and Councillors R. C. Flitton, C. E. Gelinas, and J. A. Beauchemin with Mrs. Flitton and Mrs. Beauchemin. The party was met in Three Rivers by S. E. Williams, the local manager of the Saint Lawrence Paper Mills Company, J. F. Wickenden of J. F. Wickenden and Company, Three Rivers, and the branch secretary R. E. Kirkpatrick, and proceeded by rail to Grand'Mère. At the Laurentide Inn the branch executive were hosts at an informal luncheon which was highlighted by councillor Viggo Jepsen's recounting of the history of the name Grand'-Mère which was derived from a huge rock in the Saint Maurice River which bears a striking resemblance to an elderly lady—a grandmother. This rock was transported by a very interesting series of oper-

Luncheon at the Laurentide Inn, Grand'Mère, with Councillor C. E. Gelinas and Mrs. Jules A. Beauchemin showing all the accepted indications of enjoyment.

Executive table at luncheon. Councillor Viggo Jepsen, S. E. Williams and Branch Secretary R. E. Kirkpatrick.

ations to a parksite in the centre of the town of Grand'Mère where it now stands as an imposing civic monument.

In the afternoon the visitors and their ladies inspected the plant of the Consolidated Paper Company and were then motored to the Cascade Inn at Shawinigan Falls for the reception which inaugurated the branch meeting. The ladies remained at the inn as guests of the branch ladies committee for dinner and bridge while the members returned to Grand'-Mère for the dinner meeting of the branch. The addresses and discussion which followed were most satisfying and current Institute issues were considered at length.

Above and below—Groups attending the St. Maurice Valley Branch dinner meeting at the Laurentide Inn, Thursday, November 27.

Quebec Branch Celebrates Its Fortieth Anniversary

On Friday, November 28th, following the very delightful meeting of the Valley Branch the president's party drove, through the courtesy of the Consolidated Paper Company, to Three Rivers to proceed to Quebec City for the festivities which had been arranged to mark the fortieth anniversary of the Quebec Branch. The traditions which are a notable heritage of French Canada and which were very much in evidence during the visit to the Valley Branch culminated in Quebec City in an almost overwhelming attention to every last gracious detail. In the stately atmospheres of the Chateau Frontenac, Laval University, The Cercle Universitaire and the caucus rooms of the Parliament Buildings—event

St. Maurice Valley Branch dinner meeting.

succeeded event in an effortless elegance which the visitors will undoubtedly remember for a considerable time to come.

In the afternoon a convocation was held at Laval University for the conferring of the honorary degree of Doctor of Science on Colonel Grant and Mr. Ernest Lavigne, president of the Corporation of Professional Engineers of the Province of Quebec. The proceedings were conducted in French and the addresses of Monseigneur Vandry, Rector of the University, Dr. Grant and Dr. Lavigne are reprinted in full following this account. A particularly fine touch was added to the proceedings by the presentation of a hugh armful of roses to Mrs. Grant as the president assumed the doctorate gown.

The chairman of the Quebec branch and Mrs. P. A. Dupuis entertained at the Cercle Universitaire preceding the grand ball, which took place in the evening at the Chateau Frontenac. During the ball five of the season's debutantes were presented to the President and Mrs. Grant. Dinner was served at midnight in the main dining-room and a feature was the cutting of the huge anniversary cake by Mrs. Grant.

A meeting of Council was held on Saturday, November 29th in one of the caucus chambers of the Legislative buildings with councillors in attendance from points as far distant as Hamilton (J. R. Dunbar) and Moncton (W. C. Macdonald). The minutes of this meeting will be found elsewhere in this issue of the *Journal* and Junior and Student members are requested particularly to read the discussion (page 40) on the question of possible overcrowding of the engineering profession. Those attending the Council meeting were once again guests of Mr. Dupuis at a most delightful luncheon at the Cercle Universitaire and the ladies were entertained at the Quebec Winter Club.

Addresses at Convocation

Monseigneur Ferdinand Vandry, P.A.

Messieurs les Doyens,
Messieurs les Professeurs,
Mesdames et Messieurs,

Le quarantième anniversaire de fondation de la Section québécoise de l'Engineering Institute of Canada est un événement qui méritait d'être signalé. C'est pour marquer ce jubilé que le Conseil national de cet important organisme est venu tenir une réunion à Québec et que le Conseil de la Corporation des Ingénieurs professionnels de la province de Québec a décidé également de tenir dans notre ville ses assises de novembre. Aussi avons-nous été très heureux que ces deux associations si méritantes, qui groupent les ingénieurs les plus renommés de toutes les provinces du Canada, aient accepté de si bonne grâce d'être reçues officiellement à l'Université Laval au cours de leur séjour à Québec. J'ai donc l'extrême plaisir de souhaiter à tous ces hôtes distingués la plus cordiale bienvenue.

Mesdames et Messieurs, l'Institut canadien des Ingénieurs et la Corporation des Ingénieurs professionnels de Québec accomplissent dans notre pays une œuvre de haute valeur scientifique et d'une grande portée sociale et nationale. Les tâches de l'ingénieur, en effet, sont aussi importantes que variées; elles revêtent même un caractère de primordiale importance dans la solution des problèmes qui intéressent l'économie de la nation. Si nos industries de guerre ont compté sur nos ingénieurs pour réaliser les merveilles du génie dont on vante encore l'efficacité, les industries de paix reposent encore en grande partie sur leur talent et leur compétence pour assurer leur prodigieux développement.

Mrs. Flitton, Mrs. J. A. Beauchemin, Councillors J. A. Beauchemin and R. C. Flitton at the Grand Ball at the Chateau Frontenac.

Consciente du rôle magnifique qu'est appelé à jouer l'ingénieur dans notre pays si riche en ressources de toutes sortes, l'Université Laval ne recule devant aucun sacrifice pour assurer aux étudiants dans les différentes branches du Génie à la Faculté des Sciences la formation professionnelle la plus complète et la plus adéquate possible. Aussi est-elle très reconnaissante envers les grandes associations d'ingénieurs du pays pour la collaboration si précieuse qu'elles lui apportent dans l'œuvre de la formation scientifique de nos jeunes.

QUEBEC REGIONAL COUNCIL MEETING

Left to right: **J. A. Beauchemin, J. A. H. Henderson, J. A. Lalonde, G. A. Gaherty, C. E. Gelinas, G. R. Langley, R. C. Flitton, R. S. Eadie, G. F. Layne, President Grant, the Assistant General Secretary, P. A. Dupuis, Miss M. McLaren, J. B. Stirling, W. C. MacDonald, R. G. Cameron, Hector Cimon, C. C. Lindsay, C. A. Robb, E. D. Gray-Donald, Roger Desjardins, Ernest Lavigne, C. A. Peachey, J. R. Dunbar.**

En plus de souligner la valeur personnelle de deux ingénieurs très méritants, l'Université Laval est heureuse ce soir de donner un témoignage sensible de son estime et de sa sympathie pour les associations qu'ils représentent en décernant un doctorat d'honneur au Lt-Colonel LeRoy Fraser Grant, président de l'Engineering Institute of Canada, et à Monsieur Ernest Lavigne, président de la Corporation des Ingénieurs professionnels de la province de Québec.

Né à Toronto en 1884, M. Grant a reçu son instruction primaire d'abord à Berthierville, dans la province de Québec, puis à Brockville, en Ontario. Diplômé " avec mention honorable " du Collège militaire de Kingston en 1905, il obtenait l'année suivante, avec la même distinction, son diplôme de Bachelier ès Sciences de l'Université Queen's.

A sa sortie de l'université, en 1906, il s'enrôle dans l'artillerie royale canadienne et est affecté, comme officier, à la défense du port d'Halifax. En 1907, il quitte l'armée pour se consacrer aux travaux civils du génie: après avoir passé trois ans à Prince-Rupert, où il s'occupe de la construction du chemin de fer Grand Tronc Pacifique, il obtient en 1910 une commission d'arpenteur-géomètre en Colombie Britannique et travaille pendant quatre ans à Vancouver comme ingénieur-conseil.

A la déclaration de la guerre, en 1914, il se rend outre-mer avec les forces expéditionnaires canadiennes comme adjudant du corps canadien de construction de chemins de fer. En 1917, il est promu major et commandant en second du 5è bataillon canadien. Sa bravoure au front lui vaut alors trois citations à l'ordre du jour.

Après la guerre, il retourne en Colombie Britannique où il passera trois ans au service du département des terres et forêts de cette province. En 1921, il est nommé professeur de génie au Collège militaire de Kingston et il remplira cette fonction avec grand succès jusqu'à son retour à l'armée canadienne, en 1939.

Tout en poursuivant la carrière de l'enseignement, le major Grant n'a cessé, en effet, de s'intéresser activement aux choses de l'armée. Après avoir été successivement commandant de la 32è batterie de campagne et de la 9è brigade d'artillerie canadienne, il est promu lieutenant-colonel en 1937. Au cours du dernier conflit, il occupe avec beaucoup de compétence, pendant quatre ans, le poste important de premier officier aux Quartiers généraux du district militaire de Kingston. Ayant atteint l'âge de sa retraite en 1944, il est alors nommé professeur agrégé de génie à la faculté des sciences appliquées de l'Université Queen's de Kingston.

Le Colonel Grant est un universitaire distingué: non seulement il a consacré une grande partie de sa vie à l'enseignement, mais il s'est intéressé de façon toute particulière au sort des étudiants ingénieurs qui lui sont redevables de plusieurs réformes importantes. Il est aussi un ingénieur de grande classe dont la compétence professionnelle a été reconnue par les plus grandes associations du pays: membre de l'Association des ingénieurs professionnels de l'Ontario, de l'Institut professionnel du service civil du Canada et de la Canadian Society of Civil Engineers, il fait également partie de l'Engineering Institute of Canada depuis 1927. Après avoir occupé avec beaucoup de succès et de dévouement plusieurs charges importantes dans ce dernier organisme, il en devenait le Président général au mois de mai dernier.

Pour reconnaître les qualités et les mérites exceptionnels de cet ingénieur et de ce professeur si méritant l'Université Laval a tenu à lui décerner un diplôme de Docteur ès sciences " honoris causa ".

Doctor Grant, it is a very great pleasure for me to bestow upon you, on behalf of Laval University, the honorary degree of Doctor in Science. Your brilliant achievements in the field of applied science and engineering have given you many titles to the admiration and gratitude of your fellow citizens. Our French University of Quebec is very happy to profit by the opportunity of the visit of The Engineering Institute of Canada to honour its outstanding President; it is my duty to add that we are particularly glad to convey to Mrs. Grant our best feelings with our most sincere greetings.

Mesdames et Messieurs, j'ai l'honneur d'inviter le Lieutenant-Colonel LeRoy Fraser Grant, président de l'Engineering Institute of Canada, professeur à l'Université Queen's de Kingston, à venir recevoir le diplôme de Docteur ès Sciences, " honoris causa ", de l'Université Laval, à revêtir la toge et à signer le livre d'or de l'Université.

Monsieur Ernest Lavigne est une figure bien connue du public québécois. Né à Québec, en 1892, il est le fils du regretté Arthur Lavigne, Docteur en Musique de l'Université Laval, qui a accompli chez nous une œuvre remarquable et dont le souvenir est encore vivace dans nos mémoires.

M. Ernest Lavigne est en droit de se glorifier des mérites de son père, qui fut toute sa vie l'un des meilleurs amis du Séminaire de Québec et de l'Université.

Après de brillantes études classiques au Séminaire de Québec, Monsieur Lavigne suivit pendant quatre ans les cours de génie à l'Ecole Polytechnique de Montréal et obtint, en 1916, ses titres universitaires de bachelier ès sciences appliquées et d'ingénieur civil.

Dès sa sortie de l'Université, il entre au service du Ministère des Travaux publics de la province de Québec. Après avoir passé dix ans au service de la construction des ponts, il est nommé, en 1926, Commissaire des incendies de la Province, fonction qu'il occupe encore présentement.

En plus de remplir avec beaucoup de compétence l'importante charge qui lui est assignée dans l'administration provinciale, Monsieur Lavigne s'est toujours dévoué sans compter pour la cause des ingénieurs. Tour à tour membre et officier de toutes les organisations importantes d'ingénieurs du pays, il a rendu dans ce domaine des services signalés. Ancien président de l'Association des prévôts des incendies du Dominion, vice-président de l'Association des diplômés de Polytechnique, membre de l'Institut canadien des Ingénieurs, il est actuellement président de la Corporation des ingénieurs professionnels de la Province de Québec et représentant de cette Corporation dans le Conseil national de l'Institut des Ingénieurs.

A sa rare compétence professionnelle, Monsieur Lavigne joint les hautes qualités d'un gentilhomme accompli. Sa particulière amabilité et sa remarquable sociabilité lui ont valu très tôt un grand nombre d'admirateurs et d'amis. Il est l'un des plus ardents promoteurs des études supérieures dans le domaine des sciences appliquées et il s'est toujours intéressé vivement à l'œuvre de notre faculté des sciences. Le fait que Monsieur Lavigne a été l'un de mes amis d'enfance ne peut qu'ajouter au plaisir que j'éprouve à lui présenter un parchemin de l'Université Laval.

De plus, les services qu'il a rendus au pays au cours de la dernière guerre lui ont valu d'être nommé par le Roi membre de l'Ordre de l'Empire Britannique (O.B.E.).

En décernant ce soir un diplôme d'honneur de l'Université Laval à Monsieur Lavigne, nous avons conscience de remplir un devoir de justice envers l'un de nos compatriotes les plus distingués et les plus méritants.

Mesdames et Messieurs, j'ai l'honneur d'inviter Monsieur Ernest Lavigne, président de la Corporation des ingénieurs professionnels de la province de Québec, à venir recevoir le diplôme de Docteur ès Sciences, " honoris causa ", de l'Université Laval, à revêtir la toge et à signer le livre d'or de l'Université.

Lieut.-Col. L. F. Grant, D.Sc., M.E.I.C.

Monseigneur Vandry, messieurs les doyens et les membres de la faculté, mesdames, messieurs:

Je dois vous remercier des paroles bienveillantes qui ont été prononcées à mon égard, et qui, je pense, sont beaucoup plus que je ne le mérite. Pour un homme qui a dévoué la plus grande partie de sa vie à l'enseignement il n'y a pas de plus grand honneur que le jugement de ses confrères dans le même domaine, aussi c'est avec grand orgueil et bonheur que je reçois le grand honneur qui m'est conféré par cette université. Ce sera toujours une source de satisfaction pour moi que l'Université Laval m'a enrôlé parmi les personnages distinguées qu'elle a honorés et j'espère que je serai digne d'être membre de cette assemblée choisie. En mon nom, et au nom de l'Institut des Ingénieurs du Canada je vous remercie de tout mon cœur.

L'Institut dont j'ai l'honneur d'être le président remonte déjà à plus de soixante années. Organisé au début pour les ingénieurs civils, il devint après la guerre mondiale de dix-neuf cent quatorze une corporation pour les ingénieurs de tous genres dans toutes les parties du Canada. Nous croyons, et je pense avec raison que l'Institut a exercé une influence unifiante dans notre pays parce qu'il a réuni ensemble dans une amitié professionnelle et personnelle les ingénieurs d'un bout à l'autre du Canada.

Il m'est particulièrement inspirant de recevoir ce titre honorifique ici dans la vieille capitale où les premiers jours de notre histoire et des fondateurs de notre pays semblent tout près. Ayant atteint à l'époque de la vie où l'on pense de plus en plus au passé, je me vois espérer, et pas toujours avec confiance, que nous bâtissons pour l'avenir d'une manière digne de ceux qui nous ont précédés. Dans le désordre et la tragédie qui règnent dans le monde, aujourd'hui, les responsabilités qui pèsent sur nous sont lourdes, surtout sur ceux parmi nous dont le devoir est d'enseigner et dans une certaine mesure de guider la jeunesse du pays. Je dis " dans une certaine mesure " parce que la jeunesse d'aujourd'hui est quelquefois difficile à guider. Peut-être quand on pense à l'héritage que lui ont légué ses aînés, ce n'est pas étonnant.

As I see it, if I may with all humility express myself among so many wiser than I, one duty that we owe to our country is to maintain a Canadian individuality. Every country, every race may make its contribution to the good of mankind but it must do it in its own way. We as Canadians can never fulfil our destiny nor make our contribution to civilization by following implicitly in the footsteps of others, no matter how worthy or how admirable the objects of our imitation may be. My generation will not live to see it, but I hope and feel confident that the time will come when Canadian engineering, Canadian architecture and Canadian achievement of every kind will have its own distinctiveness, and that

THE CONVOCATION AT LAVAL UNIVERSITY

Dr. Grant expresses his appreciation of the honour he has received.

while we must not be unmindful of that science and knowledge which is the property of all mankind our children may look upon structures and achievements in the field of engineering and say " That is Canadian; no other people would have done it that way."

As an English-speaking Canadian I have always thought that here is a special task and opportunity for the universities of French-speaking Canada, which are so much less subjected to North American influence than are those in my part of this country. To you we look for originality and for ideas that are peculiarly Canadian.

Comme Canadien de langue anglaise, j'ai toujours pensé qu'une mission spéciale en même temps qu'une occasion magnifique s'offrait aux universités du Canada français, moins sujettes à l'ambiance nord-américaine que ne le sont les institutions semblables dans mon coin du pays: c'est vers vous que nous nous tournons pour la manifestation originale d'idées qui soient singulièrement canadiennes.

Dr. Ernest Lavigne, M.E.I.C.

Monseigneur le Recteur,
Messieurs les doyens,
Mesdames, Messieurs.

De tous les souvenirs qui s'attacheront à mon passage à la présidence de la Corporation des ingénieurs professionnels de la Province de Québec, celui de cette cérémonie sera certainement un des plus chers.

Les paroles bienveillantes que vous avez bien voulu m'adresser, Monseigneur, me touchent vivement et l'allusion aussi généreuse que délicate que vous avez faite à mes modestes activités professionnelles donne, à cette manifestation, un caractère personnel qui m'émeut profondément. Je vous en remercie.

Je réalise fort bien, cependant, et plus que tout autre, que le grand honneur que me fait l'Université Laval en me conférant ce titre de Docteur, je le dois, non pas à mes faibles mérites, mais bien au mérite collectif des 3,000 ingénieurs qui forment le corps professionnel auquel j'appartiens.

L'événement d'aujourd'hui marque une étape glorieuse dans le développement de notre profession d'ingénieur. Car ce n'est pas sans heurts ni sans bien des efforts, voire même sans quelques déboires à l'occasion, que notre corps professionnel s'est développé et que s'est comblée la tranchée qui existait entre la rigoureuse préparation universitaire à la carrière d'ingénieur et la maigre considération dont jouissaient les diplômés de nos universités, alors que la coutume et la routine plaçaient le génie civil plutôt au rang de vocation technique que de profession proprement dite.

Je vois avec fierté et satisfaction dans ce geste que pose l'Université Laval, le couronnement des efforts de mes prédécesseurs, les présidents et autres officiers de la Corporation.

Je me crois justifiable dans une certaine mesure de dire que ce geste de l'Université honore aussi son corps professoral et, par reflet, celui de nos institutions universitaires. Notre Corporation n'est-elle pas, en effet, symboliquement, de par les éléments qui la composent, l'épanouissement de la culture et de l'enseignement que nous avons puisés à l'Université même. Ne pourrait-on pas dire d'elle, comme le poète le dirait peut-être, que c'est le champ de blé dont les épis mûrs rayonnent et ondulent harmonieusement au souffle que féconde et propage l'enseignement universitaire. Et cet enseignement universitaire ce sont vos professeurs distingués et dévoués qui le donnent à nos futurs professionnels.

C'est pourquoi notre Corporation tient l'Université Laval en si haute estime et a tant d'admiration pour l'œuvre magnifique qu'elle accomplit. Nous trouvons merveilleux l'essor prodigieux qu'a pris l'enseignement des sciences appliquées dans le district de Québec depuis à peine un quart de siècle et cela grâce à la création de votre faculté des sciences. Et en parlant de la faculté des sciences de l'Université Laval, je ne puis m'empêcher d'évoquer le nom et la brillante personnalité de Mgr. Alexandre Vachon qui a donné à son développement une impulsion si vigoureuse. Je ne puis non plus m'empêcher, en pensant aux progrès toujours croissants de cette faculté, d'évoquer le nom de son dynamique et si sympathique doyen, mon ami Adrien Pouliot. Et c'est pour moi un grand honneur que de pouvoir leur rendre, en ce moment, au nom de mes confrères ingénieurs le témoignage de notre vive admiration.

Ce progrès dans l'enseignement des sciences appliquées, c'est, dans une certaine mesure, notre corps professionnel qui en récolte les fruits de par la venue dans nos rangs de nouveaux ingénieurs mieux préparés et mieux outillés.

Il est donc indispensable qu'il existe un contact bien intime, un lien bien solide entre nos universités et la Corporation et je me plais à voir, dans la remise de ce doctorat, un geste symbolique prometteur de relations toujours de plus en plus cordiales.

Me serait-il permis, Monseigneur, avant de terminer, de formuler un vœu à l'effet que le corps professoral de nos universités s'emploie, non seulement à munir les futurs ingénieurs de l'outil fondamental et essentiel à leur profession: le savoir technique, mais aussi à leur inculquer le sens de leurs devoirs professionnels et à les former pour le rôle économique et humanitaire qu'ils seront appelés de plus en plus à remplir dans les cadres de notre société d'aujourd'hui.

Je veux témoigner en terminant ma vive et profonde reconnaissance à l'Université Laval pour le titre honorifique qu'elle me confère aujourd'hui. Je lui affirme mon attachement à la cause très noble qu'elle poursuit, celle de donner à notre jeunesse cette haute culture qui forme une élite dont nous, ingénieurs, pouvons avec une certaine fierté, nous réclamer.

Et je formule le vœu, Monseigneur, que se réalisent vos plus chers désirs et surtout celui de l'établissement prochain de votre Cité Universitaire.

Courses at Carleton College

Carleton College, Ottawa, has developed its engineering courses from a small first-year group which met in church basements to a well equipped two-year course which has been approved as equivalent to the first two years in the best Canadian Universities.

Major-General G. R. Turner, chairman of the Ottawa Branch of the Institute, has done a good deal towards bringing the high standards of Carleton's engineering courses into sufficient prominence that the College is now designated by the Institute as " a school of engineering recognized by Council " and its second year students are accepted into third year at the universities which offer the full engineering course.

The credit for this achievement is due mainly to the director of Carleton's science studies, Professor L. N. Richardson.

The Joints of Time

While man is helpless to control the passing of time, he has been interested always in the recording of it. His efforts go beyond the beginning of history and today the average citizen is well satisfied that his predecessors have perfected the system. However, there are people and organizations that see room for improvement, and one at least has shown a tenacity of purpose that is impressive.

The World Calendar Association was organized in 1930 to promote the idea that the calendar should be revised. Since then the Association has studied the problem and has examined many proposals for modification. It has acted as a central body for all similar groups in thirty-two different nations who are dissatisfied with the present irregular calendar.

The Association has gone far in propagating its excellent proposal. It is supported on all sides by influential bodies and outstanding individuals. This summer it succeeded in having a Bill for the U.S. adoption of the calendar presented to the Senate of the United States and a decision is still pending. The United Nations is also considering the subject through its Economic and Social Council, and it is hoped that a decision will be reached at the next session. In the days of the League of Nations the calendar was approved officially by fourteen nations.

The World Calendar follows the present Gregorian calendar in dividing the year into twelve months with the same Gregorian names. The difference lies in the distribution of the number of days over the sequence of months. The year is divided into equal quarters with the first month in each quarter having 31 days and the following two months 30 days. This makes up a total of 364 days. The additional day is provided by adding after Dec. 30 a " year-end day ", which it is believed will become a world holiday. Leap year is taken care of very much in the same way as at present except that it would come directly after June 30.

The advantages claimed for the new calendar are:

1. It provides a perpetual calendar.
2. Holidays become fixed and always come on the same day of the week.
3. It provides absolutely uniform quarters.
4. Each quarter begins on Sunday and ends on Saturday and contains exactly 13 weeks.
5. Month dates always fall on the same week days. Each month has 26 week days plus Sundays.

The following condensed story of the development of calendars is taken from the " Note on the World Calendar " prepared by Trygve Lie, Secretary-General of the United Nations, as part of the material to be presented to the Economic and Social Council at its next session:

History of Calendar Reform

The calendars used in antiquity by the Chaldeans, Assyrians, and Egyptians go back to at least 4000 B.C. China possessed a calendar in the YAO era, 2000 B.C. Most of these calendars used the day, the lunar month and a more or less solar year as units of time; only the Egyptians used the astral year. Ancient Greece also had a highly developed calendar based on the apparent movements of the sun and the moon. Under this system the year always began at a specified position of the sun in relation to the earth and similarly each month began with a full moon. As the solar year consists of a number of days not divisible by the number of days in a lunar month, a systematic adjustment was necessary. The Roman Republican calendar which took the place of the Greek calendar also contained twelve lunar months, but the years did not follow one another immediately. There were a few extra days between the end of one year and the beginning of the next. The Roman Julian calendar was an improvement by establishing a system of twelve non-lunar months totalling 365 days with an extra day every four years to bring the year so determined into line with the solar year.

In 1582 Pope Gregory XIII realized that, owing to an error in the method of calculation of the Julian calendar, the calendar year began with a great lag behind the seasons. He cut out ten days from the calendar of that year and devised a new formula for the leap years. The results of this reform, which was carried out in 1582, gave rise to the so-called Gregorian calendar. This calendar, first used in the Catholic countries of the West, was adopted by Britain and her colonies in 1752, by Sweden in 1753, by Japan in 1873, by China and Albania in 1912, by the Union of Soviet Socialist Republics in 1918, by Roumania and Greece in 1924 and by Turkey in 1927.

The chief stages of calendar reform were:

1. Transition from the lunar system to the combined solar and lunar system.
2. Transition from the combined solar and lunar system to the solar system.
3. Adjustment of the leap year to bring the average year into line with the period of the earth's rotation which had come to be known more accurately.

But the present proposal for calendar reform is quite distinct from earlier reforms. It is not proposed to establish an improved basic system for measuring time or to correct errors that may creep into knowledge of the movements of heavenly bodies; the real grounds are of a practical nature.

Herewith is the proposed World Calendar.

FIRST QUARTER

JANUARY							FEBRUARY							MARCH						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
1	2	3	4	5	6	7				1	2	3	4						1	2
8	9	10	11	12	13	14	5	6	7	8	9	10	11	3	4	5	6	7	8	9
15	16	17	18	19	20	21	12	13	14	15	16	17	18	10	11	12	13	14	15	16
22	23	24	25	26	27	28	19	20	21	22	23	24	25	17	18	19	20	21	22	23
29	30	31					26	27	28	29	30			24	25	26	27	28	29	30

SECOND QUARTER

APRIL							MAY							JUNE						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
1	2	3	4	5	6	7				1	2	3	4						1	2
8	9	10	11	12	13	14	5	6	7	8	9	10	11	3	4	5	6	7	8	9
15	16	17	18	19	20	21	12	13	14	15	16	17	18	10	11	12	13	14	15	16
22	23	24	25	26	27	28	19	20	21	22	23	24	25	17	18	19	20	21	22	23
29	30	31					26	27	28	29	30			24	25	26	27	28	29	30
																				**W

THIRD QUARTER

JULY							AUGUST							SEPTEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
1	2	3	4	5	6	7				1	2	3	4						1	2
8	9	10	11	12	13	14	5	6	7	8	9	10	11	3	4	5	6	7	8	9
15	16	17	18	19	20	21	12	13	14	15	16	17	18	10	11	12	13	14	15	16
22	23	24	25	26	27	28	19	20	21	22	23	24	25	17	18	19	20	21	22	23
29	30	31					26	27	28	29	30			24	25	26	27	28	29	30

FOURTH QUARTER

OCTOBER							NOVEMBER							DECEMBER						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
1	2	3	4	5	6	7				1	2	3	4						1	2
8	9	10	11	12	13	14	5	6	7	8	9	10	11	3	4	5	6	7	8	9
15	16	17	18	19	20	21	12	13	14	15	16	17	18	10	11	12	13	14	15	16
22	23	24	25	26	27	28	19	20	21	22	23	24	25	17	18	19	20	21	22	23
29	30	31					26	27	28	29	30			24	25	26	27	28	29	30
																				*W

* The Year-End World Holiday, W or 31 December (365th day), follows 30 December every year.

** The Leap-Year World Holiday, W or 31 June (an extra day), follows 30 June in leap years.

The British Export Drive

One of the results of Britain's present economic troubles may be that more British cars will be seen, in the near future, on Canadian and American highways. In October, 1947, the value of exports of British cars, parts and accessories totalled just under 35 million dollars—nearly six times the average monthly figure for 1938.

The post-war British cars for export have been designed with a view to the intended foreign markets. It can be presumed that they may achieve a greater popularity than their pre-war counterparts. Their acceptance in the North American market should be somewhat facilitated by the difficulties attending supply of the domestic product. This opportunity should induce the British manufacturers to set up, and maintain, the best possible service facilities and parts depots. As far as the *Journal* has been able to discover the British tradition of craftsmanship, although rumoured to have suffered under the exigencies of war, has not been lacking in the post-war cars which have, so far, been tested and used in Canada.

Opportunities in the Arctic

In a recent circular letter to Canadian universities, H. L. Keenleyside, Chairman of the Advisory Committee on Arctic Research of the Defence Research Board, draws attention to the greatly enlarged opportunities for major research and development work now opening up in northern Canada.

"Due to the development of modern methods of transportation and to other causes," writes Dr. Keenleyside, " there has recently been a noticeable increase in public activity within the Canadian Arctic. It is anticipated that this trend will continue and that there will be considerable development in the Northwest Territories, the Yukon and other northern areas within the next few years. Departments, and other bodies interested in this part of the country are anxious that this expansion should not be handicapped by lack of qualified personnel of the best type."

Almost all branches of science have an Arctic aspect. In subjects such as medical research, meteorology and geography, whole fields lie almost untouched. Canadian science has a special concern with work of this type. Applications for bursaries and fellowships, therefore, which relate to Arctic aspects of the sciences, are likely to receive sympathetic consideration from the Governmental and private agencies concerned. Dr. Keenleyside's letter contains a survey indicating the types of fellowships, scholarships and bursaries available through both Government and private industry, the nature of the work to be done and the kind of qualifications called for.

Many departments of Government offer openings for service within the Arctic. The most directly concerned are Mines and Resources (Lands and Development Services, and Indian Affairs Branch), National Defence, Transport, Agriculture, Health and Welfare, and the National Research Council. Each is engaged on programmes which include Arctic research, administration, education, health, welfare, communications, radio, transport, geological survey or defence.

Canada's mining development in the North shows no signs of slackening. A constant demand for geologists and mining engineers will exist for many years to come. Trading, transportation and other services, linking the Arctic with the rest of Canada, will continue to offer opportunities for qualified personnel. Problems of construction and communication peculiar to the North will call for civil engineers with specialized training and experience. A partial list of companies and organizations which have interests in the Arctic, is included in the letter.

Those who are not now attending universities, but who desire more detailed information are invited to write to Wing Commander K. C. Maclure, Defence Research Board, National Defence Headquarters, Ottawa.

"Spinning Discs" for Testing Welds and Steel

The Welding Research Council of The Engineering Foundation is sponsoring a "Spinning Disc" method of testing welds and steels at the Massachusetts Institute of Technology.

The equipment consists of an armour plated "whirl pit " forty inches in diameter and nine feet deep. In this, circular steel plates are rotated, at high speed, until they burst.

According to Mr. W. Spraragen, Director of the Welding Research Council, " This is one of the most promising of the new testing methods to provide biaxial stress all the way to fracture—it makes it possible to test thicker welded and unwelded plates than is possible by other methods. The rotating disc method will be used to test materials and welds at extremes of temperature and it is believed that the results will be particularly useful to bridge builders, ship builders and others who fabricate steel for use in extremely low winter temperatures."

The discs are suspended on a flexible steel drive shaft and rotated in a 30-inch vacuum at speeds up to 35,000 r.p.m. Material up to a thickness of 8 inches can be tested.

The whirl pit is made of three heavy pieces of Class-B armour plate lined with lead pig. For welding tests, a small central disc is welded within the outer disc.

It is expected that future tests will provide interesting information on plastic flow and on distribution of plastic strains.

Prizes for Books

Whittlesey House-Science Illustrated, a component of the McGraw Hill Book Company organization has announced the Second Biennial Prize Contest which should be of considerable interest to engineers.

Three prizes, $3,500, $1,000, and $500 are offered, together with advances of $1,000 against royalties, for books on scientific subjects written for the layman. The contest opened December 1, 1947; an outline and 15,000 words is the minimum requirement for the awarding of prizes after November 1, 1948; and the manuscripts must be completed by November 1, 1949. The prizes will be paid in installments during the second year as the winning projects are completed.

Interested readers may apply to Whittlesey House-Science Illustrated, McGraw Hill Book Company Inc., 330 West 42nd Street, New York 18, N.Y., for further information.

Bureau of Technical Personnel

Information and statistics of considerable interest to the E.I.C. membership is contained in bulletins released from time to time by the Bureau of Technical Personnel, Department of Labour, Ottawa, with respect to employment prospects, available supply of young engineers, and other statistical data relative to technical personnel.

1946 Inventory of Engineers

For example, an inventory published a little more than a year ago disclosed about 35,000 technical persons in Canada registered with the bureau; 6,500 civil engineers and foresters, 6,500 chemists and chemical engineers, 4,200 mechanicals, 4,000 electricals, 3,800 miners, geologists, and metallurgists, 1,400 architects, 2,000 physicists and mathematicians and 6,600 miscellaneous such as agriculturists, veterinarians, household scientists, etc. Since this inventory was made, registrations have grown through demobilization to a total of some 40,000. This total includes the bulk of all those registered in the field of engineering and pure science.

This means that the number of engineers and scientists employed in Canada per 1,000 population has grown from 2.14 in 1921, to 3.0 in 1941, and to 4.05 in 1946; in other words, it has almost doubled over the last 25 years.

Age Classifications

But an analysis by the Bureau of registered technical persons by groups and by ages is discouraging for employers and at the same time encouraging for undergraduates. A fifth of the total are close to retirement age. A third are more than 47 years of age, while more than half of them are in their forties and older. This is most noticeable in the ranks of the architects and civil engineers, forty per cent of whom are near retirement, and about 80 per cent of whom are forty plus. Electrical, mechanical, and mining engineers are getting old too. About two-thirds of these groups are forty plus. Moreover, this is a group of men who collectively have lived through two wars, including in the case of many, periods of combat service overseas or overwork at home or both. It can be expected that a considerable percentage of them will become casualties before reaching retirement age.

Survey of Employment Opportunities

In its first report recently issued, covering a year's operation of the Bureau since the dropping of the word " WARTIME " from its title, the Department of Labour summarizes a survey conducted early in 1947 by the Bureau through visits to some 1,500 employers of engineers, as well as to federal and provincial governments, and to professional associations respecting employment by groups which are largely self employed. Conclusions based on preliminary returns from the same survey were published in the May 1947 issue of the *Journal*.

This survey shows an estimated demand over the 5 year period 1947-1951 from employers questioned, for 2,200 civils, 2,100 mechanicals, 1,750 electricals, 1,100 chemicals, 300 metallurgists, and 700 miscellaneous; a total of 9,450. Employers were asked to base their estimates on " full employment ". Those from whom replies were received include most of the large employers.

Output of Engineers from Universities

A survey of Universities indicated that in the same period 12,885 students will graduate in all branches of engineering: in 1947, 1,111; 1948, 1,800; 1949, 3,487; 1950, 3,730 and 1951, 2,757.

About 40 per cent of all who graduate as engineers in 1948 will be veterans; in 1949 about 75 per cent. The Bureau estimates that emigration and diversion to non-engineering fields (teaching, law, commerce, finance, etc.), will reduce the number of these graduates seeking engineering posts in Canada to about 11,000.

The report states that in practically all branches of engineering there is a tendency on the part of employers to indicate greatest need in 1947 (when the supply is actually the smallest) and to taper off as estimates reach into the future.

Percentages of Graduates and of Membership in Professional Bodies

In another more recent bulletin the Bureau gives an analysis of the proportion of registered technical persons who are university graduates and of proportions that are enrolled in various professional bodies. This reveals that 90 per cent of those registered as technical persons had degrees in engineering or science from recognized universities. Of the remaining 10 per cent, 19 out of 20 hold membership in a recognized professional body. The number therefore, who have merely been assessed as having extensive engineering or scientific skill without any degree or membership is something less than 1 per cent.

This same study has also disclosed that a large number of graduates in engineering and science have not yet been enrolled in one of the appropriate professional bodies. In engineering for example, it is found that about 55 per cent of those who have degrees from recognized universities have, to date, been admitted to membership in one of the provincial professional engineering associations. Making some allowance for people who have retired or become incapacitated, this would indicate that the field of potential membership for such associations is something of the order of 75 per cent of their present joint strength.

Similar information was strikingly presented in a number of charts and graphs prepared by Mr. Huet Massue, M.E.I.C., of Montreal, respecting memberships in the E.I.C. and in Provincial Associations of Professional Engineers, which was on display at the Annual General Meeting of the Institute at Toronto, last May.

A Challenge to Professional Associations

These analyses constitute a challenge to the Engineering Institute, as well as to all other professional associations both national and provincial. In view of the fact that membership in provincial associations is mandatory for practicing engineers, the lesson probably applies in greatest measure to national associations, such as the E.I.C. Much could be done by individual branches in fostering local drives for increased membership. Resulting benefits that would accrue to the membership at large in the long run are obvious. The Institute's voice would be made stronger, while increased revenue from additional annual dues would permit wider service to membership.

A Correction

Community Planning Discussion

Carl Klotz, M.E.I.C., advises us that our editor has done him an injustice in a rewording of his discussion of C. A. Meadows' paper, "Standards of Planning of New Neighbourhoods", page 530 of the November *Journal*. Mr. Klotz states that the wording of the fourth paragraph of his discussion is not what was intended and that his original notes actually read as follows:

"There are several kinds of standards. There are Ideal Standards, Investment or Good Practice Standards, and Minimum Standards. By minimum we mean minimum commensurate with public health, safety and welfare. Such minimum standards are found in building by-laws and in zoning or land-use ordinances. Such by-laws, based legally on the police power, must stay within the bounds of public health, safety and welfare. By-laws regulating the cost of buildings can scarcely be considered within these bounds; and except under special charter or statute, by-laws attempting to regulate the appearance of things are ill at ease. It is almost impossible to agree upon aesthetic standards; but grossly unaesthetic constructions or developments, it can well be argued, do involve the public interests sufficiently to warrant some legal standards, or restrictions".

The *Journal* tenders its apologies to Mr. Klotz for any unfavourable impression which the previous wording may have caused.

Meetings of Other Societies

The **Amercian Society of Mechanical Engineers** has scheduled the following meetings for 1948: Spring Meeting, New Orleans, La., March 1-5; Semi-Annual Meeting, Milwaukee, Wis., May 30-June 4; Fall Meeting, September; Annual Meeting, New York, N.Y., November 28-December 3.

The next convention of the **Canadian Section of the American Water Works Association** will be held at Niagara Falls on April 12th to 14th (Monday to Wednesday). The General Brock Hotel will be convention headquarters. Rooms are also reserved at the Fox Head Inn, immediately adjacent to the General Brock.

The programme and the various other events for the meeting are all under preparation, and there is every assurance that this will be an outstanding convention, with good papers and discussions, as well as enjoyable events. The Water Works Equipment Association will, as usual, co-operate fully in all functions.

That the sixth annual conference of the **Society of the Plastics Industry (Canada) Inc.,** will be held in the Mount Royal Hotel, Montreal, February 16th and 17th, was announced by S.P.I. President J. H. McCready, Hale Brothers Limited.

More than 300 representatives of the plastics industry in Canada and the United States are expected to attend the two-day convention. Technical discussions on all phases of the industry will highlight the annual conference. Keynote subjects to be discussed at this international meeting will be marketing and merchandising methods for plastics. Other important topics will be world trade and economics, and greater co-operation within this fast-growing industry.

Principal speaker at the main dinner of the convention will be H. Napier Moore, editor-in-chief of MacLean-Hunter Publications. An important speaker at the sessions on merchandising will be Ephraim Freedman, well-known head of R. H. Macy's Bureau of Standards in New York.

In making the announcement, Mr. McCready issued a general invitation to all interested persons in the industry and affiliated trades to attend the meetings of the convention. General chairman of the Convention Committee is L. C. MacLeod, Monsanto (Canada) Limited. A. E. Byrne, Canadian General Electric Co. Limited is chairman of the Speaker's Committee.

Technical Books for Finland

The library of the excellent technical institute, Teknillinen Korkeakoulu, Finland, was bombed and totally destroyed during the war. The director of the Institute has said that gifts of scientific and technical books and periodicals would be most welcome.

In Finland's remarkable efforts for recovery, the lack of technical library facilities is a serious handicap. It would be a practical act of friendship if contributions were made by Canadian groups and individuals. Any such gifts should be marked for the Institute of Technology, Helsinki, and sent to the Legation of Finland, 2144 Wyoming Ave. N.W., Washington, D.C. Dr. K. T. Jutila, the Finnish Minister, will arrange for their transportation to Finland.

Correspondence

December 17, 1947

Dear Dr. Wright:

The November issue of *The Engineering Journal* reported very fully the transactions of the October Conference of the Institute on community planning.

One of the dominating notes of the Conference was the provision of low cost houses, and the difficulty of compromising the necessary similarity of house unit in order to take advantage of the lower cost of mass production, and the demand for individual designs, was evident in the addresses and in the subsequent discussion of them.

As a contribution to this subject, I would like to quote from a letter from my partner, Dennis Critoph, who has suggested a very likely solution, and I hope that you will be able to broadcast to our members this message to me.

"I have been thinking a good deal about the argument re the undesirability of covering the country with box-like houses, which is the one most frequently put up to me.

Actually the individuality of units in a low priced residential district nowadays even in B.C. is largely an illusion.

In the old towns and villages of England and Europe there was a great deal of variety and interest.

The Vicar lived among his parishioners, the doctor among his patients, the rich man among those whose mortgages he held.

In a village of my boyhood the church was next door to the rectory, and on the other side was the inn and a group of old cottages, then some modern brick houses, then the estate of a retired Colonel and so on.

In these less democratic days, however, the bootlegger and the stockbroker are neighbors in an expensive section of town, while the professional classes, the university faculty, the artisans and the unskilled workers are all carefully segregated.

This practice has far-reaching consequences: socially, in creating misunderstandings between classes: artistically, in creating deadly monotony.

These segregations of similar sized homes produce monotony no matter how each unit wears its roof, its chimney or its entrance: and this is particularly noticeable in the low priced districts in which we are the most interested.

In short, the modern problem of segregation of living units and shortage of housing call for a new and daring solution.

It is variety in the whole community rather than in the units we need. Why not have each group of similar units arranged in varied and dramatic patterns. Let individuality be shown in the community rather than in the unit.

If people could get as good a value in their house as in their car, they would complain no more about the similarity of pattern in the one case than they do in the other. If people wanted cars of bizarre and highly individualized designs, they would have to do without.

Why not face the situation and leave all houses under about fifteen thousand or so to the engineer? Architecture can be a luxury of the wealthy.

It is not a choice for most of us between mass production and individualized design, but appears to be a choice between mass production and shacktown."

Yours very truly,

C. A. Meadows.

Meeting of Council

A regional meeting of the Council of the Institute was held in Room 81a, Parliament Buildings, Quebec City, on Saturday, November 29th, 1947, convening at ten o'clock A.M.

Present: President L. F. Grant (Kingston) in the chair; Vice-Presidents R. S. Eadie (Montreal) and G. F. Layne (Quebec); Councillors J. A. Beauchemin, K. G. Cameron, R. C. Flitton, C. E. Gelinas, C. C. Lindsay, C. A. Peachey, J. B Stirling, all of Montreal, J. R. Dunbar (Hamilton), W. C. MacDonald (Moncton), E. Lavigne (Quebec), also present as president of the Corporation of Professional Engineers of Quebec, and Assistant General Secretary W. D. Laird.

There were also present by invitation—Past Vice-President Hector Cimon (Quebec); Past Councillors J. A. Lalonde and C. A. Robb of Montreal, E. D. Gray-Donald, P. A. Gagnon and A. Lariviere, of Quebec; G. A. Gaherty (Montreal), chairman of the Committee on Prairie Water Problems, G. R. Langley (Peterborough), chairman of the Committee on the Young Engineer; J. A. H. Henderson (Montreal), councillor of the Corporation of Professional Engineers of Quebec, and member of executive, Montreal Branch of the Institute; P. A. Dupuis, chairman, C. H. Boisvert, past-chairman, and Roger Desjardins, secretary-treasurer, Quebec Branch.

Death of Past-President F. A. Gaby: The president informed Council that on hearing of the death of Past-President F. A. Gaby, which had taken place in Toronto on November 14th, he had written to Mrs. Gaby, but he felt that a formal expression of sympathy should be sent by Council. Accordingly, it was unanimously resolved that the following resolution be recorded in the minutes and that a copy be forwarded to Mrs. Gaby:

> "The Council of The Engineering Institute of Canada records its deep regret at the death of Dr. F. A. Gaby, president of the Institute for the year 1935. His was a distinguished career both as an engineer and as a citizen of Canada, and his contributions to the field of hydro-electric development during his long tenure in senior executive positions with the Hydro-Electric Power Commission of Ontario are widely recognized. It was this service which led to his being honoured with the degree of Doctor of Science by the University of Toronto in 1925.
>
> Dr. Gaby was well known to and respected by engineers in many parts of Canada and this Council joins with many others of his friends and associates in extending to Mrs. Gaby and the members of his family its very sincere sympathy."

Honorary Degrees: Mr. Stirling commented on the impressive ceremony which had been held the previous afternoon when that ancient and honorable institution of learning, Laval University, had been pleased to confer upon two outstanding engineers, the president of The Engineering Institute of Canada, and the president of the Corporation of Professional Engineers of Quebec, honorary degrees of Doctor of Science.

On the motion of Mr. Stirling, seconded by Mr. Layne, it was unanimously resolved that the congratulations of the Council of the Institute be extended to Dr. L. F. Grant and Dr. E. Lavigne on this memorable occasion. Dr. Grant asked Dr. Lavigne to stand with him in acknowledgment of this tribute from the Council of the Institute.

Remuneration of Engineers in the Armed Forces—Mr. Laird read the following letter which had been received from the Minister of National Defence:

> "Ottawa,
> October 10th, 1947.
>
> Dear Mr. Wright,
>
> On my return to Ottawa, your letter of September 8, addressed to Mr. Gibson, concerning "responsibility allowance", and in which you ask for specific information as to the reasons why this allowance was not extended to other classes of officers, was brought to my attention.
>
> Whereas there was shortage of doctors and dentists in the Armed Services, in the other professional corps sufficient applications have been received to meet immediate requirements. Moreover, sufficient undergraduates in engineering at the various universities have expressed their intention of applying for commissions to meet the

need. While the Services are generally glad to have other technical officers joining immediately on graduation from the university, this is not the case in peacetime with doctors and dentists. Practically all those joining have had several years of training or practice additional to what is customary in the other professional and technical services.

In view of the national interest of your Institute in this matter, it occurs to me that the members of your Council may like to have a more general picture of the organization of the Defence Forces. Accordingly, I am sending you copies of a paper I prepared on this subject. As you will see, the question of the training of officers is dealt with at page 25.

Yours sincerely,

(signed) Brooke Claxton."

Mr. Laird also read the paragraphs on the training of officers taken from the paper referred to in Mr. Claxton's letter. Considerable discussion took place, during which it was pointed out that both the Military Engineers Association and the R.C.E.M.E. Association are preparing to make further representations to the government on this question of " responsibility allowance " in the pay of engineer officers. The feeling of members present was that the Institute should continue its efforts, either by sending a delegation to Ottawa to interview the Minister, or by supporting these other organizations in the action they are taking.

Mr. Lindsay pointed out that the Institute's Committee on the Engineer in the Armed Services, which had been active during the war, had not been reappointed, and at the request of Council he accepted the chairmanship of a committee with power to add to its numbers, whose duty would be to contact these other organizations and see what arrangements are being made for a delegation to go to Ottawa, and to offer the support and co-operation of the Institute.

E.C.P.D. Annual Meeting—In the temporary absence of the president, Mr. Laird reported on this meeting. Believing that the Engineers' Council for Professional Development (E.C.P.D.) is an excellent example of co-operation among engineering societies, Headquarters and a number of Montreal members exerted particular efforts to make the meeting an outstanding success. The volume of appreciative letters which had been received by the president and by Headquarters could be taken as an indication that the objective had been achieved.

The Montreal Branch and its Ladies Committee had rendered a real contribution in arranging for the entertainment of the large group of ladies who had accompanied the delegates, and also for the entertainment of those who stayed over the weekend in Montreal. Both the president and Headquarters have expressed the Institute's appreciation in this regard.

The business of E.C.P.D. occupied a large part of the two-day meeting and, in accordance with established custom, a report of the proceedings will be published in booklet form early in 1948.

Institute Representation on E.C.P.D.—Mr. Laird reported that Dr. C. R. Young, one of the Institute's representatives on the Engineers Council for Professional Deevlopment (E.C.P.D.), had found that his other duties would not permit him to continue. Dr. J. B .Challies had been asked to serve and had accepted the appointment as the Institute's representative on the Council and on the executive committee, to complete the unexpired portion of Dr. Young's term.

E.C.P.D. Canons of Ethics—Mr. Laird read a letter from Dr. Challies reporting on a meeting of the E.C.P.D. executive committee which he had attended in New York on November 20th. He reported on two matters. First, that the sixteenth annual meeting of E.C.P.D. would be held in Detroit, on Friday and Saturday, October 29th and 30th, 1948. Special invitations will be sent to engineers in the Detroit area who might be interested, and the branches of the Institute in western Ontario will be contacted and kept fully informed.

The second matter of interest to the Institute Council was the unanimous wish of the executive committee that the E.C.P.D. Canons of Ethics, as approved at the last annual meeting in Montreal, be accepted and adopted by the constituent members of E.C.P.D.

Mr. Laird read a letter from Dr. C. R. Young, who had been the Institute's representative on the E.C.P.D. Committee on Ethics, in which he urged that the Institute take the necessary steps towards the adoption of these Canons of Ethics. Dr. Challies also felt that the Institute should adopt these Canons of Ethics although he though there was no necessity for immediate action, since the Institute was the youngest member of E.C.P.D. and might better follow the lead of the more senior member bodies.

Mr. Eadie remarked that in discussing this with the president recently, it had been his impression that the matter would have to go to a letter ballot of the Institute members. Mr. Layne thought it was perhaps a matter which should come before the annual meeting of the Institute.

Dr. Challies had suggested that in order to give the fullest possible consideration to this matter a carefully chosen committee should be appointed to consider the adoption of these Canons of Ethics by the Institute.

Mr. Eadie reminded Council that a committee in Toronto had given a great deal of time and thought to these proposed canons of ethics. Their revised version had been submitted to the E.C.P.D. committee, and he understood that it had been accepted by the committee practically as submitted.

Following further discussion, on the motion of Mr. Eadie, seconded by Mr. Beauchemin, it was unanimously resolved that Dr. deGaspe Beaubien, Dr. J. B. Challies, and Mr. J. A. Vance, the Institute's representatives on E.C.P.D., be appointed a committee, with power to add to their number, to study the matter and advise Council as to what further steps should be taken in regard to these Canons of Ethics.

Ontario Division By-Laws: Mr. Laird presented the report of the scrutineers appointed to canvass the ballot for the adoption of the by-laws of the Ontario Division. A favourable vote had been recorded.

On the motion of Mr. Dunbar, seconded by Mr. Eadie, it was unanimously resolved that the report be accepted, that the scrutineers be thanked for their services and that the ballot papers be destroyed.

Accordingly, the by-laws of the Ontario Division, as submitted to the corporate membership in Ontario, were declared adopted.

Mr. Dunbar pointed out that in framing these bylaws the Ontario Division had been bound by the provisions of the Institute by-laws covering provincial divisions. Some of these the Ontario Division would like to see amended, and while not sufficiently important to warrant a special ballot, he suggested that, if any amendments to the by-laws on other matters were going out in the near future, the Ontario Division would like to be informed so that they might make recommendations regarding amendments to Section 69 and those following which affect provincial divisions.

Secretarial Office in Ontario: Mr. Laird read a letter from Mr. E. R. Graydon, secretary of the Ontario Division, regarding the possible establishment of a secretarial office in Toronto. He reported that Colonel Grant would be in Toronto on December 6th to discuss certain matters with Vice-President Manock, the chairman of the Ontario Division, and he understood that this matter would also be discussed at that time. It was decided to defer action on this letter until the president had had an opportunity of discussing the subject with Mr. Manock.

List of Nominees for Officers—Mr. Laird read a letter from Mr. A. R. Jones advising that he was unable to accept nomination as councillor for the Peterborough Branch for the years 1948 and 1949; also a letter from the Peterborough Branch recommending that Mr. A. L. Malby be nominated for this office, which nomination he had agreed to accept.

On the motion of Mr. Beauchemin, seconded by Mr. Dunbar, it was unanimously resolved that Mr. A. L. Malby be nominated as councillor for the Peterborough Branch for the years 1948 and 1949, his name to appear on the officers' ballot.

Maritime Professional Meeting 1948—Mr. Laird reported that definite plans were now under way for a maritime professional meeting to be held in St. Andrews, New Brunswick, on September 8th, 9th and 10th, 1948. The meeting was being held under the auspices of the New Brunswick and Nova Scotia Associations of Professional Engineers and the maritime branches of the Institute, and it was hoped that members would keep these dates in mind when making their plans for next year.

Annual Meeting—Banff—June 1948 — Mr. Laird reported that definite arrangements had now been completed for the holding of the 1948 annual general and professional meeting in Banff, Alberta, during the first week of June. The meeting was being held under the auspices of the Calgary Branch, and the western branches are hoping that there will be a particularly good attendance from the east. Inquiries are being made as to the possibility of chartering aeroplanes which might cost a little more than train transportation, but would save a great deal of time. Special railway cars will be available from Toronto, Montreal and Ottawa. The question of technical papers is also receiving attention. Suggestions as to suitable topics or possible authors of papers will be appreciated by the committee. An advance announcement, giving all available information, will appear in the February issue of the *Journal*.

Report of Finance Committee

Financial Statement: It was noted that the financial statement to the end of October had been examined and approved.

Pension Plan for the Staff: Mr. Eadie reported that all the details of the pension plan for the Headquarters staff, recommended by the Finance Committee and approved by Council by letter ballot, had been completed ,and he was pleased to report that the plan goes into effect on December 1st and that it has been accepted one hundred per cent by the staff. Council again expressed its thanks and appreciation to Mr. Eadie and the Finance Committee for the great amount of work which had been done in connection with this plan.

Institute Nominating Committee: Mr. Laird read a letter from Mr. Stewart Young, chairman of the Institute's Nominating Committee for 1947, commenting on the procedure followed at the present time in connection with the presidential nomination. In 1935, in view of the fact that by-laws make little reference to the modus operandi of the Nominating Committee, Council has drawn up certain rules for the guidance of the Nominating Committee, and Mr. Young suggested that there might, with advantage, be some revision or modification of the present procedure. In his opinion, the duties of the Nominating Committee should cease with obtaining nominees for the office of president and that the selection from these nominees by the three honorary councillors should be final.

Mr. Laird read the rules drawn up by Council, 5 and 6 of which deal with the presidential nomination as follows:

> 5. In the case of the office of president, a full list of names suggested by the members of the Nominating Committee shall be sent to the three honorary councillors and they, acting under the chairmanship of the senior honorary councillor, shall choose one nominee and obtain his consent to act in the event of his election. The senior honorary councillor shall then notify the chairman of the Nominating Committee of the choice, and the latter shall submit it to the whole Nominating Committee for their confirmation not later than July 15th.
>
> 6. In the event of such nomination not receiving a majority vote another name should be submitted by the honorary councillors and again voted upon by the Nominating Committee.

From the discussion which followed it appeared that the present procedure had been found quite satisfactory. In Mr. Dunbar's opinion, the nomination for president is made by the Nominating Committee and not by the honorary councillors, and he suggested that no action be taken to change the procedure.

Dr. Robb, as a past-councillor who, at one time, had lived at a considerable distance from Headquarters (Edmonton), reported that the procedure now followed by the Institute had made an excellent impression as it had operated over the years. He knew of other organizations which had adopted the procedure used by the Institute and he would not like to see any change.

Mr. Stirling was also in favour of continuing the present procedure. He, too, knew of other organizations which had adopted the same procedure as the Institute.

Following further discussion, on the motion of Mr. Dunbar, seconded by Mr. Peachey, it was unanimously resolved that no change should be made in the procedure and that the president should write Mr. Young informing him of the opinions expressed at this meeting.

Julian C. Smith Medals: Councillors J. R. Dunbar and W. C. MacDonald were appointed scrutineers to open the ballot for the Julian C. Smith Medal. They reported that all ballots had been canvassed and that both candidates, P. L. Pratley, of Montreal, and P. M. Sauder, of Strathmore, Alberta, had received the necessary affirmative votes. On the motion of Mr. MacDonald, seconded by Mr. Lindsay, it was unanimously resolved that the report of the scrutineers be accepted and that the ballot papers be destroyed. Accordingly, Julian C. Smith Medals will be awarded to both these gentlemen.

Appointment of Medal Committees: On the motion of Mr. Beauchemin, seconded by Mr. Peachey, it was unanimously resolved that the membership of the medal committees for the year 1947, as submitted by the chairmen, be approved as follows:

Gzowski Medal Committee: C. G. Moon, Chairman, J. R. Cockburn, L. C. Jacobs, A. W. F. McQueen, C. S. G. Rogers.

Plummer Medal Committee: J. R. Donald, Chairman, R. R. McLaughlin, W. E. Patterson, J. B. Phillips, M. P. Weigel.

Leonard Medal Committee: G. E. Cole, Chairman, A. F. G. Cadenhead, A. E. Cameron, G. M. Furnival, C. R. Boehm.

Keefer Medal Committee: R L. Hearn, Chairman, F. J. Blair, A. C. D. Blanchard.

Ross Medal Committee: D. Anderson, Chairman, J. W. McCammon, K. R. Swinton.

Safety Code for Passenger and Freight Elevators: A letter was presented from the Canadian Standards Association advising that in order that the CSA Standard B-44-1938—Safety Code for Passenger and Freight Elevators, might be brought up to date, the existing committee is being revised in order to embrace a broader list of interests, and the Institute has been invited to nominate a representative to membership on this committee, under the chairmanship of W. J. W. Reid, M.E.I.C., of Hamilton, Ontario.

On the motion of Mr. Stirling, seconded by Mr. Gelinas, it was unanimously resolved that Professor S. D. Lash of Kingston, Ont., be asked to represent the Institute on this committee.

Plaster Bust of Sir Casimir Gzowski: Colonel Grant presented a letter which he had received from Lieut.-Col. H. E. Bates, of Shawinigan Falls, advising that Mrs. John Legg, of Three Rivers, had in her possession, a plaster bust of Sir Casimir Gzowski, one of the founders of the Canadian Society of Civil Engineers, and the originator of the Gzowski Medal, which she, as a great grand-daughter of Sir Casimir, would like to present to The Engineering Institute of Canada.

On the motion of Mr. Flitton, seconded by Mr. Beauchemin, it was unanimously resolved that this plaster bust be gratefully accepted on behalf of the Institute and that the House Committee be charged with the responsibility of finding a suitable location for this gift.

Publication of Articles in the Journal: Mr. Dunbar drew attention to an article by Professor A. L. C. Atkinson, M.E.I.C., published in the September number of *The Enginering Journal,* with a note to the effect that proof of formula would be furnished by the author on request. Mr. Dunbar pointed out that as the Institute does not now publish transactions, *The Engineering Journal* is the only means of publishing and permanently recording new contributions to engineering literature and he felt that in this particular case the proof should have been published with the formula.

Mr. Dunbar had two points to bring up. First—if the Engineering Institute wishes to take its place as a scientific organization there should be some place where original contributions can be permanently preserved. Secondly, that requests for such proof, if not published in the *Journal* should be handled through Headquarters.

Mr. Laird explained that the omission of this proof had been one of a number of ways of saving paper, but the paper shortage was now easing up and it was hoped that from now on it would be possible to include such items in the *Journal.* In this particular case, Professor Atkinson had been approached and his approval of this action obtained.

Following some discussion it was suggested that it might be possible to publish the proof with any discussions which might be received on this paper, and it was agreed that this matter should be referred to the Publication Committee at its next meeting.

Civil Service Commission Qualifications — Mr. Laird read a letter which the president had received from Mr. P. E. Poitras expressing his opinion that The Engineering Institute of Canada would be making a very serious mistake if it were to press the point of the replacement of membership in the Engineering Institute as a qualification for engineers in the Civil Service. He felt that other voluntary societies might object and he suggested that the Institute should work in co-operation with the Dominion Council towards requiring registration in one of the provincial associations as the necessary qualification or failing this, recognition of graduation from a recognized school of engineering.

A copy of Mr. Poitras' letter had been referred to Mr. MacRostie, chairman of the Institute's Committee on the Engineer in the Civil Service, and Mr. Laird read a letter from Mr. MacRostie advising that he had discussed the matter with the chairman of the Civil Service Commission and had received a reply from him referring to previous correspondence with Mr. Wright, and concluding with the following statement:

> "I would like to assure the Institute that there is no question in our minds as to the qualifications of persons who are entitled to become its members, but there is need at the present time for clarification in some of the other associations of engineers and as soon as some degree of clarity can be secured we are prepared to proceed further with the matter."

In the discussion which followed it was admitted that the Institute would not object to university graduation or membership in the Corporation or any of the provincial associations being included as a requirement, but it did object to membership in The Engineering Institute of Canada being deleted from the requirements. It was finally agreed that the president should write to Mr. Poitras along these lines, advising him that the matter is receiving the further consideration of the Council of the Institute.

Possible Overcrowding of the Engineering Profession—The president referred to the letter from the Moncton Branch (already circulated) and said that this was a case of the constructive criticism which Headquarters desired from the branches. He reminded Council, that it had been referred to the Committee on the Young Engineer, and that he had asked Dr. Langley to attend this meeting of Council in order to give a first-hand report.

Dr. Langley said that the letter had been discussed the previous day by the Canadian Committee on Student Guidance (representatives of the E.I.C., C.I.M.M., C.I.C., and Mr Dymond of the Bureau of Technical Personnel). Mr. Dymond thought there was a tremendous deficit of engineers, with which opinion Dr. Langley could not agree. The Canadian Committee on Student Guidance felt that the 1948 and 1949 graduating classes would readily find employment but considered that there was a definite doubt as to 1950 and 1951. Dr. Langley explained that in his opinion there was a close relationship between the absorption of engineers and the quantity of installed horse-power in the country. He considered that any student entering university in 1949, 1950 or 1951 would face much more severe competition than at present. He then asked for an expression of opinion from the Council meeting.

Mr. MacDonald (Moncton), referring to the view (expressed in the Financial Post and by individuals) that an engineering education was valuable for a non-engineering career and that many of the present crop of students did not contemplate entering the profession in the strict sense, said that this led to the conclusion that even plumbers should take engineering courses, and that such a point of view would lower the standing of the profession. He suggested that Council should direct the president to warn high school students of the situation, and also thought that universities should limit entrance by raising standards.

The president pointed out that it was the ex-service men who had created the present large university registration, and that they could not well be refused. Dr. Langley thought that positive action was required only for those entering in the years 1948 and 1949, and that little could be done about the students already in, except possibly to change the final years to engineering administration.

Mr. Eadie said that this year's registration appeared less than last year's and that he did not think the universities would raise their requirements further. Mr. Flitton thought it would be dangerous to discourage young men from entering engineering classes and Mr. Peachey remarked that in 1943 no one would have thought that we needed as many engineers as we do at present, and that this situation might be repeated in the future.

Dr. Langley pointed out that his figures showed a deficiency of engineers up to the present (1947) but subsequently that a 400 per cent increase might need to be absorbed.

In Mr. Lindsay's opinion, the present increase was due to the government grants (to ex-service men). He said that many engineering positions formerly filled by " practical men " were now being filled by university graduates. In his opinion Canada is on the verge of a big development. He thought the situation would take care of itself. Mr. Eadie believed there was a definite place for engineers in the shops, in positions such as foremen and superintendents hitherto filled by men without technical education. He said in 1944 and 1945 industry had set up committees to plan post-war development to take care of a slowing down, but that the prognostications could not have been more wrong. He thought there was a good deal of difficulty in judging all the factors affecting future employment.

Mr. Stirling believed that supply and demand would be a great factor in working things out. He suggested that the Moncton Branch, not being in an industrialized province, might be taking a restricted view. He thought the outlook for engineering in Canada was unlimited and that the Institute should not discourage young men from going into it. A recent survey had shown that 25 per cent of a certain class were very successful outside of engineering. He considered that the Moncton Branch is too pessimistic.

Dr. Langley agreed that this estimate or any others might be wrong. What he was unable to see was a sudden rate of rise in employment for engineers. To employ them at the rate they are graduating we should need a rate of increase of 60 per cent instead of the present 15 per cent (over five years). Were we justified in shirking the question and letting supply and demand take care of it? There was some further discussion, following which the president asked Mr. MacDonald to frame a motion on the subject.

Mr. MacDonald asked that the president be directed to give warning through the press that there will not be enough engineering positions for those entering the engineering colleges, and to use every means in his power to restrict registration. Dr. Langley suggested slightly different wording: that the Engineering Institute does not see a sufficiently increased rate of employment to absorb the present rate of graduation.

After considerable discussion as to the exact form of the motion, it was moved by Mr. MacDonald and seconded by Mr. Cameron that the Council should endorse the resolution passed in Ottawa on November 28th by the Canadian Committee on Student Selection and Guidance (Dr. Langley and representatives of C.I.M.M., C.I.C., and the Director of the Bureau of Technical Personnel), Dr. Langley having reported that this reads as follows:

> " The Canadian Committee on Student Guidance in Science and Engineering anticipate that the graduating classes in engineering from Canadian universities in 1948 and 1949 will be readily absorbed. The picture for subsequent years is not so clear, and engineers carrying on guidance work amongst high school students should therefore employ increased effort toward ensuring that those entering engineering courses have definite aptitude for the profession, and at the same time also make it clear that engineering graduates may have to face much keener competition for the better engineering jobs."

This resolution was carried—nine in favour and one contrary.

Next Meeting of Council: It was decided that the December meeting of Council should be held in Montreal on Saturday, December 20th, and that routine business only would be transacted at that meeting.

January Meeting of Council: An invitation from the Toronto Branch to hold the January meeting in Toronto on Saturday, January 24th, 1948, was considered. The president stated that he would be in New York on January 21st to 23rd, attending the annual meeting of the American Society of Civil Engineers. He had not yet seen the detailed programme but hoped that he would be able to be in Toronto on the morning of the 24th. In any event, he was planning to be there to attend the annual meeting of the Toronto Branch being held that evening. It was left with the president to make a decision as soon as he had definite information regarding his commitments in New York.

On the motion of Mr. Dunbar, seconded by Mr.

Peachey, it was unanimously resolved that a hearty vote of thanks be extended to the officers and members of the Quebec Branch for their splendid hospitality and many kindnesses during the president's visit.

The Council rose at five o'clock P.M.

W. D. Laird,
Assistant General Secretary.

Elections and Transfers: A number of applications were presented for consideration, and on the recommendation of the Admissions Committee, the following elections and transfers were effected:

Members

Grassby, Robert Leigh, B.Eng., (Mech.), McGill, Coal Plants Limited, Winnipeg, Man.
Gwyther, Val M. W., B.A.Sc., (Civil), British Columbia, res. engr. i/c constrn., Bloedel, Stewart & Welch Ltd., Port Alberni, B.C.
Harrington, John Eric, Graduate, Royal Military College, (1937), president, Anglin-Norcross Co., Ltd., Montreal, Que.
Hood, James R., B.Sc., (Chem. Engrg.), Queen's, mech. supervisor's office, Canada Packers Ltd., Toronto, Ont.
Lang, Edwin George Power, R.M.C., Sandhurst, Eng., res. engr., tunnel development, Mississaugi River, H.E.P.C. of Ontario; home, 1441 Drummond St., Montreal, Que.
Milne, Henry Alexander, B.Sc., (Civil), Saskatchewan, asst. design engr., constrn. dept., Sorg Pulp Co., Vancouver, B.C.
Mordell, Donald Louis, B.A., M.A., (Mech. Sciences Tripos), St. John's College ,Cambridge; associate professor, Mechanical Engrg. Dept', McGill University, Montreal, Que.
Rogers, Cecil Gordon, B.A.Sc., (Civil), British Columbia, engr., mtce. cost control, engrg. divn., Consolidated Mining & Smelting Co. of Canada, Ltd., Trail, B.C.
Rooney, Sidney Crawford, B.A.Sc., (Mech.), British Columbia, chief engr. & genl. mgr., pulp, paper and sawmill design, Columba Mill Development Co. Ltd., Vancouver, B.C.
Sutherland, William Collie, Works Officer, R.C.E., B.Sc., (Elect.), Nova Scotia Tech. College, Camps and Defences, R.C.E., Halifax, N.S.
Wood, Leonard Robert, B.A.Sc., (Metall. Engrg.), Toronto, plant engr., Building Products Ltd., Hamilton, Ont.

Juniors

Botham, John Charles, B.Sc., (Metall. Engrg.), Queen's, jr. engr., research Dept., Dominion Steel & Coal Corp., Sydney, N.S.
Ivory, Thomas Henry, B.A.Sc., (Civil), Toronto, Jr. engr. & designer, railway & bridge section, Dept. of Works, City of Toronto, Ont.
Sleigh, Edward Barry, B.A.Sc., (Chem. Engrg.), British Columbia, Shell Oil Co. of British Columbia, Vancouver, B.C.
Walker, William Macfarlane, B.A.Sc., (Elect. Engrg.), British Columbia, ind. power engr., British Columbia Electric Railway, Vancouver, B.C.

Affiliates

Dies, Abram Stuart, B.S.A. (Chemistry), Ontario Agricultural College, chief chemist, Canada Cement Company Limited, Montreal, Que.
Rich, Clifford Earl, Montreal, Que. B.Sc., M.Sc., (Chemistry), Saskatchewan, director research & supt. production, Ogilvie Flour Mills Co., Ltd., Montreal, Que.

Transferred from the class of Junior to that of Member

Border Cities Branch
H. T. Brunskill
J. G. Hoba
H. D. Keil
W. A. McDougall
J. A. MacGibbon
D. E. Palmquist
G. M. Robinson
J. K. Ronson
J. M. Van Winckle

Calgary Branch
J. D. Harvie
J. A. Lamb
P. J. Prokopy
W. A. B. Saunders

Cape Breton Branch
C. A. Knight
A. M. Miller
G. A. Myers

Cornwall Branch
A. A. B. McMath
J. Oliver
J. N. Swartz

Edmonton Branch
S. G. Davis
W. W. Preston
W. L. Thomlinson

Halifax Branch
C. A. E. Fowler
G. R. Tremblay

Hamilton Branch
M. C. Edwards
J. M. Elliott
J. L. Fair
J. W. Kerr
J. W. Lucyk
H. F. McLachlan
H. M. Scott
R. C. Sentance
E. H. Tovee

Kingston Branch
R. C. Bryce
G. H. Schuett

Kootenay Branch
G. R. McMeekin
M. L. Zirul

Lakehead Branch
F. E. Ayers
W. D. MacKinnon
P. M. Rebin

Lethbridge Branch
H. E. Hewitt
J. R. Milne

London Branch
F. S. Hutton
W. A. Pegler
R. R. Smith

Moncton Branch
G. E. Peabody

Montreal Branch
J. Ain
F. G. Baker
G. Beaudet
J. M. Beaudry
F. M. Booth
R. I. Brasloff
L. R. Brazeau
H. B. Brewer
F. Brien
M. I. Bubbis
J. A. Burke
W. F. S. Carter
A. H. P. Cole
C. H. Cook
N. H. Cuke
L. G. Daignault
J. B. Delage
J. R. Desmarais
D. DesOrmeaux
G. P. Dewar
W. A. Dick
D. C. Dobbin
C. H. Drury
W. A. Duckett
M. A. Forsythe
G. Frechette
P. O. Freeman
J. K. French
J. C. Loiselle
J. G. M. Loomis
C. A. Miller
Z. Miller
H. A. Mullins
J. M. MacBride
P. M. MacCallum
J. T. McCay
H. A. McColeman
I. D. MacKenzie
A. F. McLean
J. G. MacLeod
J. P. E. McMath
J. D. P. McPherson
P. E. Paquin
E. N. Parker
V. M. Parrish
G. T. Perry
A. Peterson
H. J. B. Richards
J. M. Ross
J. J. Rowan
S. Fromson
J. Gargas
W. J. Gent
E. I. Glance
R. E. Gohier
H. J. Gordon
A. J. Groleau
R. E. Grout
M. P. Gunning
W. G. Hamilton
T. A. Harvie
A. A. Hink
D. H. Hobbs
A. H. Holden
W. O. Horwood
J. S. Houghton
J. T. Hugill
G. G. Janigan
J. S. Johnston
J. Kazakoff
C. N. King
H. I. King
N. A. Klodniski
M. Lamarche
G. A. Lapointe
J. C. Leahey
R. LeBel
G. G. Leroux
R. G. Rowan
H. G. Russell
R. L. Sanders
E. T. Skelton
E. B. Smith
H. F. Staniforth
J. P. Stanley
E. P. Stephenson
R. L. Stevens
J. G. Stone
J. G. Thibault
G. R. Treggett
M. R. Trudeau
J. Van Damme
J. R. White
M. F. Wilding
H. O. Wilson
H. G. Wong
G. M. Woods
R. B. Wotherspoon
A. M. Wright
E. S. Yuill

Niagara Peninsula Branch
E. R. Brannen
G. L. T. Ellis
S. D. Levine
O. N. Mann
R. A. Moore
W. G. McLaughlin
L. J. Russell
R. T. Sawle
A. D. Smith

Ottawa Branch
R. J. Beaudry
W. M. Benson
E. F. Brown
P. Codd
J. R. Dunlop
A. D. Kent
V. G. Kosnar
A. Mendelsohn
R. M. Morris
T. M. Patterson

J. R. Dunn
J. H. Ferguson
M. M. Hendrick
D. C. Smiley
J. S. Watt
R. E. Wilkins

Peterborough Branch
R. T. Bogle
A. J. Bonney
O. J. Frisken
G. H. Hall
R. S. Hull
H. A. Lancefield
D. C. McCrady
D. R. McGregor
R. D. MacKimmie
J. F. Osborn
R. A. Phillips
H. W. Wilford

Quebec Branch
M. G. Archer
B. O. Baker
C. E. Deslauriers
P. X. Laberge
J. Mercier
G. Piette
R. Rioux

Saguenay Branch
F. H. Duffy
G. Dufour
C. R. Engler
J. P. Estabrook
C. E. Hand
R. W. J. Lewis
J. T. Madill
G. T. Malby

Saint John Branch
R. M. Rice

St. Maurice Valley Branch
A. Courchesne
C. G. deTonnancour
A. T. Girard
J. C. Hamilton
J. O. Kelly
R. E. Kirkpatrick
E. M. MacLeod
T. W. Ross

Sarnia Branch
S. V. Antenbring
J. O. Giles
A. Jeffrey
W. E. Taylor
G. G. Wanless

Saskatchewan Branch
W. N. White

Sault Ste. Marie
F. J. DeStefano
S. A. Dick

Toronto Branch
A. E. Adlam
R. S. Bleackley
J. B. Bryce
H. O. Coish
J. M. Courtright
J. M. A. Crowe
W. Laari
C. E. Lewis
W. A. Logie
B. R. Murphy
D. I. Nattress
H. C. Oatway
W. E. Parker
J. H. Rogers
H. U. Ross
F. A. Davis
J. F. Ford
H. R. Frizzle
A. W. Grunsten
R. Hewitt
C. G. Kauth
R. H. Scrivener
I. Shienfield
G. Sinclair
A. G. Smith
D. D. Stiles
F. W. Taylor
R. B. Telford
E. L. Toy
P. R. Woodfield

Vancouver Branch
A. P. Alexander
J. E. Beamish
R. G. Bentall
R. Chambers
A. E. Chard
A. R. Colby
R. H. Garrett
W. G. Grimble
E. L. Hartley
E. A. Russell
R. R. Snyder

Winnipeg Branch
W. B. Boggs
C. J. Bradley
M. Gershfield
A. R. Goddard
J. G. Horsburgh
R. W. Morris
G. W. Moule
W. B. F. Mackay
J. E. Page
J. C. Pratt
D. R. Taylor
W. L. Wardrop

Foreign and U.S.
J. E. Beach
K. D. Beecher
R. A. Frigon
A. F. Garcia
C. Garrett
A. H. Meldrum
F. W. Molland
S. W. Sibbald
J. F. Baxter
H. I. Hamilton
E. L. Miller

Transferred from the Class of Junior to that of Affiliate

Murray, James Albert, B.Arch., Toronto, permanent staff, School of Arch., Univ. of Toronto; partner, Cameron, Murray and Fairfield, Toronto, Ont.

Transferred from the Class of Student to that of Junior

Pickering, John Ernest, B.Sc., (Mech.), Saskatcehwan, utility engr., prod. control dept., Polymer Corporation Limited, Sarnia, Ont.

Scharry, Leo, B.A.Sc., C.E., Ecole Polytechnique, sales engr., Sangamo Co., Montreal, Que.

Students at McGill University

Abugov, B.
Beddoe, A. C.
Bisson, J. G.
Bowie, R. A.
Brenchley, J. A.
Coates, C. S.
Cook, C. G.
Daggett, L. A.
Decarie, G. R.
Dogherty, D. D.
Dupuis, J. V. Y.
Fanjoy, W. D.
Feinberg, I.
Flett, L. C.
Giacomin, P. D.
Green, R. S.
Groome, L. H.
Guenett, R. R.
Kovacs, R. V.
Kuhn, B. G.
Lang, B.
Lanigan, P. A.
Lefebvre, E. S. J.
Love, L. S.
MacDougall, B. J. R.
McFaul, A. G.
MacKean, L. T.
Mackey, G. A.
McLaughlin, D. P.
Madore, G. W.
Mainwaring, J. E.
Moreau, U.
Mulvey, G. E.
Olfman, M.
Peat, D. W.
Percival, H. W.
Pihlainen, J. A.
Radcliffe, K. J.
Rapp, M. H.
Riesler, I. I.
Sylvia, H. C.
Thompson, C. G.
Tod, C. R.
Townsend, D. L.
Yanofsky, H.

Students at Ecole Polytechnique

Abran, M.
Attendu, M. C.
Audy, C.
Auger, J. Z. R.
Beauchemin, F.
Bessette, H.
Blais, C. H.
Boivin, F.
Bourassa, J.
Bourgon, J. P.
Cantin, G.
Caron, J. J. F.
Carrier, P.
Cleroux, M. A. E. J.
Derome, P. L.
Drolet, P.
Duchesne, G.
Duhaime, J. R.
Duval, L.
Marchand, J. C.
Marchand, Y.
Marmet, L.
Migneron, J. P.
Naud, C.
Paquet, A.
Paquette, N.
Paradis, G.
Petit, G.
Poulin, A.
Gagnon, J. P.
Garand, R.
Gauthier, G. A.
Gauthier, J. N. A.
Gendreau, L. B. L.
Godin, J. P.
Grondin, B.
Guay, N.
Hardy, Y.
Jodoin, N.
Laframboise, J. L. E.
Laframboise, J. B. A.
Laliberte, A.
Lamothe, G. L.
Lavallee, G.
Lefebvre, G.
Legault, P. Y.
Le Guerrier, V. J. G.
Major, L.
Prieur, J.
Quintal, R.
Ratelle, C. D.
Reeves, L.
Reeves, R.
Richard, J. C.
Taschereau, P.
Vandry, G. A.
Wagner, C.

Students at University of Toronto

Bahen, J. E.
Ball, W. R.
Carrington, F. G.
Dobbin, G. P.
Hudson, S. A.
Kelly, W. M.
Kennedy, R. L.
Kitchen, M. J.
McCargar, R. D.
Powell, G. G.
Protheroe, H. F.
Snider, D. R.
Sutherland, A. E.
Throop, W. J. N.
Whitehead, J. F.

Students at University of New Brunswick

Alley, C. G.
Bell, D. K.
Bouchard, J. D.
Brenan, J. A. B.
Carey, J. L. A.
Clark, R. D. C.
Fillmore, R. P.
Fonger, D. R.
Fraser, A. B.
Gander, R. B.
Gould, R. K.
Hannah, A. W.
Hannah, C. R.
Higgins, L. H. M.
Harris, M. V.
Hudson, J. J.
Johnson, F. H.
Lyon, G. D.
MacFarlane, I. C.
Monahan, J. M.
Perley, A. L.
Reeleder, G. D.
Scott, J .W. G.
Simmonds, C. C.
Smith, R. B.
Spinney, J. A.
Steele, D. F.
Wanamaker, W. J.
Wilson, J. O.

Students at Nova Scotia Technical College

Baig, J. D.
Barnard, A. F.
Bird, D. J.
Misner, M. E.
Mosher, M. C.
Phillips, W. J.

Groom, W. J. A.	Quigley, J. M.
Hann, H. V.	Scallion, J. F.
Johnson, D. C.	Shute, V. D.
Kinley, J. J.	Small, L. F.
	Wade, R.

Students at Dalhousie University

Beck, E. D.	Pertus, J. W.
Brown, J. A. G.	Ripley, D. M.
Dicks, J. B.	Rogers, J. D.
Hall, H. F. R.	Smith, C. H.
Harvey, L. M.	Shillingford, T. H.
MacDonald, J. E. A.	Stewart, W. G.
MacMillan, M. G. P.	Thompson, J. N.
Morley, L. G.	Thompso,n K. G.
Morrison, A. L.	Thurgood, C. M.
Murchison, J. H.	Whidden, F. H.
Peters, F. T.	

Students at Mount Allison University

MacKay, V. L.	Morrow, R. S.

Students at University of Manitoba

Koropatnick, W.	Smith, S. B.
Robinson, A. J.	Spicer, J. H.
Ross, R. J.	Taylor, H. W.

Students at University of Saskatchewan

Lalande, R. H.	Lewis, B. R.

Students at University of Alberta

Baracos, A.	Strum, H. A.
Cusack, W. P.	Torchinsky, B. B.
Fowler, E. L.	Underhill, A. G.
Peterson, B. N.	Usher, W. D.
Rivard, P. J.	Weir, C. H.

Students at Carleton College
(Ottawa University)

Alary, J. P.	Landry, P. R.
Armstrong, E. I.	LeBel, P. R.
Auger, L. V. C.	Leduc, M. P .B.
Baxter, R. J.	Lessard, M. J.
Bertrand, W. J. L.	Malmberg, J. M.
Bissonnette, A. G.	Marchand, F. E.
Bolton, M.	Markle, V. B.
Brisson, M. J.	Masure, P.
Brown, F. A.	McLatchie, R. S.
Cole, S.	Pack, F. G.
Creighton, L. W.	Palen, F. F.
Dube, P.	Perry, T. F.
Duhamel, J. P.	Pilon, J. F.
Dunlop, D. P.	Nadon, J. H. R.
Findlay, J. B.	Osman, D. O.
Fitzgerald, D. J.	Richards, J. D.
Flewelling, G. W	Sabourin, R. J. E.
Grace, D. E.	Sauve, C. G.
Hamel, G. A.	Thompson, C. L.
Hay, G.	Underwood, J. F.
Hill, K. M.	Ward, A. A.
Hopkinson, E. C.	Wilkins, A. L.
Johnston, M. L.	Wooff, G. F. B.
Jolicoeur, G.	

Student at Queen's University

McLean, J. R.

By virtue of the cooperative agreements between the Institute and the associations of professional engineers, the following elections and transfers have become effective:

SASKATCHEWAN

Member

Swanson, Roy Arnold, B.Sc., (Civil), Saskatchewan, division engr., Canadian Pacific Raliway Company, Regina, Sask.

Junior

Porter, John Wesley, B.A., (Geology), Saskatchewan, petroleum geologist, Mines Branch, Dept. of Natural Resources, Regina, Sask.

Students

Naylor, John Alden, Univ. of Saskatchewan, Saskatoon, Sask.
Urwin, Arthur Henry, Univ. of Saskatchewan, Saskatoon, Sask.

Junior to Member

Carroll, Arthur Frederick Gascoigne, B.Eng., (Mech.), Saskatchewan, Technical Information Service, National Research Council, Saskatoon, Sask.
Fyfe, John Cuthbert, B.Sc., (Civil), Manitoba, res. engr., Dept., of Highways, Regina, Sask.

NOVA SCOTIA

Members

Hopkins, James Moore, B.Eng., (Elect.), Nova Scotia Tech. Coll., sales engr., Canadian General Electric Co., Halifax, N.S.
Grant, Charles Enoch, instructor elect. engrg., Nova Scotia Technical College, Halifax, N.S.

Junior to Member

Dunbar, George Gray, B.Eng., (Chem.), McGill, chemicals supervisor, Imperial Oil Limited, Dartmouth, N.S.

QUEBEC

Members

Bergeron, Joseph Raoul, woodland divn. engr., Price Brothers & Company, Limited, Chicoutimi, Que.
Marshall, Harold Edward, B.Sc., (Elect.), New Brunswick, mech logging engr., Price Brothers & Co., Ltd., Chicoutimi, Que.
Rosenthal, Henry, Diplom-Ingenieur, Technisce Hochschule,& Darmstadt, Germany, design & development diesel engines & hydraulic machinery, Dominion Engineering Works Limited, Lachine, Que.

At a meeting on November 29, 1947, a number of applications were presented for consideration, and on the recommendation of the Admissions Committee, the following elections and transfers were effected:

Members

Dundas, Kenneth Brooke, B.Eng., (Civil), Saskatchewan, asst, to divn. engr., Canadian Pacific Railway Co., Medicine Hat· Alta.
Lewis, Arthur Henry Ross, Major R.C.E.M.E., B.Sc., (Chem. Engrg.), Queen's, senior instructor, R.C.E.M.E., School, Barriefield, Ontario.
Little, Henry Walsingham, Renfrew, Ont., B.Sc., (Elect.Engrg.), Queen's, mgr. & sec.treas., Hydro Electric Commission, Town of Renfrew, Ont.
Overall, Cyril, B.Sc., (Chem. Engrg.), Tri-State Coll. of Engrg. (not accredited E.C.P.D.), chief dftsman., Carborundum Co., Niagara Falls, N.Y.
Sumner, Joshua, B.Sc., (Civil Engrg.), Manitoba, i/c structl. engrg. design, Green Blankstein Russell, architects & engrs. Winnipeg, Man.

Junior

Eadie, Robert Kenneth, B.Eng., (Elect.), McGill, methods engrg., Northern Electric Co., Montreal, Que.

Affiliate

Powrie, Robert David, B.Arch., Toronto, arch. dftsman., chief engineer's office, Canadian Pacific Railway Co., Montreal, Que.

Transferred from the Class of Junior to that of Member

Ansley, Richard Herbert, B.Sc., (Civil), Manitoba, asst. constrn. engr., Winnipeg Hydro Electric System, Slave Falls, Man.
Archibald, Huestis Everett, B.A.Sc., (Civil), Toronto, township engr., Township of Tech, Kirkland Lake, Ont.
Askwith, Francis Lloyd George, B.Sc., (Elect.), distribution dept., Gatineau Power Co., Ottawa, Ont.
Boultbee, James Greer, B.A.Sc., (Civil); B.Sc., (Forestry), Toronto, constrn. engr., woodlands dept.
Brown, Malcolm Corsan Sutherland, Lt.-Col., R.C.E., Graduate, R.M.C.; B.Sc., (Civil), Queen's, Asst. Director of Works and Accommodation, Army Headquarters, Ottawa, Ont.
Cunningham, Robert Auld, B.Sc., (Civil), field engr., H. G. Acres & Co., Niagara Falls, Ont.
Donaldson, David Rennie, B.A.Sc., (Civil), British Columbia, aircraft stress analyst, Boeing Aircraft Co., Seattle, Wash.
Douglas, Lloyd Robert, B.Sc., (Elect.), Manitoba, engrg., central stn. divn., apparatus dept., Canadian General Electric Co., Toronto, Ont.
Findlay, Allan Cameron, B.Eng., (Mech.), McGill, prod. engr., Standard Brands Limited, Montreal, Que.
Hall, Albert Henry, B.Sc., (Engrg. Physics), Alberta; M.Sc., (Aero.), California Institute of Technology, Ottawa, Ont.
Marantz, Oscar, B.Sc., (Civil), Manitoba, asst. professor of civil engrg., Univ. of Manitoba, Winnipeg, Man.
McArthur, Donald Stewart, B.Sc., (Chem.), Alberta, plant supervisor, Dow Chemical of Canada Ltd., Sarnia, Ont.
Meagher, Robert Douglas, B.Eng., (Chem.Engrg.), McGill, resident engr., British American Oil Co., Montreal, Que.
Paithouski, Nicholas Joseph, B.Sc., (Civil Engrg.), field constrn. engrg., Steel Co. of Canada, Hamilton, Ont.
Padley, Gilbert, B.Sc., (Elect.), Saskatchewan, technical dept., Aluminum Co. of Canada, Kingston, Ont.
Papineau, Marcel L., B.A.Sc., C.E., Ecole Poly., resident engr., Veteran Land Act's Pointe Claire Project, Montreal, Que.

Piercy, Arthur King, B.Sc., (Mech.), Saskatchewan, design, heating, ventilating, etc., Green Blankstein Russell, Winnipeg, Man.

Ring, Alfred Jackson, B.Sc., (Civil), New Brunswick, design engr., H. G. Acres & Co., Niagara Falls, Ont.

Schwartz, Harry H., B.Eng., McGill; S.M., (Elect.), Massachusetts Institute of Tech., Chief engr., Dee Electronics, Montreal, Que.

Tanner, Charles Jewell, B.Sc., (Mining), Queen's, supervisor, hydrate dept., Aluminum Co. of Canada, Ltd., Arvida, Que.

Tuttle, Paul Douglas, B.Eng., (Elect.), McGill, engr., design divn., Hydro Electric Commission, Quebec, Dewittville, Que.

Admitted as Students

Students at McGill University

J. R. B. Carruthers	T. H. McCall
G. R. Carruthers	A. W. Samson
F. A. De Lory	C. G. Simms
J. Goldwater	K. S. Szylling
C. F. Gross	A. H. D. Walford
A. G. Hyde	

Students at University of Toronto

V. Boshuck	L. J. Hollo
D. E. Coates	J. Horvath
J. D. Cuccia	R. V. Kozak
H. B. Dulmage	J. K. L. MacKay
N. M. Engelman	C. S. Purser
R. M. Hanley	S. Toderick
G. A. Harpell	G. R. Williams
F. G. Heimrich	

Students at University of New Brunswick

T. H. Bell	M. F. K. Leighton
C. F. Buckingham	G. H. Tozer
T. H. Dobbin	L. A. Wright
G. E. Johnston	

Students at Ecole Polytechnique

J. R. J. A. Charbonneau	G. J. M. Lamarre
F. Jeffery	M. Neron

Student at Laval University

J. L. Parent

Students at University of Manitoba

C. D. Forbes	J. K. Picken
I. W. Fraser	J. A. Reid
M. Kostyniuk	R. S. White
H. Penner	R. G. Wood

Students at University of Alberta

B. H. Lacey	J. A. Pettis

Students at Nova Scotia Technical College

C. W. Higgins	J. D. Wilson

Student at Queen's University

J. N. Pritchard

Students at Dalhousie University

R. C. Bezanson	D. S. Theakston
C. K. Steeves	

Students at Mount Allison University

W. R. Newcombe	R. J. Trafford
G. J. G. North	

Students at Carleton College

C. M. McCredie	E. Oliver

Applications through Associations: By virtue of the cooperative agreements between the Institute and the associations of professional engineers, the following elections and transfers have become effective:

Saskatchewan

Members

Brown, Rex L., B.A.Sc., British Columbia, chief chemist, Imperial Oil Limited, Regina, Sask.

Myers, Walter Manville, B.Mech.Engr., Univ. of Idaho, engr., P.F.R.A., Regina, Sask.

Williams, Alfred John, B.Sc., (Chem.Engrg.), Saskatchewan, director, industrial development, Dept. of Natural Resources, Prov. of Sask., Regina, Sask.

Students

Banfield, Leonard Charles, Univ. of Saskatchewan, Saskatoon, Sask.

Currie, Ross Macham Gourlay, Univ. of Saskatchewan, Saskatoon, Sask.

Hayes, Thomas Patrick, Univ. of Saskatchewan, Saskatoon, Sask.

Jonasson, Raymond Erling, Univ. of Saskatchewan, Saskatoon, Sask.

Leigh, Robert James, Univ. of Saskatchewan, Saskatoon, Sask.

Pugsley, David Hill, Univ. of Saskatchewan, Saskatoon, Sask.

Tasker, Edwin Henry, Univ. of Saskatchewan, Saskatoon, Sask.

Welsh, Ernest Ross, Univ. of Saskatchewan, Saskatoon, Sask.

Wood, George, Univ. of Saskatchewan, Saskatoon, Sask.

Junior to Member

Staples, William Robert, B.Eng., Saskatchewan, post graduate work, Univ. of Illinois, Urbana, Ill.

Quebec

Spence, Douglas Boyle, telephone equipt. engr., Northern Electric Co., Montreal, Que.

Ontario Division

MINUTES OF THE MEETING OF THE BOARD OF MANAGEMENT OF THE ONTARIO DIVISION OF THE ENGINEERING INSTITUTE OF CANADA, HELD AT THE ROYAL YORK HOTEL IN TORONTO, ON MONDAY, NOVEMBER 17, 1947, AT 7.30 P.M.

The meeting was called to order by the Chairman, Mr. Manock, at 7.30 p.m. Those present included: Messrs. Manock, Turner, Graydon, Laughlin, Morrison and Geiger.

The minutes of the Ontario Division Executive Meeting, held at the Royal York Hotel on May 10th, 1947, were read and approved on the motion of Mr. Laughlin, seconded by Mr. Turner.

Mr. Manock reported that the By-Laws of the Ontario Division, which had been approved by the Executive of the Division, were submitted to Council and approved by them on September 20th, 1947. He also reported that these By-Laws, as approved, had been submitted to the members of the Ontario Division by ballot, returnable November 27th.

Mr. Manock then reported that no definite action on an E.I.C. Secretary or Representative for Ontario had been taken by Council. After considerable discussion on this matter, it was resolved on the motion of Mr. Morrison, seconded by Mr. Laughlin: "That this Executive recommend to Council that it give serious consideration to the establishment of a Secretarial Office in Toronto, to conduct those functions of Headquarters as might, more efficiently, be conducted in such an office rather than in Montreal, including, among others: assisting the Branches in Ontario; operating a branch of the E.I.C. employment service; fostering co-operation between the E.I.C. and other technical and professional societies; acting as an office of the Ontario Division."

Mr. Manock then reported that he had approached the Finance Committee of the Institute, and had been asked by them to submit a budget for the balance of this year and for next year. On the motion of Mr. Laughlin, seconded by Mr. Geiger, it was resolved: "That the Finance Committee be asked to allot—$50 for the remainder of 1947, and $200 for 1948, for the work of the Ontario Division".

The Secretary and the Treasurer reported no accounts or bills to be paid.

On the motion of Mr. Geiger, seconded by Mr. Laughlin, it was unanimously resolved: "That the Chairman be given the power to appoint the three members of the Board of Management for the balance of this term of office".

Mr. Manock suggested the following: Mr. Macpherson, Sarnia; Mr. McKillop, London; Mr. Jones, Peterborough; and asked the Secretary to approach them.

The Secretary reported that he had questioned the Toronto Branch Executive as to whether they wished to appoint a new Branch representative since their appointee had been elected Secretary. The Toronto Branch decided that they did not wish to appoint a new representative at this time. The Treasurer, General Turner, reported that the Ottawa Branch had taken no action on a second representative when their original appointee was elected Treasurer.

General Turner suggested that pursuance of a co-operative agreement between the E.I.C. and Association of Professional Engineers for the Province of Ontario, would be of service to all engineers in Ontario and, in particular, the younger men.

The next item on the agenda was the Toronto Branch Memorandum. This memorandum had been referred to the Ontario Division for consideration by the Council of the Institute at the Meeting on May 7th, 1947. Mr. Geiger, the Chairman of the Toronto Branch, was asked to discuss the memorandum.

Mr. Geiger gave the history of the memorandum, and pointed out that some of the points in it have now been acted upon by Council. He suggested that the Ontario Division seek an opinion from all Ontario Branches on the memorandum.

On the motion of Mr. Laughlin, seconded by Mr. Morrison, it was unanimously resolved: "That the Toronto Memorandum, along with the Report of the Committee on Professional Interests on it, be submitted to the Ontario Division Executive, with the announcement that these would be considered at the next Annual Meeting of the Ontario Division, and with the request that the Branch representatives and Councillors jointly present these to their Branch or Branch Executive".

The Meeting was adjourned at 10.15 p.m.

PERSONALS

News of the Personal Activities of Members of the Institute

J. H. Blake, M.E.I.C., has retired after twenty-six years of service to the British Columbia Department of Lands and Forests. He was a marine and structural engineer in the operations division of the Department. Mr. Blake studied mechanical engineering at University of Edinburgh, Scotland, and in the ensuing years worked in marine, railway, mining, civic and whaling activities. Having served in the South African war, he enlisted in the Royal Canadian Engineers at the outset of the First World War and was subsequently released to the Imperial Munitions Board to serve as examiner of ammunitions. He joined the forest service as mechanical inspector with headquarters in Victoria and in 1942 he was appointed marine and structural engineer.

Bruno Grandmont, M.E.I.C., is on retiring leave from the Department of Public Works of Canada. He will retire officially in March, 1948. Mr. Grandmont studied at Ecole Polytechnique, in Montreal, and was graduated in 1914 with the degree of civil engineer and bachelor of applied science. He had worked for the Department of Public Works at Trois Rivières, Que., during summer vacations, and in 1914 he was appointed assistant engineer. In 1916-1917 he was assistant engineer on the construction of the Champlain dry dock at Lauzon, Que. In 1918 he returned to Trois Rivières as acting district engineer, becoming district engineer in 1921. In 1937 he was promoted to district engineer at Rimouski, Que., and in 1944 he was transferred to Quebec, Que., as district engineer and it is from this position that he will retire in March.

Adam P. Linton, M.E.I.C., after completing over thirty-five years' service as chief bridge engineer with the Saskatchewan department of highways, has retired. He is a past president of the Association of Professional Engineers of Saskatchewan and was chairman of the Saskatchewan Branch of the Engineering Institute in 1935 and 1942. He served on the Council of the Institute in 1939. He attended University of Toronto, graduating in 1908, and after a few years spent with the Dominion Bridge Company, he was appointed in 1915 to the position of chief bridge engineer of the department. From 1915 to 1919 Mr. Linton was overseas, serving with the Canadian Railway Troops in France and commanding the 1st Bridging Company of the Canadian Railway Troops in Palestine. On his return to Canada with the rank of major, he had been mentioned in despatches and had been awarded the O.B.E. He served for a time in the militia in Canada with the rank of lieutenant-colonel.

Gilbert H. Bancroft, M.E.I.C., is chief engineer and head of the consulting engineering service of Engineering and Machinery Limited, Vancouver, which company was appointed in October last as Western Canada representatives for Pacific-Western gears and gear products. Pacific-Western Gear Products are so identified because of the association between Western Gear Works and its San Francisco plant, Pacific Gear and Tool Works. Mr. Bancroft joined the company in 1945.

J. S. Bryant, M.E.I.C., who was with the Provincial Electricity Board in Montreal for nine years as an electrical engineer, went in October last to the Carborundum Company at Shawinigan Falls, Que. He came to the Provincial Board from the Southern Canada Power Company, Drummondville, Que.

A. S. Mansbridge, M.E.I.C., has resigned from the Bloedel, Stewart and Welch pulp mill construction project at Port Alberni, B.C., and he is now designing engineer for Pacific Mills Limited, Vancouver, B.C., designing their new wood room at Ocean Falls, B.C. He was with the company in 1932-36, prior to going to Consolidated Mining and Smelting Company, Tadanac, B.C., and the West Kootenay Power and Light Company at Trail and South Slocan, B.C.

J. E. Hanlon, M.E.I.C., is at Powell River, B.C., as engineer on construction of new industrial buildings and on enlargement of old buildings. He was chief engineer on construction of the Scanlon dam in British Columbia which is now completed. He is a University of Toronto graduate, class of 1915, and after service overseas with the Canadian Engineers, his engineering activities took him across Canada and to New York State. He was with Aluminum Company of Canada in Montreal from 1940, and in 1943 he went west to build wireless stations in British Columbia for the Navy.

T. C. Main, M.E.I.C.

E. M. Rensaa, M.E.I.C.

G. R. Henderson, M.E.I.C.

C. G. Southmayd, M.E.I.C., a graduate of the University of Toronto, 1932, is manager of the new hydraulic and engineering division of Canadian Allis Chalmers, Limited, Toronto. He joined the company in 1937 as sales engineer. He had then been associated with J. Fleury's Sons Limited, Aurora, Ont., for five years, where he was general superintendent and purchasing agent of the plant.

W. M. Stobbart, M.E.I.C., is works manager for the Vancouver Division of Dominion Bridge Company Limited. He has been with the bridge company since 1929 when he came from England, where he was educated and where he spent ten years in engineering activities. He was located first at Lachine, Que., as a mechanical designer, and was appointed assistant engineer in 1934.

T. C. MacNabb, M.E.I.C., is the newly elected chairman of the Saint John Branch of the Institute. He is from Revelstoke, B.C., and graduated from the University of Manitoba in 1902. He then joined the staff of the Canadian Pacific Railway Company at Winnipeg and was engaged on various works with that company in many parts of Canada until his retirement in 1946. He worked first on location with the construction department as chainman, rodman and topographer. At Winnipeg, Man., he was successively draughtsman, instrumentman, and resident engineer. In 1908 Mr. MacNabb was made assistant engineer on construction, and the following year division engineer on maintenance. In 1916 he was appointed assistant engineer for Saskatchewan, and a year later he became superintendent at Revelstoke. In 1926 he returned to Winnipeg, Man., to be engineer of construction of the company's western lines. He transferred to Saint John, N.B., as general superintendent of the New Brunswick district, in 1934, and it was from this position that he retired.

M. F. Ker, M.E.I.C., is chairman of the Niagara Peninsula Branch of the Institute for the year 1947-48. A native of Niagara Falls, Ont., he is a graduate of Queen's University, class of 1918. He worked with the H.E.P.C. Laboratory and inspection department after graduation, and in 1921 he became engineer in charge of construction for the township of Stamford, Ont. In that position he has contributed greatly to the industrial development of the section, as the Township Council declared when marking recently the 25th anniversary of his assumption of that position.

Gordon R. Henderson, M.E.I.C., the new chairman of the Sarnia Branch of the Institute, is chief engineer of Polymer Corporation. Born at London, Ont., he 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 Dominion Engineering Works, to work on hydraulic machine design. From 1929 to 1932 he was with the Power Corporation of Canada working on power installations. He joined Shell Oil Company, Montreal, in 1932, becoming chief engineer of refinery in 1936. He went to England in 1940 where he was in charge of construction of a new refinery of Shell Marketing and Refinery and was chief engineer during the 1st year of operation. He went to Polymer Corporation in 1942 as chief chemical engineer and construction works manager, and in 1944 he became chief engineer.

P. B. Stroyan, M.E.I.C., has been elected chairman of the Vancouver Branch of the Institute. He is from Derby, England, but he studied engineering in Canada at the University of British Columbia, graduating in 1924 with a B.A.Sc. degree. In 1924 he joined Sydney Junkins Company, and from 1926-28 he was with A. E. Coffin & Co., Vancouver general contractors. He then spent several years with the architectural department of the Vancouver School Board. Later, in the employ of various engineering organizations, he was reinforced concrete designer for the Burrard Bridge, Vancouver, designer of grain elevators at Seattle and Vancouver, reinforced concrete designer of Fraser Bridge at New Westminster. In 1935 he was a designer on the plant at Trail, B.C., of the Consolidated Mining and Smelting Company. In 1936 he was clerk of works on school construction for the Vancouver School Board, and a year later he joined the Vancouver Parks Board as assistant superintendent and engineer. He is now superintendent and engineer for the Board of Park Commissioners of Vancouver.

J. H. Legg, M.E.I.C., is in charge of operations for Ferrum Limited, Cap de la Madeleine, Que., a newly incorporated company, which is bringing into operation a plant for the production of iron and steel powders. Mr. Legg was at Shawinigan Falls, Que., as manager for Suzorite Company Limited from 1946, when he transferred from Aluminum Company of Canada Limited, Wakefield, Que.

T. C. Main, M.E.I.C., and **E. M. Rensaa,** M.E.I.C., have formed the general consulting engineering firm of Main and Rensaa at Edmonton, Alta.

Mr. Main spent 35 years with the Canadian National Railways, the early years on reconnaissance, survey and construction. For twenty years he was engineer on water service. In the past 18 years the railway loaned him almost constantly as consulting engineer, first to the government of Bermuda in 1931, then to the Saskatchewan Government in 1932 to study the drought situation, and to the Dominion government in 1935 to help get the Prairie Farm Rehabilitation Act into action. He was finally loaned to Ducks Unlimited as general manager. During 10 years this construction group have built projects that safeguard 1,300,000 acres of water-fowl nesting grounds. He recently resigned as general manager to become their consulting engineer.

Mr. Rensaa graduated in Norway in civil engineering and came to Canada in 1926. In the early 30's he obtained his B.Sc. and M.Sc. degrees from Manitoba University. In the meantime, he worked seven years for the Water Supply department of Canadian National Railways, chiefly as designing engineer, and on survey and construction as well. Later, he spent two years with the Dominion Department of Public Works, chiefly on bridge design. During the depression he went back to Norway and started a consulting practice in Oslo, where his work consisted mainly in designing large reinforced concrete buildings and other structures.

Francis Peacock, M.E.I.C., is president and managing director of Peacock Brothers Limited, Montreal, Canadian sales representatives of the Foxboro Company, of Foxboro, Mass., whose new instrument manufacturing plant is now in operation in Montreal.

The Canadian activities of The Foxboro Company began many years ago, and their association with Peacock Brothers Limited dates back to the year 1911. With the development of Canadian industry, came the increasing demand for industrial instrumentation and the appointment of Peacock Brothers Limited in 1922, as exclusive sales representatives in Canada and Newfoundland. The next logical step, the manufacture of instruments in Canada, followed; and The Foxboro Company Limited was formed in 1933. The company's office and factory were located in one of the Peacock buildings until expansion finally necessitated the building of the new plant which was occupied in November 1947.

K. Y. Lochhead, M.E.I.C., is now with the Cemco Electrical Manufacturing Company in Vancouver. He was formerly associated with the Hudson Bay Company as building superintendent of the Vancouver store. He returned to the Hudson Bay Company on his release in 1946 from the R.C.A.F. He had joined the company in 1933 in Winnipeg, after spending a year after his graduation from McGill University, Montreal, in the mechanical engineering laboratory as a demonstrator.

L. C. Sentance, M.E.I.C., was appointed in November last as assistant manager of works, Canadian Westinghouse Co. Ltd., Hamilton, Ont. In this position he has full charge of manufacturing and production in the electric and air brake divisions. Graduating from the University of Saskatchewan with a Master of Science degree in 1937, he enrolled in the Westinghouse Engineering Apprenticeship course. On completion of this course, nine years ago, he was attached to the general engineering staff as a mechanical engineer. Transferred to the Manufacturing Methods Division in 1944, as manufacturing engineer, he was appointed director of manufacturing methods in 1945, which position he held until his recent promotion.

G. E. Otter, M.E.I.C., is no longer with Fleet Manufacturing and Aircraft Limited, Fort Erie, Ont. He is in Montreal, Que., in the employ of Canadair Limited. He was chief aeronautical engineer of Fleet Aircraft from 1941. He had previously spent three years with DeHavilland Aircraft and Airspeeds (1934) Limited in England after graduation from the University of Toronto in 1938.

E. S. Yuill, M.E.I.C., has accepted employment with The Foxboro Company Limited, Montreal. He was with Northern Electric Company in Montreal, working on design in the Wire and Cable Division from January 1946, when he was released from the R.C.N.V.R., where he served as a Radar Officer. He received a B.Sc. degree from University of Toronto in 1942. He was then an instructor on a radio physics course given to the R.C.A.F. at Sackville, N.B. He received the degree of B.A.Sc. from U. of T. in 1944, specializing in engineering physics.

J. J. Miller, M.E.I.C., has been appointed secretary-treasurer of the Niagara Peninsula Branch of the Institute. He is electrical and mechanical superintendent for the Niagara, St. Catharines and Toronto Railway at St. Catharines, Ont. He was with the Steel Company of Canada at Hamilton from 1939 to 1944, where he was successively junior engineer, supervisor of the ore plant, and technical assistant to the ore plant superintendent. In the last instance he was in charge of development and research of the ore plant. He is from Hamilton, Ont., a graduate of University of Toronto, class of 1939.

J. H. C. MacLure, M.E.I.C., of Canadian Fairbanks Morse, Saint John, N.B., has been appointed secretary-treasurer of the Saint John Branch of the Institute. He is from Winnipeg, Man., and is a graduate of McGill University, class of 1944.

D. L. Rigsby, Jr.E.I.C., the new secretary-treasurer of the Kingston Branch of the Institute is with Aluminum Company of Canada Limited, Kingston. He is from Galt, Ont., and is a Queen's University graduate in mechanical engineering, class of 1940. He was with Sheldon's Limited at Galt, for some months after graduation, and then joined the British Air Commission at Washington, D.C. He was stationed in Montreal for the Commission at Canadian Car and Foundry Company in 1941, and later at the Consolidated Aircraft Corporation at San Diego, Calif. He joined the staff of Aluminum Company of Canada Limited at Kingston, in 1942, to work on production engineering and was later transferred to be engineering expeditor and co-ordinator.

R. E. Davey, Jr.E.I.C., has accepted the position of town engineer for Trenton, Ont. He was divisional operations manager with Canadian Oil Companies Limited, Montreal, since 1946, having come there from 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, Shelburne, N.S.

F. E. Everett, Jr.E.I.C., has accepted employment with Canadian Vickers Limited, Montreal. He graduated from McGill University in 1944 and was an engineer with G. D. Peters and Company of Canada Limited in Montreal until his recent appointment.

F. Lionel Peckover, Jr.E.I.C., who was studying in the field of soil mechanics and foundation engineering at the Graduate School of Engineering of Harvard University, Cambridge, Mass., during the academic year 1946-47, received the degree of master of science (civil engineering) in June 1947. He spent the summer in visiting numerous soil mechanics laboratories and earth construction projects across the continent. In July he rejoined the staff of National Research Council, Ottawa, as assistant research officer in charge of the soil mechanics section of the newly formed Division of Building Research.

F. J. D. Bilodeau, Jr.E.I.C., is employed by Canadian Ingersoll-Rand Company Limited, Montreal, as an application engineer. His duties consist of selling, service, sales promotion work and the engineering connected with the application of such products as air compressors, pneumatic tools, centrifugal pumps, etc. He received his B.Eng. degree in mechanical engineering from McGill University in 1945.

William J. F. Wilson, Jr.E.I.C., is in Ottawa, working as an electrical engineer in the Radio Marine Section of the Dominion Government. He had been at Northern Electric Company, Montreal, a power equipment engineer, since his graduation in 1945 from Queen's University in electrical engineering.

Duart A. MacLean, Jr.E.I.C., is in Victoria, B.C., being employed there as assistant hydraulic engineer, Water Rights Branch, of the Provincial Government. He had previously been with the Department of Mines and Resources, Ottawa, as surveys engineer in the Bureau of Topography and Geology.

J. A. W. Izard, Jr.E.I.C., is with Yarrows, Limited, Victoria, B.C. He had been at Ottawa, a surveys engineer for the Bureau of Topography and Geology of the Department of Mines and Resources. He received the degree of B.Sc. (civil) from University of Manitoba in 1944.

Donald R. Burns, S.E.I.C., who is employed by S. Morgan Smith (Canada) Limited, Toronto, has been sent to York, Penna., to follow the junior engineering training course sponsored by S Morgan Smith Company, the American associates of his firm. He graduated from University of Toronto this year with a B.A.Sc. degree in mechanical engineering.

Lucien Trudel, S.E.I.C., is with the Department of Mines as an electrical engineer on inspection in the mining industry in the Province of Quebec, with headquarters at Noranda, Que. He received his B.A.Sc. degree in 1946 from Laval University, Que., and was posted at Quebec city for the Department for a time.

Henrik Verdier, S.E.I.C., is employed by the Holden Company Limited, Montreal, in the capacity of sales engineer. He has completed requirements for the degree of bachelor of science at Sir George Williams College, Montreal, and has been attending courses at McGill University in economics and government for the past year.

Harold Tapay, Jr.E.I.C., of Nanaimo, B.C., was the recipient of an award in the international "Design for Progress" programme sponsored by the J. Lincoln Arc Welding Foundation of Chicago, to whom papers were submitted from 17 countries. Mr. Tapay is at Heaps Engineering Limited, New Westminster, working on designing and draughting. His prize-winning paper dealt with a fabricated Gangsaw connecting rod which he designed at Heaps Engineering.

Obituaries

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

Sam Graham Porter

1875-1947

President of The Institute 1931

Members who knew Sam Graham Porter have learned with deep regret of his death in Calgary on November 30.

Elected to the presidency of the Institute in 1931, Mr. Porter was the first Albertan to occupy that high position and his election highlighted the fact that the engineering training provides a sound basis on which a man of suitable personality may develop an executive talent—a fact which daily becomes more apparent as the influences of science and technology become more and more evident in the aspects of the daily life of every citizen. Sam Graham Porter was a particularly able executive engineer who at the time of election to the presidency was manager of the department of natural resources of the Canadian Pacific Railway.

Sam Graham Porter, M.E.I.C.

Mr. Porter acquired a wide experience in the United States in the problems of reclamation and irrigation and he began to apply this experience for the benefit of Canadians when he came to this country in 1913 as irrigation consultant to the Dominion Government. In 1918 he joined the Canadian Pacific Railway which affiliation he maintained until his retirement in 1942. He was a director of the Lacombe and Northwestern Railway, the Canada Colonization Association and the Lethbridge Collieries Limited.

In addition to his enviable technical and executive talent Mr. Porter demonstrated a civic consciousness which might well provide an inspiration for those who would seek to follow in his footsteps. He had been on the Council of the Calgary Board of Trade, the boards of directors of the Calgary Rotary Club and the Y.M.C.A.; he was president of the Lethbridge Rotary Club in 1920 and vice-president of the Lethbridge Board of Trade in 1923-24. He was a member of First Baptist Church in Calgary and in 1942 he headed a division of the Red Cross-Community Chest drive. Mr. Porter's interest in the welfare of the profession was greatly in evidence in his activities on behalf of the Institute and particularly by his unremitting efforts in the movement for the registration and licensing of professional engineers in Canada. For some years a member of the council of the Alberta Association of Professional Engineers, he was vice-president of that organization in 1923-24 and was chairman of a committee of the Institute which studied the relations of the Institute with the Provincial professional associations.

Sam Graham Porter's death leaves a gap in the ranks of the profession which will not too easily be closed. It is safe to assume that he must have derived a considerable satisfaction in seeing the pioneer work of his committee commence to bear fruit in the co-operative agreements which have been affected between the Institute and five of the provincial professional associations of which that in his own province in Alberta is one.

He is survived by his widow, a daughter, Mrs. Jack Stewart of Red Deer, Alberta, and a son, Robert, of Edmonton, and to these The Engineering Institute of Canada extends its most sincere sympathy.

John Hegan Parks, M.E.I.C., died at his home in Calgary, Alberta, on October 21st, 1947. Born in St. John, N.B., in 1874, he entered the Royal Military College at Kingston in 1892. Upon graduation in 1896, he was appointed lieutenant in the 8th Princess Louise Hussars in New Brunswick. At that time, also, he entered the employ of the Canadian Pacific Railway and was in the party sent to survey the Crow's Nest Pass.

Upon the outbreak of the South African War, Mr. Parks resigned from the Hussars and joined the 1st Canadian Mounted Rifles, later known as the Royal Canadian Dragoons, in 1899, as a trooper. He served with this unit in South Africa, and upon their return to Canada, was transferred to the Imperial Military Railway with which he served as a assistant engineer until the end of the War. He stayed in South Africa after the War, and, at the time of leaving in 1909 held the position of district superintendent of the Central South African Railways with headquarters at Johannesburg.

When Mr. Parks returned to Canada, he worked for a short time with the C.N.R. and in private engineering enterprises in Victoria and Vancouver. At the outbreak of the First World War, he joined the Seaforth Highlanders with the rank of captain. He went to France with the 1st Battalion and was wounded at the 1st Battle of Ypres. He was awarded the D.S.O. and mentioned in despatches. In November 1915 he was seconded to the War Office for duty with the Royal Engineers in the Salonica Expeditionary Force and served with this unit until February 1919, during which service he was made an Officer of the British Empire, awarded the Order of White Eagle, 4th Class, by the Serbian Government, and was again mentioned in despatches. At the end of the war he held the rank of lieutenant colonel.

Upon his return to Canada, Colonel Parks purchased an orchard in the Okanagan Valley which he operated until 1924 when he again returned to the engineering field. In 1925 he moved to Calgary where he became district engineer for the Board of Railway Commissioners (now known as Board of Transport Commissioners), which post he held till his retirement in December 1945, after several extensions granted him due to the War.

Mr. Parks was a member of the Military Institute in Calgary. He joined the Engineering Institute in 1902 as an Associate Member, becoming a Member in 1911 and a Life Member in 1940.

Frank Alexander Barbour, M.E.I.C., who was born in Saint John, N.B., in 1869, died suddenly May, 1947, on a private golf course near his home in Framingham Center, Mass.

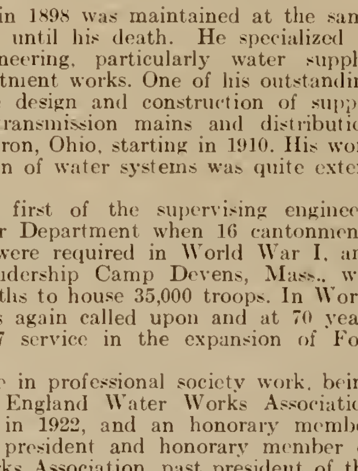
Mr. Barbour graduated from the University of New Brunswick in 1888 with an A.B. Degree. He was at first engaged in railroad survey and construction work in Canada, but went to Boston after a few years. There he did railroad location work in New England and after an engagement on the Sudbury Water Supply for the City of Boston he was connected with the City of Brockton, Mass., on the development of water and sewerage work; and then he met F. H. Snow, with whom he was later associated in private practice in Boston until 1905.

The office established in 1898 was maintained at the same location by Mr. Barbour until his death. He specialized in municipal sanitary engineering, particularly water supply, sewerage and sewage treatment works. One of his outstanding accomplishments was the design and construction of supply works, filtration plant, transmission mains and distribution system for the city of Akron, Ohio, starting in 1910. His work on appraisal and valuation of water systems was quite extensive in later years.

Mr. Barbour was the first of the supervising engineers selected by the U.S. War Department when 16 cantonments for the National Army were required in World War I, and through his energetic leadership Camp Devens, Mass., was constructed in three months to house 35,000 troops. In World War II Mr. Barbour was again called upon and at 70 years of age repeated his 1917 service in the expansion of Fort Devens.

Mr. Barbour was active in professional society work, being a member of the New England Water Works Association since 1894, its president in 1922, and an honorary member since 1934. He was past president and honorary member of the American Water Works Association, past president of the Boston Society of Civil Engineers, life member and past director of the American Society of Civil Engineers, and author of numerous technical articles. Mr. Barbour joined the Engineering Institute in 1904 as a Member, and was awarded Life Membership in 1947.

John B. D'Aeth, M.E.I.C., who was chief engineer of the Dufresne Engineering Company Limited, Montreal, died suddenly on November 25th, 1947, at Trois Rivieres, Que.



John B. D'Aeth, M.E.I.C.

He was born in 1885 at Montego Bay, Jamaica, B.W.I., and he studied at McGill University, Montreal, graduating in 1908 with a B.Sc. degree in civil engineering. On leaving university he returned to Jamaica, where he was engaged on the construction of reinforced concrete buildings following the earthquake of 1907. Later, he went to the Ambursen Hydraulic Construction Company as resident engineer on the development of the Barnett Shoals Hydro Electric Development at Athens, Georgia, after which he returned to Canada, and in 1912-1913 he was field engineer on the construction of the Saskatoon Street Railway.

In 1914, he joined the staff of the Quebec Streams Commission, being engaged on river investigation and survey work, and later he was resident engineer on the construction of the Gouin dam on the Upper St. Maurice river. Upon completion of that project, Mr. D'Aeth joined Fraser Brace, Limited, and was construction engineer on the Big Eddy dam in Ontario for the International Nickel Company and the Great Falls hydro development in Manitoba. Later he became designing engineer for the company, during which time the following works were either wholly or partially designed by that firm and under his direction: the hydro-electric development at Deer Lake, Nfld.; Chelsea and Farmers developments on the Gatineau river; the Big Eddy power house on the Spanish river; the log chute at Aubrey Falls, Ont.; for Carpenter Hixon Company Limited; Island Falls hydro-electric development on the Churchill river for the Hudson Bay Mining and Smelting Company Limited.

Mr. D'Aeth joined Dufresne Engineering Company Limited in Montreal in 1938. At the time of his death he was chief engineer of the company, and was at Trois Rivieres supervising construction work on the new bridges between Three Rivers and Cap de la Madeleine over the St. Lawrence River.

Mr. D'Aeth joined the Institute in 1916 as an associate member and transferred to Member in 1924. Active in the Montreal Branch, he was its chairman in 1936.

Colonel H. R. Lynn, M.E.I.C., of Montreal, whose activities in flame warfare in the recent war are well known, died on November 25th in hospital after a short illness.

Col. H. R. Lynn, M.E.I.C.

Born in Victoria, B.C., in 1890, he studied engineering under the late W. L. Lynn, C.E., M.E., and he worked first for the city of Edmonton sewerage department. In 1915 he went overseas in command of engineering troops (Pioneers). He attained the rank of major in France and commanded railway troops. On his return he was field engineer for Fraser Brace Limited at Edmonton for a time, but he settled in Thetford Mines, Que., in 1920. There he was associated with the Maple Leaf Asbestos Company and the Canada Slate Corporation. He went into partnership with W. K. MacLeod and formed Lynn, MacLeod Engineering Supplies Limited and a subsidiary company, Lynn, MacLeod Metallurgy Limited. Activities were later extended to Trois Rivieres, Ottawa and Montreal.

At the outbreak of the second World War, H. R. Lynn enlisted for active service and proceeded overseas as second-in-command of the 1st Battalion, R.C.E. He was promoted to the rank of lieutenant-colonel and officer commanding the battalion in 1941 and was chosen to develop flame warfare in the Canadian Army in conjunction with the British. His work resulted in the Canadian Ronson Flame Thrower, which brought him the appointment of commander of the Canadian Petroleum Warfare Experimental Unit, R.C.E. The unit produced the first thickened fuels for flame throwers ultimately adopted by the British Army. Colonel Lynn conceived the idea of area incendiarism and developed the unit Aeroflame, a device which laid a carpet of flame from an aircraft over a target. He developed new fuels from collodial magnesium suspended in hydrocarbons, which were used in Aeroflame, the British 9.75 Mortar and the Rocket Mattress, this fuel being unextinguishable and most effective on wet targets such as the jungles of the Pacific and under winter conditions in Europe. He participated in the development of fog dispersal and acted as consulting engineer on such installations in the Aleutians. After his promotion to full colonel in 1943, he was technical adviser to the British Petroleum Warfare Department. He co-ordinated production of the Hays Cable in the U.S., and helped to build the Hays Under-Channel Pipe Line project from England to France.

Colonel Lynn retired from the Army in 1946 and resumed his activities with the Lynn, MacLeod companies in Montreal. He had joined the Engineering Institute in 1920 as an associate member, transferring to member in 1940.

P. J. Jennings, M.E.I.C., who was superintendent of the Banff National Park, Alberta, died on November 14th at his home in Calgary.

Born in Canterbury, Kent, England in 1881, Mr. Jennings studied science in England and was an articled pupil in engineering for three years. In 1903 to 1915 he was assistant engineer engaged on preliminary surveys and estimates and design of water supply dams, pipelines, river crossings, etc., at Port Elizabeth, Cape Colony, South Africa. Later he was resident engineer on the construction of Sand River Dam, and the Bolk River Dam, in South Africa. He came to Canada in 1908, and contracted in Manitoba to build 250 miles of telephone lines. The next year he joined C.P.R.'s irrigation department. He first worked on the construction of the company's irrigation system north of Strathmore, Alta. In 1911 he joined the irrigation branch of the Department of the Interior and remained with the department until retiring in 1946. He had then been superintendent of Banff National Park for fifteen years.

Mr. Jennings served from 1900 to 1902 in the South African campaign, and he joined the 4th Canadian Pioneers as an adjutant when the First World War broke out, serving overseas for three and a half years. He received a mention in despatches and the O.B.E. for service in East Africa along the Abyssinian border, where he met Salomi chiefs to arrange terms of punishment for treachery during the war. He was the first white man to enter that territory in two years. Major Jennings was again awarded the O.B.E. in 1946 for " special and extra services rendered during the war " but, as he had already been awarded the decoration, the second was cancelled.

Major Jennings was one of the original members of the Alberta Military Institute, he was director in 1928 and 1929, and was district intelligence officer at M.D. 13 from 1921 to 1925. He was a Charter Member of the Calgary Branch of the Engineering Institute, chairman of the Branch in 1922-23, and Councillor representing the Branch in 1928. He was also a member of the Alberta Association of Professional Engineers.

Robert H. Stevens, M.E.I.C., of Victoria, B.C., died on August 16th, 1947. He had been, until March, 1947, engineer of the municipality of Esquimalt, B.C. Born in Weymouth, Dorset, England, in 1883, he was articled in 1897-1902 as surveyor and civil engineer in the office of the borough surveyor and engineer of Weymouth. He was then appointed an assistant in the same office, and he spent some time as engineering assistant in the London County Council, Spring Gardens, in London, before coming to Canada in 1908.

He entered the City Waterworks Department in Edmonton, Alta., and remained in its service until 1943. As technical assistant he supervised water main construction, statistics and plans. He made surveys for water waste over the entire system. He resigned as waterworks engineer for the city when he went in 1942 to join the staff of the R.C.A.F., No. 2 Western Command, at Comox, B.C., as assistant waterworks engineer. In 1944 he was appointed municipal engineer for post-war public works for the township of Esquimalt. He continued as engineer for the municipality for two years, also supervising a project of Central Mortgage and Housing Corporation, at Lake Cowichan, B.C.

Mr. Stevens joined the Institute in 1927 as an associate Member, becoming a Member in 1911 and a Life Member in 1940.

NEWS of the BRANCHES

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented

CALGARY BRANCH

J. F. Langston, M.E.I.C. - - *Secretary-Treasurer*
T. M. Parry, M.E.I.C. - - - *Branch News Editor*

A regular general meeting of the Calgary branch was held on Thursday, November 13, in the Palliser Hotel, with R. T Hollies in the chair.

At the invitation of the acting chairman, Lieut.-Col. Beaman, O. C. Engineers, Western Command, gave a short talk on the work and organization of the military engineers. He pointed out that the qualifications of the military engineer, professionally, were very similar to those of the civilian engineer. The general organization of this branch of the service, in both the active and the reserve forces, was outlined briefly. Col. Beaman stated that the Alaska Highway was one of the major concerns of the engineers of the Western Command at the present time.

Attention was drawn to the existence of the Military Engineers Association comprised of former, and serving sapper officers, both active and reserve.

In closing, Col. Beaman asked for the support and interest of the Calgary branch of the E.I.C. towards the local units of the reserve army engineers.

A vote of thanks to the speaker on behalf of those present was moved by J. McMillan.

The attention of the meeting was again drawn to the luncheon meetings on Wednesdays, at 12.15 noon, in the Empress Grill.

Four interesting films were then shown. " Scotland, Land of Invention ", dealt with the work of some of the famous inventors in the past of that country—McAdam, Watt, Murdoch, Naismith and others. " One World or None " showed in a thought-provoking manner the effect of the atomic bomb on warfare, compared to previous methods. A third film, " Hydraulics " gave some interesting applications of the behaviour of water under the application of pressures. A different treatment of water under the title of " Water Sports " was covered in the final film.

Following the film showing, an enjoyable smoker was held which gave members and guests a real opportunity of getting together. A count of the attendance indicated that some 100 members and their guests were present.

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A regular general meeting of the Calgary branch was held on November 27 at the Palliser Hotel, when Professor J. A. Harle presented a paper entitled, **Influence of Short Circuit Testing Stations on Circuit Breaker Design.**

Professor Harle, recently appointed professor of electrical engineering at the University of Alberta, Edmonton, came to Canada after some 27 years of experience in circuit breaker design and testing as a member of the staff of the short circuit testing station of Great Britain.

In his opening remarks, Professor Harle, who was introduced to the gathering by H. Randle of the Calgary Power Company, stated that circuit breaker design in the early days consisted of a lot of guess work. Today, it has advanced to the point, in Great Britain at least, where testing is a routine matter, free of the former excitement of "blow-ups" when units undergoing test, disintegrated violently. Some of the causes of these spectacular failures were traceable to inadequate breaking of the arc, inadequate contact strikes, lack of enclosure strength and mechanical weaknesses.

Mr. Harle illustrated his paper with several graphic slides and photographs of the testing stations and its special facilities. Two interesting films followed, which showed various types of breakers undergoing test. Many cases of failures and their causes were viewed.

During the question period it was indicated that there is no similar station in Canada where breakers may undergo tests to determine whether they meet the adopted standards. Canadian practice is, in general, to accept circuit breakers which have passed American or British requirements.

A vote of thanks to Professor Harle for his interesting paper was moved by R. McKay, superintendent of the Calgary Electric Light Department.

There were 42 members registered, and 9 guests.

EDMONTON BRANCH

W. W. Preston, jr.e.i.c. - *Secretary-Treasurer*

The policy of the Alberta government for protecting the interests of both the owners of the surface rights of her oil land and of all the tax payers of Alberta, was presented by Hon. N. E. Tanner, Minister of Lands and Mines, in his address on **Oil Development in the Province of Alberta,** at the annual joint dinner meeting of the Association of Professional Engineers of Alberta, the Edmonton Branch of the E.I.C., and the Northern Alberta Branch of the Canadian Institute of Mining and Metallurgy. The meeting was held on Friday, December 5th, in the Macdonald Hotel, under the Chairmanship of J. S. Irwin, president of the A.P.E.A. The attendance was about 150.

Mr. Tanner reviewed the practices of the Dominion Government prior to the transfer of the administration of natural resources to the Province in 1930. He outlined the complications concerning the mineral rights and the surface rights, and stated that the Provincial Government now collects royalties only on crown lands, which represent about half the total area producing at the present time.

The policy of the Province, the speaker stated, is based on five points:

1. The Province must help to get development. Until recently, 90 per cent of the Dominion's oil requirements had to be imported.

2. The development must be carried out according to the best engineering practice for the best recovery of the oil. Drilling and production quantities are controlled by the Alberta Natural Gas Conservation Board which has done excellent work since its formation in 1938.

3. No monopolies must be allowed, even for the Government. An oil company may lease land in blocks located corner to corner as in the black squares of a checkerboard. The interlying property may then be rented by any other company by sealed tender.

4. The Province must see that its people obtain a share of the returns. The oil companies must pay a royalty based on production, amounting to from 5 to 15 per cent, and must also pay rent at a dollar an acre per year, on crown land.

5. The owners of the surface rights must be treated justly. When the oil company and the land owner cannot agree, the Arbitration Board may give the oil company the right of entry in return for a payment which the Board considers fair.

In conclusion, the Lands Minister defended the Government's policy of staying out of the oil production business. He claimed that a billion dollars a month is being spent on the search for oil. If no oil were obtained this sum would be lost—a hazard the Government avoids. In terms of total amounts, he said that the oil companies had spent 165 million dollars, and collected only 155 millions—a loss of 10 millions—while the Government collected 16 millions from royalties and rental.

Mr. Tanner was introduced by the Chairman, J. S. Irwin, and was tendered a hearty vote of thanks on a motion of J. Garrett. During the evening Miss Bernice McBeth sang.

HALIFAX BRANCH

J. D. Kline, m.e.i.c. - - *Secretary-treasurer*
M. L. Baker, m.e.i.c. - - *Branch News Editor*

Has the Engineer a Place in Community Planning? was the subject of a timely and interesting address given to the members of the Halifax Branch at the dinner meeting on November 27 in the Lord Nelson Hotel. The speaker was Ira P. Macnab, m.e.i.c., general manager, Halifax Public Service Commission and vice-president of the Nova Scotia Division of the Community Planning Association of Canada.

In his introduction, the speaker gave a resumé of the National Conference on Community Planning which he recently attended in Montreal. In naming the principal speakers at this conference, he pointed out that not only were engineers prominent among the speakers but that each engineer had a wide knowledge of all phases of community life as well.

Mr. Macnab explained that the C.P.A.C., this is, the Community Planning Association of Canada, was the outcome of a conference in 1946 of provincial planning officials and technical experts. Since its formation, the C.P.A.C. has had a rapid growth. By the end of August, 1947, it had organized divisions in British Columbia, Manitoba, Ontario, Quebec, and Nova Scotia, and it was expected, in the near future divisions would be set up in the remaining provinces. The number of individual members in the Association was given as 298, while the number of co-operating agencies, of which the E.I.C. is one, was 15.

The overall picture of Community Planning was then discussed. It cannot be considered as being confined to any one municipality, but must be a joint effort of continuous municipalities. In fact, it is provincial in its scope.

Of the many and varied problems entering into Community Planning, the following were treated at some length.

1. The problem of providing decent living facilities for those who, for financial reasons or otherwise, are inclined to lodge in areas that eventually deteriorate into slums.
2. The problem of providing services, such as streets and street lighting, water, sewers, fire protection, schools, etc., for rapidly growing areas on the outskirts of the larger cities and towns or in the rural areas round about.
3. The problem of sanitation and sewage disposal.
4. The problem of providing safe and adequate transportation.

In addition, provision for education, for places of worship, for public libraries, for public auditoriums, and for recreational facilities are problems that come within the broad field of Community Planning. Many others can be suggested, such as the elimination of heavy street grades, the question of zoning, proper build-codes and building control, and the attraction and location of new industries.

Mr. Macnab emphasized the opportunities that were presented to trained engineers to play a part in Community Planning programmes. He suggested that engineers look on their training not only for the purpose of making a living but as a training which must be used to benefit their fellow men. That the subject is of vital concern to engineers is shown by a study of the activities of the Engineering Institute Council during the last two years.

A vote of thanks to the speaker was moved by H. W. L. Doane and seconded by A. E. Priest. Guests at the dinner, which was attended by about fifty members, were: C. L. Beazley, Deputy Minister of Municipal Affairs for Nova Scotia, and R. T. Donald, president of the Nova Scotia Division of the Community Planning Association of Canada. E. C. O'Leary, chairman of the Halifax Branch, presided.

HAMILTON BRANCH

L. C. Sentance, m.e.i.c. - - - *Secretary-Treasurer*
I. M. Macdonald, jr.e.i.c. - - *Branch News Editor*

The regular monthly meeting of the Hamilton Branch of the Institute was held at the Science Lecture Theatre, McMaster University, on October 23rd, 1947, with approximately 50 members and guests present. Vice-Chairman W. E. Brown presided, and called on Neil Metcalf to introduce Mr. Redfern, the speaker of the evening.

W. Blaine Redfern, m.e.i.c., an honour graduate of the University of Toronto in 1909, has specialized in public health projects for many years, in nearly every community of any size in Ontario. As a member of the firm of consulting engineers, Proctor, Redfern and Laughlin, he is eminently qualified to discuss the latest trends in treatment of sewage and trade wastes.

Mr. Redfern began his address, entitled **Stream and Lake Pollution, and Sewage Treatment Plants,** with a plea for the maintenance of the purity of Canadian waters. Our ideal, he said, should be to keep the waters in the rivers, lakes and streams pure. Lakes and rivers in Ontario provide a cheap means of sewage discharge because of oxidation processes carried on in the water. Of 150 municipalities in Ontario which have sewage systems, only 75 have sewage treatment plants of any description. Describing sewage treatment plants, Mr. Redfern told of the various processes from screening for removing rough materials, to chlorination which he asserted was one of the best instruments for purifying sewage at the disposal of the sanitary engineer. In general, sewage treatment consists of screening, settling, digesting, aeration if more treatment is required, and disposal of the purified product.

At the end of the address, a lively discussion period was enjoyed by those present. Mr. Redfern was called on to answer many general questions concerning sewage disposal. Considerable discussion was held on Hamilton's method of disposal and any effects it may have on the health of the community, and City Engineer W. L. McFaul, and Medical Health Officer Dr. Davey, supplied much interesting information on this topic.

It was moved by Mr. Hollingsworth that the Hamilton Branch of the Institute study Hamilton's sewage disposal system, and support any recommendations for improvements which an appointed committee may submit.

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The Annual Ladies' Night of the Hamilton Branch took the form of a dinner meeting at the Scottish Rite club on November 17, 1947. One hundred members, guests and ladies were present to enjoy this function, and to hear the speaker of the evening, Mr. Charles B. Pearce.

Mr. Pearce is manager, Laundry Equipment Section, Appliance Division, of Canadian Westinghouse Company. He chose as his topic, **The Electric Home of Tomorrow,** a subject of particular interest to the ladies.

Mr. Pearce began by describing the many features the housewife desires in her home and in the electrical appliances used there. She dreams of an automatic washing machine which she can turn on and leave. When she returns, the clothes have been washed, rinsed and dried enough for ironing. She dreams of an electric range which can be pre-set to cook as she wishes while she goes shopping. She dreams of an electric iron, neither too hot nor too cold, and adjustable for different materials. She dreams of an electric air cleaner which cuts dust in the house to a minimum, so that dusting need not be done more than once a week. She dreams of a heater which will supply hot water continually; of a device for disposing of garbage; and of a machine which will do her ironing. She dreams of beauty as well as utility in all her electrical appliances—porcelain enamel, de luxe and chrome finishes which are durable and easy to keep clean. All these things, and many more, make up the electric home of the future.

" The housewife need dream no more," said Mr. Pearce. All these things are here now, and many are in every day use. Such things as automatic washers, automatic ranges, automatic irons, precipitrons, newly designed water heaters, garbage disposal units, and ironing machines make the housewife's load much lighter, and are a reality, not a dream of the future.

Two interesting films were shown during Mr. Pearce's address. The first, " The Dawn of Better Living ", pictured many of the appliances described by Mr. Pearce; the second, " Music in the Air ", showed a broadcast of the Westinghouse programme starring John Charles Thomas.

LETHBRIDGE BRANCH

Thomas Miard, m.e.i.c. - - *Secretary-Treasurer*
J. A. Haberman, s.e.i.c. - - *Branch News Editor*

On Saturday evening, November 15th, at a meeting of 27 members of the Lethbridge Branch, held at the Marquis hotel, K. K. Balderson of Magrath, Alta., entertained with a talk and slides on living conditions on the island of Trinidad in the Caribbean.

Trinidad, a tropical island 70 miles wide and about 100 miles long, situated off the coast of South America about 30 miles north of Venezuela, is inhabited by about 500,000. This population is made up of one-third African blacks, descendants of early slaves brought to the island by the British, one-third East Indians brought to the island after abolition of slavery, and a remaining third which is a conglomeration of practically all races. The chief industry of this crown colony is sugar cane production, but with the discovery of oil the island became important as a petroleum centre.

The oil industry on the island is controlled by a British Company known as Trinidad Leaseholds Limited, with which company the speaker served. The refinery at Pointe-a-Pierre, whose operation capacity is 50,000 barrels per day, is the largest in the British Empire, and is supplied by Leaseholds' wells at Forrest Reserve, some small independent companies on the island, and to some extent by additional crude oil from nearby Venezuela. The refinery and wells are operated by a staff of about 5,000 of which only about 400 are white, made up mostly of British, Canadians and Americans. This staff is housed in company-owned towns at Pointe-a-Pierre, under conditions well described by Mr. Balderson with the help of fine coloured slides of photographs taken by him while employed as an electrical engineer on the island.

Mr. Balderson's talk, well received by those present, was followed by two interesting reels of pictures shown by courtesy of the Shell Oil Company.

Dinner music by Brown's trio and especially solos by Miss Ella Findlay were much enjoyed features of the programme.

MONTREAL BRANCH

BRANCH DANCE

This dance will be held at the Mount-Royal Hotel Ballroom on February the 13th, 1948. A Buffet Supper will be served and a Bar will be operated in the Brittany Room.

Dress: — Informal — Cost: — $4.00 per couple.

Members are asked to purchase their tickets early and to encourage their friends to attend.

ANNUAL MEETING

The Annual Meeting will take place on January the 22nd, 1948 at E.I.C. Headquarters. It is the intention to keep business down to a minimum with the hope that members will avail themselves of this opportunity to get together for an enjoyable evening.

QUESTIONNAIRE

The Annual Report outlines certain services rendered to the branch membership. The report is accompanied by a questionnaire which the Branch Executive hope will be completed and returned as an indication of what further activities are desired.

Junior Section

The third Annual Dance of the Junior Section was held on Friday November the 28th, in the Ballroom of the Ritz Carlton Hotel with a record attendance of nearly 600 guests. Special guests of the Junior Section included Mr. J. M. Crawford, Chairman of the Montreal Branch and Mrs. Crawford, Mr. J. A. Beauchemin, Past-Chairman of Montreal Branch and Mrs. Beauchemin, Mr. J. B. Sterling, Past-Chairman of Montreal Branch and Mrs. Sterling. The 4 student final contestants at the Annual Students' Night, Guy Perreault and Louis Desrosiers of the Ecole Polytechnique and R. V. Kovacs and J. P. G. Kemp of McGill University were also guests for the evening.

Leo Scharry and Florian G. Leroux were delegates of the Junior Section representing the Junior Engineers at the recent convention of The Quebec Federation of Youth Movements held at the University of Montreal on November the 29th and 30th.

On Monday, December the 8th, R. E. Heartz, vice-presi-

At the Third Annual Dance—Front row: Mrs. J. M. Crawford, Mrs. R. Griesbach, Mlle J. Desjardins, Miss M. Montgomery. Back row: Mr. J. M. Crawford, Bob Griesbach, Leo Scharry, John McPherson.

dent and chief-engineer of the Shawinigan Engineering Company Limited, gave a talk on Developments in Hydro Power. Mr. Heartz dealt specifically with power developments on the St. Maurice River and illustrated his talk with a 40 minute film showing the progress of construction in the carrying out of the La Tuque project. Both the talk and film were much appreciated by those in attendance.

OTTAWA BRANCH

C. G. Biesenthal, m.e.i.c. - *Secretary-Treasurer*
R. C. Purser, m.e.i.c. - - - *Branch News Editor*

At the noon luncheon at the Chateau Laurier on November 13, Col. J. P. Carrière, city manager and chief engineer of Hull, spoke on **City Management—A New Field of Action for Engineers.** He was introduced by Louis-George Trudeau and was thanked by W. F. M. Bryce. Major-General G. R. Turner, chairman of the Ottawa branch, presided.

The speaker compared the city manager system to the method of administration in most business firms, maintaining it was quite simple in principle. Property owners he compared to shareholders in a company, who elected a board of directors—city council—to lay down policy. The council then appoints a trained administrator as city manager.

This system has been adopted in more than 720 cities in America. While varied abilities were needed, more than half of the city managers appointed were engineers. In the province of Quebec this was the case with 24 of the 29 city managers.

" The story of improved government under the manager plan is a story of reduced costs of operation and of increased service, of government removed from politics and operated in a business-like manner," said Colonel Carrière.

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The Ottawa branch held a smoker on the evening of November 14 at the De Salaberry Armouries, Hull, at which about 200 members and male guests attended. Col. J. P. Carrière. Hull, of the Management Committee, acted as master of ceremonies in the absence of the Branch Chairman, Major-General G. R. Turner, who was called to Toronto.

Entertainment included songs by the Gatineau Troubadours, and a programme of magic as well as other features. A buffet lunch was served.

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At the noon luncheon November 27, the Ottawa members were treated to a most interesting address by Maj.-Gen. J. F. M. Whitely, commandant of National Defence College, Kingston, on **My Experiences with Eisenhower.**

General Whitely, deputy chief of staff to Eisenhower in North Africa and a member of the general's staff until the end of the war, said he thought Eisenhower's success as supreme commander of the Allied forces was due to the fact that he got " the complete confidence of all those with whom he came in contact ".

Eisenhower's sincerity, singleness of purpose, courage and sense of humour made him a chief who was neither American nor British in the eyes of his men. Gen. Whitely said " Allied unity, to Eisenhower, was not only a belief, it was an obsession. He would brook no opposition to it."

Eisenhower would travel amazing distances, by plane, by ship or by car, to speak personally to troops. A great speaker, he was able to win them regardless of nationality. He was naturally friendly and informal. He treated correspondents, for instance, as members of his staff, with equal privileges and equal responsibility. But he always spoke " straight from the shoulder ".

Gen. Whitely related many incidents of his association with Eisenhower that testified to the supreme commander's great ability as a leader.

SAGUENAY BRANCH

J. E. Dyck, m.e.i.c. - - - *Secretary-Treasurer*

Heliarc Welding was the topic of an address given by J. S. Johnston to the Saguenay Branch of the Institute on November 24, 1947.

Mr. Johnston is process service supervisor with the Dominion Oxygen Company Limited of Montreal.

With the aid of slides, Mr. Johnson discussed the construction and operation of heliarc welding equipment, showing how the use of a flow of such gases as helium or argon around the electrode produced a weld which was absolutely free of scale. The welding, moreover, can be done without the aid of any fluxing material.

The process was first attempted by using helium in conjunction with the electric arc, and from this resulted the present term, *heliarc welding.* Since helium is difficult to get, it has been largely replaced by argon gas.

Heliarc welding is especially suited to welding of such materials as aluminum, stainless steel, copper and brass. The samples of welded plate presented by Mr. Johnston showed uniform welds with good penetration. In cases where automatic welding machine had been used the finished job required no touching up even on very particular work.

At the close of the meeting Mr. Johnston gave a demonstration of heliarc welding on aluminum, giving the meeting an opportunity to see the actual process and to examine the equipment used.

Junior Section

F. H. Duffy, jr.e.i.c. - - - *Secretary-Treasurer*

A meeting of the Junior Section, Saguenay Branch of the Engineering Institute of Canada was held at the Arvida Protestant School at 8.15 p.m., Thursday, December 11, 1947.

H. V. Paige of the Aluminum Company of Canada, Limited addressed the meeting on the subject of **Process Control and Development in a Motion Picture Laboratory.**

Mr. Paige spent some time with the National Film Board and based his address on his experience with this organization. He briefly traced the procedure followed in producing a film after it has been decided upon, and the use of library stock films and location shots to provide a complete picture. A description followed of the processes involved in controlling defects in the picture due to camera faults, improper developing or printing of the negative. The speaker then outlined the work of the development department of the organization. This included testing of new developing solutions and investigation of new or better methods of producing films. While he dealt only with black and white pictures, the speaker in conclusion mentioned the more complicated field of color photography and the rapid expansion of the film industry in countries other than the United States.

The speaker was introduced by the chairman, C. J. Tanner, and thanked on behalf of the Section by T. T. Anderson. The address proved very interesting to everyone attending the meeting.

SAINT JOHN BRANCH

J. H. C. MacLure, m.e.i.c. - - *Secretary-Treasurer*
A. R. Bonnell, m.e.i.c. - - - *Branch News Editor*

The regular monthly meeting of the Saint John Branch was held on Thursday evening, Nov. 20, in the Admiral Beatty Hotel, with the Chairman L. O. Cass presiding.

The guest speaker for the evening was J. L. E. Price, general manager of J. L. E. Price Company Limited, general contractors, Montreal, and chairman of the Canadian Legion Committee on Veterans Housing.

Mr. Price chose as his topic **Modern Housing.** He spoke at length of the problems facing low cost housing, stating that these problems have not yet been solved due mainly to the high cost of labour and materials to federal, provincial and municipal bodies playing " political football ".

Insurance companies, stated Mr. Price, through Housing Enterprises Limited, produced houses far out of reach generally of the income of those needing houses. He thought that under the integrated housing scheme, small contractors could produce a much cheaper house, but this would still be out of reach of people in small income brackets.

Mr. Price suggested that veteran housing could only be solved by a system whereby the veteran built his own home with a 100 per cent government loan at a low interest rate over a period of 30 years.

A vote of thanks was extended to Mr. Price by Packard Campbell. John Flood in seconding the vote of thanks stressed multiple housing as the only solution to low cost housing.

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The annual meeting of the Saint John Branch was held Wednesday evening, December 10, in the Admiral Beatty Hotel, with the Chairman L. O. Cass presiding.

As usual at the annual meeting, there was no guest speaker. The minutes of the last annual meeting, the annual report and the financial statement for the year were presented by the secretary-treasurer, K. W. Salmon, and discussed. The scrutineers presented their report on the count of the ballots for the election of officers. After brief addresses by the new officers, the meeting adjourned.

SASKATCHEWAN BRANCH

D. W. Houston, M.E.I.C. - *Secretary-Treasurer*
R. Bing-Wo, M.E.I.C. - *Branch News Editor.*

The regular monthly meeting of the Regina branch was held on November 21st, in the Kitchener Hotel, with approximately 55 guests present. H. I. Nicholl was chairman of the meeting. The guest speaker of the evening, J. D. Mollard, air surveys engineer, of the P.F.R.A., was introduced to the audience by G. L. MacKenzie. Mr. Mollard spoke on **Airphoto Interpretation and its Application to Engineering Problems.**

Mr. Mollard explained that some of the techniques involved in the identification of engineering soil areas was acquired from a careful study of all the elements which compose the "soil pattern." Soil patterns are a result of natural and human forces acting on the original material from which the soil was derived. The elements of soil patterns may be altered by changes in climate, but the overall pattern remains the same for a given soil profile regardless of geographical location. Instances were given such as the similarity of loess or wind blown deposits in China, Alaska and South America.

Mr. Mollard went on to explain the formation of eskers, kames, sand dunes, alluviums and moraines and how these appeared in airphotos. The practical application of identifying these forms were shown by the speaker. The use of photo interpretation to Natural Resources surveys was shown in the classification of forest reserves, soil mapping and drainage planning.

Mr. Mollard's talk was well illustrated by slides. A lively discussion and question period followed the talk. M. J. Spratt moved a vote of thanks to the speaker.

TORONTO BRANCH

E. G. Tallman, M.E.I.C. - *Secretary-Treasurer*
E. R. Graydon, M.E.I.C. - *Branch News Editor*

Problems involved in **eliminating overhead wires and cables from streets** were discussed at a meeting of the Engineering Institute of Canada, Toronto Branch, on November 27th. Members of the Toronto Section, American Institute of Electrical Engineers, were guests of the Institute. The meeting, under the chairmanship of D. G. Geiger, and with an attendance of some 170, took the form of a panel discussion by C. E. Schwenger, assistant chief engineer, Toronto Hydro Electric System; W. H. Slinn, division plant engineer, Bell Telephone Company; J. F. Neild, electrical engineer, Toronto Transportation Commission; O. W. Titus, chief engineer, Canada Wire and Cable Company, and Jacob D. Von Maur, consulting engineer, Consumers' Gas Company.

Mr. Von Maur, the opening speaker, pointed out that in Toronto a committee, without legal standing, of engineers representing the various utilities interested in underground construction—Hydro, Bell Telephone, the City, the T.T.C., and the Gas Co. had been set up to manage such matters and that a programme of underground wiring should have to go through this committee. Room underground is congested, and every move will have to be studied in advance, and carefully planned to avoid controversy. A small square of streets in the city might be done first.

Mr. Slinn stated that Bell had removed its poles from 90 per cent of the 572 miles of streets in Toronto, replacing them by a conduit system of 368 trench miles, with 3,100 manholes, yet other forms of wiring had increased. Bell's underground system in Toronto involved 63,500 pairs of wires terminating in the Elgin Building, 393 miles of underground cable, and 90 miles of cable inside buildings.

Mr. Titus expressed particular concern that any underground project should be proceeded with in orderly fashion, on a progressive plan over a 20, 30 or 40 year period. "Is there no practical limitation", he stated, "as to size or voltage to underground cables necessary" 120,000 volts had been used since 1927, and 220,000 volts used in Paris, France, since 1937. Compared with Toronto's six or seven street miles cleared of overhead, he said, Montreal has 83 street miles cleared, while Boston has 200. Baltimore has 17 per cent of its streets cleared, plus about 36 miles of main incoming highway. Pittsburgh has 52 miles cleared. These cities are comparable in size to Toronto. Our record not so good. All the wires must go underground to gain the proper effect.

Mr. Schwenger said Toronto was known as the pole-man's paradise, with over 50,000 Hydro poles, besides the 25,000 already removed. The first step is to place transformers underground and to install lighter poles. The second step is total elimination of poles. An example of the first alternative was Avenue Road here in Toronto. Support was left for street lighting fixtures and an inexpensive street lighting system, which is very important to street lighting cost. With all poles eliminated, there is expense for special standards with underground connections. There is also considerable expense for underground to supply house lighting.

To put wires underground on 572 miles of Toronto streets, he believed, would cost upwards of $150 millions. To eliminate primary feeder poles, the cost would be close to $30 millions. The question was how much we are willing to spend for aesthetic conditions.

Mr. Neild assured the meeting that the T.T.C. would be delighted to see improvements made in Toronto, would comply with any feasible plan, but until the rapid transit scheme is in operation and something is known of the changed travelling habits of the citizens of Toronto, it would be rather hazardous to promise too much on certain streets. The Toronto Railway Company, he said, turned over some 7,000 poles to the T.T.C. Since that time the mileage of their service had been doubled, but only 1,000 poles had been added. Through close co-operation with Toronto Hydro, 6,000 poles have not been erected. In 20 years the T.T.C. had placed about 150,000 feet of underground cable, while they still have 1,300,000 feet of overhead. The city, he thought, would gain little from putting trolley wires underground from an engineering point of view. Underground, they would require double the cross-section to dissipate the heat due to peak hour overloads. Some problem is involved in fire alarms, police signals, etc., which now use the public utilities' poles. There were many hidden costs, and many problems to be worked out.

Mr. Titus recognized that it costs more money "once you get below a load of 7,500 K.V.A. per square mile", to go underground, but above this loading, underground is actually cheaper. The programme for pole removal, he believed, should extend over 50 years, which would mean removal of poles from only three miles of streets a year. When poles are eliminated, however, it did not mean that wires were eliminated. A utility, he said, could not be asked to pay the expense of local underground distribution in residential streets. He felt that many people would be prepared to pay the increased costs for underground service as a local improvement over 15 to 20 years, and some localities have done this already on a limited scale. To this Mr. Schwenger answered that all new systems were watched with a view to keeping costs down. On an underground system, repairs took longer. Overhead is exposed to the elements but there is greater ease of restoring service.

Replying to a remark from the audience as to whether a buried street car trolley was feasible, Mr. Neild said a slot to eliminate trolley wires was an old subject he had worked on back in 1923. It was possible in many places, but was a hazard and a nuisance because people always poke things into slots. Commenting on "back lot" construction, Mr. Schwenger stated that back lot construction had been tried, where residents paid for improvements. After 20 years or more, the poles rot off, and it is almost impossible to change them because of growth. He was definitely opposed to this.

The elimination of overhead wires, he believed, was possible in Toronto. However, he doubted that the elimination of poles was possible. It might be possible for the Bell Telephone Company to run cable in back yards, but Toronto Hydro must still have poles for street lighting. Underground construction is not nearly so subject to breaks and interruptions, but when repairs are necessary, they are slower and more costly. Overhead wires are claimed by some to seriously interfere with fire-fighting operations in congested business districts. The gradual elimination of overhead wiring and poles should be done, but he believed it should be done by some method of advancing money year by year according to a plan, as Montreal has done.

VANCOUVER BRANCH

Alan M. Eyre, Jr.E.I.C. - - *Secretary-Treasurer*
G. W. Allan, M.E.I.C. - - *Branch News Editor*

Some eighty-five members of the Vancouver Branch of the Institute attended a meeting in the Hotel Vancouver, on October 29, to hear C. E. Webb, M.E.I.C., district engineer of the Dominion Water and Power Bureau. The speaker took as his subject **The Columbia Basin Water Resources in Canada,** a review of the investigations now in progress for the International Joint Commission.

This address, which proved extremely interesting, was published in full in the December issue of the *Journal.*

The address was followed by the showing of two motion picture films in technicolor: "The Mother of Rivers", a Canadian National Film; and "Winter Transport in the Big

Bend Area of the Columbia River Basin", filmed by Bill Harland of the Dominion Water Bureau staff.

D. J. McLeod gave an explanatory talk during the showing of these pictures, illustrating clearly the conditions and problems encountered in this project.

The number of questions asked of the speaker during the discussion period was an indication of the interest of his listeners.

VICTORIA BRANCH

S. H. Frame, m.e.i.c. - - - - *Secretary-Treasurer*
Kenneth Reid, m.e.i.c. - - - *Branch News Editor*

The first meeting of the season of the Victoria Branch was addressed by R. Bowering, m.e.i.c., on November 21, 1947. This was the first of a series of meetings to be held the third Friday of each month until June 18, 1948.

Mr. Bowering who is director of the Division of Public Engineering for the Province of British Columbia, gave a very interesting and instructive paper on **Public Health Engineering.**

He devoted the first part of his talk to an historical sketch of the different methods of combatting disease until such time as preventive measures are widely used. It is here that the engineer comes into the public health field, very noticeably, in the wholesale drainage of mosquito-infested swamps, the proper laying of sewers, the conveyance and treatment of water supplies, etc. Mr. Bowering stressed the great importance of this engineering work, and traced the work of the Provincial Health Department in public health engineering.

A discussion of some length followed his address, many questions being asked about the pollution of water, the carrying of disease, alternative preventive measures, etc.

Attending the meeting was Mayor George Muir of Nanaimo and municipal engineers from the Victoria area.

On December 4th the Branch held a luncheon meeting for the purpose of nominating the officers for the coming year, the election to take place at the forthcoming annual meeting.

WINNIPEG BRANCH

R. T. Harland, m.e.i.c. - - - *Secretary-Treasurer*

Electrical Section

L. A. Bateman - - - - - - - - - - *Secretary*
D. C. Bryden - - - - - - - - - *News Editor*

The Electrical Section of the Winnipeg Branch has now received more information on meeting dates and speakers, and the following can now be considered as definite:

January 30—Mr. G. A. Muir, special service engineer, Manitoba Telephone System, will speak on "General Mobile Telephone Service".

February 12—Mr. M. B. Mallett, head of Transformer Design Department, English Electric Company, St. Catharines, Ont., will discuss "Transformer Design".

April 15—Mr. H. R. Sills, A.C. Machines Engineer, Canadian General Electric Co. Ltd., Peterborough, Ont., will speak of "Design of Large A.C. Machines".

THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF NOVA SCOTIA

Max L. Baker, m.e.i.c. - - - - *Correspondent*

Collective bargaining, insofar as it concerns the professional engineer, is an issue giving rise to numerous and lengthy discussions. The Association of Professional Engineers of Nova Scotia has consistently maintained that any collective bargaining proposal for professional workers should be such that complete control would rest with the members of the profession.

New labour legislation—the Trade Union Act—prepared for presentation to the Nova Scotia legislature last spring, followed the same wording for the definition of "employee" as that given in the Federal Bill referred to in the editorial "New Collective Bargaining Legislation" in *The Engineering Journal,* July 1947.

The Council of the Association felt that as there was no provision in the proposed Provincial Bill for engineers to do their own bargaining, it would be in the best interests of the Association to exclude a member of the engineering profession from the definition of "employee". Accordingly, the Council made representation to the Provincial Department of Labour to amend the Bill by adding the word "engineering" to the professions already mentioned therein as excluded from the term "employee": namely, the medical, dental, architectural and legal professions.

The Bill was passed with the recommended amendment and this part of the Act now reads:

> Section 2, sub-section (i)
> "*employee* means a person employed to do skilled or unskilled manual, clerical, or technical work, but this does not include
> (1) a manager or superintendent, or any other person who in the opinion of the Board is employed in a confidential capacity in matters relating to labour relations or who exercises management functions;
> (2) a member of the medical, dental, architectural, engineering, or legal profession qualified to practice under the laws of a province and employed in that capacity;"

As a result of having "collective bargaining" for the engineering profession in Nova Scotia wholly under the jurisdiction of the Association, the Council, under the authority of the Nova Scotia Engineering Profession Act, (Section 6, sub-section j) set up a committee to function as follows:

(a) to provide for the government, discipline, and honour of persons practising professional engineering and those enrolled as Engineers-in-Training within the province.
(b) to negotiate for and on behalf of any member or Engineer-in-Training in any matter pertaining to his welfare as a professional engineer or engineer-in-training.

This Committee, tentatively called the "Industrial Relations Committee", consists of three members who occupy or who have occupied responsible executive positions, three who occupy responsible positions in engineering work, and one Engineer-in-Training or a member who has been a graduate less than five years.

Dr. F. H. Sexton is Chairman of the committee. Members are C. A. Fowler, W. Wilson, G. J. Currie, G. T. Clarke, F. Morrison, J. P. Vaughan.

In general, the duties of the Committee will be to consider claims from registered engineers of unjust treatment, claims for low salaries, discipline of members, special cases brought up for investigation and action, and the handling of public relations of the Association.

Personals

Admitted to Honorary Life Membership in the Association of Professional Engineers of Nova Scotia as from January 1, 1948, are Mr. W. H. Munroe and Dr. F. H. Sexton.

Mr. Karl Whitman has been appointed Association Representative on the Senate of the Nova Scotia Technical College.

—Library Notes—

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEW

AIR CONDITIONING

Herbert Herkimer and Harold Herkimer, Chemical Publishing Co. Inc., Brooklyn, New York, 1947, 692 pp., illus., 5½ x 8½ in., cloth, $12.00.

Reviewed by ERIC TAIT, M.E.I.C.*

Herbert Herkimer, consulting engineer, has been engaged in the air conditioning industry for more than 30 years and has gathered a collection of notes, data and empirical formulae which has gone into the preparation of this book. Aided by his son, the result is a well rounded text which will be found useful to practising engineers as well as to students of the art.

The first nine chapters cover in detail the theory and basic principles of physics and chemistry applicable to air conditioning. These include the gas laws, properties of matter, change of state, heat transfer, heat transmission factors for building materials, heat factors in cooling, thermodynamics, air and vapour mixtures, as well as a chapter dealing with radiant heating.

The remaining fifteen chapters are concerned with the practical application of the basic principles. Fans ducts and air distribution, heating and cooling loads, dehumidification and humidification, air washers, spray systems and cooling towers, drying, cooling methods and refrigeration, unit air conditioners and central systems, auditorium cooling and by-pass systems, industrial applications and automatic controls are all treated, with a final chapter on estimating costs.

This book is fundamentally of a practical nature and will be found of most use to engineers who are designing air conditioning systems. It is not an all-embracing treatise on the subject but covers the most frequently encountered problems of design and the use of present day equipment. Several tables and empirical "rules of thumb" will be found of value to engineers requiring quick preliminary estimates of capacities and costs of equipment.

It will be noted that most of the illustrations and a considerable amount of the tabular data are taken from the A.S.H.V.E. Guide and A.S.R.E. Data Books. Arithmetical solutions to problems are preferred as opposed to graphical methods with the psychrometric chart. An appendix contains a glossary of air conditioning terms and symbols.

* *Engineer, McDougall & Friedman, Consulting Engineers, Montreal, Canada.*

CORRECTION
RELATIVITY; THE SPECIAL AND GENERAL THEORY

Albert Einstein. N.Y., Hartsdale House, c1947. Reviewed in the Engineering Journal, November, 1947, page 567.

This book is published by *Hortsdale House*, New York, and not by Peter Smith as stated.

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Architectural Construction; Choice of Structural Design:
Theodore Crane. N.Y., Wiley, 1947. 414 pp., illus., cloth.

Data Book for Civil Engineers—Field Practice:
Elwyn E. Seelye. N.Y., Wiley, 1947. 306 pp., illus., fabrikoid.

Growth of Physical Science:
Sir James Jeans. Cambridge, the University Press, 1947. 364 pp., illus., cloth.

Handbook of Personnel Management:
George D. Halsey. N.Y., Harper, 1947. 402 pp., illus., cloth.

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International Civil Aviation Organization, Montreal, 1947.

Illustrated Jig-Tooling Dictionary:
Torger G. Thompson and Ross A. Peterson. N.Y., Macmillan, 1947. 349 pp., illus., cloth.

Industrial Health Engineering:
Allen D. Brandt. N.Y., Wiley, 1947. 395 pp., illus., cloth.

On Understanding Science; an Historical Approach:
James B. Conant. New Haven, Conn., Yale University Press, 1947. 145 pp., illus., cloth.

Soil Mechanics; Its Principles and Structural Applications, 2nd ed.:
Dimitri P. Kryninc. N.Y. and London, McGraw-Hill, 1947. 511 pp., illus., cloth.

Spectrochemical Abstracts, Vol. III, 1940-45:
Ernest H. S. van Somerin. London, Adam Hilger Ltd., 1947. 112 pp., paper.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

Caribbean Commission:
Report to the Governments of the French Republic, the Kingdom of the Netherlands, the United Kingdom, the United States of America, for the Year 1946.

Educational Film Guide:
Dorothy E. Cook and Evo Rahbek-Smith. N.Y., H. W. Wilson Co., 1946.

International Management Congress, Eighth:
Papers Submitted to the Sectional Meetings, Vol. I, 1947.

North-East Coast Institution of Engineers and Shipbuilders:
Transactions, Volume 63, 1946-47.

TECHNICAL BULLETINS, ETC.

Electrochemical Society:
Preprints: *92-18—Some Analytical Applications of Controlled Potential Electrolysis, James J. Lingane.—92-28—Self Discharge in Lead-Acid Storage Batteries, A. C. Zachlin.—92-29—Production of Fused Silica, B. A. Rogers, W. J. Kroll, and H. P. Holmes.—92-30—Development of Photoflash Dry Cells, R. C. Clock.—92-31—Graphite Anodes in Brine Electrolysis: II. Application to Chlorate Cells, Milton Janes.—92-32—Storage Battery Addition Agents, Eugene Willihnganz.—92-33—Electrolytic Reduction of Carbonyl Compounds at Carbon Cathodes, Sherlock Swan, Jr., and H. D. Kerfman.—92-34—Addition Agents for Negative Plates of Lead-Acid Storage Batteries, Everett J. Ritchie.—92-36—Concentrated Hydrogen Peroxide, M. E. Bretschger and E. S. Shanley.—92-38—Automotic Potentiometric Titrations, H. A. Robinson.*

Institution of Mechanical Engineers:
Publications: *Mechanical Differential Analyser: Its Principles, Development, and Applications, H. E. Rose.—Radiology of Joints in Welded Piping for Power Plants, E. Thomas.*

National Research Council of Canada. Associate Committee on Soil and Snow Mechanics:
Technical Memorandum: *No. 9—Proceeding of 1947 Civilian Soil Mechanics Conference.*

North-East Coast Institution of Engineers and Shipbuilders:
Publications: *Shipgrafting—Certain War-Time Ship Repairs, E. J. Hunter.—Some Developments in Diesel Engine Design: Especially Referring to Scavenging Problems, H. Pyk.*

STANDARDS, SPECIFICATIONS, ETC.

British Standards Institution:

Code of Practice: *CP(B) 682—Code of Functional Requirements of Buildings: Chapter IX. Durability.—CP(B) 694—Concrete Floors and Roofs.*

Canadian Fan Manufacturers' Association:

Bulletin: *No. 100-C—Standards, Terms and Definitions in Use by the Fan and Blower Industry.*

PAMPHLETS, ETC.

Aerodromes, Air Routes and Ground Aids Division, Third Session, Doc 4809—AGA/558:

International Civil Aviation Organization, Montreal, 1947.

Astronomical Navigation without Mathematics:

Lt.-Col. A. L. Mieville. N.Y., Macmillan, 1946.

Engineering Applications of Controlled Expansion Cast Alloys:

Frederick G. Sefing. N.Y., International Nickel Company, 1947.

Five-Room House for $4,000.00; a Description of the Meadows House:

Clifford A. Meadows. Toronto, Meadows, Critoph and Co., nd.

Functions of the Personnel Director:

Metropolitan Life Insurance Company, N.Y., nd.

Investigation into the Effect of Variations in Coke Quality and Burden Composition on the Performance of No. 2 Blast Furnace at Workington Iron and Steel Company Ltd.:

G. H. Jowett. Sheffield, United Steel Companies Ltd., 1947.

Management Literature—a Selective List:

Elizabeth R. Asset. Chicago, Special Libraries Associations, 1947.

Nuclear Energy for Power Production:

Ward F. Davidson. The Hague, World Power Conference, 1947. Section A6 Paper No. 1. (Contains Bibliography.)

Outline for a Management Audit:

Metropolitan Life Insurance Company, N.Y., nd.

Pearlite Interval in Gray Cast Iron:

Alfred Boyles. Columbus, Ohio, Battelle Memorial Institute, 1940.

Recent Developments in Education and Training for Management in Great Britain:

Education and Training Committee of the British Management Council, 1947.

Resurgam:

Jarrold and Sons, Norwich, nd.

Study of Higher Education for Engineers:

Frank C. Hockema. Lafayette, Ind., Purdue University, 1947. (Purdue University. Studies in Higher Education LIX.)

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

ASTRONOMICAL NAVIGATION WITHOUT MATHEMATICS:

Lt.-Col. A. L. Mieville, M.E.I.C., D.S.O., M.C. N.Y., Macmillan, 1946. 25 pp., illus., 8½ x 5½ in., paper, 65c.

This little book reduces to the simplest terms the reasoning which enables us to navigate by the stars. Though the principles are based upon the usual mathematical processes, all calculations are reduced to a single sum of addition, and any subjects which might obscure the argument are avoided. This simplified method has been found most useful, since it enables anyone, at a single sitting, to master the elements of navigation and provides a firm ground upon which to base further study.

BRITISH STANDARD FOR COPPER TUBES (HEAVY GAUGE) FOR GENERAL PURPOSES, BS 61: Part 1, 1947:

London, British Standards Institution. 2/-.

This specification is a revision of that part of BS 61: 1913, concerning copper tubes, the threading details being published separately as BS 61, Part 2. In the revision, the thickness of tubes has been co-ordinated with other specifications and a number of slight alterations have been made to the outside diameter of the tubes. The standard applies to seamless copper tubes for screwed connections, and for use at temperatures not in excess of 320° F.

BRITISH STANDARD FOR COPPER TUBES TO BE BURIED UNDERGROUND, BS 1386, 1947:

London, British Standards Institution. 2/-.

This standard applies to copper tubes which are suitable for connection by means of compression fittings or capillary fittings, or by bronze or autogenous welding, and which are to be buried underground for the conveyance of water, town gas, etc. It standardized the tubes on the basis of outside diameter. Special attention is directed to the variable nature of soils and to the need for protection of tubes where they are laid in soils, particularly when the soil is of an acid nature, which has a deleterious effect on metals. Care should also be taken to ensure that the method of jointing and materials used for the joints are suitable for use underground.

BRITISH STANDARD FOR FRACTION-DEFECTIVE CHARTS FOR QUALITY CONTROL, BS 1313, 1947:

London, British Standards Institution. 6/-.

This standard describes the simplest and cheapest form of quality control, by the examination of the fraction defective in samples; it sets out accepted methods which are easy to use and can satisfactorily and profitably replace 100 per cent examination. It shows in this standard that these methods are of wide application, not only in factories but also in stores, or even shops and offices. Every method described in the standard is covered by examples from actual practice and reproductions of many actual control charts are given. A bibliography has been included.

BRITISH STANDARD FOR LOG-SHEETS FOR STEAM BOILER PLANTS, BS 1374, 1947:

London, British Standards Institution. 2/-.

This standard is intended to establish uniformity in practice in recording the performance of boiler plants, because the keeping of a proper log-sheet is an essential step towards assuring economical and efficient operation of the plant. The specification comprises a daily log-sheet and a weekly summary. Notes are given on the use of the log-sheets, including some of the deductions to be drawn from them. The sheets are suitable for a single boiler or for a battery of about six boilers with one economizer, and have been compiled with the object of introducing a simple form of boiler-house record which will provide a continuous check on the performance of the plant and the cost of fuel per 1,000 lbs. of steam generated.

BRITISH STANDARD FOR MEASUREMENT OF PHOTOGRAPHIC TRANSMISSION DENSITY, BS 1384, 1947:

London, British Standards Institution. 4/-.

This is a British reproduction of the American Standards Association Standard Z38.2.5/161-1946. It is intended primarily for photography in monochrome, and recognizes that there is no unique method of density measurement which is universally applicable, and gives in some detail a classification of the various types of density which occur in practice. Three fundamental types of transmission density are distinguished and precisely defined. Since most densitometers are calibrated in terms of diffuse density, which is usually used in expressing the characteristics of photographic materials, this type of density has been specified in detail in the standard, and sub-divided into other types that are dependent upon spectral conditions which are also specified. Three approved standard methods for determining "British Standard Diffuse Density" are given, and fully described.

BRITISH STANDARD FOR POWER DRIVEN CIRCULATORS FOR HEATING PLANTS, BS 1394, 1947:

London, British Standards Institution. 2/-.

The design of power driven circulators varies so greatly that standardization is not possible nor practical. Certain features, however, can be specified, and those dealt with here are centrifugal, axial flow, or mixed flow pumps, which create a flow in water mains for heating purposes, either direct or indirect, or for domestic hot water supplies, and deals only with pumps for water at a temperature not exceeding 200° F. This specification covers direct coupled and belt driven pumps and also sets in which the pumps are integral with the driving unit.

CANADIAN STANDARD ELECTRICAL CODE, PART I (FIFTH EDITION): Essential Requirements and Minimum Standards Governing Electrical Installations for Buildings, Structures and Premises. CSA C22.1—1947.

Ottawa, Canadian Standards Association. $1.

This standard supersedes C22.1-1939, and represents intensive study of current practices and contemporary codes of practice dealing with Inside Wiring Rules. The code is intended to establish essential requirements and minimum equipment for adoption and enforcement by Electrical Inspection Departments throughout Canada. Consideration has been given, not only to prevention of fire hazard and injury to persons and property, but also to proper maintenance and operation. Some of the additions and changes in this new edition have to do with thermoplastic insulated conductors, cellular metal floor raceways, automatically started motors, installation of lighting equipment, and fur and silk storage vaults.

CANADIAN ELECTRICAL CODE (PART III—OVERHEAD SYSTEMS)—RULES, REQUIREMENTS AND SPECIFICATIONS FOR THE CONSTRUCTION OF SUPPLY LINES CROSSING COMMUNICATION LINES. CSA C22.3 No. 1(C)—1947:

Ottawa, Canadian Standards Association, 1947. $1.00.

These specifications are designed to establish a standard of good practice in construction and maintenance of poles, towers, conductors and other similar construction items which collectively form the structure of supply and communication systems at and adjacent to those points where they cross each other.

CANADIAN ELECTRICAL CODE FOR THE CONSTRUCTION AND APPLICATION OF SUPPRESSORS FOR RADIO INTERFERENCE. CSA SPECIFICATION C22.4 —No. 108—1947:

Ottawa, Canadian Standards Association, 1947. 80c.

The purpose of this standard is to set up requirements for the construction, application and installation of suppressors for radio interference. It is divided into five sections. The first outlines general principles of the application of suppressors to electrical circuits and apparatus. The second and third give details of the types, construction and installation of suppressors for use with existing apparatus and new apparatus respectively. The fourth and fifth deal with interference suppressors for internal combustion engines and electric railways. In many cases, the type of suppressors suitable for particular applications are recommended.

CANADIAN STANDARDS ASSOCIATION CODE OF PRACTICE FOR THE USE AND CARE OF CHAIN. CSA B75—1947:

Ottawa, Canadian Standards Association, 1947. 50c.

This standard complies with the many requests that have been put forth for a specification outlining the salient features representing good practice in the use and care of hoisting or lifting chain. It is believed that all details of this Code will find appropriate application in the many usages of chain.

CANADIAN STANDARD SPECIFICATION FOR IRON AND STEEL ARC-WELDING ELECTRODES: 2d. ed. CSA W48—1947:

Ottawa, Canadian Standards Association. 75c.

This specification covers light-coated and heavy-covered metal arc-welding electrodes for the welding of carbon and low alloy steels of weldable quality. The electrodes are classified on the basis of the physical properties of the deposited metal and on the usability characteristics of the electrode. In the preparation of the code, the Canadian Standards Association has incorporated the technical features of the corresponding specification of the American Welding Society, with modifications for the differences in operating conditions between the two countries.

CANADIAN STANDARD WELDING QUALIFICATION CODE FOR THE APPLICATION TO FABRICATING AND CONTRACTING FIRMS, THEIR WELDING PERSONNEL AND EQUIPMENT. CSA W47—1947:

Ottawa, Canadian Standards Association. 75c.

This standard has been prepared by the Canadian Welding Bureau, a new division of the Canadian Standards Association. It is a revision of W47-1938, and deals with the Engineering Personnel, the Supervisory staff, the actual Welding operators, the equipment and facilities, but with each of these as elements in, and of, the Firm contributing to its capacity and efficiency.

HERITAGE OF THE ENGLISH-SPEAKING PEOPLES AND THEIR RESPONSIBILITY:

Gambier, Ohio, Kenyon College, 1946. 190 pp., 9 x 6 in., paper, $2.00.

This book is a collection of the addresses delivered at the conference on the Heritage of the English-speaking Peoples and their Responsibility, held at Kenyon College in October, 1946. Papers were given by men eminent in the fields of letters, political and economic thought, law, and religion, and most of these are incorporated, although unfortunately without the discussions from the floor. Subject matter treated includes the Anglo-American press and journalism in general; the Palestine question; a comparison of Eastern and Western thought and the influence of the English-speaking peoples on both East and West; a discussion of the heritage and responsibility which is the subject of the conference; the necessity of political scepticism; the ethical tradition in English literature; the manifestations of the English language in literature; the law in the United States; the influence of Britain and America in international economic relations; a statement of the achievements of Anglo-American democracy, and the necessity for understanding and planning to avoid destruction of our civilization in the future; our responsibilities in government and the maintenance of individual liberty; and a sermon showing the choice between the way of good and the way of evil. The collection as a whole, within the subject limits to which it is confined, presents a thought-provoking picture of our heritage and responsibility.

ICAO REGIONAL MANUAL; NORTH ATLANTIC (Doc 4500):

Montreal, International Civil Aviation Organization, May 15, 1947, illus., leather.

This Manual is intended to supply that information necessary to supplement, on a regional basis, the PICAO RECOMMENDATIONS FOR STANDARDS, PRACTICES AND PROCEDURES and the PICAO PROCEDURES FOR AIR NAVIGATION SERVICES. It is intended to serve the interests of flight and ground personnel, operational and planning personnel, civil aviation authorities, and those with a general interest in aviation. It contains five major divisions providing data relative to procedures applicable to the region, radio navigational and communication facilities, designated land and water aerodromes, instrument approach and landing charts, and general information. The Manual has been compiled primarily from source material furnished by the various North Atlantic States in response to questionnaires, supplemented by National NOTAMS, civil and military aviation publications and other valid sources. Additions and amendments are supplied from time to time. The Manual is published in the three official ICAO languages —English, French, and Spanish.

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.

COURS DE MECANIQUES, Tome Premier—Statique.

H. Favro. Dunod, Editeur, Paris; Loeman Freres, Editeurs, Zurich, Switzerland, 1946. 384 pp., diagrs., tables, 9¼ x 6½ in., paper, 820 fr

Intended for use on the college level, this volume is of interest to engineers, physicists and mathematicians who wish to acquire a general idea of classical mechanics. This first volume, of a proposed set of three, is divided into three parts following an introduction that covers fundamental laws and principles. The first part is on the statics of a rigid solid body. The second and third parts are devoted to the statics of an elastic solid body and hydrostatics. Problems are given at the end of each chapter. A knowledge of calculus is assumed.

ELECTRIC MOTOR MAINTENANCE:

W. W. McCullough. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 126 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $2.00.

Reviewing some of the fundamental principles of electric motors, this volume describes the procedures to be followed in the maintenance, repair and inspection of motors. The first part, dealing with mechanical maintenance, covers motor assembly, bearings, current collecting devices, and air gaps. Insulating materials, including their cleaning, drying and testing, are treated in the second part. The operating characteristics of induction, direct current, synchronous, and gear motors are covered in the last part, together with motor-generator sets and electric couplings.

ELECTRONIC TRANSFORMERS AND CIRCUITS:

R. Lee. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 282 pp., illus., diagrs., charts, tables, 9¼ x 5¾ in., cloth, $4.50.

Providing a reference book on the design of transformers for electronic apparatus, this book furnishes electronic equipment engineers with an understanding of the effects of transformer characteristics on electronic circuits. The author assumes familiarity with basic circuit theory and transformer principles. Physical concepts are emphasized, and mathematical proofs are kept to a minimum. A prominent feature is the detailed treatment of important wartime developments in video and pulse transformers.

ELEMENTS OF AEROFOIL AND AIRSCREW THEORY:

H. Glauert. 2 ed. University Press, Cambridge, England; Macmillan, New York, Toronto, 1947. 232 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, $3.75 in Canada.

The object of this book is to give an account of aerofoil and airscrew theory in a form suitable for students without a previous knowledge of hydrodynamics. The first five chapters give a brief introduction to those aspects of hydrodynamics which are required for the development of aerofoil theory. The following chapters deal with aerofoil lift, the effect of viscosity and its bearing on aerofoil theory, the theory of aerofoils of finite span, and the development of airscrew theory. Particular changes in the new edition have been made in the theory of viscous motion and the flow of the boundary layer. Complex mathematical analysis has been avoided as far as possible.

FM RADIO HANDBOOK, 1946 Edition:

Edited by M. B. Sleeper. FM Company, Great Barrington, Mass., 1946. 174 pp., illus., diagrs., charts, tables, 11½ x 8¾ in., paper, $2.00; cloth, $4.00.

This first edition of the FM Handbook represents an attempt to compile information on a subject that is still undergoing a period of rapid growth. Only topics on which progress has begun to slow down have been discussed. Thus, such topics as transmitters and communications equipment have been omitted. The history and theory of FM, FM broadcasting and studio techniques, coaxial cables, antennas, selective calling methods, maintenance, alignment of receivers, railroad radio installations, facsimile equipment, and FM standards are among the topics included.

FUNDAMENTALS OF ELECTRICITY AND MAGNETISM:

L. B. Loeb. 3 ed. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 669 pp., diagrs., charts, tables, 9¼ x 5¾ in., cloth, $6.00.

Using calculus and the gaussian system of units, this volume presents the various concepts of electricity and magnetism in terms of experimental observations and the logical deductions and inferences based thereon. In this third edition, the historical survey is reduced to an outline. Some major changes are the introduction of a section on atomic structure, including material on conduction in gases, and the inclusion of new material such as the presentation of the ferromagnetic phenomena from the viewpoint of the theory of domains. In addition, there are sections dealing with the electrical principles underlying the achievement of high-energy electrical particles, including such devices as the betatron, sychrotron, synchrocyclotron, the magnetron and klystron.

INDUSTRIAL MANAGEMENT:

W. R. Spriegel and R. H. Lansburgh. 4th ed. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 656 pp., illus., diagrs., charts, tables, 9¼ x 5¾ in., cloth, $5.00.

Policies and principles of successful management are presented, with the devices necessary for carrying them out, keeping in mind the needs both of the college student and the executive. Throughout the book an effort has been made to show the interdependence of the various major departments of a business. This fourth edition has been thoroughly revised to cover the recent developments in the field, and includes as new material a chapter on maintenance. There is a broadly classified bibliography.

METALLURGY:

C. G. Johnson. 3 ed. American Technical Society, Chicago, Ill.; General Publishing, Toronto; 1946. 418 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $6.75 in Canada.

This textbook is intended to provide a working knowledge of the manufacture and behavior of metals and their alloys. Early chapters discuss the properties of metals, iron and steel production and the theory of alloys. The alloys of steel and of the more important non-ferrous metals are dealt with at some length, and separate chapters are devoted to the shaping and forming of metals, heat treatment, cast iron, and powder metallurgy. Physical metallurgy has been stressed rather than chemical metallurgy for practical reasons.

TEXTBOOK OF THE MATERIALS OF ENGINEERING:

H. F. Moore and others. 7th ed. McGraw-Hill Book Co., New York and London, Toronto, 1947. 500 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.00.

Elementary in character, this book is devoted to the common materials used in structures and machines, together with brief descriptions of their manufacture and fabrication. Primary emphasis is placed on the strength, toughness and stiffness of stress-carrying materials. The revised edition covers many new materials of construction, developed during the war, and new methods of processing them. Additional data on plastics, synthetic rubber testing machines, and methods have been included. Reference material is given at the end of each chapter, and a section of review questions is provided.

THEORY AND DESIGN OF CYLINDRICAL SHELL STRUCTURES (Modern Building Techniques, Bulletin No. 1):

R. S. Jenkins. The O. N. Arup Group of Consulting Engineers, Calquhoun House, London, W.1, May, 1947. 75 pp., diagrs., tables, 9½ x 7 in., paper, 21s.

In addition to a thorough treatment of the design of reinforced concrete cylindrical shell structures, this publication demonstrates the use of matrix calculus as a development in the analytical methods for structures in general. The theoretical treatment is based on Jenkins' equation which enables the designer to deal with unevenly distributed pressures and temperature changes, thus allowing the actual calculations of monents, etc., formerly dealt with arbitrarily. This is the first of a series of bulletins intended to further the exchange of information concerning the science of building.

WATERBURY'S VEST-POCKET HANDBOOK OF ENGINEERING, 4th ed.:

Revised by H. W. Reddick and others. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1947. 386 pp., diagrs., tables, 5½ x 3 in., fabrikoid, $2.50.

This practical pocketbook provides mathematical engineering data under the headings of algebra, trigonometry, mensuration, analytic geometry, differential and integral calculus, theoretical mechanics, mechanics of materials, fluid mechanics, heat engineering, and electrical engineering. New sections added in this edition cover illumination engineering and radio-electronics formulae. Besides the revised tables from the previous edition, the book contains additional ones on the properties of saturated water and steam.

Although not available in the Institute Library, inquiries concerning the following new books will be welcomed there or may be sent direct to the publishers.

APPLIED THERMODYNAMICS:

By V. M. Faires. Macmillan Co., New York, 1947. 480 pp., illus., diagrs., charts, tables, 9½ x 6 in., cloth, $4.75.

The theories of thermodynamics involved in engineering problems are covered in an elementary fashion by this text. It is designed to be understandable to those who have not previously studied heat engines. The revised edition contains a more extensive treatment of the second law of thermodynamics, more material on the internal combustion turbine, and a chapter on heat transfer. Illustrations and equations have been added. The customary material for a thermodynamics course constitutes the main framework of the book.

CAPACITORS, Their Use in Electronic Circuits:

M. Bratherton. D. Van Nostrand Co., New York, 1946. 107 pp., diagrs., charts, 9¼ x 6 in., cloth, $3.00.

Capacitors, or condensers, are considered with reference to the basic factors which control their characteristics and which are conducive to success or failure in electronic circuits. Specifically the book discusses how a capacitor behaves under direct voltage and under alternating voltage, describes the construction and operation of mica, ceramic, air, impregnated paper and electrolytic capacitors, and considers the selection of proper capacitors. A separate chapter briefly notes some synthetic dielectrics of the future.

CHEMICAL ENGINEERING CATALOG, the Process Industries Own Catalog, 1946-47, thirty-first edition.

Reinhold Publishing Corp., 330 W. 42nd St., New York, 1946. 1758 pp., illus., diagrs., charts, tables, 11 x 8 in., cloth, free to companies in the Chemical Industries; $7.50 to foreign countries.

This annual publication provides a collected source of condensed and standardized data about equipment, machinery, raw materials, heavy and fine chemicals, and laboratory supplies used in the industries employing chemical processes of manufacture. Classified indexes to the catalog material are provided, and there is a large trade name index. The technical and scientific book section now catalogs, with brief descriptions, the Reinhold books on chemistry and related topics, and includes separate listings of similar books by three other publishers.

(Continued on page 62)

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

December 31, 1947

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

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

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

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

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

The Council will consider the applications herein described at the February meeting.

L. Austin Wright, General Secretary

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professionl responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

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

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

FOR ADMISSION

ADAMS—FRED ROBERT, of Vancouver, B.C. Born at Lachine, Que., April 22, 1910. Educ.: B.A.Sc., Toronto, 1936; R.P.E., British Columbia; 1929-30 (summers as well during univ. years), machinist Ingersoll Machine and Tool Co.; 1936-37, engr., testing & experimenting with refrig. units, engrg. dept., Universal Cooler Co., Detroit, Mich.; 1937-39, sales engr., Canada Machinery Corp., Galt, Ont.; with Canadian Liquid Air Co., as follows: 1942-44, asst. engr., engrg. dept. working on oxy-acetylene & elect. welding applications, flame hardening & oxygen-acetylene industrial piping instalns., 1944 to date, district mgr., Vancouver, B.C.

References: F. G. Kerry, L. C. Jacobs, J. M. Duncan, C. E. Hawke, J. A. Walker.

BACH—DENIS GEORGE, of Hamilton, Ont. Born at Birmingham, England, Dec. 22, 1911. Educ.: Cert. Apprent. Mech. Engr.; National Cert., 1934; 1927-31, tool room, Blackmore, Howard & Metherel; 1931-35, tool room & shops, jig & tool design, J. Lucas, Ltd., Birmingham; 1935-37, prod. engr., B.S.A., Birmingham; with Midland Efficiency Tools Ltd., Birmingham, as follows: 1937-44, managing-dir., 1944-47, managing-director of Jigs & Tools Ltd., Birmingham, as well; at present methods analyst, Canadian Westinghouse Co., Hamilton, Ont.

References: L. C. Sentance, G. L. T. Vollmer, H. O. Peeling, H. Thomasson, E. H. Tovee.

CAZALET—FRANCIS MOTT, of Vancouver, B.C., Born at Bransfourd, Worcester, Eng., April 2, 1910. Educ.: B.A.Sc., (Mech.), British Columbia, 1937; R.P.E., British Columbia; with British Columbia Electric Co., Ltd., as follows: 1937-44, industrial gas research & sales, 1945-46, planning divn., 1946-47, research dept., and at present gas engr. in research dept., Vancouver, B.C.

References: H. T. Libby, T. M. Moran, W. O. Scott, P. H. Buchan.

CLENDENNING—HARRY VAIR, of Edmonton, Alta. Born at Harding, Man., Dec. 12, 1915. Educ.: Univ. of Manitoba, (civil engrg.), 1938-40; 1935-39, chainman, rodman, paving insptr., plant inspector, lab. tech., instrument work, estimating. dftng., etc., Dept. of Highways, Manitoba Gov't. (1938-39, 1 yr., chief plant inspectr., Manitoba Gov't.); 1940, chief plant & paving inspectr., Dept. of Transport; with R.C.A.F., as follows: 1941-43, Foreman of Works. 1943-45, Works Officer, 1945 to date, Constrn. Engrg. Branch, Command Hdqts., Winnipeg & Edmonton, highway constrn., bridge bldgs., (creosote pile type), bldg. constrn., frame & steel, drainage, soil survey, asphalt testing, mech. engrg., etc.

References: A. J. Taunton, W. Hobbs, C. L. Ingles, E. Kellett, G. B. Williams.

DREWES—GEORGE HENRY, of Winnipeg, Man. Born at Stettler, Alta., Oct. 21, 1916. Educ.: B.Sc., (Mech.), Saskatchewan, 1944; 1944, dftsman., International Nickel Co. of Canada, Copper Cliff, Ont.; 1944 to date, asst. supt. plants, Purity Flour Mills Limited, Winnipeg, Man.

References: J. W. Tomlinson, A. M. Thompson, W. E. Lovell, I. M. Fraser, N. B. Hutcheon.

DYCK—WILLIAM J., of Vancouver, B.C. Born in Russia, Sept. 26, 1912. Educ.: B.Sc., (Chem.Engrg.), Saskatchewan, 1942; 1942, (summer), plant operator, Consumers Coop. Refineries Ltd., Regina, Sask.; 1942-46, fuel technologist, Bureau of Mines, Ottawa; 1946-47, petroleum engr., Dept. Natural Resources, Regina; 1947 to date, chem. engr., British Columbia Research Council, Vancouver, B.C.

References: R. E. Gilmore, A. A. Swinnerton, H. Riesen, J. M. Duncan, N. B. Hutcheon.

GOLDSTONE—JAMES SYDNEY, of Sarnia, Ont. Born at Corning, Sask., May 27, 1912. Educ.: B.Sc., (Elect.), Manitoba, 1936; R.P.E., Ontario; 1936, surveyor, H.E.P.C., Ontario; 1936-40, elect. engr. on constrn. and mtce., Pickle Crow Gold Mines Ltd., Pickle Crow, Ont.; 1940-46, elect. mtce. supervision and engrg., Canadian Johns-Manville, Asbestos, Que.; at present, elect. supt., Dow Chemical Co. of Canada, Ltd., Sarnia, Ont.

References: E. P. Fetherstonhaugh, N. M. Hall, E. R. Love, J. Guthrie.

HEIM—WALLACE CLARE, of Toronto, Ont. Born at Wadena, Sask., July 26, 1917. Educ.: B.A.Sc., (Chem.Engrg.), British Columbia, 1940; R.P.E., Ontario; 1937-39, (summers), Consolidated Mining & Smelting Co., Trail; Britannia Mining & Smelting Co., Britannia, B.C.; 1940-42, asst. chem. engr., tech. dept., i/c lab. control tests in sulphite, sulphate, and groundwood mills, with general control analyses and development work on all phases of pulp & paper mfg. Pacific Mills Limited, Ocean Falls, B.C.; 1943 to date, chief engr., railroad dept., complete supervision of water treatment contracts and pertaining engrg. services supplied to all railroad customers, Aluminate Chemicals Ltd., Toronto, Ont.

References: H. G. Thompson, J. S. Fowler, L. S. MacGregor, H. Taylor, G. R. Connor, C. B. Jackson.

NONNENMAN—WILLIAM KENNETH, of Montreal, Que. Born at Montreal, Que., Sept. 24, 1913. Educ.: B.Sc., New Brunswick, 1934; M.Sc., M.I.T., 1936; R.P.E., Quebec; 1936-37, reinf. concrete designer, British Reinforced Concrete Engrg., Stafford, Eng.; 1937, (½ yr.), reinf. concrete design, Truscon Steel Co., Montreal; 1938, mgr., Nonnenman Tile Co., Saint John, N.B.; 1938-39, reinf. concrete design, Truscon Steel Co., Montreal; 1939-40, general design & quantities, Foundation Co. of Canada, Ltd., Montreal, Que.; with Aluminum Co. of Canada, Ltd., as follows: 1940-42, reinf. concrete design, 1942-44, asst. to constrn. mgr., Montreal and Arvida, 1944-46, squad boss & genl. structl. & estimating design, and at present, genl. structl. design & estimating, Montreal, Que.

Reference: M. P. Weigel, M. E. Hornback, W. L. Pugh, W. J. Wong, N. P. Taylor, D. G. Elliot.

SUCHAROV—BERT, of Montreal, Que. Born at Winnipeg, Man., Feb. 26 1908. Educ.: B.Sc., (Civil), Manitoba, 1933; 1929-32, (summers), acting municipal engr., Municipality of Springfield, Manitoba Good Roads; highway engr., town engr., Transcona; 1933, town engr., Transcona; 1934-47, genl. mgr., Milk Processing plant, Winnipeg; 1938-39, lecturer, dftng. & general shop, Vocational Training School; 1940-46, Major, then Lt.-Col., R.C.E.; Marchak Diesel Locomotive Ltd., New York, vice-president i/c design & production, president, Marchak Diesel Locomotives Ltd., Montreal and president, Sumac Ltd., Montreal, Que.

References: A. G. L. McNaughton, G. R. Turner, E. P. Fetherstonhaugh, N. M. Hall, E. C. Thorne, C. V. Antenbring.

WHITTAKER—JOHN DEAN, Major, R.C.E., of Ottawa, Ont. Born at Kaslo, B.C., Sept. 1, 1912. Educ.: B.A.Sc., (Civil), British Columbia, 1934; 1934-35, mine surveyer, Granby Consolidated; Mining Smelting & Power Co., Anyox, B.C., surveying & mapping underground workings; 1935-36, constrn. engr. & surveyor, Windpass Gold Mines, Chuchoo, B.C.; 1936-38, asst. res. engr., design & supvn. of constrn. of wood, steel and concrete bldgs. and misc. plant work, B.C. Pulp and Paper Co., Ltd.; 1938-40, sales engr., Gutta Percha and Rubber Ltd.; with R.C.E., as follows: 1940-43, Lieut., 1943-45, Captain, 1945 to date, Structl. Engr., Directorate of Works and Accommodation, Br. of Q.M.G., National Defence H.Q., Ottawa, Ont.

References: H. W. Love, G. R. Turner, S. Hardcastle, J. P. Carriere, H. L. Meuser.

WHYTE, GEORGE HERBERT, of Vancouver, B.C. Born at New Westminster, B.C., Feb. 19, 1890. Educ.: private study; 1908-10, with Dept. of Interior, as follows: 1910, various hydrographic surveys, jr.engr., Milk & St. Mary River Invest., 1911-12, engr., hydro survey, irrigation br., 1912-16, st. asst. to chief hydro engr.; 1916-19, Lieut. to Major, Canadian Engineers, C.E.F.; with Dept. of Interior as follows: 1919, divn. engr., Reclamation Service, 1920-40, asst. dist. chief engr., Dominion Water Power; 1940-42, Lieut.-Col., C.R.E., 3 Cdn. Div., 1942., Lieut.-Col. D.D.E.S., C.M.H.Q., London, Eng., 1942-45, Colonel, Commanding 1 Cdn. Eng. Rein. Unit., Eng.; 1945 to date, asst. dist. chief engr., (Eng. Civil Grade 4) Dominion Water & Power Bureau, Surveys & Engrg. Branch, Dept. of Mines & Resources, Vancouver, B.C.

References: F. H. Peters, A. L. Ford, C. E. Webb, V. Meek, J. M. Wardle, G. A. Gaherty.

Library Notes

(*Continued from page 60*)

CIRCUIT ANALYSIS by Laboratory Methods:

C. E. Skroder and M. S. Helm. Prentice-Hall, Inc., New York, 1946. 288 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.35.

The object of this book is to provide in a single volume a wide selection of laboratory circuit experiments, including a very comprehensive coverage of the related circuit theory and laws, the theory and limitations of the necessary instruments, and the methods of making measurements. The experiments are presented as problems to induce the student to adopt an analytical approach in determining the experimental data needed, the circuits to be used, the measurements to be made, and the interpretation of the observed and calculated data for a rational solution.

COLLIERY EXPLOSIONS and RECOVERY WORK:

J. W. Whitaker and H. L. Willett. 2 ed. Sir Isaac Pitman & Sons, Ltd., London, Toronto; Pitman Publishing Corp., New York, 1946. 230 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, 12s. 6d.

Following descriptions of some typical explosions, this textbook covers the conditions conducive to explosions in collieries, the ways in which they occur, preventive measures, and effective rescue methods. Separate chapters are also devoted to dust sampling and testing, and to inundations, another serious matter in coal mines. This is one of a series of British textbooks covering various aspects of the mining of coal and other stratified deposits.

DICTIONARY OF ELECTRICAL ENGINEERING:

G. W. Stubbings. E. & F. N. Spon, Limited, London, 1945. 219 pp., diagrs., tables, 7½ x 5 in., cloth, 10s.6d.

Composed of definitions of terms relating to the theory and practice of heavy electrical engineering, this small dictionary is intended for the use of students, practical engineers, and all those whose work brings them into contact with the field. A concise explanation of the more important technical terms is given. Since this book is published in England, British terminology is used.

DWELLING HOUSE CONSTRUCTION:

A. G. H. Dietz. D. Van Nostrand Co., New York, 1946. 371 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.00.

A comprehensive guide to frame building construction, this book explains in detail all of the steps involved in the complete erection of a house, from the original inspection of the site to the final coats of paint. Excavation and soils, foundations and footing design, framing details, roofing and flashing, windows and doors, lathing and insulation, etc., are described with numerous illustrative sketches and photographs supplementing the exact directions. Plumbing, heating and wiring are omitted as being separate specialized fields.

ELECTRONS (+ and —), PROTONS, PHOTONS, NEUTRONS, MESOTRONS, AND COSMIC RAYS, revised edition 1947:

R. A. Millikan. University of Chicago Press, Chicago, Ill., 1947. 642 pp., illus., diagrs., charts, maps, tables, 7½ x 5 in., cloth, $6.00.

Continuing the expansion of the author's original small work, "The Electron", this new edition replaces the last fifty pages of the previous edition by some 200 pages of new material under the following headings: release and utilisation of nuclear energy; geomagnetic studies on cosmic rays at low altitudes; discovery and significance of the mesotron; nature and number of the incoming primary rays; and the atom-annihilation hypothesis as to the origin of cosmic rays. The first 400 pages, dealing with the progressive developments in atomic theory, the mechanism of ionization, waves and particles, the neutron, and the release of nuclear energy, remain much the same except for the addition of new knowledge such as values of units, etc.

ELEMENTARY FLUID MECHANICS:

J. K. Vennard. 2 ed. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 330 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $4.00.

Fundamentals, physical properties, and fluid statics are discussed in the beginning chapters, followed by a chapter on frictionless flow to lay the groundwork for a number of important principles arising therefrom. The principles of similarity and dimensional analysis are similarly considered, as important tools for future use. The discussion of frictional processes leads to flow in pipes and open channels, and fluid measurements are dealt with. Considerable revision, including some condensation and the deletion of certain advanced topics, resulted in a shorter book despite the normal addition of recent developments. The principal change is the expansion of the original chapter on ideal fluid flow.

FUELS, COMBUSTION AND FURNACES. (Chemical Engineering Series):

By J. Griswold. McGraw-Hill Book Co., New York and London, 1946. 496 pp., illus., diagrs., charts, tables, 9½ x 6 in., cloth, $5.50.

Broad in scope, this new book provides an up-to-date chemical engineering text in an important field. It covers the fundamental background and the more essential specific details of the technology, combustion properties, and utilization of fuels, as well as the apparatus and equipment involved. It also introduces the student to petroleum refining technology and engineering, chemical engineering thermodynamics, chemical kinetics, refractories, and the process industries that use furnaces. A bibliography of available films is correlated with the text as supplementary material.

HANDBOOK OF CUPOLA OPERATION:

Published by American Foundrymen's Association, 222 W. Adams St., Chicago 6, Ill., 1946. 470 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.50.

Beginning with a historical summary of the metallurgy of iron, this handbook proceeds to take up in detail the full range of cupola operations. Topics covered include cupola construction, lining, charging equipment, blowing equipment, blast control, fuel, slags and fluxes, thermal equilibrium, and actual operational procedures. There is a twenty-seven page table of specific applications of alloy cast iron and a bibliography of some 500 references,

INTRODUCTION TO ELECTRON OPTICS:

V. E. Cosslett. Clarendon Press, Oxford, England; Oxford University Press, New York and Toronto, 1946. 272 pp., illus., diagrs., charts, tables, 9½ x 6 in., cloth, $6.50.

This book provides a connected treatment of the production, propagation and focusing of electron and ion beams. Its main subject is the theory of electron lenses, including aberrations, and their applications in cathode-ray tubes and electron microscopes. Attention is also paid to other devices employing electron beams in radio and atomic physics. The mathematical treatment has been subordinated to the description of physical principles. Reference lists are appended to each chapter, and a table of electronic data is included.

JOB EVALUATION:

F. H. Johnson, R. W. Boise, Jr., and D. Pratt. John Wiley & Sons, New York; Chapman & Hall, London, 1946. 288 pp., diagrs., charts, tables, 8½ x 5½ in., cloth, $3.75.

This book is designed to explain how a job-evaluation plan functions under actual operating conditions. The first part of the book demonstrates the recommended procedures for establishing the plan, evaluating the jobs, and estimating the cost of the program in terms of increased payroll. Succeeding chapters discuss the methods for assigning workers to the jobs and maintaining the plan in efficient operation. There is a bibliography.

(*Continued on page 68*)

Employment Service

The 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 therefore be particularly appreciated if employers would make the fullest possible use of these facilities to make known their existing or estimated requirements. Notices appearing in the Situations Wanted column will be discontinued after three insertions, and will be inserted upon request after a lapse of one month. Personal interviews by appointment.

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER experienced in use of physics and mathematics, under 30 years of age, required by industrial and chemical organization with Headquarters in Montreal. Duties include development work and study explosives and chemistry and hydro-dynamics. Salary open. Apply to File No. 3995-V.

ELECTRICAL

ELECTRICAL ENGINEER with 2 years' experience in industrial electrical maintenance and at least 1 year's supervisory experience, age 20-35, required by chemical organization with headquarters in Montreal. Duties include responsibility of all electrical and instrument maintenance also electrical distribution system and air-conditioning system. Salary open. Apply to File No. 3995-V.

ELECTRICAL ENGINEERS, age 30 to 40, required for the Commercial and Distribution Department of large Hydro-electric Utility. Must have experience in electrical distribution. Salary open. Apply to File No. 4002-V.

ELECTRICAL ENGINEER required for Research Laboratory in Montreal, Knowledge and practical experience in electronics and electric welding desirable. Permanent position. Salary open. Apply to File No. 4004-V.

MECHANICAL

GRADUATE MECHANICAL ENGINEER required by engineering concern in Montreal area engaged in manufacture of hydraulic turbines and mining machinery. Preferably with 5 or more years' experience. Excellent working conditions, free pension, group and health insurance, five-day week, cafeteria service. Salary open. Apply to File No. 3992-V.

MECHANICAL DESIGN DRAUGHTSMAN with experience in reinforced concrete and structural steel required by a mining company in Northern Ontario. Housing available. Salary open. Apply to File No. 3994-V.

MECHANICAL ENGINEER, with 2 or 3 years' experience, preferably bilingual, required as Mechanical Development Engineer by industrial and chemical organization with headquarters in Montreal. Duties will be conducting investigations on existing equipment and a certain amount of plant layout work and draughting. Salary open. Apply to File No. 3995-V.

*MECHANICAL ENGINEER, recent graduate, required by an industrial and chemical organization with headquarters in Montreal. Duties include work assignments of a special nature and studies of a technical nature in connection with maintenance work. Salary open. Apply to File No. 3995-V.

MECHANICAL ENGINEER with 1 to 3 years' experience in production, required as Industrial Engineer by industrial and chemical organization with headquarters in Montreal. Duties include responsibility for conducting methods engineering studies using methods of process charts, time and motion study. Salary open. Apply to File No. 3995-V.

MECHANICAL ENGINEER, required by a Montreal manufacturer of machines and equipment for work consisting of general engineering and design in connection with the manufacture of pulp and paper machinery. Salary open. Apply to File No. 4000-V.

MECHANICAL ENGINEER, required by a textile manufacturing concern near Montreal. Applicant after becoming acquainted with the plant would be expected to act as general follow up man on repair of mechanical and electrical equipment also see that all material necessary is on order or on hand. Salary open. Apply to File No. 4001-V.

*MECHANICAL ENGINEERS required by a specialized industrial plant in Montreal as designers. Must be capable of working in a supervisory capacity in Drawing Office. Salary open. Apply to File No. 4005-V.

MECHANICAL ENGINEER with some experience in production control methods required for a progressive furniture manufacturer in the Eastern Townships. Preferably bilingual. Salary open. Apply to File No. 4006-V.

MECHANICAL ENGINEER, must be bilingual, required by paper company for general duties in line with capabilities and interest. Position in very small community in Province of Quebec. Salary open. Apply to File No. 4020-V.

MECHANICAL ENGINEER required as assistant in Chief Engineers Department by large paper company. Paper experience essential. Some knowledge of French language would be helpful. Must be able to complete investigations and write reports. Age 28-40. Salary $350-$450. Apply to File No. 4022-V.

METALLURGICAL

METALLURGICAL ENGINEER, preferably with lab. experience also some industrial experience would be helpful, required by large transportation company in Montreal. Salary open. Apply to File No. 3998-V.

MISCELLANEOUS

ELECTRICAL OR MECHANICAL ENGINEER, recent graduate, bilingual preferred, required for Public Utility in Quebec City. Salary open. Apply to File No. 3993-V.

GRADUATE ENGINEER, age 32 up, preferably bilingual and with 10 years' experience in industrial design required by chemical organization with headquarters in Montreal. Duties include supervision of Works Design Department, supply draughting and design service for plant, prepare appropriation requests, maintain cost estimating units, etc. Salary open. Apply to File No. 3995-V.

GRADUATE ENGINEER, three to five years' plant experience, required by chemical organization in Montreal. Duties include assisting in developing and carrying out in various plants training programs in subject and related fields for junior industrial engineers. Develop and apply such office routine as may be necessary. Salary open. Apply to File No. 3995-V

MECHANICAL ELECTRICAL OR CIVIL ENGINEER, age 23-30, preferably single and bilingual with some experience in maintenance required by an industrial and chemical organization with headquarters in Montreal. Duties include construction project and design studies. Salary open. Apply to File No. 3995-V.

GRADUATE ENGINEER, with some experience in industrial building design to supervise construction of the railway buildings and allied structures of a large railway terminal project in Montreal. Salary $300 to $350. Apply to File No. 3996-V.

SENIOR ENGINEER for layout work on construction job required by construction firm in Montreal. Location of job around 300 miles west of Montreal. Salary $300 to $350. Apply to File No. 3997-V.

CIVIL OR MECHANICAL ENGINEERS with up to five years' design experience required by an engineering firm in Montreal for hydraulic work. Salary open. Apply to File No. 3999-V.

CIVIL OR MECHANICAL ENGINEER wanted with 5 to 8 years' experience for key position in moderate size plant in Manitoba doing fabrication of Plate Work and Light Steel Work, also Grey Iron Foundry and Machine Shop. This will lead to key position in a growing organization. Salary open. Apply to File No. 4003-V.

JUNIOR SALES ENGINEER, preferably with a few years' sales experience, required by Montreal branch of a firm manufacturing industrial building products. Salary open. Apply to File No. 4007-V.

SALES ENGINEER required by a manufacturer of industrial building products in the Toronto area. Preferably with sales experience and knowledge of building products. Salary open. Apply to File No. 4008-V.

SENIOR SALES ENGINEER required as District Manager by a firm manufacturing industrial products in Ontario. Must have considerable sales experience. Salary open. Apply to File No. 4008-V.

MECHANICAL AND CHEMICAL ENGINEERS, interested in entering the Pulp and Paper industry, required in Newfoundland. Vacancies in Technical Department and studying process work and improved methods of operation. Pulp and paper experience is not necessary. Salary open. Apply to File No. 4009-V.

SAFETY SUPERVISOR required for South America. Age 25-40 years. Single. To supervise safety activities, promote safety first and inspect operations to assure proper installation and use of safety devices. Salary $350. U.S. currency. Apply to File No. 4011-V.

RESERVOIR ENGINEER, required for South America. Age 25-35. Should be experienced in reservoir and production cost analysis. Capable of determining efficient flow rates for reservoirs and wells. Salary approximately $400. U.S. currency. Apply to File No. 4011 V.

MAINTENANCE ENGINEER, required for South America. Age 35-40. Duties include refinery maintenance, inspection of units, metal inspection work. Responsible for engineering calculations, design of equipment and pipefitting work. Salary $375. U.S. currency. Apply to File No. 4011-V.

POWER PLANT SUPERVISOR required for South America. Age 30-40, single preferred. To supervise steam power plant including operating, boiler cleaning and minor repairs. Salary $375. U.S. currency. Apply to File No. 4011-V.

SALES AND SERVICE ENGINEER preferably a graduate in mechanical or chemical engineering required for power plant field in the Toronto area. Possession or ability to obtain an automobile for transportation essential. Starting salary $250 to $325 according to experience. Apply to File No. 4012-V.

ENGINEERING DRAUGHTSMEN, with mechanical background, required by large paper company in the Province of Quebec. Salary $250-$300. Apply to File No. 4019-V.

GRADUATE ENGINEER, required as Assistant to Manager of Sawmill and Woodlands operations. Position located in Ontario. Good commercial sense essential, also some sales ability. Salary $300-$350. Apply to File No. 4021-V.

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

CHEMICAL

CHEMICAL ENGINEER OR CHEMIST, preferably with Ph. D., required by a pulp and paper company with plants in Eastern Canada, for research work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER required by a pulp and paper company with plants in Eastern Canada, for mill control and pilot plant work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER OR CHEMIST interested in textile dyeing required by an industrial firm in South Western Quebec. Salary open. Apply to File No. 3798-V.

*CHEMICAL METALLURGIST with background in extraction metallurgy and ore dressing (knowledge of mineralogy desirable) and experience in use of petrographic microscope. Required for research work in B.C. Maximum salary $4,000. Apply to File No. 3865-V.

CHEMICAL ENGINEER with considerable mechanic and hydraulic experience or mechanical engineer with good chemical knowledge and experience in hydraulics, required by a manufacturer in Ontario. Salary open. Apply to File No. 3928-V.

CHEMICAL ENGINEER OR CHEMIST required by a Pulp and Paper Mill in Ontario to develop, install and directly supervise the operation of technical control systems for raw material, inspections process control, quality reporting, inventory, measurement and product satisfaction. Salary open. Apply to File No. 3938-V.

CHEMICAL ENGINEER OR CHEMIST required as Technical Superintendent to administer the Technical Department of a pulp and paper mill in Ontario. Minimum of 5 years in technical or production work in the pulp and paper industry. Salary open. Apply to File No. 3938-V.

CHEMICAL ENGINEER required by Pulp and Paper Mill in Ontario to undertake the solution of manufacturing and technical control problems etc. Preferably experience in the pulp and paper industry. Salary open. Apply to File No. 3938-V.

CHEMICAL ENGINEER, recent graduate, required to study and become experienced with industrial products fabricated from carbon or graphite by firm in Toronto area. Position to eventually lead to sales. Salary $180 to $200. Apply to File No. 3958-V.

CHEMICAL ENGINEER, recent graduate, is needed by a chemical manufacturing firm situated in the Province of Quebec. Some experience in oil refinery, pulp and paper, or synthetic resin manufacture would be useful. Salary open. Apply to File No. 3978-V.

*Filled since appearance in advance notice.

CHEMICAL ENGINEER OR CHEMIST wanted by large manufacturers of bleached sulphate pulp for their Technical and Development Department. Several years' experience preferably in the pulp and paper industry. Mill located in Northern Ontario. Salary open. Apply to File No. 3991-V.

CIVIL

CIVIL ENGINEER to take charge of work in a drainage district in Quebec. Must be bilingual, may be recent graduate. Salary from $200. Apply to File No. 3479-V.

CIVIL ENGINEERS with experience in detailing and designing structural steel and reinforced concrete for manufacturers are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

CIVIL ENGINEERS, recent graduate up, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

GRADUATE CIVIL ENGINEER required by a public utility in the Montreal area with three or four years' experience in design of reinforced concrete and structural steel. Salary $250-$300. Apply to File No. 3766-V.

CIVIL ENGINEERS with some experience on design and field work required by a public Utility in Toronto. Salary open. Apply to File No. 3813-V.

CIVIL ENGINEERS required as draughtsmen in bridge department of large transport company. Preferably with experience in steel, concrete and timber construction. Location Montreal. Salary $200-$300. Apply to File No. 3884-V.

CIVIL ENGINEER, required in New Brunswick. Must be qualified designer of miscellaneous public utility buildings in frame and masonry construction. Thorough working knowledge of timber, reinforced concrete and steel framing essential, knowledge of the design of various types of heating system and plumbing. Salary open. Apply to File No. 3887-V.

CIVIL ENGINEER required as Town Engineer of a town in the Maritimes. Required to supervise and layout work for Water and Sewerage Department also construction of a general nature for the Electric Light Department. Salary open. Apply to File No. 3930-V.

CIVIL ENGINEER, required by a Steel Company in Montreal for the design of reinforced concrete frame. Salary open. Apply to File No. 3931-V.

JUNIOR CIVIL ENGINEER, with some structural experience, required for general duties by a textile manufacturing concern near Montreal. Salary around $300. Apply to File No. 3954-V.

GRADUATE CIVIL ENGINEER with some experience in municipal work required as Assistant to the Director of Community Planning of the Province of Saskatchewan. Starting salary $200-$250. Apply to File No. 3957-V.

CIVIL ENGINEER, recent graduate, required to understudy City Engineer of a city in Western Quebec. Salary open. Apply to File No. 3966-V.

JUNIOR ENGINEER, preferably with civil background required for sales and service by a Montreal manufacturer of waterproofing compounds. Salary open. Apply to File No. 3968-V.

CIVIL ENGINEER required in Montreal with considerable experience in design of reinforced concrete and steel structures. Ability to make stability reports of wharves and retaining walls, also draft specifications, prepare estimates and economic studies. Preferably bilingual and veteran with overseas service. Salary not less than $3,480.00. Apply to File No. 3987-V.

CIVIL ENGINEER required in Montreal with general knowledge of reinforced concrete and steel structures. Special knowledge of triangulation surveys, boundry surveys, also laws and procedure to be followed in regard to the purchase, transfer and registration of lands in the Province of Quebec. Must be bilingual. Preferably veteran. Salary not less than $3,480. Apply to File No. 3987-V.

ELECTRICAL

ELECTRICAL ENGINEER, age 30-45, required as sales engineer in Canada for U.S. firm making special equipment for transport and industry. Must have sales training in electrical equipment instruments also experience as sales and service engineer. Salary open. Apply to File No. 3447-V.

ELECTRICAL ENGINEER recent graduate, required for the engineering staff of a paper mill in the Lake St. John area. Salary open. Apply to File No. 3507-V.

ELECTRICAL ENGINEER with considerable industrial experience required as a safety engineer by a public utility in the Montreal area. Bilingual preferred. Salary open. Apply to File No. 3654-V.

ELECTRICAL ENGINEER, with general knowledge of a.c. and d.c. motors, switchgear, mercury rectifiers, transformers and other electrical apparatus, for sales work in Eastern Canada, age 30 to 35. Salary open. Apply to File No. 3695-V.

*ELECTRICAL DRAUGHTSMEN with several years' experience in industrial layouts for large concern in Eastern Townships. Permanent position and attractive salary available for experienced men. Apply to File No. 3701-V.

*ELECTRICAL ENGINEER, required by an insurance company, preferably with a few years' practical experience for the inspection of boilers. steam plant and allied equipment in Montreal area. Salary open. Apply to File No. 3754-V.

ELECTRICAL ENGINEER, recent graduate up, required by a manufacturer in Montreal, for sales engineering. Preferably bilingual and familiar with rotating electrical equipment. Salary $200. up. Apply to File No. 3761-V.

GRADUATE, ELECTRICAL ENGINEERS, with 3 to 10 years' experience in design operation, layout of substations, switching stations, and electrical machinery, together with engineering studies, including draughting for a large hydro-electric power house in Quebec. Salary $225. up according to experience. Apply to File No. 3787-V.

ELECTRICAL ENGINEER required for power sales by an electrical utility in Province of Quebec. Preferably experienced. Bilingual. Salary open. Apply to File No. 3802-V.

ELECTRICAL ENGINEER with experience in layout and design of generating and transformer stations, required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

SEVERAL EXPERIENCED ELECTRICAL DRAUGHTSMEN, for the design and layout of industrial power and control systems. Required by consulting engineering office in Montreal. Salary open. Good chance for advancement. Apply to File No. 3890-V.

JUNIOR ELECTRICAL ENGINEER, with practical experience in general manufacturing industries, required by an industrial organization in Ontario. Salary open. Apply to File No. 3904-V

ELECTRICAL ENGINEERS, required for sales engineering work in Western Canada. Graduates with some selling experience preferred. Salary open, plus expenses. Apply to File No. 3915-V.

*ELECTRICAL ENGINEER, recent graduate, required in Montreal for general engineering on telephone and radio. Salary $175 to $225. Apply to File No. 3923 V

*Filled since appearance in advance notice.

ELECTRICAL ENGINEER wanted for new Chemical Plant in Western Ontario. Engineer must have had previous Electrical Rectification experience. Salary open. Apply to File No. 3945-V.

JUNIOR ELECTRICAL ENGINEER, age about 30, required as assistant to superintendent of light department in Montreal area. Practical experience in Hydro Distribution and Steam Turbines. General office routine of administrative nature. Salary open. Apply to File No. 3950-V.

GRADUATE ELECTRICAL ENGINEER, age 28-32, required for sales engineering by an industrial firm specializing in products, made of carbon and graphite in Toronto area. Experience in plant maintenance or installation work or Canadian General Electric or Westinghouse test course desirable. Salary $3,000-$3,600. Apply to File No. 3958-V.

ELECTRICAL DRAUGHTSMAN required by a firm of Engineer Contractors in Alberta for layout and plotting with a minimum of supervision. Should be accustomed to working with power lines to 2,300 volts and must be able to do lighting circuits, both overhead and underground. Salary $250. to $300. Apply to File No. 3972-V.

PROFESSOR IN ELECTRICAL ENGINEERING required by a Canadian University in the Province of Quebec for second term, beginning January. Preferably with teaching and practical experience in power, electrical machinery design, lab. etc. Bilingual preferred. Attractive salary available for right man. Apply to File No. 3982-V.

RECENT GRADUATE, electrical background, preferably bilingual, required by a Montreal manufacturer of electric motors, generators, ventilating equipment and pumps. Position to eventually lead to sales. Salary open. Apply to File No. 3989-V.

MECHANICAL

MECHANICAL ENGINEERS, preferably with design experience, are required for armament research and development by government establishment in the Quebec area. Salary from $190. Apply to File No. 3401-V.

MECHANICAL ENGINEER with experience in pulp and paper or mining work required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

JUNIOR MECHANICAL ENGINEER with knowledge of precision machine shop practice and aptitude for research work in metals and plastics required for an organization in Toronto for the production of artificial limbs. Must be veteran. Salary from $225. Apply to File No. 3675-V.

MECHANICAL ENGINEERS with at least five years' experience in the pulp and paper industry required by an Ontario Paper Company. Salary open. Apply to File No. 3733-V.

MECHANICAL ENGINEER experienced in heating, ventilating and air-conditioning required by a consulting engineer in Montreal. Salary open. Apply to File No. 3773-V.

MECHANICAL ENGINEERS required by a Pulp and Paper Mill at Powell River, B.C. Preferably with experience in plant design in the pulp and paper industry. Salary according to qualifications. Salary open. Apply to File No. 3796-V.

MECHANICAL ENGINEERS with experience in plant layout and design or ventilation problems or general mechanical design, required by a firm in Quebec. Salary from $250. Apply to File No. 3818-V.

MECHANICAL ENGINEER, age 35-40 with considerable experience in design and layout of machinery and equipment, required by an organization with Head Office in Montreal. Salary $300-$400. Apply to File No. 3820-V.

MECHANICAL ENGINEER with six to ten years' experience in maintenance and engineering work required by alkali manufacturers in Ontario Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER, required by a manufacturer in Ontario for the plant operation staff. Salary open. Apply to File No. 3833 V.

MECHANICAL ENGINEER with knowledge of physical metallurgy heat treatment, ability in stress analysis and design. Required for research work in B.C. Maximum salary $4,000. Apply to File 3865-V.

MECHANICAL ENGINEER, age 30-38, required for Northern Ontario Paper Mill. Preferably with paper mill experience or experience in general layout and design. Knowledge of pumps capacities, piping, conveyors, estimating and structural design essential. Salary open. Apply to File No. 3891-V.

MECHANICAL ENGINEER, bilingual, with 4 or 5 years' experience in sheet metal work required as Plant Manager by a manufacturer in the Province of Quebec. Salary open. Apply to File No. 3894-V.

*MECHANICAL ENGINEER required by a firm of Power House and Building Specialist to act as representative in the Toronto territory. Must be familiar with that district. Preferably manufacturers' agent to act as sub-agent. Salary open. Apply to File No. 3897-V.

RECENT GRADUATE mechanical background, required by a manufacturer in Montreal for work in machine design, possibly for production in the future. Salary $225. Apply to File No. 3901-V.

MECHANICAL ENGINEER, age 25 to 35, experienced in industrial plant layout and machine design required by manufacturing firm in Brantford. Salary open. Apply to File No. 3907-V.

MECHANICAL OR CHEMICAL ENGINEER required by a Pulp and Paper Mill in Ontario to secure continuous optimum performance from all process instruments, maintenance of instruments, etc. Salary open. Apply to File No. 3938-V.

MECHANICAL ENGINEER, recent graduate, with some knowledge of heat exchanges, condensers, or any type of unfired pressure vessels required by an industrial organization in Montreal. Salary open. Apply to File No. 3976-V.

MECHANICAL ENGINEER, recent graduate, bilingual, with some experience in general plant work, required in Montreal. Industrial engineering experience would be useful. Duties include time-study in Standards Department. Salary open. Apply to File No. 3980-V.

MECHANICAL ENGINEER age 25 to 30 is required by a company in Shawinigan Falls to eventually act as Assistant Works Manager when qualified. Salary open. Apply to File No. 3985-V.

MECHANICAL ENGINEER, with experience in plant lay-out and knowledge of reinforced concrete, timber and steel design, required in an industrial manufacturing and processing plant situated 75 miles from both Ottawa and Montreal. Salary open. Apply to File No. 3990-V.

MINING

MINING ENGINEERS, with varied experience required by a firm in Quebec for general mine operation, exploitation and development work. Salary from $250. Apply to File No. 3818-V.

MINING ENGINEER with several years' experience required by a company engaged in large scale asbestos production in Quebec. Salary open. Apply to File No. 3935-V.

MISCELLANEOUS

MANAGEMENT ENGINEER with business administration and mechanical background, age 30 up, bilingual with at least five years' pratical experience, required by an industrial engineering consultant in Montreal. Salary open. Apply to File No. 3307-V.

STRUCTURAL STEEL DRAUGHTSMEN AND CHECKERS, preferably graduate engineers but any experienced men acceptable, are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

*ASSISTANT PLANT ENGINEER with paper mill experience required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

GRADUATE ENGINEERS, required by an industrial and chemical organization with headquarters in Montreal for all phases of research, design, operation development, production and maintenance. Salaries open. Apply to File No. 3588-V.

DESIGN DRAUGHTSMAN for the design of cranes and hoists of all types, capable of making and checking complete manufacturing detail drawing, required by a manufacturer in Southern Ontario. Apply by letter with full details. Salary open. Apply to File No. 3628-V.

SALES ENGINEER with wide engineering experience, wanted by a company in Toronto for the sale of textile machinery and construction equipment. Salary open. Apply to File No. 3639-V.

JUNIOR ENGINEERS, recent graduates up, as designing draughtsmen for a brewing company with headquarters in Montreal. Salary from $200. Apply to File No. 3670-V.

CHEMICAL OR METALLURGICAL ENGINEERS, from recent graduates up, required by a Quebec firm engaged in metal production for employment as production and development engineers. Salaries open. Apply to File No. 3693-V.

MINING AND METALLURGICAL ENGINEER, age about 30, with considerable experience, required by a manufacturer in the St. Maurice Valley. Salary open. Apply to File No. 3723-V.

CIVIL ENGINEERS AND ASSISTANT HYDRAULIC ENGINEERS required for government organization on West Coast for highway and construction. Salary open. Apply to File No. 3724-V.

*CONSTRUCTION ENGINEER with considerable experience required for the permanent staff of a Montreal inspection company. Salary about $200, Age immaterial. Apply to File No. 3728-V.

STRUCTURAL STEEL DETAILER AND CHECKER with considerable experience, required for checking shop details by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

DETAILER AND DESIGNER for reinforcing steel with considerable experience, required by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

SALES ENGINEER, preferably bilingual required by a Montreal firm dealing in building materials. Salary from $200. Apply to File No. 3745-V.

GRADUATE ENGINEER, required by an electrical firm in Montreal to organize publicity department and edit trade journal. Salary open. Apply to File No. 3751-V.

STRUCTURAL STEEL DRAUGHTSMAN, qualified to detail and check all classes of structural steel, and to supervise draughtsmen in a large drawing office on the West Coast. Salary open. Apply to File No. 3777-V.

BRIDGE ENGINEER, qualified to be in charge of the design and supervision of the construction of highway bridges. Apply stating qualifications, experience, age and salary wanted. Apply to File No. 3780-V.

GRADUATE CIVIL OR MECHANICAL ENGINEERS with 3 to 10 years' experience in design, cost estimates, draughting, and engineering studies for a large hydro-electric power house in Quebec. Salary $225 up according to experience. Apply to File No. 3787-V.

STEAM PLANT ENGINEER, for large concern in Eastern Townships, with at least 5 years' practical experience. Must be familiar with thermo-dynamics, combustion control, steam turbines, mechanical refrigeration, hydraulics, etc. Permanent position and attractive salary for the right man. Apply to File No. 3791-V.

RECENT GRADUATES OR JUNIOR ENGINEERS, with mechanical background, required by a Montreal engineering, fabricating and contracting firm for training purposes leading to sales and service. Area Montreal. Salary $175 up. Apply to File No. 3810-V.

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open. Apply to File No. 3811-V.

DRAUGHTSMAN, preferably with mechanical background, required by a manufacturer in Montreal for design work on electrical equipment. Salary open. Apply to File No. 3829-V.

CITY ENGINEER required by City of Moose Jaw, Saskatchewan. Salary open. Apply to File No. 3856-V.

DRAUGHTSMAN of the following classes:—Architectural, piping layout, equipment layout, mechanical design, steam plant, heating and ventilating, electrical and plumbing required by an industrial organization in Montreal. Salaries open. Apply to File No. 3860-V.

STRUCTURAL STEEL CHECKER AND ONE DETAILER CHECKER, wanted for large fabricating plant in Vancouver, B.C. Age between 30 and 40 years preferred. Must be experienced. Give full information and references. Salary open. Apply to File No. 3862-V.

MECHANICAL, CHEMICAL OR CIVIL ENGINEER, recent graduate up, required for sales and service in Toronto and Alberta by a Montreal manufacturer. Salary open. Apply to File No. 3867-V.

MECHANICAL OR CHEMICAL ENGINEER, recent graduate, required by a firm in Montreal. Ability to do simple drawings, such as layout of piping and instruments. Some experience in oil refinery or chemical plant or pulp and paper would be useful. Position to eventually lead to sales. Salary $200. Apply to File No. 3879-V.

GRADUATE ENGINEERS required for all phases of research, design, operation, and development by an industrial organization with Head Office in Montreal. Salaries open. Apply to File No. 3882-V.

SALES ENGINEERS, required by established Canadian manufacturer of fabricated steel products. Some construction experience an advantage. Wanted for Maritimes, Ontario and Manitoba. Salary open. Apply to File No. 3883-V.

GRADUATE ENGINEER, familiar with industrial processes, metallurgical and chemical engineering as applied to steel, copper, mining and chemical plants. Broad general experience in estimating and designing. Salary open. Toronto area. Apply to File No. 3886-V.

CIVIL OR STRUCTURAL ENGINEER, 24-35 years, required for Northern Ontario Paper Mill. At least 2 years' construction and 2 years' design experience. Opportunity to train junior personnel. Salary not less than $350. Apply to File No. 3891-V.

*INDUSTRIAL ENGINEER, preferably with mechanical background and several years' experience in time study, estimating, etc. Required by a manufacturer in Montreal. Salary $250. up according to experience. Apply to File No. 3893-V.

STRUCTURAL ENGINEER, preferably a graduate civil engineer with experience in the design of mill buildings required by a paper manufacturer in Eastern Ontario. Salary open. Apply to File No. 3896-V.

DETAILERS OR JUNIOR DESIGNERS on mechanical or sheet metal design required by an industrial organization in Ontario. Salary open. Apply to File No. 3904-V.

INDUSTRIAL ENGINEERS, with production experience required by a firm of industrial consultants in Montreal. Preferably with experience in time study, cost control, etc. Salary around $400. depending on quallifications. Apply to File No. 3910-V.

RECENT GRADUATES in Electrical or Mechanical Engineering can still be offered the opportunity of being trained by large Hydro-Electric Utility. Very good opportunities for regular employment in various departments at the completion of training period. Minimum salary 1st year $200; 2nd year $215. Apply to File No. 3912-V.

*CIVIL OR MECHANICAL ENGINEER, interested in the sales and engineering of power transmissions, gravity conveyors and grain separators required in Western Canada. Salary open. Apply to File No. 3915-V.

*GRADUATE ENGINEER OR PHYSICIST, bilingual, preferably with knowledge of X-Rays required by Canadian office of worldwide electronic concern to manage X-Ray application engineering activities. Salary $2,700 to $3,600. or more depending on qualifications. Apply to File No. 3917-V.

*JUNIOR ENGINEER with some structural experience required by large milling company with headquarters in Toronto for design work on flour and feed mill buildings and equipment. Salary open. Apply to File No. 3918-V.

*GRADUATE ENGINEER from a recognized university, preferably in the field of applied science, with a few years' of industrial experience and fluently bilingual; possession or ability to obtain an automobile for transportation, essential. Required in Montreal. Salary open. Apply to File No. 3927-V.

GRADUATE ENGINEER, Mechanical, Electrical or Civil, about 30 years of age, required by a large Hydro-Electric Utility in Montreal for Field Testing Hydraulic Turbines. Salary open. Apply to File No. 3932-V.

RECENT GRADUATE required by a Montreal contractor for survey and making of plans. Must be bilingual. Salary $175. up according to experience. Apply to File No. 3933-V.

*RECENT GRADUATE, willing to learn and study in detail the welding industry, required by an industrial organization in Montreal. Salary open. Apply to File No. 3937-V.

TWO METALLURGICAL ENGINEERS AND ONE CHEMICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No. 3942-V.

SALES ENGINEER required by well known manufacturer of mechanical equipment to solicit industrial accounts throughout the Province of Quebec. Applicants must reply giving full details, age, training, etc. Salary open. Apply to File No. 3951-V.

INDUSTRIAL ENGINEER thoroughly experienced in time study, standard data and wage incentive installation and administration required for firm in Quebec. Salary open. Apply to File No. 3952-V.

JUNIOR ENGINEERS, preferably with mechanical background required for general duties by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 3954-V.

CITY ENGINEER, required by a City in Saskatchewan to take full charge of its utilities which include electric light, power, sewer, water, sidewalk, etc. Salary open. Apply to File No. 3955-V.

GRADUATE ENGINEER experienced in work analysis and job simplification. Should be bilingual and experienced in handling staff. Permanent position in Montreal. Salary $350, with good prospects for advancement. Apply to File No. 3959-V.

INDUSTRIAL ENGINEER to act as assistant in the Engineering Department of Meat Packing firm with plants throughout Canada. Headquarters in Calgary. Requires knowledge of building construction, mechanical maintenance and power plant work. Experience in refrigeration desirable. Salary open. Apply to File No. 3960-V.

JUNIOR ENGINEER preferably chemical background required for Alberta refinery. Duties include plant tests, inspection of equipment and assistance on designs and specifications. Opportunity for supervised training in all phases of refinery operations. Salary open. Apply to File No. 3961-V.

*EXPERIENCED DRAUGHTSMAN required for civil engineering work by a paper company in Eastern Quebec. Duties will include designs and details of buildings, dams and miscellaneous structures required in Woodlands operations. Preferably a single man and bilingual. Salary $225-$300. Apply to File No. 3962-V.

DRAUGHTSMAN preferably with electrical or mechanical background required for industrial plant layout and electrical and mechanical equipment of buildings, required by a firm of consultants in Montreal. Salary open. Apply to File No. 3964-V.

JUNIOR SALES ENGINEERS with production experience required by a firm of industrial consultants in Montreal. Salary $300. depending on qualifications. Apply to File No. 3965-V.

PRODUCTION SUPERVISOR, age 30 to 45 years, with experience in sheet metal fabrication required by established Canadian manufacturer in Ontario. Salary open. Apply to File No. 3970-V.

GRADUATE ENGINEERS, age 20-35, with training in one or more of the following lines—foundation work involving reinforced concrete; structural steel; steam and process piping; oil refinery experience; boilers; pumps and heat exchange equipment and miscellaneous machinery; required by oil company in Montreal. Salary open. Apply to File No. 3974-V.

ENGINEER with estimating and cost experience, able to read blueprints, take stock of and price materials, evaluate general machine and assembly shop operations and fully capable of organizing and installing a Standard Cost System. Required by a manufacturer in Southern Ontario. Salary according to qualifications and ability. Apply to File No. 3977-V.

*JUNIOR ENGINEER with estimating and time study experience covering Tools and Dies and general machine shop work required by a machine and tools manufacturer in Ontario. Some experience in designing and engineering department would be an advantage. Salary open. Apply to File No. 3979-V

*Filled since appearance in advance notice.

GRADUATE ENGINEER, with some experience in a manufacturing industry, required by Hamilton company. Some knowledge of production operations, mill scheduling, job evaluation, time study, job methods, industrial relations would be helpful. Salary open. Apply to File No. 3981-V.

GRADUATE ENGINEER, interested in sales, preferably with electrical background, required in Montreal. Salary around $275. Apply to File No. 3983-V.

*JUNIOR ENGINEERS, required by a Wholesale Coal Importing Company in Montreal for duties, primarily co-operation with Sales Department in combustion service work. Salary open. Apply to File No. 3984-V.

ASSISTANT CITY ENGINEER

Duties include operation of the pumping and filtration plant; sewage disposal plant; incinerator and cleansing branch; asphalt plant also construction of street paving, concrete curbs, sidewalks, sewer and water mains and the building inspection Department.

Salary will be $4.000.-$4.500.

Applications stating full particulars to be addressed to the undersigned at the City Hall, Saskatoon, Saskatchewan.

ANDREW LESLIE (*City Commissioner*)

Experienced Designing Draughtsmen

Preferably with at least 5 years' experience in manufacture of Newsprint or Sulphite pulp.

Applicants must be capable of doing their own fieldwork, preparing layout drawings and also complete estimates. Partial supervision of the construction work involved may be necessary.

Very good salaries and opportunities for advancement. Permanent employment. Apply to File No. 4014-V.

SENIOR CHEMIST PAPER INDUSTRY

Required by leading Paper Manufacturer in Eastern Canada.

Successful applicant should be a University Graduate with some experience in Paper Mill Control work. This position offers plenty of scope for advancement.

Complete details of education and experience should be made in writing to File No. 4013-V.

MECHANICAL ENGINEER for Paper Mill Converting Department

by large Paper Manufacturer in Eastern Canada.

Applicant should be a University Graduate with Production and Mechanical Maintenance experience. Wage incentive plan on light automatic equipment. Position offers good future for applicant with required experience.

Reply stating age, experience, etc., to File No. 4013-V.

Wanted Immediately

Mechanical, structural and electrical engineers as designers, draughtsmen and construction cost estimators for mining, metallurgical, chemical and fertilizer plant design and layout by the Consolidated Mining and Smelting Company of Canada, Limited, Trail, B.C. Reply giving full particulars of education, experience, age, status, salary expected and when available to Manager, Personnel Division, at the above address.

GRADUATE ELECTRICAL ENGINEER

Experienced in Power Station, Transmission and Distribution design and installation. Permanence and advancement depending upon performance. Applicants should state full details of qualifications, when available and salary expected. Address: Engineering Department, Power Corporation of Canada Limited, 355 St. James St. W., Montreal.

Bilingual Graduate

A vacancy exists on the staff of the National Research Council in Ottawa for a University Graduate (bilingual) in Applied Science, preferably Mechanical Engineering. The incumbent of the position will be expected to make literature searches, to prepare replies to technical inquiries on a variety of subjects and to translate technical papers into French. Salary range $3,000-$4,000, depending on experience and qualifications. Apply Personnel Officer, National Research Council, Ottawa.

*Filled since appearance in advance notice.

Situations Wanted

PART TIME WORK—Senior Civil Engineer P.E.Q., M.E.I.C. Montreal area, available part time where consultant or engineer staff short handed. Preliminary plans, estimates, reports, industrial or engineering projects. Apply to File No. 1021-W.

MECHANICAL ENGINEER, B.Sc. Queen's '33, M.E.I.C., M.I.A.S., P.Eng. Que. Married, age 37, over twelve years' experience including design, stress analysis, maintenance, inspection, administration and 5½ years as an R.C.A.F. Engineer Officer. Presently employed, desires permanent position with good future prospects. Preferably in an English speaking locality. Apply to File No. 1042-W.

ELECTRICAL ENGINEER, Jr. E.I.C., P.E. Que., McGill '44, single, bilingual, ex-naval officer, two years' experience as assistant electrical superintendent in a large industrial plant. Desires change in position. Apply to File No. 1450-W.

CIVIL ENGINEER, P. Eng. Jr. E.I.C., McGill, graduate, would like spare time work at design of reinforced concrete or structural steel on a fee basis or otherwise. Also qualified for checking drawings and estimating quantities and cost. At present employed in the Montreal district. Apply to File No. 1552-W.

CHEMICAL ENGINEERING GRADUATE, M.E.I.C., age 26, veteran, single, 2 years' oil refinery experience in South America, experienced in estimating, inspection and maintenance. Desires position in Canada or U.S. Available February 1st. Apply to File No. 1570-W.

GRADUATE MECHANICAL ENGINEER M.E.I.C., P. Eng. Que., M.A.S.T.E. Stuttgart 1924, married. 18 years' experience in experimental work, plant maintenance, aircraft, jig and tool design, mechanical equipment and handling fixtures. Available at short notice. Montreal area preferred. Apply to File No. 1862-W.

ELECTRONICS ENGINEER, Jr. E.I.C., B.E.E., McGill, 1938, S.M.-M.I.T.—1942; P. Eng. Que., with 10 years' general design and supervisory experience in electronics desires position or partnership with consultant or manufacturing firm with view towards exploiting the field of electronics and electronic controls in industry. Location anywhere, but preferably Montreal. Apply to File No. 2492-W.

EXECUTIVE ENGINEER, M.E.I.C., B.A.Sc. R.P.E. (B.C.), Veteran, age 35, married. 15 years' civil engineering and construction, over 7 years' in executive capacity. Interested in position with construction or industrial firm in British Columbia or Ontario. Apply to File No. 2515-W.

GRADUATE CIVIL ENGINEER, Jr. E.I.C., P. Eng. (Ont.) with wide experience in building construction and design, desires spare time employment evenings and weekends on design of reinforced concrete steel and masonry structures, preferably on a fee basis. Location Toronto. Apply to File No. 2581-W.

MECHANICAL ENGINEER, Jr. E.I.C., P.E.Q., B.Sc. Age 32, married. Presently engaged in Montreal area would prefer position in Eastern Ontario. Experience includes machine design, jig, tool and die design, methods engineering, design development, plant layout, engineering department organization. 4½ years' as chief engineer. Also experience in construction industry on building, mechanical and electrical trades. Salary $415. per month. Available one month's notice. Apply to File No. 2682-W.

CHEMICAL ENGINEER, Jr. E.I.C., McGill, age 27, married. Experienced manager, in charge of personnel, production, purchasing. Synthetic resin research, distillation. Plant and laboratory control. Time study. Sales. Available immediately. Bilingual. $4,500. year, last position. Apply to File No. 2850-W.

ELECTRICAL ENGINEER, M.E.I.C., Graduate I.E.E., thorough grounding in cable and transformer manufacture, development and estimating. Also extensive instrument making experience in Government Laboratories. Anxious to contact companies re—openings in application sales, maintenance or production engineering. Age 26, single. Apply to File No. 2876-W.

MECHANICAL ENGINEER, Jr. E.I.C., McGill '44, age 26, bilingual, single, good health. Due to an unusual situation, have not been employed in work of an engineering nature since graduation. Would prefer to locate with organization building custom-built automatic industrial machinery. Available on short notice for assignment in Canada or U.S.A. Apply to File No. 2882-W.

CHEMICAL ENGINEER, Jr. E.I.C., B. Eng., McGill '45, age 24, single. 2½ years' experience in quality control, general office work and for over a year with pulp and paper mill (sulphite) on process control working in conjunction with the foreman. Desires position in production, planning, or sales engineering requiring initiative. Prefer Montreal or vicinity. Available on one month's notice. Apply to File No. 2899-W.

CHEMICAL ENGINEER, B.A.Sc. Toronto '43, Jr. E.I.C., age 28, married; 4 years' experience including chemical process equipment installations, maintenance, manufacturing methods and laboratory control in a large manufacturing company. Interested in a change of employment which would offer more scope in the chemical field. Prefer Ontario location. Available 1 month's notice. Apply to File No. 2901-W.

GRADUATE CIVIL ENGINEER, B.Sc., Alberta, 1947, S.E.I.C., married, desires position doing structural design work. Preferably in reinforced concrete or steel. Two years' experience in draughting and half year practical work in field. West Coast area preferred. But would consider other localities. Presently employed and residing in Edmonton. Apply to File No. 2907-W.

CIVIL ENGINEER, B.A.Sc. (Toronto), S.E.I.C., P. Eng. Ont. with some experience in reinforced concrete and structural steel design including detailing of reinforced concrete and estimating. Would accept part time work during evenings and weekends. At present employed and residing in the Toronto area. Apply to File No. 2910-W.

ENGINEER, (27), graduate of London (England) University, ambitious and energetic with five years' industrial experience, lately Deputy Works Manager in a large chemical works. Familiar with design, production control, costing, job evaluation and factory layout procedure. Handled a great variety of equipment, tactful leader of men, keen and able to get results. Willing to accept responsibility. Living at present in Toronto, Ontario, but willing to go to any part of Canada or abroad. Apply to File No. 2912-W.

SUPERINTENDENT, GRADUATE ENGINEER, P. Eng. (Ont.), M.E.I.C., 12 years' experience with men and cost control in casting, fabricating and machining brass, aluminum and grey iron. Available immediately. Apply to File No. 2913-W.

YOUNG GRADUATE CIVIL ENGINEER, S.E.I.C. Presently employed seeks part time work of such nature that it may be done at home, i.e. Estimates, etc. Apply to File No. 2914-W.

CIVIL ENGINEERING STUDENT, S.E.I.C., 3rd year at McGill University would like part time work with firm in Montreal vicinity, dealing with design or construction of structural steel or reinforced concrete; 25-30 daytime hours per week available, plus evenings if necessary. Experienced in foundation construction. Apply to File No. 2916-W.

GRADUATE ELECTRICAL ENGINEER McGill '24, M.E.I.C., Prof. Eng. (Que.); over 20 years' experience in High Voltage Transmission line, design and construction. Interested in part time or temporary position in general engineering or transmission line work. Location preferably Montreal or in B.C. At present residing in Montreal area, due to certain physical defects the type of work that can be undertaken is limited. Available at once. Apply to File No. 2918-W.

MECHANICAL ENGINEER, M.E.I.C., P. Eng. (Que.) B.A.Sc., Ecole Polytechnique '44. Presently employed with R.C.E.M.E. Canadian Army. To be released from engagement in one month or two. Age 24, married, bilingual, 2 years' experience in automotive engineering, job evaluation, supervision, management and administrative work. Also experience in designing mechanical testing apparatus. Would consider any kind of work with industrial firm. Willing to learn. Apply to File No. 2919-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng. Que., B.Eng. '40 McGill, age 33, married. Presently employed, desires experience in heating and ventilating. Experience with boilers, piping, construction, machine shop and plant maintenance. Available 1 month. Apply to File No. 2922-W.

Library Notes

(Continued from page 62)

KINETIC THEORY of LIQUIDS:

J. Frenkel. Oxford University Press, New York and Toronto; Clarendon Press, Oxford, England, 1946. 488 pp., diagrs., charts, tables, 9½ x 6¼ in., cloth, $13.00.

Considering liquids to be more closely akin to solids than to gases, the author discusses, in the early chapters, the types of disorder in the solid state, purely thermal displacements of atoms, the motion of interstitial atoms and ions, and many types of transition from an ordered to a disordered state as fundamentals of the problem of transition to the liquid phase. Later chapters deal with the specific heats of liquids, diffusion in liquids, surface and allied phenomena, and various properties of solutions and high polymeric substances.

MANUFACTURING PROCESSES:

M. L. Begeman. 2 ed. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 626 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $5.00.

Beginning with foundry practice and ending with grinding wheels and abrasives, this volume presents the technical fundamentals of the important manufacturing processes, discusses engineering materials, and describes the modern machine tools necessary for processing these materials. New chapters in the present revision deal with special casting methods, powder metallurgy, hot forming and cold forming of metals. The material on welding and plastic molding has been extensively revised. There is also a chapter on inspection and gaging practice.

MATERIALS HANDBOOK:

By G. S. Brady. 6th ed. McGraw-Hill Book Company, New York and London, 1947. 831 pp., charts, maps, tables, 8½ x 5¼ in., cloth, $7.00.

Useful to purchasing executives and product engineers, this book is a descriptive encyclopedia of industrial materials. It contains general information and patented and trade names of some processed and many raw materials. Detailed specifications are not given. The book is divided into two parts. Part I is devoted to definitions; Part II, to a condensed handbook, of general information ranging in scope from economic data to elementary nuclear physics. Statements regarding the characteristics of the materials and nomenclature used are data backed by competent authorities or are common usage of well-known manufacturers.

MECHANICAL LABORATORY METHODS:

F. W. Keator. 5th ed. D. Van Nostrand Co., Toronto, New York and London, 1947. 380 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.50.

Intended for use in connection with undergraduate laboratory courses, this volume contains four parts dealing with the testing of instruments, analysis of combustion, the testing of power plant units, and other tests. Fundamental principles are presented in such a way that the student may apply them to specific cases. This fifth edition is only slightly different from its predecessor. The abridged tables of properties of steam and ammonia have been deleted, and a few new items have been added to the section on instruments.

PLANNING RECOMMENDATIONS FOR THE WASHINGTON SQUARE AREA, prepared for the Washington Square Association:

A. C. Holden. Washington Square Association, 65 Fifth Ave., New York, July 1, 1946. 101 pp., illus., maps, charts, tables, 11 x 8½ in., paper, $1.50.

The recommendations contained in this report have to do with transportation, housing, business locations, parks, and the preservation of public buildings. A physical analysis of the area with numerous descriptive maps and plans, comprises the second section, followed by a functional analysis and synthesis of the factors involved as presented in the first two sections. The whole offers a typical example of an overall planning job.

PETROLEUM PRODUCTION, Vol. 3. Oil Production by Water:

P. J. Jones. Reinhold Publishing Corp., New York, 1947. 271 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.00.

Continuing the series by this author, the present volume is limited to oil production by water, covering the following principal factors: convergence, fluid factors, invasion factors, displacement factors, and well-interference factors. Two contours, called the breakthrough and maximum recovery contours, are used in estimating cumulative oil recovery and producing rates. The applications of these basic factors and limiting features to various types of reservoirs are effectively detailed, using statistical procedures which reduce the numerous variables to a comparative few, and taking into account economic as well as physical conditions.

PHYSICAL PRINCIPLES of WAVE GUIDE TRANSMISSION AND ANTENNA SYSTEMS:

W. H. Watson. Clarendon Press, Oxford, England; Oxford University Press, New York and Toronto, 1947. 208 pp., illus., diagrs., charts, tables, 9½ x 6¼ in., cloth, $7.00.

The aim of this book is to describe the way in which the technique of handling radio frequency transmission-lines has been extended to deal with propagation through hollow metal pipes known as wave guides. The theoretical and mathematical aspects of the control and transmission of microwaves are emphasized, with special attention given to the linear aerial-system consisting of resonant slots cut in the side of a wave guide. Dominant wave propagation and loading characteristics are dealt with early as basic concepts.

PROBLEM of REDUCING VULNERABILITY to ATOMIC BOMBS:

A. J. Coale. Princeton University Press, Princeton, N.J., 1947. 116 pp., tables, 8 x 5¼ in., cloth, $2.00.

The problem as stated is analyzed under four main headings: reduction of vulnerability under an effective agreement on limitation of atomic weapons; reduction of vulnerability when atomic armament is unlimited; technical considerations of atomic weapons and possibilities for defense; the necessity for further research and analysis. The author does not seek to give final answers but rather, by analysis and synthesis, to show the exact nature of the questions awaiting answer, from both the physical and social points of view.

WIND-TUNNEL TESTING:

A. Pope. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 319 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $5.00.

This volume presents an analysis and study of the extensive but scattered technical information published on the subject. The topics covered are design and general consideration of tunnels, testing procedures with scale-model aircraft, extrapolation to full scale, and wind-tunnel-boundary corrections. The design of a propeller-flow straightener system is treated. An appendix discusses the construction of a wind-tunnel-model. A list of references is given at the end of each chapter.

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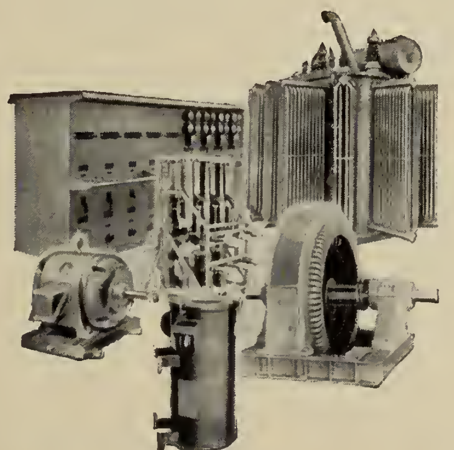
That is why we of English Electric strive honestly to produce equipment that will add to *your* efficiency, *your* security, *your* progress — for that is the foundation on which our prosperity must be built.

When you think of Power . . .



. . . think of English Electric

ENGLISH ELECTRIC
COMPANY OF CANADA, LIMITED

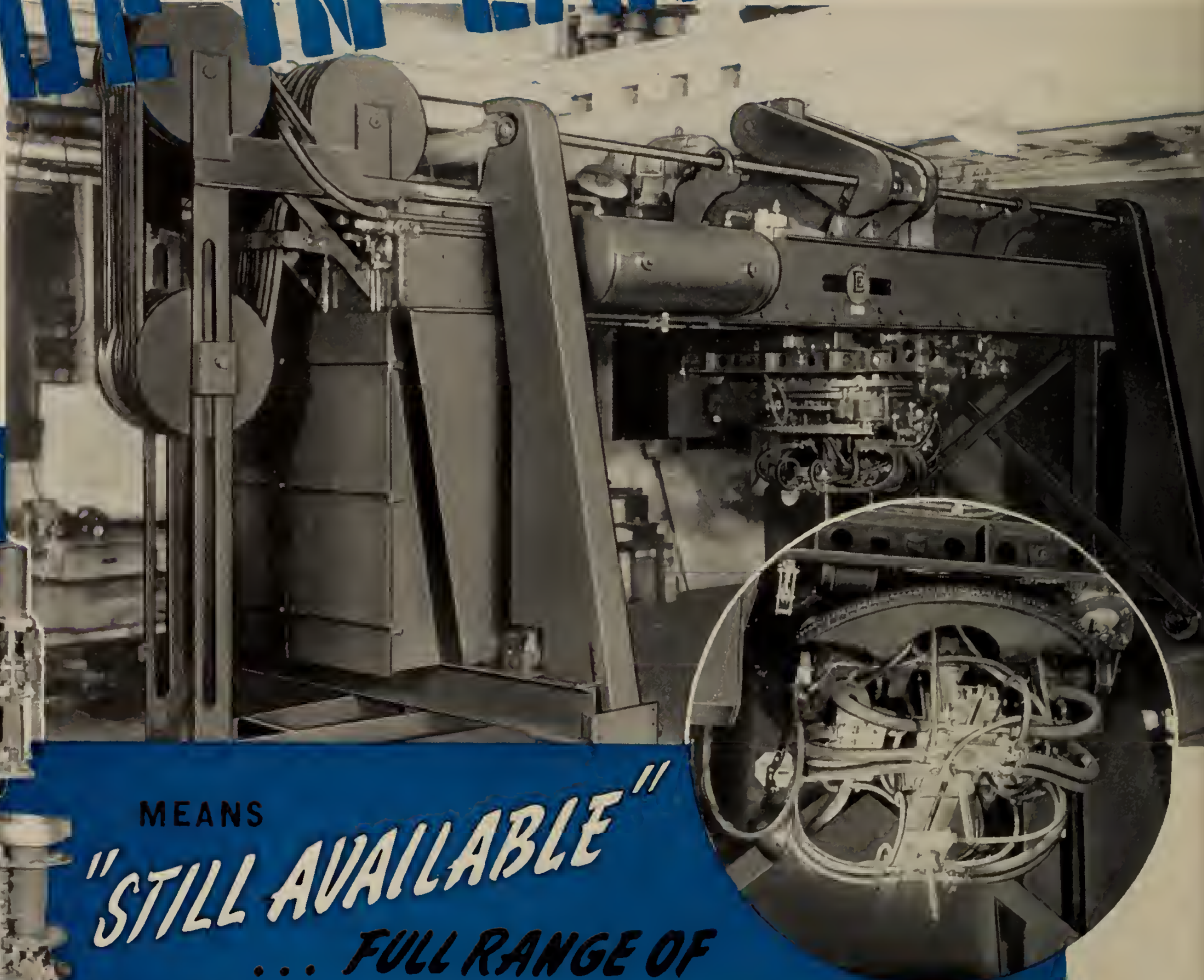
CANADA

48 A

SEE NEXT PAGE

OTORS • CONTROL • TRANSFORMERS • SWITCHGEA
R BLAST AND OIL CIRCUIT BREAKERS • RESISTANCE WELDERS

"MADE IN CANADA"



Gantry Type Travelling Spot Welder for fabrication of sides of railroad cars and similar structures.

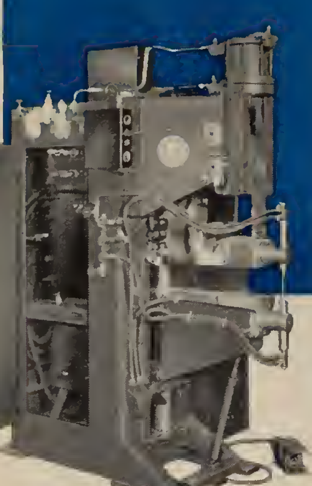
(Inset — Detail of Welding Head Assembly.)

Press ... with ... for hig... spot ... Shown ... dial m...

MEANS "STILL AVAILABLE" ... FULL RANGE OF NATIONAL ELECTRIC WELDERS

Each year Canada takes another step to increase its stature as a nation. Until recently the building of a full line of Resistance Welders was left to others. Now they are made in Canada by English Electric.

The machines shown, and others, were made in St Catharines. Each is designed to speed up a particular production process. If you would like to examine your own operations with a view to reducing costs by use of Resistance Welders, a staff of specialists is available here to advise you.



Medium size air operated Press Type Welder for wide range of spot and projection welding. Also for brazing operations.

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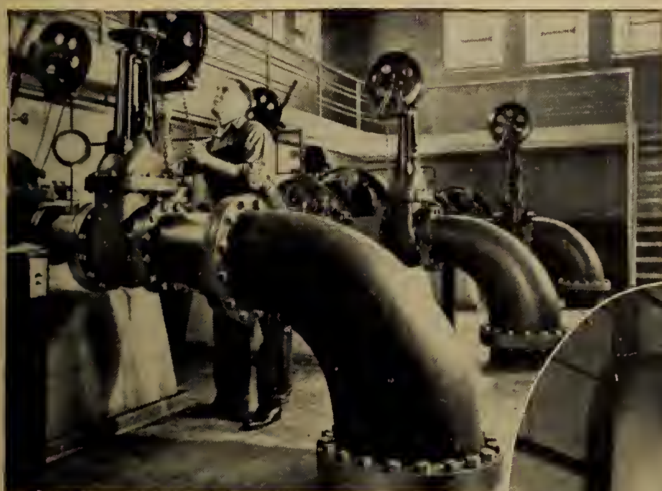

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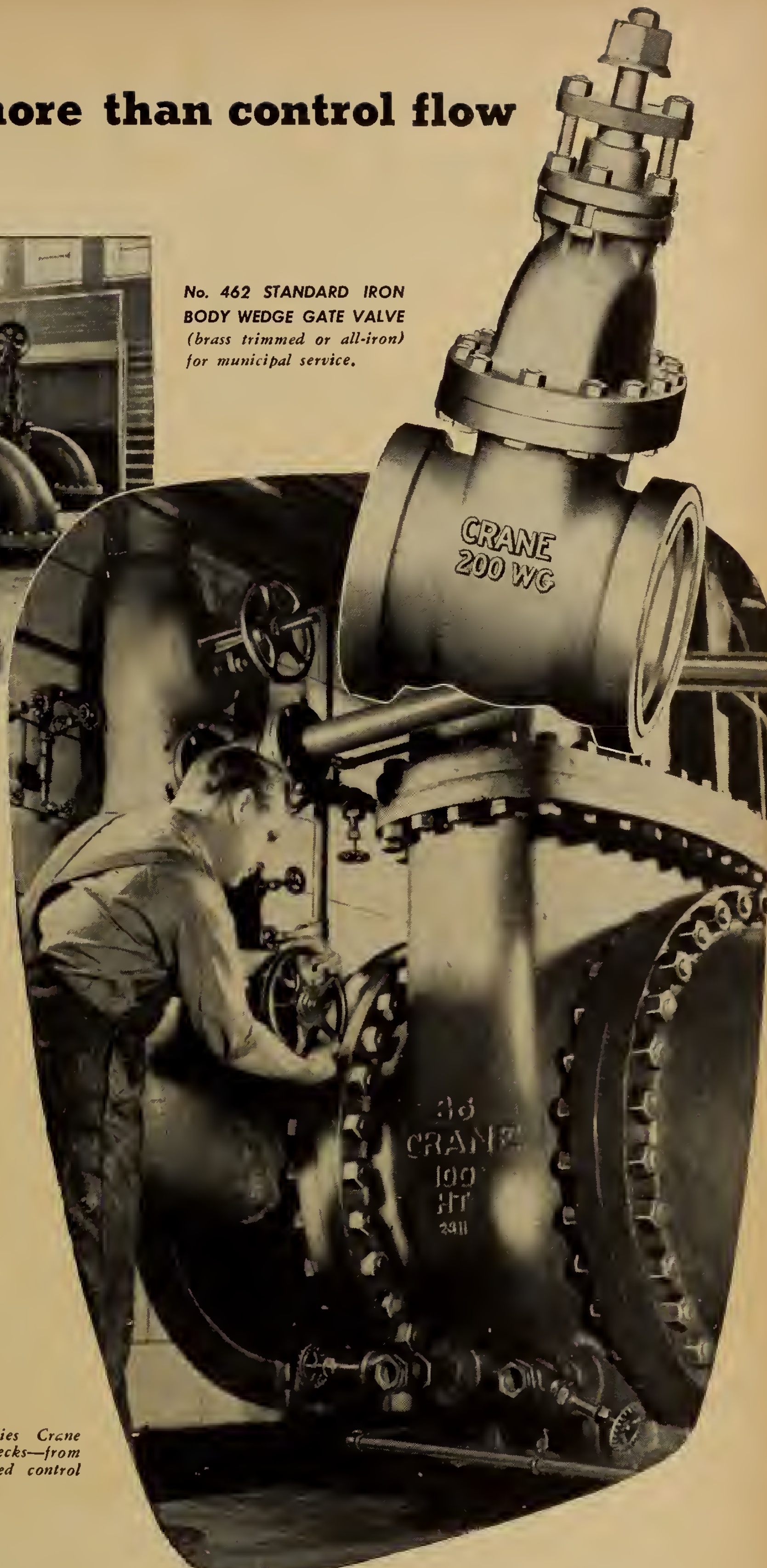

A SUBURBAN TOWN *waterworks equips with Crane. Shown are Crane 10-in. gear and chain wheel operated gate valves on high lift pumps.*

In water and sewage plants the country over, Crane valves do more than just stop and start flow. By doing that job precisely, they safeguard public health. By giving unusually long and faithful service, they hold valve maintenance, repair and replacement costs to the lowest level.

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NATION-WIDE SERVICE THROUGH BRANCHES, WHOLESALERS and PLUMBING AND HEATING CONTRACTORS

SPECIFY
ELLISON
FOR RELIABLE SERVICE

CIRCUIT BREAKERS	*for currents of up to 3000 amps.*
STARTERS FOR SLIP-RING MOTORS	*of up to 1000 h.p.*
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547

Three foot diameter wood pipe used for Hydro Electric Development, installed by us in Selkirk Range.

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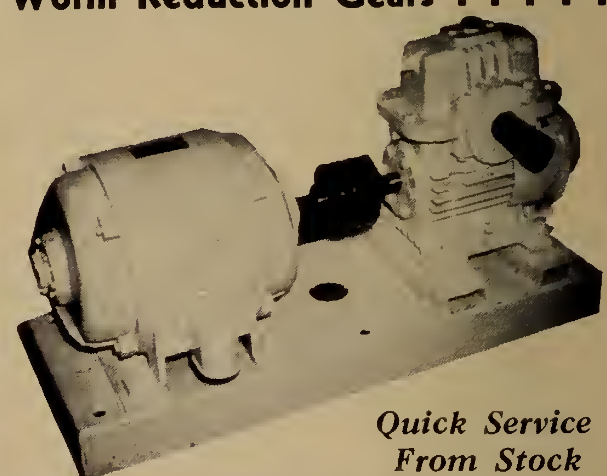

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All types of precision gears for industrial and production purposes.
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Also final chain drive or coupling on output shaft if required.

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Annual Meeting

are

June 2nd-5th

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CONCISE—ATTRACTIVE

FACTUAL—INFORMATIVE

Read them carefully for the latest, authentic, information pertaining to engineering equipment, supplies and services.

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Index to Advertisers

The revenue derived from the sale of advertising space enables the *Institute* to publish the *Journal* on a regular monthly basis. Listed below are the names of the Companies and Individuals whose advertisements appear in this issue.

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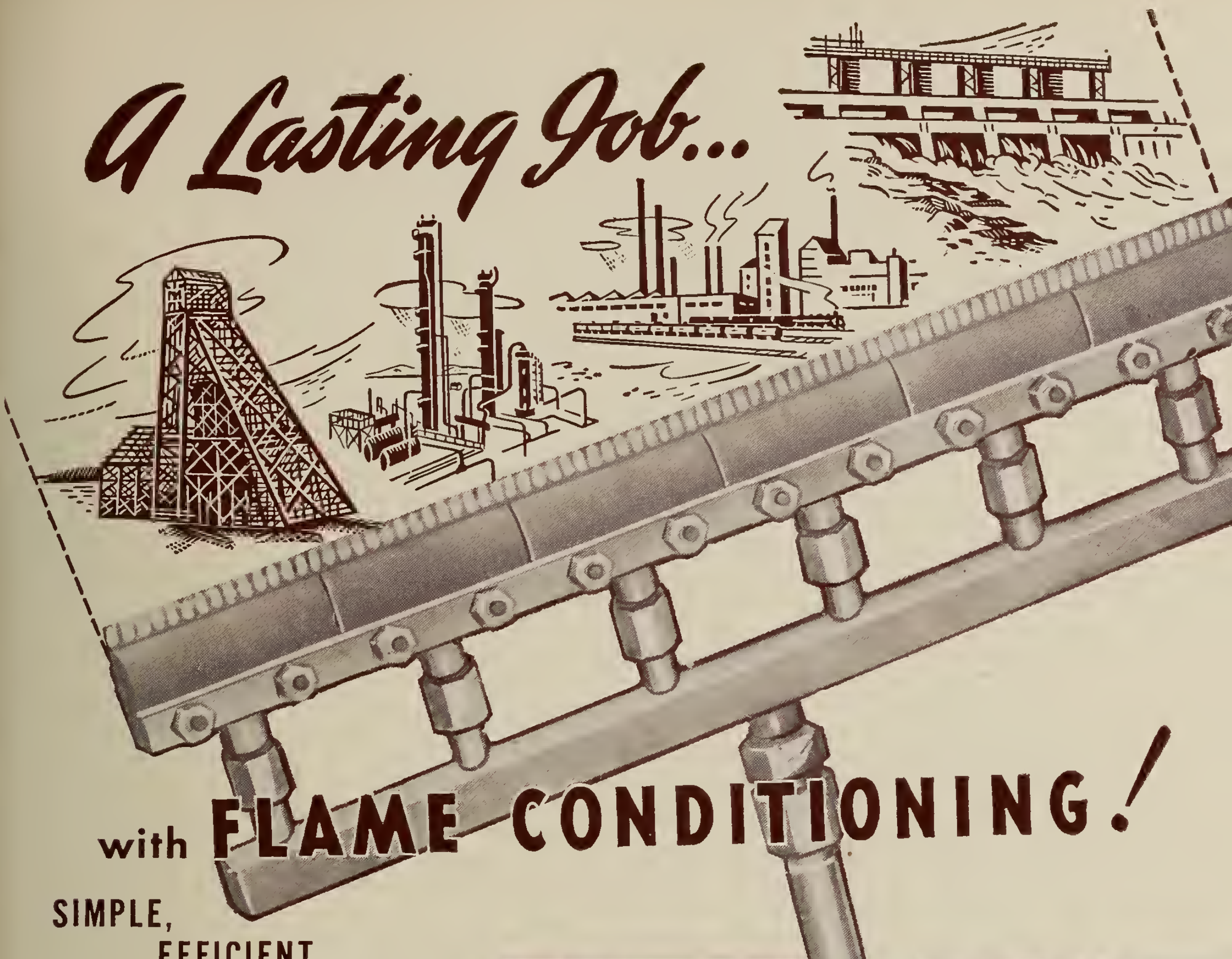

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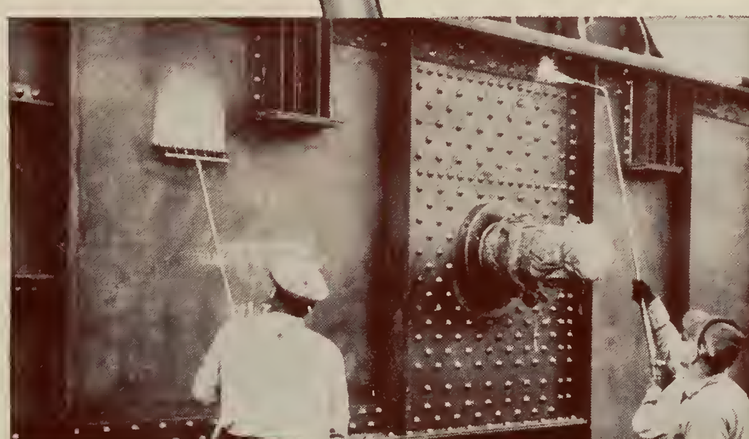
Intense oxyacetylene flames remove old paint, dirt and rust, explode loose scale, scabs and blisters and drive out moisture. Result is a thoroughly clean, dry surface for perfect bonding of paint, ensuring longer lasting protection. Equipment is standard, portable and flexible.



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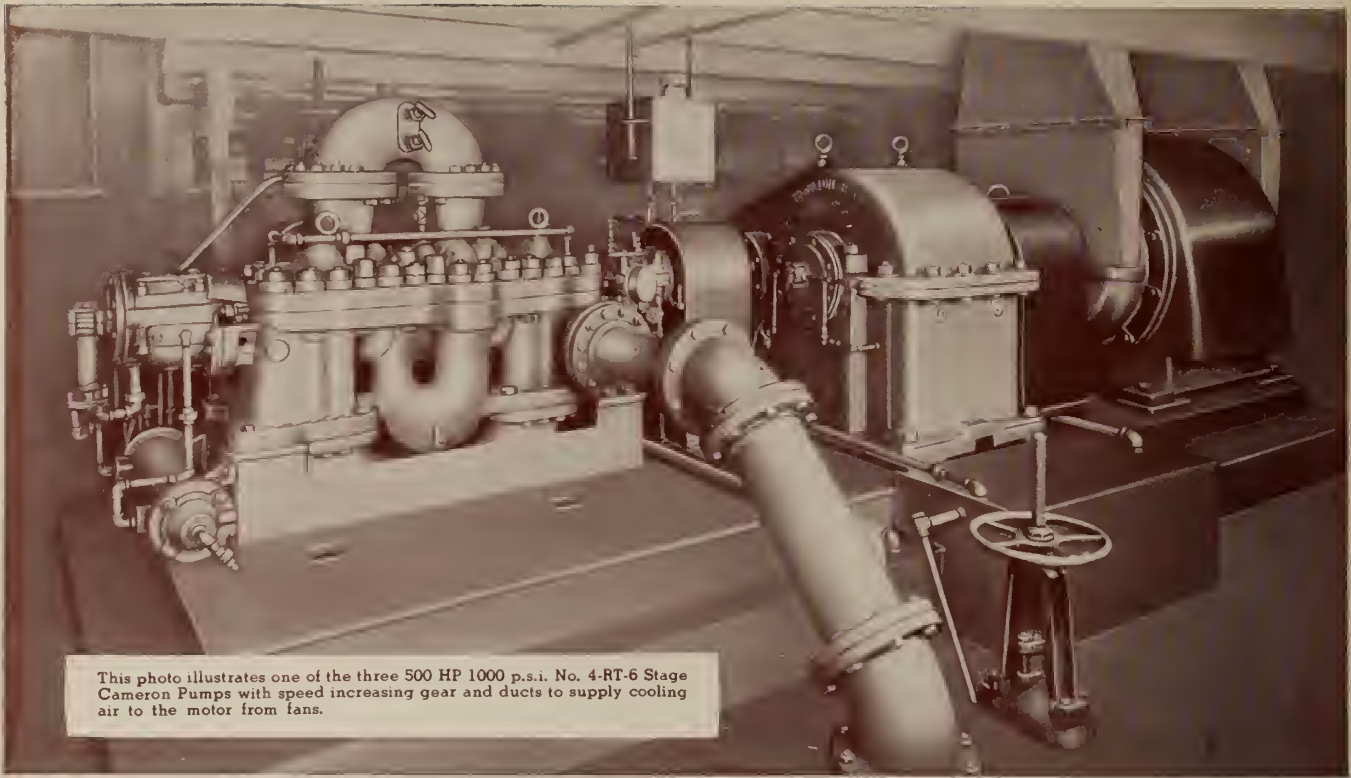

This photo illustrates one of the three 500 HP 1000 p.s.i. No. 4-RT-6 Stage Cameron Pumps with speed increasing gear and ducts to supply cooling air to the motor from fans.

Steel TAKES A *Shower*

AT 1000 P.S.I.

● High pressure descaling makes good steel cleaner and easier to handle. To provide the high pressure water sprays for descaling hot billets and slabs in the plate and strip mills of a Canadian steel plant, three Cameron No. 4-RT-6 Multi-Stage Centrifugal Pumps were built for the job.

Many times an hour these descaling pumps are called upon to leap from zero to full load in accordance with the rapid opening and closing of the spray control valves. This service places severe strains on every section of a pump, and only pumps designed for heavier than usual duty can stand up under these conditions.

Cameron Class "RT" Multi-Stage Pumps were specially developed for heavy duty performance in steel mills; for hydraulic log barking; for boiler feeding, mine de-watering and other high head duties. They are built by Canadian Ingersoll-Rand in capacities of 150 to 2000 GPM for heads of 1500 to 3000 ft., and are available in semi-steel, bronze or alloy steel, depending on the pressures and liquids handled.

Our engineers will be glad to work with your consulting engineers or mechanical staff in the selection, manufacture and installation of dependable pumps to meet requirements.

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THE ENGINEERING JOURNAL

VOLUME 31 NUMBER 2
FEBRUARY 1948

PUBLISHED MONTHLY BY
THE ENGINEERING INSTITUTE of CANADA

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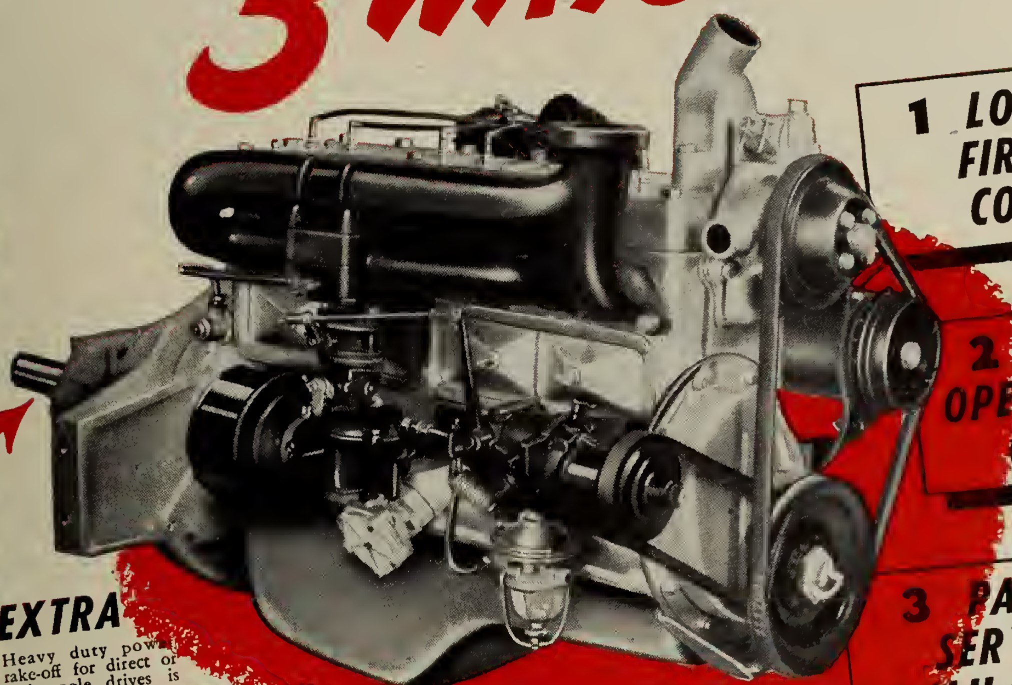
SAVE YOU MONEY 3 WAYS . . .



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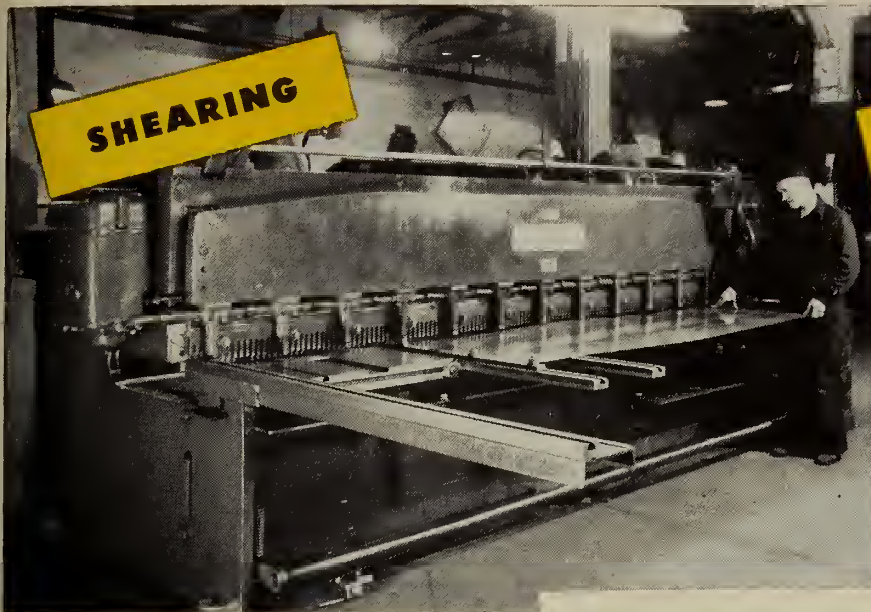
Heavy duty power take-off for direct or right-angle drives is available as extra equipment. Supplied complete on Chrysler Indusrrial Engines

CHRYSLER ANSWERS ALL 9 INDUSTRIAL ENGINE REQUIREMENTS!

Chrysler Industrial Engines bring you three-way economy . . . low first cost . . . low operating cost . . . and nation-wide parts and service availability to eliminate costly tie-ups for repairs. Chrysler Industrial Engines answer all 9 requirements which experts agree are essential to continuous peak performance and saleability of your product . . . (1) adequate power and torque; (2) low first cost; (3) low operating cost; (4) parts and service availability; (5) dependability; (6) facility of installation; (7) flexibility; (8) simplicity of repairs; (9) power your products with famous Chrysler Industrial Engines and you enhance their sales value. Before you buy any industrial engine, send for free booklet, "Power, Coast-to-Coast." Write the Industrial Engine Division, Chrysler Corporation of Canada, Limited, Windsor, Ontario.

Chrysler Industrial Engines
BUILT IN CANADA BY CHRYSLER



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WESTEEL SPECIAL SHEET METAL DIVISION

Westeel's Special Sheet Metal Division is completely equipped to shear, stamp, form, weld, rivet, paint and assemble sheet metal up to 3/16″ and light structurals. Pictured are a few processes in Westeel's shop. Modern equipment, years of skilled engineering experience, careful adherence to tolerances, assure satisfaction in Westeel Sheet Metal Parts.

A FEW OF OUR SPECIAL JOBS:

Dust Collector Systems: Shelving: Troughs: Guards: Ventilating Ducts: Chutes: Conveyor Frames: Heavy Metal Linings: Tanks: Flues: Hoppers: Piping.

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WESTEEL PRODUCTS LIMITED

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4340
the Steel to lick tough jobs
For difficult jobs where high strength with great toughness is required, you get the most for your money in type "4340" steel.
This steel has high hardenability with consequent high mechanical properties in heavy sections.
You are invited to write for a recommendation regarding the best type of steel for your application and for a suggested source of supply.
E INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED • 25 KING STREET WEST, TORON
EMBLEM OF INCO SERVICE
TRADE MARK
The International Nickel Company of Canada, Limi
25 King St. West, Toronto, Ont.
Dear Sirs:—Please advise us concerning the best typ
steel for the application named below.
Name

Let Inco's DOUBLE SERVICE help you!

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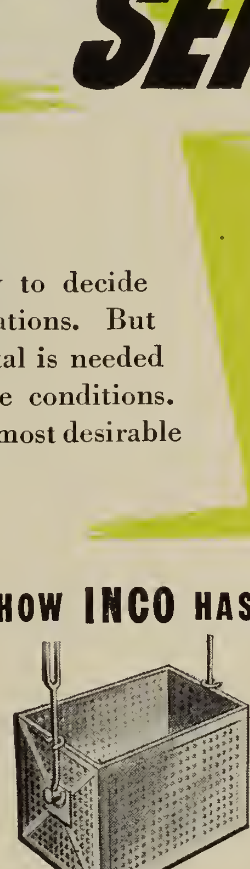
For many years, representatives of International Nickel have worked closely with designers and fabricators of equipment. Our technical staff will be pleased to assist you in selecting a fabricator, qualified to make equipment to your specifications.

HOW INCO HAS HELPED OTHERS



Prior to the introduction of Monel,* much of the pickling equipment in use required constant care and frequent replacement to keep it on the job. Because of Monel's high strength and exceptional corrosion resistance it quickly proved a natural for pickling equipment. Pickling equipment properly designed to take advantage of the properties of Monel and then produced by qualified fabricators resulted in smaller, lighter pickling baskets that carried bigger payloads . . . meant less power required . . . more parts pickled . . . less acid used . . . less expense all the way through. *Let INCO'S DOUBLE SERVICE assist you to solve your equipment problem.*

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**Monel is the registered Canadian trade mark of The International Nickel Company, Inc.*

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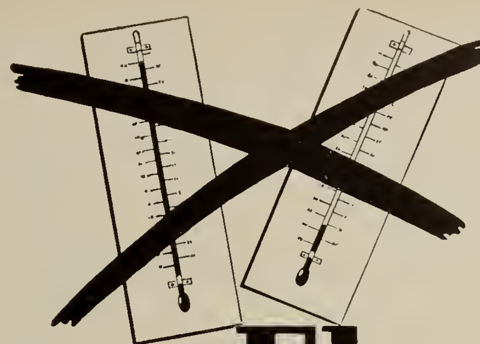

Sub atmospheric Steam Flow

Assures Heat Comfort

Uncomfortable overheating and underheating in a building is avoided with Dunham Differential Heating. With this system a continuous steam flow is provided but only in amounts and at temperatures for constant heat comfort. It will meet the smallest increments of change in heat demand. Dunham Differential Heating utilizes a continuous flow of flexible steam to maintain true heat comfort.

The comfort and economy of Dunham Differential Heating has been proved in buildings from coast to coast . . . industrial, institutional, commercial and apartment buildings.

Dunham engineers will collaborate on installation of Dunham Differential Heating in new buildings and make recommendations for modernization of present systems. C. A. Dunham Co. Ltd., 1523 Davenport Rd., Toronto 4, Ontario. Sales Offices in Halifax, Quebec City, Montreal, Sherbrooke, Ottawa, Toronto, Hamilton, Winnipeg, Calgary and Vancouver.

FLEXIBLE STEAM is the most easily manageable and transportable means with which to distribute heat. It is quickly variable in temperature and volume, consequently, it can respond precisely to changes in demand for a greater or lesser flow of heat.

The DUNHAM HEATING SERVICE

THE PRIME FUNCTION OF HEAT IN A BUILDING IS TO PROVIDE COMFORT

THE ENGINEERING JOURNAL

THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOLUME 31 | MONTREAL, FEBRUARY 1948 | NUMBER 2

"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

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2050 MANSFIELD STREET - MONTREAL

Indexed in The Engineering Index.

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COVER PICTURE

Montreal's new 1,100-room Laurentien Hotel, viewed from the top of the Sun Life Building. The photograph shows the fluted aluminum facing, which is only one of the novel design features pioneered by the engineers and architects to overcome the uncertainties of postwar construction conditions.

The technical papers in this issue of the *Journal* are devoted entirely to this interesting project.

A VIEW *of Banff Springs Hotel from the top of Sulphur Mountain.*

BANFF — *A Must!*

This world-famous spa in the Canadian Rockies is a *must* on the itinerary of millions of travellers the world over. As a Canadian, you should *know* Banff and, as an engineer, what better time could you choose for your visit than in June— in company with your fellow engineers at the....

62nd Annual Meeting

June 1st-5th, 1948

THE ENGINEERING INSTITUTE OF CANADA

The Laurentien Hotel

A Symposium

Specially prepared for The Engineering Journal *by*

J. A. Laughton, M.E.I.C.
Staff Engineer, The Wilson Contracting Co. Ltd.

C. O. P. Klotz, M.E.I.C.
The Aluminum Company of Canada Limited

J. H. R. Dansereau, Jr.E.I.C.
The Dominion Bridge Company Limited

H. G. Owen
The Bell Telephone Company of Canada

MR. LAUGHTON'S and the three following papers will present to readers of the *Journal* an excellent general description of the design and construction of a major Canadian post-war engineering achievement. By careful study and application of all possible means of reducing costs—and particularly by substituting prefabrication for on-the-job labour—the designers and builders have achieved what is today a remarkable performance. In the face of acute material shortages, labour difficulties, and skyrocketing costs, the $5 million hotel will be completed only about six months behind the originally scheduled date and—what is even more surprising—at a cost remarkably close to the original estimates. The delay in opening the hotel is almost entirely due to a shutdown in steel erection because of the coal strike in the United States.

The first paper considers the overall picture. The author discusses early stages of planning for use of prefabrication wherever possible to save cost, and the design of furniture for saving space. Extensive use of Arborite, a water-resistant plastic wallboard, is shown. The design and construction of foundation walls and footings is described. Steel erection is briefly referred to. The loading used on prefabricated aerocrete floorslabs is given. A description of the special steel framing sections for internal wall construction, as developed by the General Contractor, is given. The electric installation and wiring are referred to and the use of aluminum for wall facing briefly described. The author estimates a saving of 45 cents per square foot was effected on exterior walls by the use of aluminum facing. Prefabricated bathroom units were used throughout to save time and on-site labour.

The supplementary papers deal with outstanding features of the project. Carl Klotz, M.E.I.C., of the Aluminum Company, discusses the extensive use of aluminum extrusions for external facing to speed erection, reduce costs and modify traditional appearance. Early alternative methods of application are discussed. The alloys used for various portions of the facing are described and chemical compositions and mechanical properties of each given. The extrusion process is explained in detail and the advantages of extrusions outlined. Methods of finishing surfaces are explained. Various other applications of aluminum for the interior of the hotel are enumerated.

J. H. R. Dansereau, P.Eng., of The Dominion Bridge Company considers the steel structure and the particular problems encountered in the design and erection. Loadings are discussed with particular consideration given to the method of handling wind stresses. H. G. Owen of The Bell Telephone Company of Canada describes the "saddle" system of telephone installation.

The Construction
of the
Laurentien Hotel

by
J. A. Laughton, M.E.I.C.
The Wilson Contracting Co. Limited, Montreal

During the war it became apparent that there was a need in Montreal for a new modern hotel. The Ford Hotel Corporation, which operates the Ford Hotel chain in Montreal, Toronto and Ottawa, decided to undertake the venture, and formed the Laurentien Hotel Company to build and operate the new hostelry, which bears the appropriate name of Laurentien Hotel. Plans were laid for the construction of this building as soon as the required materials became available. The Company's personnel, in conjunction with the architects and the staff of the general contractor, then spent considerable time in studying designs of hotels, room layouts and available materials, to take advantage wherever possible of the developments in construction methods and materials which had taken place during the war.

After considering a large number of items with a view to reduction in cost, and keeping the labour involved to a minimum, step by step construction was discarded wherever possible in favour of prefabricated assemblies, such as precast concrete flooring, dry wall bedroom partitions, fibre glass insulation, aluminum external wall facing, plastic decorations and internal wall covering, aluminum trim, prefabricated bathrooms, and slimline cove lighting. All items chosen for use in the building met the standards set by the Building Code in force in the City of Montreal. In meeting these requirements, it was not possible to use all of the materials and construction methods which were considered in the initial planning.

The actual construction of an eleven hundred room hotel and the planning involved for erecting the structure are only part of the details which must be covered. The problems of furniture, draperies, linens, and floor covering are of vital importance. Interior decorators were employed to design special furniture of high utility value to give a maximum of clear floor space in the different rooms. As a result of these studies, a new type of chesterfield-bed was designed, which can be changed from day to night service with a minimum of trouble.

New end tables of convenient height for ash-trays and bedside telephone, a combination dresser and writing desk, cabinets with built-in radios which allow for push-button selection of five different programmes, were developed. All are of modern design and the flat surfaces are covered with cigarette proof and stain proof table top Arborite. Because of the tremendous quantity of plastic required for bathroom walls and ceilings, outside spandrels, furniture covering, wall covering in the lobby and cocktail lounge and the baseboard on the lower three floors, the qualities of Arborite were carefully studied before the final decision to use this new material in the building was made.

The total quantity of Arborite purchased involved nearly a quarter of a million square feet. This material is made from lignin felt paper, the lignin being incorporated by mixing it with the paper stock in the beater. This paper is then laminated by subjecting it to heat and pressure at the same time, incorporating into the laminate a decorative surfacing of colours and patterns, ranging from delicate pastels to reproductions of costly woods.

The net result is a plastic wall board impervious to household temperatures and so repellent to water that the most delicate laboratory equipment is necessary to detect moisture pick-up after twenty-four hours of immersion. The decorative finish eliminates maintenance other than cleaning and for that purpose nothing more is required than a damp cloth.

Foundations

Ground was broken for the foundations in the spring of 1946, and these presented the normal difficulties and problems which would be expected in the foundations required for a building the size of the Laurentien Hotel. The large concentrated loads, which were transmitted by the columns, were carried down to solid rock some 40 to 50 feet below street level. The building has two stories below the street level, the boiler room being 29 ft. below the highest point of the sidewalk. A buttressed retaining wall was built around the building to support the earth pressure for the full height of the excavation. This retaining wall was at the same time the outside wall of both stories below grade.

All retaining walls had to be permanently self-supporting, without counting on the stabilizing action of the earth-fill outside the building. Although conditions exist which would permit bracing one external wall against the opposite wall through the floor structure, it would require that the earth-fill outside of both opposite walls remain undisturbed. Since it was likely that the ground adjacent to the building on three sides might later be excavated, possibly causing damage to the foundations, it was decided to build buttressed reinforced concrete walls.

The buttresses make the retaining walls self-supporting, without using the floors as diaphragms and without counting on the stabilizing effect of the weight of the structure. The buttresses are located in the line of the columns and main steel girders. The internal foundations of the main steel columns are carried to solid rock, and the foundations of the buttresses connected with the foundations of the columns supporting heavy loads have been carried down to rock with concrete caissons, the foundation carrying light loads, and the connecting buttresses have been placed on spread concrete footings.

Before excavation was started, all surrounding buildings were carefully photographed inside and out, and special photographs taken of any visible crack or defect in the existing structures. This was done so that any damage caused through the excavation could be noted and actual damage ascertained. Fortunately, none of the surrounding buildings had additional defects show up while erection was in progress.

Steel Structure

The design of the steel structure by Dominion Bridge Company was performed in 1946 and involved a few problems worthy of mention, as covered by their accompanying article. However, in 1946 decontrol of

Retaining wall and buttresses. August 2, 1946.

Above—Foundations completed and arrival of the first structural steel on the site. October 10, 1946.

Below—Progress of structural steel at February 18, 1947.

prices in the United States, labour disputes, and general difficulties of procuring materials were factors of major significance in the design of a structure involving some 3,521 tons of structural steel. Materials had to be designed and ordered months ahead of time to avoid undue delay in the construction time table. In addition, the architectural requirements such as floor heights, room layout, the use of prefabricated bathrooms and their connection to the steel, the floor system required by the use of aerocrete slabs, and the requirements of the external walls to use of aluminum facing, had to be kept in mind constantly throughout the design of the structure. It was necessary for the Architect and the Dominion Bridge Company to work closely together so that the approval of drawings would not delay the initial planning. The work on the design of the structural steel began in March 1946, in conjunction with the architectural layouts. By the middle of February 1947 the last of some 900 detailed drawings were issued to the steel shops. The steel erection started in late October 1946 and was completed June 15th, 1947.

Aerocrete Floor Slabs

The floor slabs were designed to carry the following live loads; office and public space—100 lbs. per square foot; merchandise, baggage and loading platforms—125 lbs. per square foot; and bedroom floors—40 lbs. per square foot. The slabs used in the lower lobby, lobby and mezzanine floor are precast haydite concrete channel slabs over an average span of approximately 7 ft. 6 in. All other floors were precast Aerocrete.

The steel was carefully laid out in such a way that it was possible for a crew of men to lay all the slabs on a typical floor in 2½ to 3 days. The slabs were immediately grouted into place and used as a working platform for the erection crews. As the construction progressed, screed boards were laid on the aerocrete slabs to the centre line of the bedroom walls, and 1½ inch concrete floor topping was poured between these screeds. The steel channels which were used for the base of the bedroom walls were then attached to the screeds.

Internal Wall Construction

The wall construction is a development of the Wilson Contracting Company Limited, and consists of steel framing sections of four different shapes; a tubular section used as wall stud, a 3 in. channel section which is used as floor and ceiling runner for the studs, furring strips and special corners which can be used to form either external or internal wall corners. This material is made from 20 gauge sheet steel and roll formed to the special shapes and lengths required.

Door frames are of rolled steel manufactured by the Truscon Steel Company with the framing to the size required to match the wall studding and furring strips. All studding and furring are erected on 16 in. centres and the gypsum board applied on the surface. The space between the wall board is insulated with fibre glass for protection against noise. This type of construction has been found economical and extremely fast to erect. It has been possible to install the steel studding required to complete the walls on one floor in five working days with a crew of approximately twenty men. The gyproc is applied and screwed to the steel studs with self-tapping screws on 8 in. centres. Thirty to thirty-five men can apply approximately 50,000 square feet of wall board in one week.

Electrical Installation

A building of this size requires a great lighting and power load and necessitated the installation of a substation having six 200 kva transformers. The Quebec Hydro brings two 3 phase delta, 12,000 volt, 60 cycle lines to the potheads in the sub-station vault. One is a main service, the other a standby to insure continuous electrical service. A manual control panel mechanically controls the disconnect switch that disconnects the main line from the load. A feature of the control panel is the mechanical and electrical control of the 600 amp oil circuit breaker; an interlock prevents both lines from being on at the same time. Protection for the lines is also provided by a set of fuse disconnects, with high rupturing fuses, on each of the fuses branching off for lighting and power. The lighting and 220 volt power load is carried by a bank of three 200 kva transformers, connected delta to star for 3 phase service, 120/208 volts, 1800 amp, secondary. The 550 volt power is carried by a bank of three 200 kva transformers connected delta to delta for 3 phase 3 wire 575 volt 600 amp secondary.

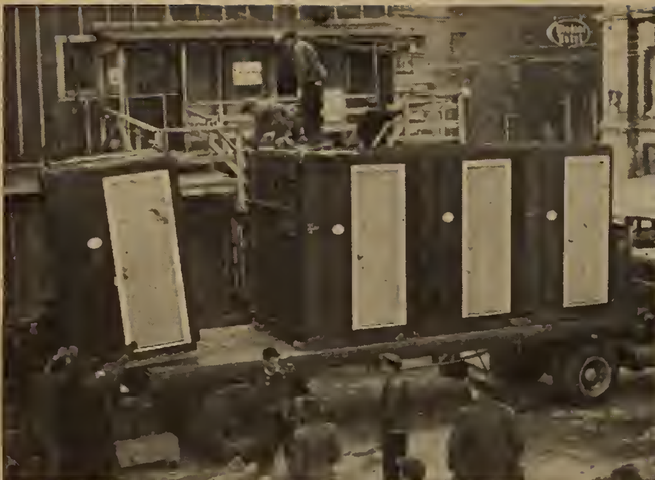
The feeders for lighting and power from the main switchboard to the panels in various locations on the lower floors, and on each of the bedroom floors up to the 23rd, were run in conduit ranging from ¾ in. to 3 in. and using wire from No. 10 to 500 MCM cable. The variety of layouts required is best shown by the fact that there are 14 stores, a beauty parlor, barber shop, dining-rooms, cocktail bars and several offices. In the design of the lighting for the more prominent public spaces, an installation was chosen which is perhaps a first in large buildings in Canada; the slimline lighting. These consist of 6 ft. and 8 ft. slim hot cathode tubes in coves, and will give soft overall lighting of even distribution for the main lobby and restaurants. They will also eliminate the harshness of the ordinary fluorescent lamps.

The bedroom floors have over 12 different types of rooms. There are at least three lamps in each room, one floor lamp and two table lamps, complementing the furniture arrangement. There is no ceiling light, hence one of the table lamps is switched from the door. The different outlets in any one room are not on the same circuit, so if anything should happen to one particular circuit, it could not throw the whole room in darkness. In every way possible, the guests have been provided with electrical conveniences which will add to their enjoyment of the service which the building affords.

Aluminum Wall Facing

The outside walls of the building are in large part faced with aluminum extrusions, backed by 12 in. x 12 in. x 16 in. cinder concrete building blocks. These extrusions consist of sections — flutes, stiles, window jambs, lintels and sills. It was necessary for the general contractor and the Aluminum Company of Canada to work in conjunction over a considerable period of time, in developing the different shapes and widths of extrusions required and the method to be used to attach the aluminum to the building. As over 70,000 square feet of outside wall area was to be covered with aluminum, detailed consideration was given to the method which would be used to hold this material in place.

Initially, it was planned to have brackets attached to the steel structure which would project through the



SOME LAURENTIEN PICTURES

Top, 1—**Unitility bathrooms arriving on site. 2—Bolting bathroom to structural steel.**

Centre left (top)—**Placing 4-inch aerocrete slabs on bedroom floors. They are supported on the lower flange of 4-inch I-beams.**

Centre left (lower)—**Aluminum panel finishing against stone header at 23rd floor.**

Centre right—**Aluminum being placed on Dorchester Street face of building.**

Bottom, 1 and 2—**Typical room sections.**

building blocks to take the type of aluminum extrusion originally planned. However, this was not feasible, as the steel required for the brackets could not be procured in time to meet the erection schedule. It was necessary to change the type of extrusion, and to use horizontal tee irons anchored into the masonry on 9 ft. 3 in. centres. These tees were accurately located and were level from end to end. In addition, the faces of the tees were kept in the same plane throughout the height of the building.

The aluminum extrusions were purchased in 9 ft. 3 in. lengths and shipped to Robert Mitchell Company for anodizing. An anodized flashing was rivetted to the bottom end of each extrusion to cover the space left for expansion between the different tiers on the face of the building. After anodizing and flashing, the material was shipped to the hotel site and cut to exact length and notched to fit over the tee irons. After preparation was completed in the shop, the material was locked between the tee irons and all joints were sealed with mastic. Before locking the aluminum sections on the tee irons, all masonry and exposed tees were thoroughly coated with bituminous paint.

It is felt that the use of aluminum has been highly successful, and although final costs are not complete as yet, at least a saving of forty-five cents per square foot has been effected in using aluminum rather than stone masonry.

Unitility Bathrooms

St. Catharines Steel Products Limited manufactured the bathroom units for the Laurentien Hotel, in accordance with designs as originated by the hotel company's staff, which they had studied over a period of years. Each bathroom was assembled as a complete unit on a production line in their plant at St. Catharines, Ontario. They consist of a welded steel frame, steel floor covered with linoleum, Arborite plastic wall and ceiling, steel door buck, flush doors, and hardware, bath tub, shower fixture, toilet, wash basin, mirror and electric lights; all fixtures are completely piped with the necessary valves and vents. The complete units were brought to the site, and hoisted into place on the steel structure. The bathroom was then bolted to the steel through holes located by Dominion Bridge Company.

In the studies of the system, full consideration was given to the initial cost of the units, as well as to the cost of installation and to the difficulties of handling these units on the site during construction. Careful layouts were made of the bathroom locations, and Dominion Bridge Company was required to supply the holes in the flanges of the beams which support the bathrooms. These holes were so located that they matched the brackets on the bathroom frames. Due to this planning, it was possible for a crew of five men to place on the steel structure an average of 15 bathroom units a day. The bathrooms were placed in pairs, with the pipe shaft between each pair through the height of the building. The piping layout of the unit was made in such a way that all pipes terminated in the pipe shaft. All that was left for the plumbers to do was to run the pipes in the main shaft and connect the hot and cold water, waste and vent pipes for each pair of bathrooms. Streamlined copper pipe was used throughout the building, and it was possible for 30 plumbers to handle the piping requirements for the 1100 rooms.

Design and Construction

The Laurentien Hotel Company employed Messrs. L. A. & P. C. Amos as Architects, C. Davis Goodman as Associate Architect, and G. McL. Pitts as Consulting Architect. The contract for the erection of the building was let to the Wilson Contracting Company Limited, as general contractor, with John Wilson as President, J. A. Grant as Chief Engineer, J. A. Laughton, M.E.I.C., as Staff Engineer, and S. Strachan as Building Superintendent.

□ □ □

Laurentien Aluminum

by

C. O. P. Klotz, M.E.I.C.

The Aluminum Company of Canada, Limited

The extensive use of aluminum in the construction of Montreal's new multi-storey Laurentien Hotel makes possible a title that appropriately associates the hotel with the source of the metal. Within the Laurentian Plateau, on the Saguenay River, lies the planned City of Arvida, the home of the world's largest aluminum smelter and of Shipshaw, the million-horsepower hydroelectric plant necessary to operate the smelter. An abundant source of electrical energy is essential in the reduction of alumina to aluminum; and at Arvida one drainage segment of the Laurentian Shield which so richly provides a wide area of Canada with waterpower and storage basins, is caught and harnessed in its fall to tidewater.

The Laurentien Hotel has no parallel and few precedents anywhere in the world in its extensive use of aluminum extrusions as an external facing. Major portions of each elevation have been thus treated, from mezzanine level upwards to its full 23-storey height. More than 70,000 square feet of wall are faced with aluminum and 200,000 pounds of aluminum were employed if the extruded window sills and lintels are included. The 7-storey laboratory building of the A. O. Smith Corporation* in Milwaukee, Wisconsin, completed in 1931, is one of the few which might be considered precedents, and here the aluminum was more in the nature of mullions between very large glass areas.

Without the closely co-operative joint efforts of the Laurentien Hotel Company, Architect C. Davis Goodman and the Wilson Contracting Company, the development of the aluminum facing would have been impossible. For everyone concerned it represented a firm step forward in the quest for the elusive lightweight curtain-wall construction that removes the anomaly of hoisting and hanging tons of age-old masonry on modern slender steel frames, yet does not sacrifice fire resistance, thermal and sound insulation, and life expectancy. It offered relatively rapid erection, " dry construction ", lower cost than traditional stone facing, and an aesthetically satisfactory treatment of a very modern structure of simple lines free of false ornamentation and of massive obliteration of its true nature.

*See *The Architectural Forum,* Vol. LV, No. 5, November 1931.

Development

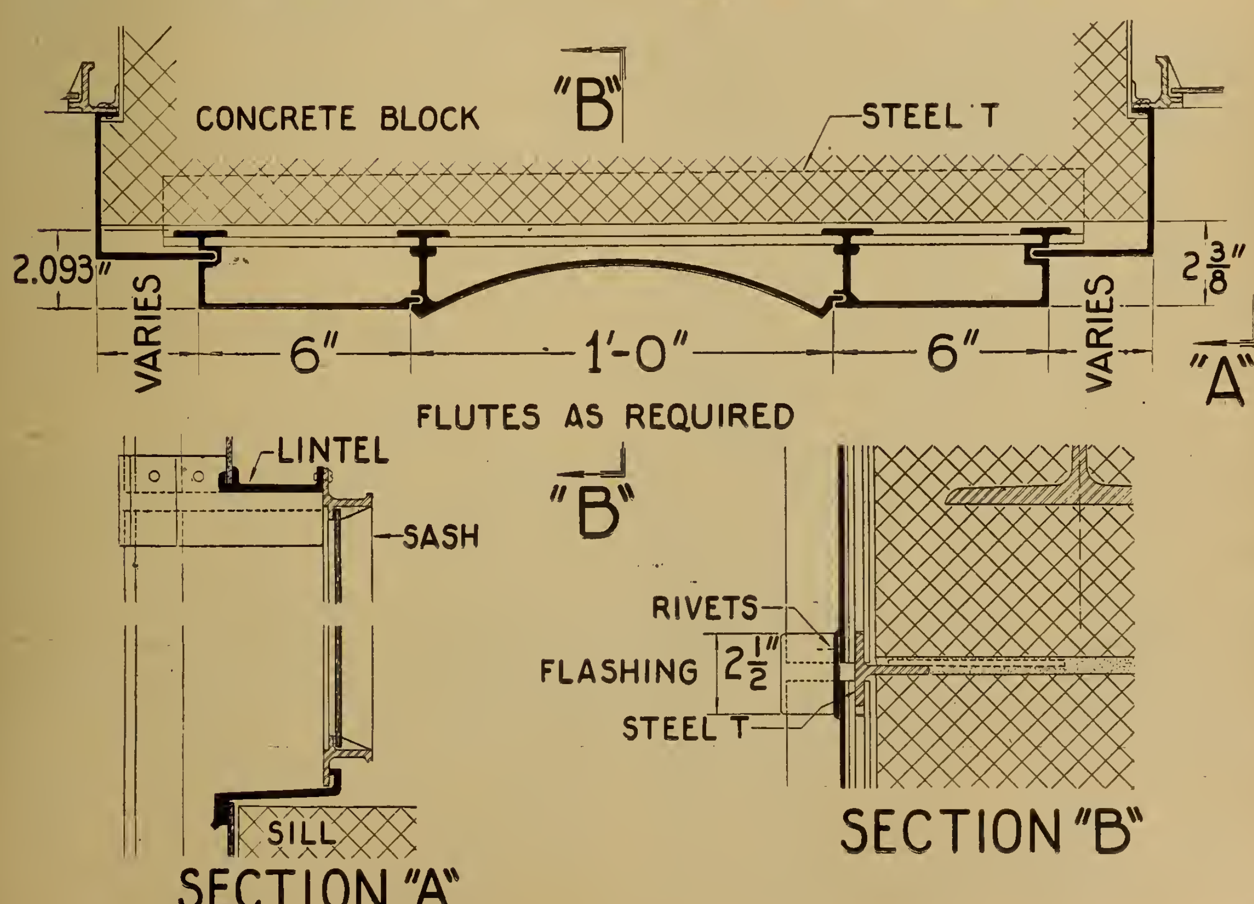
Early suggestions that aluminum spandrels should be employed, and consideration of the reasons for their use, led quickly to an investigation of how aluminum might be employed to construct the walls of the building. The aim was to speed erection, reduce costs and modify traditional appearance. The building by-law respecting fire resistance required the adoption, as a minimum, of 12-inch concrete-block curtain walls. The aluminum would therefore be employed only as a facing material in place of stone or brick; and a 4-inch stone facing was set as the criterion of economic acceptance, since stone was to be employed to some extent in any case.

The possibility of using castings, the traditional form of aluminum spandrels, was soon ruled out on grounds of cost and production time required. Sheet was considered, but in this case the considerable amount of shop work involved in forming and fabricating attractive pans or panels, and the rather unpredictable cost of their erection, turned the tables overwhelmingly in favour of extrusions. Relatively little shop work would be required on these, and they could be readily handled in storey-lengths by one person. It was desirable that each extrusion be wide enough to provide an architectural unit. The adoption of a flute profile 12 inches wide grew from an attractive but much smaller fluted extrusion (originally designed for covering window mullions) and the fact that extrusions much in excess of 12 inches in width are neither very practicable nor possible with present equipment.

In the first proposal for facing the hotel with vertical extrusions the main units, "flutes", were of symmetrical shape, 12 inches in face width and ⅛ inch thick with a rectangular groove on each side to engage a continuous (one storey), extruded aluminum cleat angle having wings or a double tongue on its outstanding leg. These cleats were to be bolted to horizontal steel clip angles built into the masonry backup or riveted to the structural frame. It was decided to erect these in storey lengths of approximately 9 ft.-3 in., the flutes to be bolted to the cleats, at their tops only, so as to allow for expansion and contraction. The method of flashing the horizontal joints at each storey was not decided upon immediately; but extrusion dies were built, extrusions made and a prototype panel erected. This scheme contemplated special aluminum sills and cast aluminum spandrels. The prototype was successful; but it was felt that the bolting of the flutes to the cleats would be difficult and expensive. It was also planned to use two other extrusions, a "stile" and a "jamb" to return the fluted panels into the window-spandrel reveals.

The next development step called for the cleat angle to be extruded integrally with each extrusion, with all vertical joints to be of tongue and groove nature. Each extrusion except the "jamb" was to be bolted fast at its top to the horizontal steel clip angle, slot bolted at its lower end to permit expansion and contraction.

Typical plan and sections of aluminum facing showing method of attachment.



This scheme was an improvement from an erection point of view; but the unsymmetrical nature of such broad extrusions would doubtless introduce production problems and require most careful die design.

Before extrusion dies were built for Scheme 2, the final design illustrated on page 81 was evolved. The unsymmetrical section was retained, but the use of any attachment screws or bolts was eliminated. The integral cleats or legs of the extrusions were altered to a " T " shape with a heavy double bead on the stem. Horizontal steel " T's " were to be anchored in the concrete block back-up at each storey and in line with the window heads, with their faces clear of the back-up by about ⅜ inch. The stem of each extrusion leg was to be cut back or notched at each end, between its rear face and its bead (the slot in the case of the " stile "), so that each extrusion could be fitted on and would clutch the face of the steel " T's " snugly. The extrusions would sit over the upper half of one steel " T " and clasp the lower half of the steel " T " above.

A male and a female " stile " member would be required to make the returns into window reveals; the jamb extrusions would be coped to fit around sills and spandrels and would be fixed to the window frames with self-tapping or machine screws; arborite spandrels would be employed to provide a change of colour and material in the vertical window bands; standard aluminum extruded sills would be used and a special extruded lintel would be made to receive the spandrels. A prototype of Scheme 3 was then erected successfully; and costs, when analysed, were found to be below stone facing. The final item to be decided was the method of flashing the horizontal expansion joints, and a face flashing riveted to the lower end of each extrusion was adopted. This had the desirable effect of creating with the lintels a subordinate horizontal line at each storey. Cover picture, and photos on page 80 and at lower left of page 83, show completed work.

Alloys

The alloy employed for the extruded facing, sills, lintels, and interior trim was Alcan 50S, the facing material being in the heat treated " A33 " temper, the sills and lintels in the " as extruded " condition. Alcan 50S, containing magnesium silicide as the hardening constituent, is the standard architectural alloy. It has good colour, fine finishing and anodizing characteristics, intermediate mechanical properties, excellent corrosion resistance, good welding and brazing characteristics, reasonable machinability, good formability and excellent extrudability. It is a heat-treatable alloy, lending itself to a variety of such treatments; and it is one of the less expensive of the various extrusion alloys. Alcan 50S extrusions are used for all types of architectural purposes such as windows, window sills, doors, thresholds, railings, mullions, pilasters, trim, mouldings and store fronts. When an alloy of generally similar characteristics but higher mechanical properties is desired, Alcan 65S is available. It too is a heat treatable alloy of the magnesium-silicon group; and is a standard structural alloy.

The flashings riveted to the Laurentien facade extrusions were of Alcan 2S-½H sheet, 1-16 inch thick. They were preformed, backpainted with alumilastic sealant and fixed with Alcan 2S rivets. Alcan 2S is commercially pure aluminum, hence non-heat-treatable; and the sheet is produced in four tempers: " O ", annealed; " ½H ", half hard; " ¾H ", three-quarter hard; "H ", full hard. Alcan 3S, containing manganese as an alloying constituent and having higher mechanical properties than 2S, is also a non-heat-treatable alloy produced in similar tempers. Both 2S and 3S sheets are useful for general building purposes including roofing, flashing, ductwork, doors, canopies, panelling, in fact wherever sheet is required for other than structural work. The preference is commonly 3S, and the temper usually employed for ordinary forming requirements is ½H.

Table 1 shows the chemical composition limits for Alcan 2S, Alcan 3S, Alcan 50S and Alcan 65S. Table 2 shows the typical mechanical properties of these alloys.

The " O " temper is soft or fully annealed. " W " temper signifies a " solution heat treatment " which consists of heating the metal to a temperature, below the melting point, at which the alloying constituent goes into solid solution, following with a quick quench in water to retain this condition. Temperatures required vary with the alloy between 800 and 970 deg. F. and must be closely controlled. The " T " temper is produced by the " age hardening " of metal that is in the " W " temper. Alloys such as 50S and 65S require artificial aging by heating to temperatures ranging from 250 deg. to 350 deg. F. for various periods ranging up to 24 hours. This process is known as " precipitation heat treatment " because dissolved constituents are precipitated in extremely fine particles. The " Q " temper in Alcan 50S is obtained by air quenching of the hot extrusion as it leaves the die; and the " A33 " temper results upon furnace aging of " Q " material.

The Extrusion Process

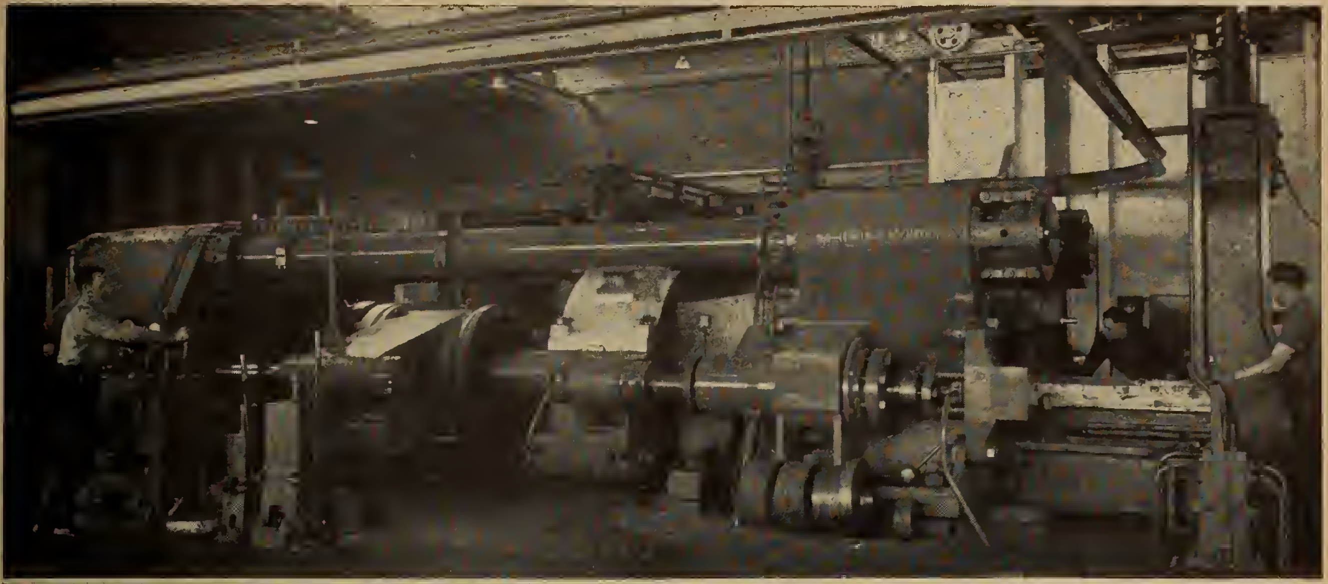
During the war great quantities of extrusions went into aircraft frames. Today, the sword becomes the

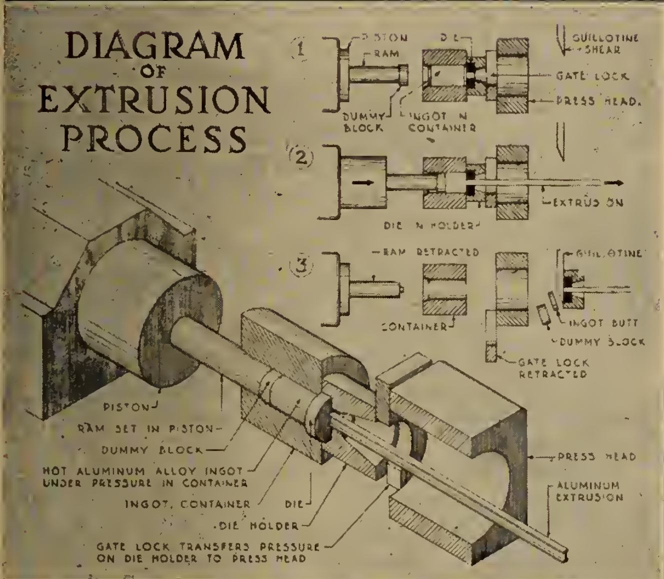
TABLE 1

Chemical Composition Limits

Alloy Number	Cu %	Fe %	Mg %	Mn %	Si %	Zn %	Cr %	Ti %	Other Elements % (each)	Other Elements % (Total)
Alcan 2S*	0.20	*	—	0.10	*	0.10	—	—	0.05	0.15
Alcan 3S	0.20	0.7	—	1.0–1.5	0.6	0.10	—	—	0.05	0.15
Alcan 50S	0.2	0.7	0.5–1.0	0.1	0.25–0.75	—	—	—	0.05	0.15
Alcan 65S	0.15–0.4	0.7	0.8–1.2	0.15	0.4 –0.8	0.10	0.35	0.15	0.05	0.15

*Iron plus silicon, 1.0% max. and aluminum, 99.0% min.





Top—**General view of heavy extrusion press.**
Left—**Diagram of extrusion process.**
Bottom, left—**Completed aluminum facing.**
Bottom, right—**Aircraft spar being extruded.**

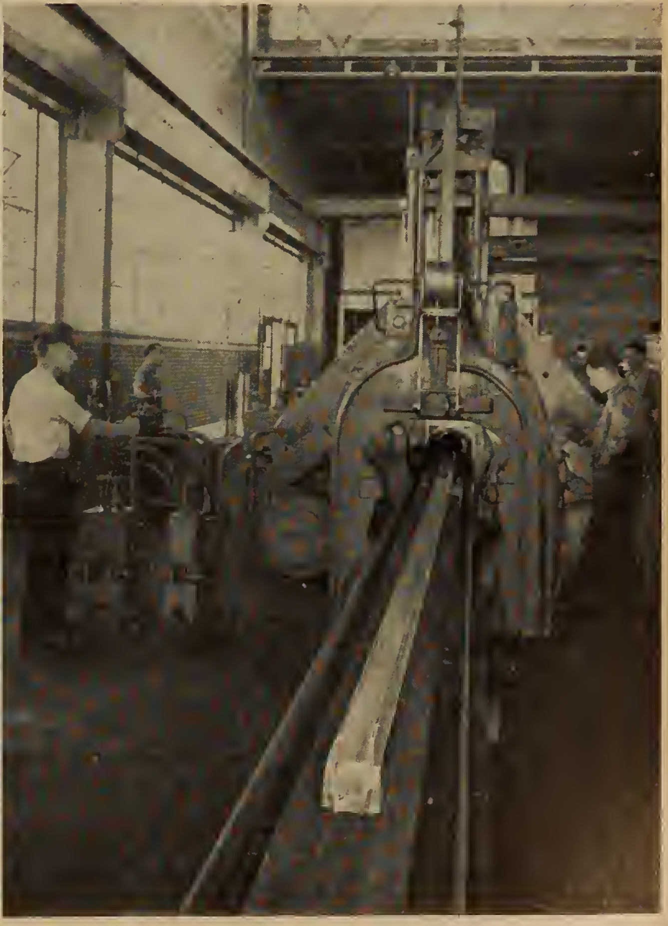


TABLE 2

TYPICAL MECHANICAL PROPERTIES

Alloy and Temper	Tension			Hardness Brinell 500 kg. 10.m.m. ball	Shear lb./sq. in.	Endurance Limit lb./sq. in.
	Ultimate lb./sq. in.	Yield lb./sq. in.	Elong'n.			
Sheet						
Alcan 2S–O	13,500	5,500	35	23	9,500	5,000
Alcan 2S–½H	17,000	16,000	9	32	11,000	7,000
Alcan 2S–H	24,000	23,000	5	44	13,000	8,500
Alcan 3S–O	17,000	7,500	30	28	11,000	7,000
Alcan 3S–½H	21,000	19,000	8	40	14,000	9,000
Alcan 3S–H	29,000	27,000	4	55	16,000	10,000
Extrusions						
Alcan 50S–Q	22,000	12,000	22	—	—	—
Alcan 50S–W	23,000	14,000	30	—	—	—
Alcan 50S–A33	32,000	28,000	12	—	—	—
Alcan 50S–T	33,000	29,000	18	—	—	—
Alcan 65S–O	20,000	12,000	20	30	12,500	9,000
Alcan 65S–W	35,000	21,000	20	65	24,000	13,500
Alcan 65S–T	45,000	39,000	14	95	30,000	13,500

ploughshare as extrusions go into peacetime building industry in ever increasing quantities. The figure at the centre of page 83 illustrates the extrusion process diagrammatically. A hot but solid cylindrical ingot is put into the container and pressed with such force against a steel die that the metal flows through and takes the cross section of the opening cut in the die. In practice the pressures on the die range up to 150,000 lb. per sq. in.

The figure at the top of page 83 is a general view of a 5000-ton extrusion press, one of the several Alcan presses ranging in capacity from 1500 to 5000 tons ram pressure. At the extreme left is the cylinder and piston powered by a pneumatic-hydraulic accumulator system which feeds hydraulic fluid against the piston at pressures up to 4750 lb. per sq. in. The crosshead with the pointer on it is a massive guide and support for the piston and ram. Next on the right may be seen the cylindrical ingot container which is electrically heated in order to hold the ingot and die at the proper extrusion temperature. Above the head of the press may be seen a stand for the hydraulic operation of the gate lock while beyond the press on the right is the guillotine. The figure at the bottom of page 83 is a head-on view of an aircraft spar, coming out of a press.

Extrusions really start in the remelting department where metal is melted, and alloys made up in large coke-fired furnaces. From the furnaces, or from holding ladles, cylindrical ingots of various diameters up to 16 inches are cast in either cold molds or by the vertical continuous casting system. The cast ingot usually contains too much metal for a single extrusion and it is cut to the proper lengths on a cold saw. A certain ratio of length to diameter is desirable for best operation of the press, too long an ingot resulting in excessive power consumption and container wear, too short an ingot in poor economy and an excessive loss ratio in butts. Furthermore a reasonable ratio of container bore to cross-sectional area of extruded product must be maintained, hence various lengths and diameters of ingots are prepared.

The extrusion ingots are then preheated at temperatures under 1000 deg. F. for several hours to improve their grain structure, and after cooling are ready for the extrusion department. Here they are reheated to render them more extrudable, and then one is quickly transferred from furnace to press where it is pushed into the container by the ram and the extrusion commenced. It is impracticable to extrude the ingot completely, and a short butt is left. This butt, along with the die and its holder, is pushed out of the press upon completion of the extrusion; the butt is lopped off and the die reset while the ram is withdrawn ready for the next stroke.

Leaving the press, the extrusion is hot and relatively soft, hence distortion may occur as it cools. Solution heat treatment likewise is accompanied by distortion upon quenching. Elimination of such distortion requires straightening operations. Longitudinal stretching beyond the yield point, will often do all that is necessary. This is accomplished in a 'stretcher' not unlike a horizontal version of a laboratory tension testing unit. A similar machine may be used for de-twisting; a hydraulic press may be employed to remove local bows or warping while a roll straightener may be required to true up the cross section.

The Laurentien Hotel flutes were extruded in a 5000-ton press from 16-in. diameter ingots. Extrusions up to 110 feet in length were run, then cut into lengths of about 35 feet for stretching. Due to their unsymmetrical nature, considerable distortion occurred upon cooling, and this was removed by a regulating operation on a roll straightener followed by a stretch on a 385-ton stretcher and completed by another pass through the regulator. Other facade sections were extruded from 11-in. diameter ingots in a 3100-ton press. Upon completion of straightening operations, the extrusions were cut to the ordered length of 9 ft. 3 in. then aged to the "A33" temper in a batch furnace, and thereupon inspected and crated.

ADVANTAGES OF EXTRUSIONS

A broad variety of shapes can be readily and economically extruded in aluminum. The process offers sections that cannot possibly be hot rolled, offers also variations in metal thickness and corner radii that cannot be duplicated in cold roll-forming from strip. While a wide range of extruded standard structural and architectural shapes is available, the designer is not limited to these. He may have special dies built to produce sections of his own design because die costs are relatively low, the average range being between $50.00 and $300.00.

In the production of doors, windows, store-front assemblies, transportation equipment, mouldings, furniture, hardware and many other articles and pieces of equipment, manufacturers can design open or hollow sections to suit their requirements exactly as to profile, strength and function. Extruded sections are not subject to many of the restrictions governing hot or cold rolled shapes. The practical overall width limit is 13 inches, while the minimum practical section thickness is 0.035 inches; and the total cross sectional area should not exceed 25 square inches.

Hot-rolled sections require a heavy capital outlay for rolls. Their outside corners must have relatively liberal radii, inside corners generous fillets. Re-entrant sections cannot be rolled; and complicated or hollow shapes are quite impossible. Extrusions can be produced with sharp corners, re-entrant recesses, wings, flanges, bulb and socket features, tongue and groove edges, dovetail connections, and with wide variations in metal thickness across the section. Die costs are low. A press can be readily set up with a new die so that relatively small quantities of a particular shape can be economically run. All structural sections and most of the rectangular and square bars produced by Alcan are extruded.

In comparing extrusions with shapes cold-rolled from strip, the outstanding difference is that the sectional thickness of the latter cannot be varied except by piling up two or three laminations. On the other hand cold-rolled shapes can be produced in much lighter thicknesses, and it is possible to do certain punching and cutting operations simultaneously with rolling.

The Laurentien Hotel facade extrusions give a good idea of what the extrusion process can offer to the designer. Interlocking, lapping, or tongue and groove features make it possible to provide joints with sheet, castings, or other materials such as glass, or fibreboard. One of the outstanding advantages of the process is the ease with which seamless hollow shapes of oval, rectangular, or irregular nature may be made. The torsional rigidity of a hollow shape is high per volume of metal, and such sections can be easily joined by inserts in the openings, facts taken advantage of by many window manufacturers.

Finishes

Aluminum lends itself readily to a wide variety of mechanical, chemical, electro-chemical and dyed surface finishes. The casual observation of aluminum in household articles such as cooking utensils, toasters, washing machines, vacuum cleaners, venetian blinds and bric-a-brac, in storefronts, in aircraft, in railway coaches, in kitchen and restaurant mouldings, in buildings, will impress this fact.

For many applications the ' as extruded ' finely lined finish is attractive and sufficient. Windows are commonly produced with no further refinement. Coarse lined, fine lined, satin or highly lustrous finishes may be produced using belt sanders, oiling buffing or colouring wheels, or wire or fibre brush wheels. Sandblasting and ball burnishing offer further finishes; while hand brushes or steel wool may even be employed where the number of pieces is not great.

Etched or frosted finishes are readily and inexpensively possible by dipping in a hot alkaline etching solution such as sodium hydroxide. Such surfaces do have a tendency to pick up dirt and finger mark easily unless anodized, an electrochemical process for developing a thin, hard, transparent oxide film on the surface.

Several simple chemical treatments are available for increasing the thickness of the normal oxide film thus giving increased protection against corrosion and abrasion. At the same time these render the surface smudge-free and easier to keep clean, some imparting an opaque or gray to greenish gray colour, others giving a clear film. However the most common method for producing artificially thickened oxide films is anodizing, an electro-chemical treatment in which the aluminum, immersed in a suitable electrolyte, is made the anode of an electrical circuit. Of several electrolytes, chromic acid and sulphuric acid have been most used; and since the latter gives a clear transparent film of excellent uniformity, it is the one commonly used in architectural work.

The sulphuric acid anodizing process, patented and referred to as the " alumilite " process, may be very briefly summarized thus: (1) Racking, aluminum racks being used to support and carry current to the work; (2) Degreasing, cleaning, usually in an alkaline solution, followed by water rinsing; (3) Alumiliting in a sulphuric acid solution of about 15 per cent concentration held in a lead-lined tank, with the aluminum as anode of a circuit operating at about 22 volts and 12 amperes per sq. ft. current density for about 30 minutes; (4) Rinsing in cold water; sealing the amorphous oxide coating in boiling water; (5) rinsing and drying.

The clear oxide film thus built up has a thickness in the order of .0004 in. It enhances and gives a rich depth to the natural colour of the metal, particularly on highly polished surfaces. It not only renders the surface more attractive but makes it easier to keep clean. Dust, soot and dirt are less adherent and more easily wiped or rinsed off. Anodic films are characterized by a minutely porous structure capable of absorbing dies or within which insoluble pigments may be precipitated, and a wide range of colours from pale pastels to deep shades are employed in finishing many products.

The facade extrusions on the Laurentien Hotel were sent directly from the extrusion plant at Kingston, Ontario, to the Robert Mitchell Co. of Montreal where they were cleaned and alumilited without any previous mechanical finish. The preformed sheet flashings were anodized before riveting to the extrusions thus avoiding possible entrapment of acid between the faying surfaces. The flashed extrusions were then delivered to the hotel where they were trimmed to the exact length required, as gauged for each panel by the General Contractor who also did all coping and notching work, using band saws and hack saws.

Other aluminum applications in the Hotel received various finishes such as hand rubbing with steel wool, belt sanding with No. 240 grit to give a fine-lined satin texture, buffing to give a lustrous tone, and painting where colour schemes required it. The storefront extrusions were buffed and alumilited, by the storefront subcontractor, this being a standard practice for such work.

Other Aluminum Applications in the Laurentien Hotel

In the construction of the Laurentien Hotel, and apart from the exterior facing, aluminum has been employed in a variety of ways both utilitarian and ornamental. Mention has already been made of the extruded window sills, a standard Alcan product, used throughout the building; also of the storefronts which incorporate polished and anodized extrusions. Still on the outside of the building is the main entrance canopy which has been made of aluminum sheet and shapes.

Within the building, all the exhaust ventilation ducts serving the hundreds of prefabricated bathrooms as well as large areas on the ground and lower floors were made of Alcan 2S-½H sheet in various gauges, mostly 20 and 22 B.&S. i.e. 0.032 in. and 0.025 in. Alcan 3S-½H is also commonly used for ductwork. It is of interest to note here that the firm which installed this ventilation system, Douglas Brothers, erected a sheet aluminum cornice on the Canada Life Building, Montreal, in 1896 and again on the Canadian National Railways office building on McGill Street in 1901, both of which can be seen to-day, black with city grime but otherwise unchanged. The discovery of an economical process for making aluminum had only taken place 10 years previously in 1886.

Throughout the lobby and mezzanine areas, extruded aluminum trim has been extensively employed while the railings of the main stairs and mezzanine areas are also made up of extrusions panelled with glass. For the railing infill there was specified a fine-lined or satin finish produced by belt sanding, with a highly polished handrail. In the prefabricated bathrooms, we again find aluminum, this time in the form of polished mouldings used in panelling the walls.

Considerable aluminum rigid conduit was employed in the electrical installations, while the heating convectors throughout the hotel have sheet aluminum casings which can be left in their attractive natural colour where colour schemes permit. On exit stairways and shafts, Kalamein doors clad with aluminum sheet have been employed; in the corridors, extruded wire mouldings, painted to suit adjacent colours, have been used; and in the elevators, aluminum trim is again found. Another application developed when the general contractor, in trimming and coping the facade extrusions, found aluminum so easy to cut and handle that he built up attractive stools for certain windows using scrap cuttings. The strength combined with the easy cutting and working characteristics of aluminum alloys frequently brings some astonishment to those not familiar with them.

The Laurentien Hotel presents to-day in Canada greater use of aluminum by designers, and by the building industry generally, than any other structure.

Steel Structure *for the* Laurentien Hotel

by
J. H. R. Dansereau, Jr.E.I.C.
Dominion Bridge Co., Limited

Late in February 1946, the contract was awarded for the design, fabrication and erection of the structural steel for the 1100 room Laurentien Hotel facing Dominion Square in Montreal. The building contains two floors below street level, a ground and a mezzanine floor, nineteen floors of bedrooms, an apartment floor for the managing staff, a mechanical equipment floor, and an elevator penthouse. The completed building rises some 240 feet above street level with some 25 feet underground.

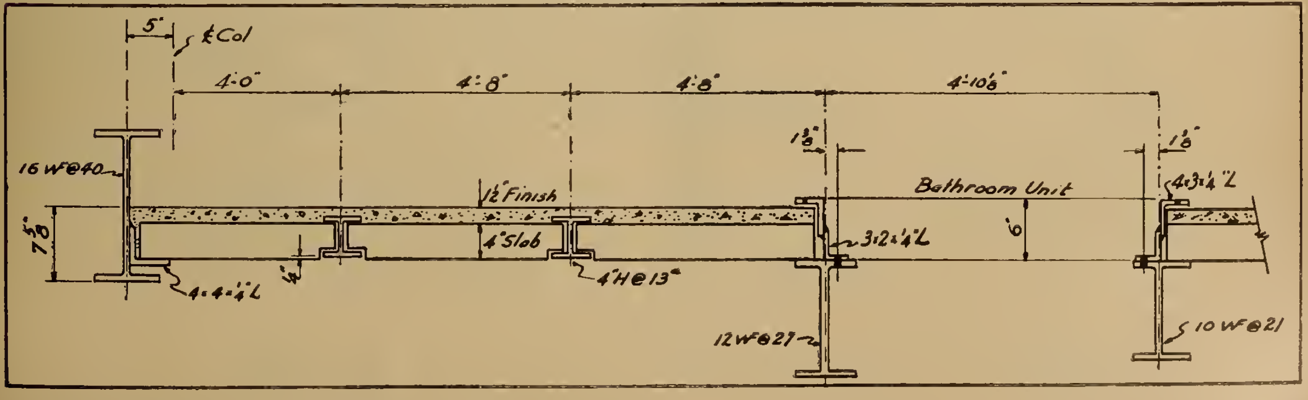
Due to the acute shortage of both skilled and common labour, maximum advantage was taken of prefabrication. With this in mind a unique floor system was developed, using 4 in. precast aerocrete slabs set between 4 in. H beams, which are continuous over the main floor members. The floor finish consists of 1½ inches of concrete poured as a monolithic layer over the entire floor area. A typical cross section of this floor arrangement is shown in Fig. 1. This floor system provides a flush ceiling, the main beams being located in the partitions in all but a few rooms, with the economical advantages of lightness, speed of construction, absence of form work and an extremely low resultant storey height of 9 ft. 3 in. between floor levels. The partitions are of the dry type, preassembled on the site, and the washrooms are prefabricated units shipped from the manufacturer's factory ready to be placed on the structural steel.

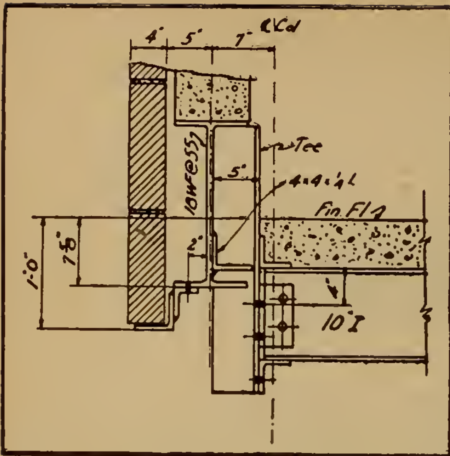
The exterior wall construction at pilasters consists of 4 in. cut stone, backed by 8 inches of concrete blocks, and in the window areas 12 in. concrete block walls faced with aluminum. To comply with city of Montreal by-laws for fire protection, vertical wells of elevators, stairways, laundry chutes, etc. had to be enclosed in block partitions and all main structural members covered with a minimum of 2 in. of fireproofing.

Loading

With these conditions clearly established the design was started March 7th, 1946. So as not to delay the construction time table, the steelwork contractor with the approval of the architects adopted the policy of designing the first tier of the structure, from sub-basement to lobby floor, of immediately available material and of ordering the balance of the required steel to size and length out of monthly mill quotas. In proportioning the sizes of members the allowable unit stresses and live load requirements of the City of Montreal by-laws were used. These unit stresses and loads appear in Table I. The dead loads were determined by the weight of the different architectural elements such as exterior and interior walls, roof and floors. A typical floor panel's dead load was made up of the following items:

Fig. 1—Typical cross section of floor arrangement.





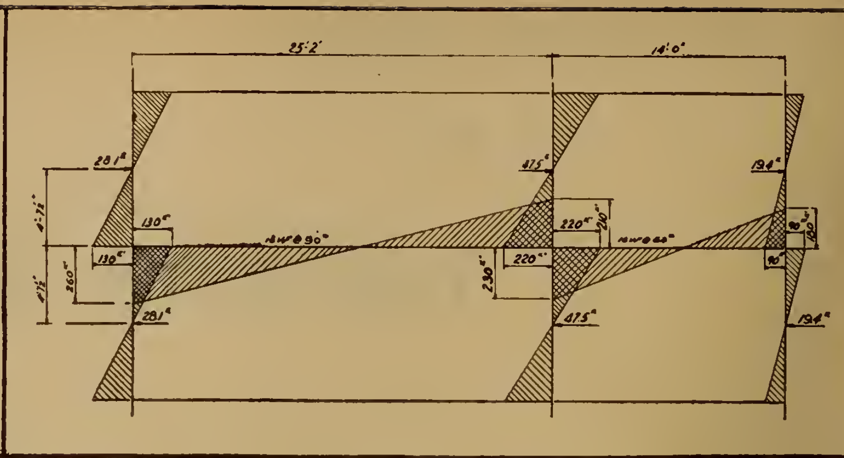


Fig. 2—Typical wall cross section. **Fig. 3**— Wind moment diagram of a typical section through central portion of building.

	lbs. per sq. ft.
1½ in. cement finish and carpet	18
4 in. aerocrete	23
Ceiling, vermiculite plaster	5
Steel including girders, beams and fire-proofing	9
	55

Table I

Unit Stresses

	lbs. per sq. in. (max.)
Compression on columns	15,500
Compression in beams and girders	20,000
Tension in beams and girders	20,000
Tension on rivets (Dead & live load)	15,000
Shear on rivets (Power Driven)	15,000
Shear on rivets (Hand Driven)	10,000
Bearing on rivets (Power Driven)	30,000
Bearing on rivets (Hand Driven)	20,000
Elevator supporting beams	12,000

For members carrying wind only, unit stresses may be increased 25%.

For members carrying combination of dead, live and wind, unit stresses may be increased 50%.

Live Loads

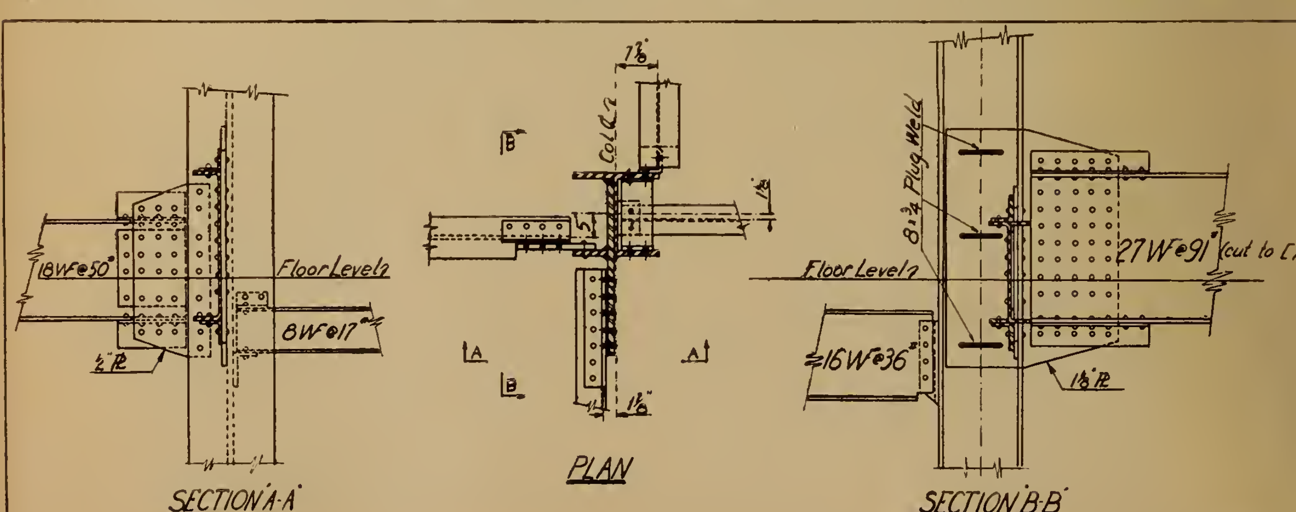
	lbs. per sq. ft.
Bedroom floors	40
Offices and public halls	100
Merchandise and Baggage unloading platforms	125
Wind load	30

Design Procedure

The design procedure adopted was first to calculate the loads on the columns from the floor area and partitions supported by each. Simultaneously floor and spandrel beams were designed as simple beams, and the column loads were checked using actual beam reactions. Wind loads were next applied and the beams together with columns into which they framed redesigned as rigid bents using a moment distribution method. In this connection it was necessary to restrict the depth of structural sections used both across corridors and around prefabricated bathrooms on account of the low storey heights.

Spandrel beam locations were also a problem, since these beams had to be proportioned and placed at each floor in such a way that they would not interfere with window openings of the floor below. For that reason,

Fig. 4—An eccentrically-positioned connection designed for end wind moment and dead and live load vertical shear.



wall supporting beams had to be located above the level of the floor beams framing into them. Special stiffening connections had to be designed to provide the compression flange with proper lateral support. Furthermore these beams had to be set 5 or 7 inches outside of column centre lines to support the stone facing, the outside wall line being generally 1 ft. 2 in. from centre line of column. Figure 2 shows a typical wall cross-section with a spandrel beam and its stiffening connection to floor beams. Column sections were fabricated in 37 foot lengths, equal to 4 storeys in height, and where possible, the same detail design was used on each of these four floors.

Wind Analysis

An item of prime importance in the design of such a 23 storey building is the effect of wind on the structure. The reader will understand the magnitude of the problem when it is realized that the City by-laws required the building to be designed for a wind pressure of 30 lbs. per square foot of projected area, and that the building rises approximately 240 feet above the level of the street. Furthermore, the depth of the central portion and of each wing of the building from wall to wall is about 40 feet for a height of some 200 feet.

Owing to the many novel features of construction used in this building, in which exterior walls are largely composed of 12 in. concrete blocks faced with aluminum, and interior partitions are built of dry prefabricated panels, the bracing effect of walls and partitions was totally neglected. The steel frame was, therefore, calculated to resist the entire wind load. The use of diagonal bracing or knee braces was studied and found impractical, due to the limitations of the building layout and the special wall construction.

Because of the peculiar shape of the building, the open mezzanine floor, the set backs, and the different elevations of the lobby floor to accommodate store concession on the sloping Windsor street face, it was found that the usual methods of wind analysis such as the portal or the cantilever methods were not applicable. The method that was used took full advantage of the various floor slabs as monolithic diaphragms to distribute wind load to each column proportionately to their stiffness ratio.

It was assumed as a fundamental hypothesis that under wind pressure, the floors would act as diaphragms, and would not distort or buckle. Whence any horizontal displacement due to wind load would cause equal lateral displacement of all columns. By maintaining the angle between the beams and columns constant, with properly designed flanged connections, resistance to wind shear is provided and rotation of the joints induced. The amount of joint rotation is dependent on the stiffness of the column and of the beams framing into it. The weaker of these two opposing structural elements is the factor determining the amount of wind shear that each joint absorbs.

The total horizontal pressure was therefore figured for each floor, and divided amongst all the columns in proportion to their stiffness factors, since in all but a few cases, the columns had a smaller stiffness factor than the beams framing into them. Due allowance was made for suitable reduction of the amount of shear taken by columns into which beams framed eccentrically. To reduce the amount of calculations involved, it was assumed in most cases that the points of contra flexture of columns would be midway between adjacent floors. The horizontal shear was applied at this point for wind moment calculations, and the share of wind moment resisted by each beam was determined by moment distribution. Fig. 3 shows a wind moment diagram of a typical section through the central portion of the building.

The design of wind connections developing these computed end moments was complicated by the fact that many beams, for architectural reasons, could not be framed on the centre lines of columns. An eccentrically positioned connection designed for end wind moment, as well as dead and live load vertical shear, is shown in Fig. 4.

Erection Procedure

Erection drawings were made and sent to the architect for approval. Upon receipt of the approved prints, the steel contractor prepared detail drawings, which were issued to the fabricating shops as soon as all details, such as overall dimensions, clearances, rivet pitch, matching connections, etc. of every individual structural member had been checked by experienced draughtsmen.

The fabrication was carried out well on schedule, except for a few unavoidable delays caused by tardy mill deliveries. Careful planning of the shipment of all structural members of this 3,500-ton contract was necessary as there was only a limited storage space at the site, and other building trades were to follow closely behind the steel erectors.

The entire frame was erected with the use of three 12-ton guy derricks, each having a 100-foot mast and a 90-foot boom. The derricks were first assembled at the garage floor level and erected steel up to ground floor. They were then raised to this level, and erection proceeded up to the first bedroom floor. The derricks were subsequently raised every four floors until erection was completed. Two derricks only were required above the seventeenth bedroom floor.

The architects on this project were L. A. & P. C. Amos, and C. D. Goodman, with G. McL. Pitts as Consulting Architect and Engineer, the general contractor was Wilson Contracting Co. The Dominion Bridge Company Ltd was sub-contractor for the structural steel.

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The Telephone Installation *in the* Laurentien Hotel

by

H. G. Owen

Bell Telephone Company of Canada

Installing a telephone in every room of the 1,100-room, 23-storey structure was not the only job required to provide telephone service for Montreal's new Laurentien hotel. Miles of wire had to be pulled through ducts in the building, a fully-equipped manual switchboard and dial switching apparatus installed, and new cable facilities provided between the hotel and the Lancaster central office and within the hotel itself. All this involved months of planning and engineering even before the actual work began.

The Bell Telephone Company was first asked to provide service for the new hotel in a letter from the Ford Hotel Company of Canada, in September, 1945. Details of the structure and the location of the switchboard and equipment rooms were not available until some months later, and the final recommendations for the type of service needed were approved by the Ford Hotel Corporation, in June, 1946.

These recommendations called for the installation of a 605-A manual switchboard with positions for five operators on duty at one time, a 740-AX satellite dial private branch exchange (or PBX), 50 central office trunks, and direct tie lines to the Ford Hotel, which is owned by the same company, and to Elgin Management Limited, the parent corporation.

The telephone company received the floor plans for the switchboard and equipment rooms in December, 1946. The switchboard room is located on the Main or Lobby floor, and the dial equipment room in the basement. The two rooms are connected by a private stairway to facilitate maintenance. In order to ensure that telephone equipment would be completed for an anticipated mid-summer opening of the hotel, these rooms had to be ready for equipment installation by March 1. The rooms were prepared and the plaster rapidly dried out with salamanders while the rest of the hotel was still largely unfinished. The Northern Electric Company began installing the equipment on April 7, but the men worked in heavy clothing and it was necessary to use small oil heaters for some weeks to provide reasonably satisfactory working conditions.

The manual switchboard serves the telephones in the 1003 guest rooms and the four apartments on the 23rd floor, and 25 telephones for the various concessions and services in the hotel. The operators also handle all incoming calls to the hotel. This switchboard is equipped with a jack appearance of the dial station lines to permit completion of manually handled calls to the dial equipment. Because of the number of jacks required for manual and dial lines and trunks, and due to the fact that 605-A positions with larger jack field openings were not available, it was necessary to omit all designation strips from the guest room multiple. As the room numbering plan ensures a uniform arrangement for each floor whereby every room with the same number will occupy an identical position on all guest room floors, a special numbering scheme was adopted for the switchboard jacks serving all floors above the twelfth.

The dial equipment serves 58 administration telephones, 45 of which are for intercommunicating calls within the hotel only. This is the first time in The Bell Telephone Company's territory that this combination of a manual switchboard and a satellite dial PBX has been installed in a hotel.

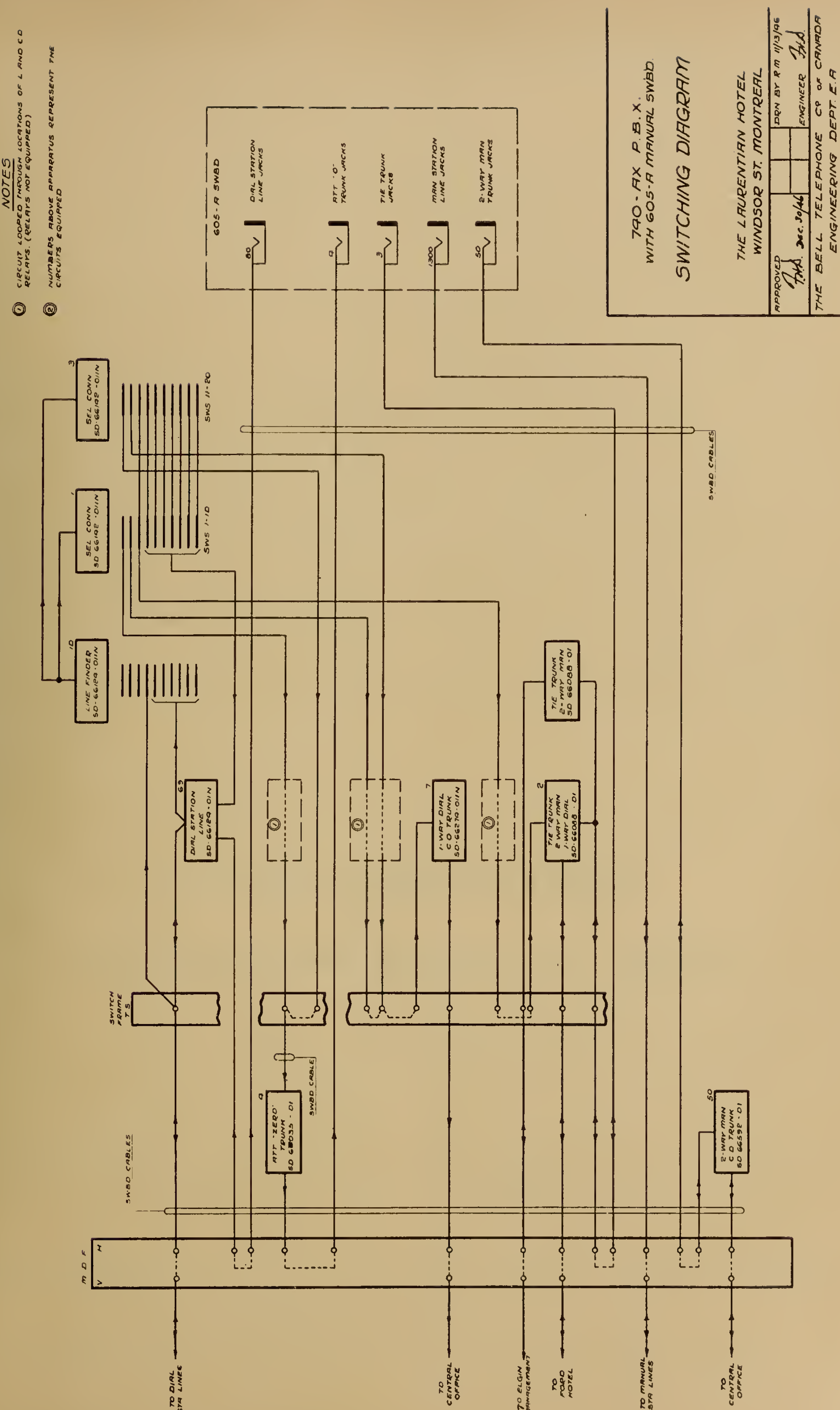
The dial PBX used for the hotel administration is a small two-digit system of the step-by-step type employing linefinders and selector-connectors with a capacity of 79 lines. The equipment operates on 48 volts d-c supplied from the telephone power plant in the equipment room. A separate group of outgoing one-way dial trunks to central office was installed, these being reached by dialing " 9 ". Incoming calls are handled at the main switchboard to which the dial station lines are multipled. Direct tie lines to the Ford Hotel PBX are provided and calls can be made by dialing " 8 ". Communication to Elgin Management Limited is furnished over the lines from the manual switchboard.

The power plant, known as the 110A plant, consists of a full wave regulated tube rectifier with variable plate voltage control, primary 210-250 volts, 60 cycle a-c, output 48 volts, 30 amp d-c. Means are provided automatically to maintain the battery voltage in the floating range 49.5 $\pm$ ½ volts, to prevent the rectifier from overloading and to give the necessary alarms in case of trouble. The 200 amp hour battery has a 6 to 8 hour busy hour reserve.

The ringing machine to provide the ringing current, tones and signals, consists of two panel-mounted converter type machines arranged so that, upon the failure of the regular machine, the load will automatically be transferred to the reserve machine and an alarm given. Both regular and reserve machines operate from battery.

Associated with the installation is a distributing frame on which all lines and trunks from both the

TELEPHONE SWITCHING DIAGRAM



switching equipment and manual switchboard are terminated. The feeder and house cables are likewise terminated on this frame, thus permitting complete flexibility of cross connections between the equipment and house services.

The feeder cable that feeds the hotel is part of the underground cable system providing facilities from the Lancaster central office into the hotel area. From this feeder cable system a 404 pair entrance cable provides facilities for the specific use of the hotel. This cable enters the building in conduit from Stanley Street, runs through the building in metal conduit and is terminated on the distributing frame.

Obviously the number of telephones required in a hotel makes it impractical to place a pair of wires through the building each time a telephone is installed. This necessity is avoided by the installation of a house cable distribution plant which terminates on the distributing frame and permits convenient, efficient connection of telephone equipment at any location in the building. This house cable system, designed to meet the maximum requirements of the hotel, consists of about 2,860,000 feet of wire in lead covered cables ranging in size from 909 pair to 26 pair, and about 125 distribution terminals.

The north section of the hotel, from the third to the twenty-second floor comprising about 400 rooms, is served by a 606-pair main riser cable, and the south section of the hotel, including the twenty-third floor comprising 600 rooms, is served by a 909-pair main riser cable. These cables are run in three and a half inch metal conduits from the telephone equipment room in the basement to splicing rooms on the third floor. Above this floor the riser cables are lashed to strand in riser shafts from which they are brought out and spliced on every third floor in the splicing rooms. The 606 and 909 pair riser cables diminish to 202 and 404 pair cables respectively on the twelfth floor.

On the floors where the riser cables are brought out and spliced, three smaller sized distribution cables, 101 pair in the south riser and 51 pair in the north riser, are brought out to serve that floor, the one above, and the one below. The splices are supported on cable racks which are bolted to the metal wall studs for stability. The distribution cables for the guest room floors of the hotel are run through the wall of the splicing rooms and into aluminum moulding along the corridors to feed distribution terminals which are placed at strategic locations just above the moulding.

From these floor terminals, the wiring to the individual telephone is placed in the aluminum corridor moulding, in picture moulding in the individual rooms and by fishing vertically between the walls. About 150,000 feet of insulated wire were required to complete this part of the installation.

Where it is necessary to cross corridors, separate conduits are provided for cable and wiring. These conduits terminate in the corridor moulding. Thus, all cable and wiring are concealed on the guest room floors of the hotel except for the distribution terminals which when painted to match the walls will be inconspicuous.

The administrative floors of the hotel are served by three separate 101 pair riser cables. These are routed in conduit to seven built-in cabinets in which terminals are placed. From these cabinets, conduits are run to outlet boxes for use in wiring individual sets, switchboards and other telephone equipment.

IMPORTANT!

Change in Annual Meeting Dates

- **Trains from the East arrive in Banff about noon.**
- **More time must be allotted for enjoyment of the superlative recreational facilities at Banff.**
- **THEREFORE the Annual Business Meeting will be held at 8 p.m., Tuesday June 1st, with the Council Meeting convening at 9.30 a.m. of the same day. This will permit the Professional Sessions to commence on Wednesday morning June 2nd with Thursday afternoon and Saturday available for recreation.**

COUNCILLORS *and others invited to attend the Council Meeting should plan to arrive in Banff on Monday, May 31st*

OTHER DELEGATES *should plan to arrive Tuesday, June 1st*

The Geneva Trade Agreements
and
The Engineer

by

H. G. Cochrane, M.E.I.C.

SYNOPSIS

This article draws the attention of the engineering profession to the Geneva Trade Agreement, and to the Draft Charter for the International Trade Organization. It defines their scope and some of their limitations. A summary of the concessions given to and by Canada on tariff reductions for products of forest, mine, quarry and heavy manufacturing industries is given. These are the products of widest interest to the Engineer. An attempt is made to draw a few conclusions with regard to the benefits accruing to Canada from the agreements.

News of the Geneva Trade Agreement on November 17th last probably escaped the notice of a considerable number of Canada's 50,000 engineers and scientists. Many of them who did read the press release, busy as they were with stresses and stopes, with kilowatts and passenger miles, with decibels, " cold fronts " and many other professional interests, were quite happy to leave the details to exporters, revenue officers and federal budgeteers.

But behind the texts of Draft Agreements and Schedules lies vital information which may well affect their own purchases; information which will have considerable impact on the next few National Budgets and will indirectly affect taxation. Moreover, knowledge and conclusions derived from their careful study will, in many cases, also be of definite value to employers and clients of many members of the profession.

This important announcement, as well as comment thereon, so far as Canada was concerned, was unfortunately crowded out of the headlines by the news appearing the following day of the Dominion Government's so called " Austerity Programme ", brought about by Canada's desperate need for conserving U.S. dollars. Action on this restrictive programme had been postponed as long as possible, since Canada was concerned that the Geneva negotiations should be successful, and that no action on Canada's part should prejudice the success of this concerted effort to reduce trade barriers and to foster international trade.

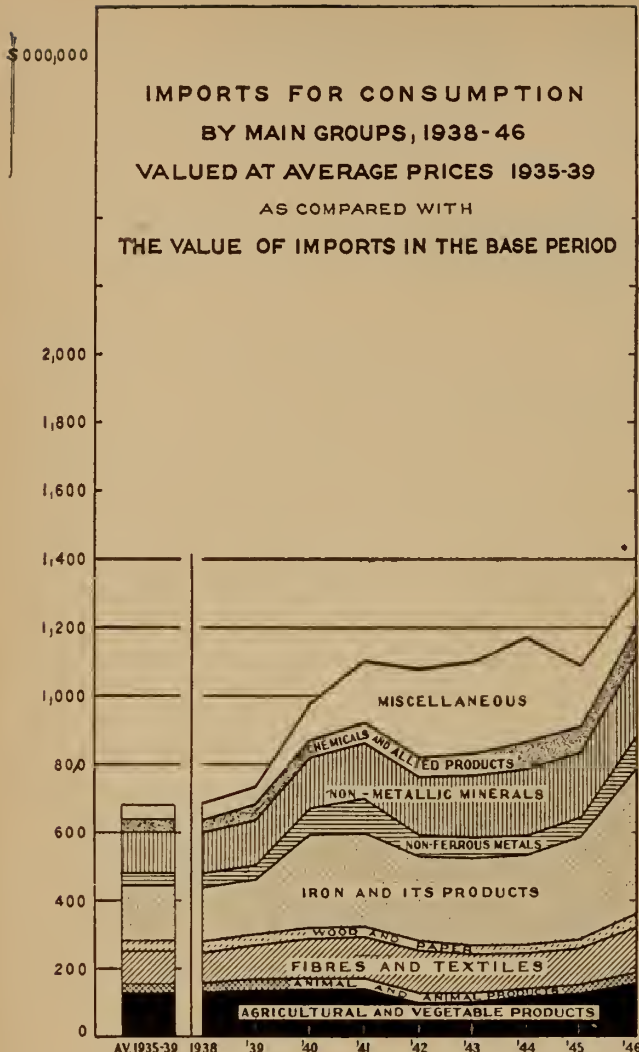
The Canadian Government has declared its intention to administer these " Austerity " controls in a manner consistent with the Geneva Agreement. The use of quantitative restrictions; to safeguard a country's external financial position and balance of international payments, is provided for in article XII of the Agreement. This article takes account of the situation of a country which does not possess sufficient foreign exchange to pay for imports required for normal purchases and consumption, recognizes that such a country may find it necessary to restrict the volume of its imports essential to its economy, and lays down rules for the use of quantitative restrictions in such circumstances.

The " Austerity Programme " is intended to be a temporary expedient, while it is hoped that the Geneva Trade Agreement is something of lasting value. The two may, from a short term aspect, appear to be acting at cross purposes. Yet the ultimate results from the former may well be found to ultimately augment or enhance the benefits accruing from the latter, by virtue of the potential increases in exports of secondary manufactures, and of additional raw products of our natural resources, at the new low rates of duty called for in the Geneva Pact.

Scope and Limitations

The announcement on November 17th featured the " Multilateral General Agreement on Tariffs and Trade ". It concerned agreements between Canada and the United States of America, the United Kingdom, Australia, Benelux, (Belgium, Netherlands and Luxembourg), Brazil, Burma, Chile, Ceylon, China, Cuba, Czechoslovakia, France, Lebanon-Syria, New Zealand, Norway, the Union of South Africa, South Rhodesia, India and Pakistan. The Draft Charter for an International Trade Organization, published earlier, was the outcome of two years of intensive preparation, including six months continuous international negotiations at Geneva, and was unprecedented in scope and importance in the history of international trade, reversing as it does the trend that has persisted over the past thirty years towards trade restrictions and economic isolation. This charter has gone forward for adoption to the World Conference at Havana, now in session.

The General Agreement went into force provisionally on January first 1948 for the countries which have signed the protocol, viz. Australia, Canada, France, Benelux, the United Kingdom and the United States.



(Prepared by the Dominion Bureau of Statistics)

It goes into force definitively only when accepted by parties accounting for eighty five per cent of the total external trade of all signatories. It will remain in force at least until January first 1951.

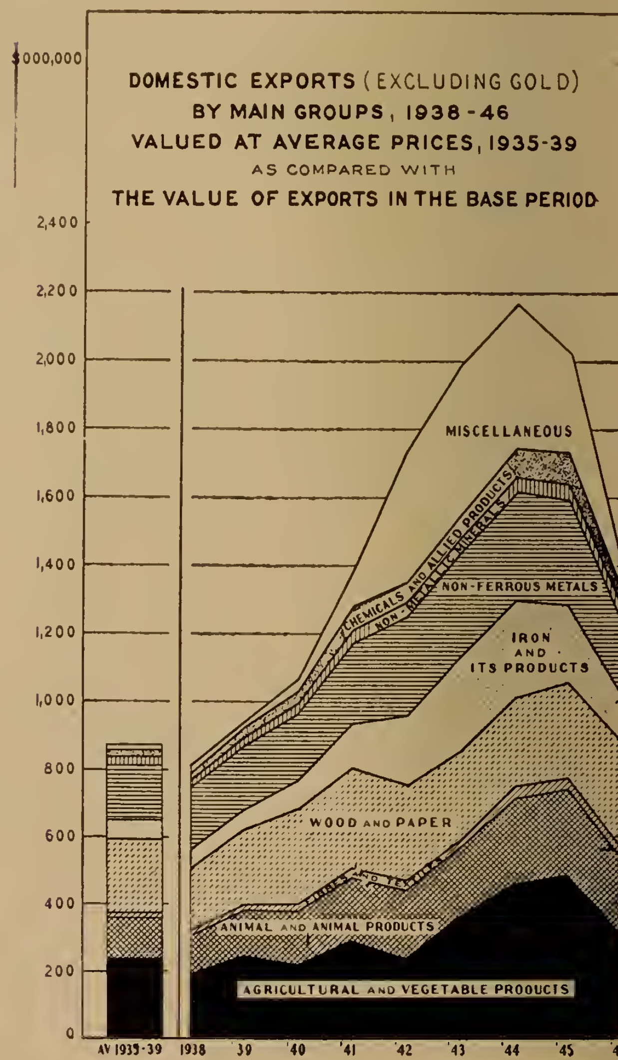
Though the agreement follows the usual prewar trade agreement pattern, it represents a quite new and significant experiment, in that it incorporates multilateral undertakings by which each country binds itself to other signatories. Important articles therein concern most favoured nation treatment, and important export restrictions. Provision for abolition is made in each case, yet modified to suit present world economic conditions. Article eleven, for example, provides that no restrictions other than duties, taxes or other charges shall be instituted or maintained on the importation of any products of any other contracting party or on the export of any product to any other contracting party.

Products of Forests, Mines and Factories Widely Affected

The official Bulletins respecting the Geneva Agreement, together with the related documents, including schedules, are published under the title CANADA TREATY SERIES, 27 and 27A. These are of wide interest to every Canadian citizen, and are available from the King's Printer at Ottawa, at a price of 25 cents each. On first glance at the schedule, it is easy to jump to the conclusion that the widespread reduction in tariffs on foodstuffs, which apply on some 40 per cent of the total value of Canada's principal exports in 1946, far outweigh the benefits accruing from tariff reductions applied on other exports. But such is far from being the case. There are also many items in the schedules dealing with concessions to Canada in the reduction of duties on the export of products of forests, mines and of heavy industries. These apply on items totalling about 45 per cent of the total value of all 1946 exports in the form of raw or partly processed materials, and on about 15 per cent of total 1946 exports in the form of manufactured or processed goods. These are of more than passing interest to engineers generally, and to consulting engineers and those employed in mining, forestry, and heavy industry manufacturing in particular.

Concessions to Canada by Various Countries

Disregarding the concessions on agricultural products, such as livestock and other food stuffs, as having less direct interest to the engineering profession, concessions that affect exports of products of forest, mines, quarries and heavy industry generally are as follows:



(Prepared by the Dominion Bureau of Statistics)

FOREST PRODUCTS

Maximum 50 per cent reductions on U.S. duty, as well as in I.R.C. tax, are made on sawn and dressed soft lumber, and on plywood and veneers (other than birch and maple). Duty is bound free on certain hardwoods. Binding of free entry is assured for poles, ties and firewood. Further reductions are allowed in U.S. duty in many manufactured products of forest origin such as canoes, hockey sticks, staves, lath, shingle bolts, tool handles, etc. Benelux binds free entry for logs, pulpwood and wood pulp and binds rates on veneers, and tongue and groove wood. France reduces duty on logs, pulpwood, veneer leaves, tongue and groove wood and wood pulp. India and Pakistan reduce duties on Douglas fir lumber and wooden ties. The U.S. binds free entry on newsprint and wood pulp and reduces rates on uncoated printing paper. Tariff on rolls for wallboard is bound in case of unfinished board and reduced in the case of finished board.

BASE METALS

The U.S. duty is cut one-third on aluminum metal, and halved on aluminum plates, sheets and scrap; maximum 50 per cent reduction of duties is provided by the U.S. on magnesium, tantalum, calcium, nickel in all forms excepting tubes and tubing, and on zinc sheets, scrap and dross; free entry and maximum reduction on I.R.C. tax applies on all copper, including manufactured products containing over 4 per cent copper. Benelux gives free entry for lead and zinc ores, copper ingots, nickel ingots and plates, zinc ingots, and nepheline syenite; and reduction in duties on feldspar, talc, limestone, lime, brick, cement, corundum and magnesite. Free entry remains on asbestos, gypsum, lignite, stone, sand and gravel, gas, radium and selenite. France binds free entry on ores, and reduces duty on copper, nickel, aluminum and zinc ingots. Free entry is allowed for lead ingots. Czechoslovakia and Norway bind free entry for certain forms of copper, nickel, aluminum and cadmium.

IRON

For entry into the U.S., the 75 cents per ton duty on iron remains. Duties on scrap iron and steel are halved, and reduced on ferro manganese and ferro chrome.

RUBBER

Free entry or reductions in duty are allowed by Benelux, France, India, Norway, Brazil, Chile, China, Cuba and Czechoslovakia on synthetic rubber, belting and tires.

CHEMICALS

The U.S. allows various reductions in duties for various chemicals, carbon-black and gas black, cedar oil, salt, selenium and tellurium compounds, aluminum sulphate, ammonium nitrate, calcium carbide, explosives and ethyl acetate. Benelux binds duty free on blacks and reduces duties on fertilizers. Cuba reduces duty on calcium carbide, while India provides for free entry on penicillin.

MANUFACTURED GOODS

The U.S. tariff is reduced or halved on many metal articles and wares and machinery, and on articles made wholly or in part of natural rubber, carbon, or graphite; on machinery and appliances employing any electric element or device; on electric stoves, articles made of synthetic rubber, aircraft and aircraft parts, pleasure boats, sporting goods, organs, binder twine, agricultural implements, farm tires and whiskey. The U.S. tariff is halved on all metal articles not otherwise named in the Schedule. This is a " basket " item of wide interest to Canadian manufacturers. Benelux gives reductions in duty on rubber and belting, and binds existing tariffs on agricultural instruments, soaps and toilet goods. France binds free entry on synthetic rubber.

Principal Canadian Exports, by Commodities

(Order of Importance in 1946)

No.	——	1938	1945	1946
		(Millions of Dollars)		
1	Newsprint paper	104.6	179.5	265.8
2	Wheat	89.4	475.8	250.3
3	Wheat flour	17.6	97.9	126.7
4	Planks and boards	35.9	98.9	125.4
5	Wood pulp	27.7	106.1	114.0
6	Fish	25.6	80.2	86.5
7	Automobiles trucks and parts	24.9	300.6	78.3
8	Bacon and ham	30.9	96.5	66.4
9	Aluminum	23.7	133.6	56.0
10	Nickel	52.5	54.8	55.2
11	Locomotives and railway cars	0.4	45.9	53.3
12	Copper	53.3	40.9	37.0
13	Fertilizer	7.1	30.4	32.1
14	Raw furs	13.6	28.5	30.9
15	Whisky	10.8	23.0	29.7
16	Farm implements and machinery	7.8	20.2	28.9
17	Pulpwood	13.6	23.9	28.7
18	Zinc	9.8	20.4	27.8
19	Fresh beef and veal	0.5	37.8	27.2
20	Canned meats	0.4	21.8	27.1
21	Eggs	0.5	44.1	26.8
22	Asbestos	13.3	22.2	24.5
23	Cheese	11.9	27.9	21.9
24	Electrical apparatus	4.1	61.0	20.9
25	Ships and vessels	0.2	15.6	18.8

Principal Canadian Imports, by Commodities

(Order of Importance in 1946)

No.	——	1938	1945	1946
		(Millions of Dollars)		
1	Machinery, except farm	36.9	92.8	130.3
2	Coal	35.8	102.4	120.4
3	Cotton and manufactures	29.5	89.4	119.2
4	Automobiles and parts	37.4	72.7	98.2
5	Fruits	20.9	71.5	95.5
6	Petroleum, crude	41.1	72.3	89.5
7	Farm implements	19.6	50.4	68.4
8	Wool and manufactures	25.2	43.7	64.6
9	Rolling mill products	25.5	55.0	53.4
10	Electric apparatus	13.1	43.1	47.8
11	Sugar and products	20.6	32.1	39.9
12	Books and printed matter	15.3	21.4	30.7
13	Petroleum refined	13.4	20.4	29.6
14	Engines and boilers	7.8	20.8	29.5
15	Furs	5.7	21.2	27.3
16	Vegetables	6.1	22.0	27.2
17	Glass and glassware	6.7	16.1	23.3
18	Flax, hemp, jute and products	8.5	17.8	23.1
19	Nuts	3.5	14.3	22.6
20	Artificial silk and products	3.7	20.8	22.1
21	Grain and grain products	17.3	12.5	20.2
22	Rubber and manufactures	11.3	15.1	20.1
23	Paper	7.5	13.4	18.8
24	Household and personal effects	6.2	8.4	18.6
25	Clay and products	7.7	13.7	17.8

Concessions Given by Canada

Concessions granted by Canada to other countries with respect to reductions in tariff on imports or articles other than those of farm origin, or textiles, can be summarized as follows:

PULP, PAPER, BOOKS, ETC.

Duties on periodicals, books, etc. bound at present levels. Tariffs reduced on various manufactured paper products such as forms, labels, bonds, cards, etc. and advertising and printed material. Reductions allowed on tariffs for roofing and felt shingles, paper bags and wall paper. Because of U.S. action in halving I.R.C. code tax on imported lumber, Canada has accepted a 50 per cent reduction in margins of preference on lumber enjoyed by the United Kingdom and other Commonwealth countries.

CHEMICALS

Tariffs on some 20 chemical items are bound at present levels. Reduction in tariffs are allowed on oxalic acid, butyl alcohol, salt cake, glue, edible gelatine, spraying chemicals, certain toilet preparations, motion picture films and negatives, paints, putty and gums, ink, whale oil, certain acids not produced in Canada, toilet soap, varnishes and lacquers.

GLASSWARE AND EARTHENWARE

Reductions are allowed in tariffs on window and plate glass, marble, asbestos goods, incandescent bulbs, drain pipe, sewer pipe and wall tile.

NON-FERROUS METALS AND METAL PRODUCTS

Reduced tariffs are allowed on primary and rolling mill products of aluminum; free entry bound or tariff slightly reduced on zinc products; tariffs on wire of all metals other than steel and aluminum are reduced by a third, and on brass and copper manufactured products by a fifth. Slight reductions apply on nickel plate and electro plate wares.

IRON AND STEEL ROLLING MILL PRODUCTS

Tariffs on tinplate not made in Canada reduced one-third, tariff on flat steels reduced by 30 per cent, on iron and steel castings by ten per cent, on forgings by ten per cent, and on axles and bars by ten per cent. Entry of cast iron pipes, tubes and couplings, springs and chain, farm implements and machinery is bound free; reductions of twenty per cent in tariffs are allowed on crushers, drills, and mining and quarry railway equipment, and of seventeen per cent on machinery, logging cars and cranes for logging operations. Tariffs on lighting fixtures and appliances, on telegraph, telephone and radio equipment are reduced twenty per cent, and on generators and transformers, insulators and electrical appliances, by ten per cent; tariffs on fire fighting equipment and locomotives are reduced fifteen per cent; tariff on mining railway equipment reduced one-third, with free entry if not made in Canada. Tariff on aircraft is reduced by 25 per cent and on aircraft engines by 12½ per cent; tariff on domestic pumps is reduced ten per cent. Slight concessions are given on fencing. All types of motor vehicles are bound against any increase in tariffs.

Overall Benefits Difficult to Assess

An intelligent translation of these various tariff concessions into benefits to Canada's trade accruing from the agreement, is only possible by experts. Generally speaking, however, tariffs appear to be eased on exports of Canada's raw materials other than food, to a somewhat greater extent than on the exports of manufactured goods. On balance the concessions seem to tend toward greater encouragements for Canada's trade with the United States, Benelux, and France, rather than with Britain and other commonwealth countries, at least so far as Canadian products of mine, forest and heavy industry are concerned. For example, it will be observed that U.S. tariff concessions on lumber are at the expense of restrictions in United Kingdom preferences on this product.

Exports of synthetic rubber and certain rubber products are widely encouraged. Entry to the U.S. and Benelux on certain chemicals readily produced in Canada is made easier, while concessions by Canada relate mostly to chemicals not produced in this country. In the case of partly manufactured durable goods, while we allow minor concessions on entry of flat steels, castings, forgings, axles and bars, there is a far wider domestic market than Canadian producers can presently fill.

Entry to the U.S. of our manufactured products made wholly or partly of natural rubber and carbon, and of machinery or equipment employing any electrical device, is made easier, but this is a difficult market for Canada to compete in. Entry to the U.S. on Canadian made boats, sporting goods, pipe organs, will be helped. The concessions we give relate largely to machinery and equipment of a special nature not extensively made in Canada at present. Yet many of them may well be rendered ineffective by " austerity " controls limiting imports, perhaps for a long time to come.

One reason these concessions on manufactures don't show up to advantage is because a few large export items such as wheat, flour, meat, lumber, paper and minerals constitute about eighty per cent of our exports. The effect of tariff reductions on such items dwarfs the benefits from concessions on manufactured goods.

But if some of them may appear trivial, it should not be forgotten that Canada is so dependent on world trade that she is not solely or even primarily concerned with getting tariff reductions. She is far more deeply concerned with general expansion of world trade, so as to alleviate our customer nations' dollar shortages and to enable them to live within their dollar resources.

While the foregoing summary of schedules is far from being a complete one, it catalogues the principal items, and should serve the purpose of directing attention to the type and extent of tariff reductions on articles of forest, mine and quarry, as well as the products of heavy manufacturing industries. These are the items of direct interest to the engineering profession. The well informed engineer of today cannot afford to ignore important developments such as this in the field of economics, one that may well be looked back upon as the turning point in the history of international trade.

Report of Council For the Year 1947

Together with Committee and Branch Reports

In preparing the annual report of Council on the state of the Institute it is always a pleasure to note a substantial increase in membership. With some variation this has held for over ten years, but lately the rate of increase has been accelerating.

Membership

The total membership at the end of 1947 was 9,159, an increase of 752 for the year. Over 1,100 names were added to the list but deaths, resignations and removals held the net gain to the lower figure.

Once again the statement of transfers from one grade to another tells the story of the working of the new by-laws whereby Students are transferred automatically to Juniors, and the transfer of Juniors to Members is expedited. There were 527 Students transferred and 387 Juniors. It is interesting to see that the combined forces of Students and Juniors now total 4,000, or approximately 43 per cent of the total membership.

Rehabilitation and Employment

1947 saw the completion of this service to members overseas. The regular employment service has been unusually active and naturally in the course of ordinary business has had many contacts with members who formerly were included in the rehabilitation field. The funds voluntarily subscribed by members were adequate for the purpose, and were of inestimable value in aiding the Institute to render a really useful service to the men in uniform. This early interest in overseas members has been spoken of as one of the most useful things ever undertaken by the Institute.

The records of the Employment Service indicate that the openings for engineers still far exceed the supply. Throughout the year the ratio between openings and applicants was three to one. As a gauge of the usefulness of this activity and of its task, it is observed that almost 900 interviews took place in 1947. It is recommended that members read the detailed report of the service shown later in this report.

Council Meetings

Eleven meetings of Council were held throughout the year, six in Montreal and the others at Saint John, Toronto (two), Halifax and Quebec. The average attendance of councillors throughout the year was fifteen.

Annual Meeting

Toronto was the location for the 1947 annual meeting and Diamond Jubilee. Once again it proved its suitability for such occasions. The unexcelled facilities of the Royal York Hotel, and the interest, enthusiasm and hospitality of the Toronto members made an unbeatable combination. The innovation of holding the meeting in May instead of in February as has been customary, was well received. It is not likely that Council will go back to the February dates again.

Student Conference

As a feature of the annual meeting the second annual conference of student society representatives was held at Toronto under the chairmanship of Dr. G. R. Langley. Every university at which an engineering degree is given was represented and the conference lasted all day. It is quite apparent that this method of showing a genuine interest in the students is appreciated. The delegates took the first steps towards setting up a permanent organization to work with and to aid the Institute in future conferences.

New Activities

Under this heading there are two events to record. For the first time the Engineers' Council for Professional Development met in Canada and were guests of the Institute at Montreal. Again for the first time, a conference in Community Planning was held in Montreal under the direction of the Institute's committee in co-operation with the first annual meeting of the Community Planning Association of Canada. Both events were successful and it is hoped will be repeated from time to time as opportunity offers.

Ottawa Interests

Throughout the year the Institute followed several matters of importance to the profession that required correspondence, and visits with government officials at Ottawa. These included the perpetual effort to secure just reward for the employee in the civil service, the unfair basis of remuneration in the Navy, the renewal of the tariff on engineers' plans coming into Canada from other countries, and collective bargaining. All issues remain active but there is little progress to report.

Ontario Division

During the year members in Ontario secured authorization from Council and from the membership to set up a provincial division in accordance with the by-laws. The purpose of the division is to promote branch activities, increase membership and to develop close cooperation with other societies. Vice-president W. R. Manock of Fort Erie was elected chairman; J. R. Dunbar, vice-chairman; secretary, E. R. Graydon; and treasurer, Maj. Gen. G. R. Turner.

Roll of the Institute

The membership of all classifications now totals 9159, which again is a record. New names added for the year 1947 amounted to 1101, but deaths, resignations and removals reduce the net figure to a gain of 752.

During the year 1085 candidates were elected to various grades of membership. These were classified as follows: Honorary Member, 1; Members, 197; Juniors, 43; Students, 836; Affiliates, 8. The elections for the previous year totalled 1215. Sixteen reinstatements were effected. Life membership was conferred on 56 members under the revised by-law 26.

Transfers from one grade to another were as follows: Member to Honorary Member, 3; Junior to Member, 387; Student to Member, 7; Student to Junior, 527; Junior to Affiliate, 1, a total of 925.

The names of those elected or transferred are published in the *Journal* each month immediately following their election.

Removals From the Roll

There have been removed from the roll during the year for non-payment of fees and by resignation, 136 Members; 94 Juniors, 37 Students, and 12 Affiliates, a total of 279.

Deceased Members

During the year 1947 the deaths of 70 members of the Institute have been reported as follows:

Members

Affleck, Garnet
Archibald, George DeWolfe
Barbour, Frank A.
Barton, Harold Miall
Bruce, William Joseph
Bury, Bertram Edward
Campbell, Lorne Argyle
Cariss, Carington Carysfort
Carmel, Joseph Edward
Chapleau, Samuel J.
Charlton, Richard M.
Currie, Homer Lindsay
de Hueck, Baron Boris
D'Aeth, John Bancroft
Dickie, Frank Evans
Drysdale, William F.
Evans, E. Ronald
Fetherstonhaugh, William S.
Flanagan, Oliver L.
Fleming, Alex. Greig
Floyd, Edward
Folger, Collamer Coverdale
Gaby, Frederick A.
Ganter, Ernest Linwood
Gaudet, Frederick Mondelet
Grant, Gordon
Gray, Samuel Wilson
Greig, Alex. R.
Hardy, George F.
Hill, George Rixon
Hughes, Henry Thorsby
Irving, T. T.
Jennings, Percy John
Jette, J. Arthur
Johnson, Claude Vernon
Kensit, H. E. M.
Lea, William S.
Lewis, David O.
Lynn, Harold Riviere
McCall, Thos. Lockhart
MacDonald, Peter James
McIntyre, Earl John
Macleod, George
MacNab, Thomas Morrow
Macphail, Jeffrey Burland
Menges, Edwin A. H.
Mitchell, George Breck
Moore, Henry Alex.
Murdock, Charles Russell
Murray, Archibald
Openshaw, John Edward
Parks, John H.
Piche, Joseph Pierre
Porter, Sam G.
Powell, George Giles
Raley, Charles
Reevely, Fred. Richard
Reid, Frederick Blair
Reid, William Murray
Ricker, Herbert A.
Roberts, P. B.
Sinnamon, Alvin Wheeler
Smaill, William
Spence, John James
Stephens, John
Stevens, Robert Herbert
Strickland, Robert
Tripp, George Mason

Juniors

Lee, William Ulysses
Moseson, Stanley Gustav

Total Membership

The membership of the Institute as at December 31st, 1947, totals 9159. The corresponding number for the year 1946 was 8407.

	1946	1947
Honorary Members	16	20
Members	4681	5075
Juniors	1833	1924
Students	1783	2049
Affiliates	94	91
	8407	9159

Respectfully submitted on behalf of the Council,

L. F. Grant, M.E.I.C., *President.*
L. Austin Wright, M.E.I.C., *General Secretary.*

Legislation Committee

The Committee has kept itself advised on all matters which might have led to legislation likely to affect the interests of the Institute or of its members.

It has stood in readiness to consider all suggestions or reports on the matter.

Opportunity would have met a great desire to serve.

Respectfully submitted,

J. A. Beauchemin, M.E.I.C., *Chairman.*

Employment Service

The past year has been one of intense activity in the matter of placements and interviews. The trend continues. and although there is a slight decrease in the number of openings, the ratio of vacancies to engineer applicants available to fill them during 1947 was approximately three to one.

While this condition is typical of many of the professions today, there is no positive indication of how long it may continue. For that reason the Employment Service is more concerned with the lasting value of the work done in effecting placements and making new contacts. Only by the earnest co-operation of members in informing the service in each instance when negotiations between applicants and employers are concluded can the Employment Service achieve its full benefit to all concerned. Applicants should be particularly careful to follow up and clear correspondence between themselves and prospective employers. The prompt closing of files in the Employment Service records will enable the staff to handle efficiently the large volume of work, and thus increase the value of the service to the members.

All possible steps have been taken to systematize the work and, during the latter part of 1947, when unavoidable delays in printing and preparing the *Journal* were experienced, advance bulletins listing "situations vacant" and "situations wanted" were sent out to members to ensure early information. This service continues.

A total of 893 interviews was recorded in 1947, and known placements totalled 178. Many more placements undoubtedly were made through the services of the Employment Section, but no first hand information was available to put these on the official record. In addition, some 400 new job files were opened during the year. Applicants' files open at the year's end numbered 96.

Demand is still at its highest for junior engineers. A recent official survey indicated that, for the next three to four years, very large numbers of engineering graduates may be expected from Canadian universities. One of the main objectives of the Service is to ensure that these young men, many of them student-veterans, are taken care of and, with scores of new firms added to the enquiry files, the outlook is bright.

There has been a close liaison between the Institute and the universities, both in respect to vacancies for engineer graduates and in suggesting applicants to fill university posts that had become available.

More difficulty has been experienced in the placing of older men. Despite a sizable number of successful allocations in this group, a fairly large list of these men still remains. All, however, are working at present.

The Service has had many enquiries from Great Britain regarding employment in Canada. All such enquiries have been answered directly and frankly concerning the situation here. Although it is not the Institute's policy to encourage British engineers to pull up roots and venture here on a gamble, a great many have come and have been placed without difficulty at no detriment to existing applicants.

An encouraging factor in the work has been the favourable letters from engineering firms—some of them among the largest and most exacting in their requirements—regarding the number of applicants and the high professional calibre of these new employees which the Employment Service has been able to send to them.

Respectfully submitted,

(MISS) J. SUMMERS, *Employment Service.*

Board of Examiners

The practice of referring applicants classed as Member with examination to the provincial associations or the Quebec Corporation has proven satisfactory during the past year and the board of examiners has not been called upon at any time.

The board therefore has nothing to report.

R. DEL. FRENCH, M.E.I.C., *Chairman.*

Publication Committee

The past year has been one of great significance for *The Engineering Journal.* There is every reason to believe that the low point of the curve has been passed and that the year 1948 will show a steady improvement.

The most important feature of the year's activities has been the termination of the present advertising contract and the appointment of a new full-time publications manager for the *Journal.* Mr. N. E. D. Sheppard, the former advertising manager in his capacity as president of Canadian Engineering Publications Limited had necessarily to devote the majority of his efforts to his firm's own publications and your Committee believed that the promise of an expanding *Journal* should warrant the appointment of a full time publications manager. The appointment of Mr. E. J. Blandford to this post effective January 1st, 1948, was noted in the December 1947 issue of the *Journal.*

During the year just passed the *Journal* has been seriously affected by rising costs and it has been found necessary to increase the cost of advertising space by 50 per cent—an unprecedented but essential increase and an increase justified by the fact that *Journal* rates per page per thousand of circulation have stood previously at only about one-half the national average for technical publications. In view of increases also announced by many publishers the *Journal's* rates are still only about two-thirds of this average.

The paper situation has shown considerable improvement and the Committee is pleased to announce that the *Journal* will shortly be printed on a good quality coated stock. The committee submits that, as the official organ of the Institute, the *Journal* should be of as high quality as possible and it is considered that coated stock although more costly is essential to this high standard.

Because of the great activity in all branches of engineering, supply of papers for the *Journal* has not presented a serious problem. Plans are in hand for restoration of features which have been deleted due to paper shortages and your committee has already approved other plans for a considerable improvement in the overall layout of the editorial pages.

Due to an increase of approximately 50 per cent in printing and engraving costs which was effective in October, the excess of income over expenses for 1947, is below that of 1946, but the increase in advertising revenue expected in 1948, should, your committee believes, reverse the downward trend although the full effects of the increase will not be felt until late in 1948 when most existing contracts will have expired.

The committee wishes to record its sincere regret on the death of Mr. J. B. Macphail. Although Mr. Macphail's illness prior to his death prevented active participation in the work of the committee his contributions in the past have been valuable. His place will be difficult to fill.

Respectfully submitted,

C. E. GELINAS, M.E.I.C., *Chairman.*

Membership Committee

The new by-laws (Nov. 1946) in respect to the admission and transfer of members have been in force for over a year now. The results are eminently satisfactory. The sweeping readjustment of membership to comply with these by-laws was accomplished smoothly, the operations of the Admissions Committee have relieved Council of much detail work, and the Headquarters routine work has been immeasurably simplified.

Your Committee has been studying the implications of the very able analysis of the Institute presented by Dr. Huet Massue at the last Annual Meeting. The membership of the Institute is not as well balanced as it should be, either geographically or by occupation; nor is the membership as large as the branch coverage should warrant. The Institute is the one engineering body whose membership embraces all occupations of engineers from coast to coast. It is an invaluable medium within which to "make friends and influence people". The comparative value of a medium for meeting people who know, to a medium for learning technical facts, is grossly undervalued by too many engineers. The unique advantages of the Institute in widening one's circle of erudite and influential friends cannot be overemphasized.

Your Committee is working on ways and means of coordinating and expediting the work of the Branch membership committees. These Branch committees have a thankless, tedious job, and upon their voluntary efforts depends, in large measure, the advance or decline of the Institute. It is hoped that developments, underway, may be helpful in making their work easier and more rewarding, and that means will be found to subdivide the work so that their efforts are more profitably directed and that routine chores are taken over by a professional staff.

Respectfully submitted,

H. R. SILLS, M.E.I.C., *Chairman.*

Committee On Industrial Relations

Since the last annual meeting the Committee on Industrial Relations has held meetings on 17th January, 21st February and 8th April, 1947.

During the year the Committee has studied schemes for inducting young engineers into industry and for giving them a general training. It also maintained contact with the committee established to arrange for Canadian participation in the International Management Congress in Stockholm during the summer of 1947, and with the development of the Institute of Industrial Relations of the University of Toronto.

The Committee also received a report on wage and labour matters in Great Britain from one of its members who had recently visited that country.

Respectfully submitted,

WILLS MACLACHLAN, M.E.I.C., *Chairman.*

Committee on Community Planning

Early in the year it was decided to promote a meeting of the Institute in Toronto to discuss the engineering approach to Community Planning. It was suggested that the meeting be held in May or June, 1947.

However, it was discovered that the Community Planning Association of Canada was organizing a convention of its members in Montreal in October, and as many of our members would be attending this meeting, it was decided to make it a joint affair with the Association and the Institute combining.

This meeting proved to be a most successful affair, and the members of the Institute took a prominent part in its proceedings.

During the conference a meeting was held to discuss what should be the Institute's part in Community Planning. Several suggestions were made, one of which was that a hand book should be prepared by the Institute. Another was that a Director of Planning might be engaged to do promotion work in the various branches of the Institute.

A great deal of the discussions at the conference centered on Housing, and it was apparent that this was one of Canada's most important problems at the present time.

This committee is of the opinion that the above suggestions might well be considered by Council. The various branches should be encouraged to set up local committees to promote the science of planning in their communities.

Where permanent planning committees are set up in our cities and towns, members of the Institute should be included in these committees. It is our opinion that city councils would welcome assistance of this kind.

We recommend that in the future, one or more papers should be included in the programme of our annual meetings on the subject of Community Planning.

The subject of Housing is of such great importance that the members of this committee resident in Toronto, were asked to prepare a special report on the Institute's part in its solution. This report is now before the Council of the Institute.

All of which is respectfully submitted,

R. L. Dobbin, M.E.I.C., *Chairman*

Papers Committee

The branches appear to have managed their programmes satisfactorily during the 1947-48 season and the Papers Committee has not been called upon for any assistance.

The committee therefore has nothing to report.

Respectfully submitted,

S. G. Coultis, M.E.I.C., *Chairman.*

Canadian Standards Association

At the Annual Meeting of the CSA held in Montreal on the 28th Nov. 1947 it was announced by the Manager that 23 new Standards had been issued, which number could be sub-divided as follows:

Civil Engineering	6	Welding Section	2
Mechanical Engineering	2	Miscellaneous	1
Electrical Engineering	6	Tentative	6

In addition to these, some 32 current standards had been revised or brought up to date and this latter work included as a major item the publication of the 5th Edition of the Canadian Electrical Code, Part. I.

The Welding Bureau had advanced in organization and usefulness and there is every indication that its prestige was growing with its activity. Besides its primary work of qualifying operators and plants the Bureau is already making itself felt as an agency for the improvement of technique, and the provision of advice on welding procedure and design. Further development along the educational line is confidently looked for and there is every reason to believe that it will soon be widely recognized as furnishing a valuable service to industry and construction. The City of Toronto has recently advised the Bureau that its approval and qualification of firms and work will render such work acceptable to the Municipal Authorities.

Another important standard which is nearing completion is that concerned with Limits and Fits in Engineering Practice. Together with a standard on Drawing Office Practice, this undertaking is of an international character, as both the U.K. and the U.S.A. are co-operating. Activity is also noticeable in the field of standards for metallic alloys including Al. Cu. and Ni. Screw products and various building products are being dealt with by special committees and a new field of "Packaging" is being entered quite heavily. Photographic equipment and materials constitute another new line where the CSA has assumed responsibilities, upon the request of interested parties, for producing standard specifications.

In the electrical field the CSA has become a working member of the International Electrotechnical Commission, having organized a national committee to that end.

Membership in the newly established International Standards Organization has been accepted, which will connect the activities of the CSA with the work of corresponding bodies in 30 nations. This is in addition to the co-operation established between the standardizing bodies of the Commonwealth.

Respecting this international aspect of standardization, it is useful to remember that the CSA maintains stocks of many British and foreign standards on a wide variety of subjects.

The Approvals Division of the CSA continues its successful career and has enlarged its activities to a notable extent in taking over approval of equipment used in connection with fire hazards, oil burners, etc. The recent expansion in quarters has made it possible to separate the detail work of administration of this Division from that of the Standardizing Body, so that the staffs will now be largely independent as to space and personnel.

Financially the CSA has found the expense of operation to be increasing rapidly with new demands and rising costs, but measures looking to a wider support from industry, and a gratifying augmentation in the Government grant are expected to make possible the continuation of all activities on a sound basis.

Respectfully submitted,

P. L. Pratley, M.E.I.C.

Representing E.I.C. on Main and Executive Committees.

Library and House Committee

Three meetings, attended by all members, were held during the calendar year. Preliminary plans and estimates were prepared by Mr. R. F. Shaw for a new building to replace the front part of the existing Headquarters building, utilizing the space to the street line and the whole width of the lot, also retaining the present auditorium. The auditorium would be enlarged into the new building. These plans were submitted to the House Committee of the Montreal Branch and their comments and suggestions were received as well as those of the Headquarters staff.

After further discussion on this subject it was decided that a proposal to renew the whole existing building should be studied, but before doing so the matter was submitted to the Finance Committee to ascertain if means could be found to finance a new building, and to what extent. The Committee is fully cognizant of the needs of Headquarters staff for enlarged facilities, but does not wish to waste time on a preliminary study of a project, the cost of which would impose too great a burden on the Institute.

During the year considerable much needed redecorating was done, as well as improvements made to the ventilating system, and steps taken to have it operated more effectively. A new beaded glass screen for projection purposes was purchased, and more coat hooks provided in the cloak room. Additional chairs for the auditorium were also recommended. The front steps of Headquarters building were found to be in dangerous condition and were repaired in a temporary manner. It is expected that a permanent replacement will be made very shortly.

Library

The Library consists of approximately 13,159 volumes including text books, reference books, periodicals, transactions, etc., some 2,475 feet of shelving and 49 vertical file drawers.

Accessions	1947	1946
New Books	228	101
Proceedings & Transactions	82	33
Reports & Bulletins	447	541
Standards & Tentative Standards	90	91
Pamphlets	152	155

Material including textbooks, transactions, periodicals, etc., but excluding pamphlets, standards and miscellaneous items, to the value of $2,470 has been added to the Library during 1947. Included among our holdings are the 1947 edition of The Encyclopaedia Britannica and also four films which comprise the nucleus of the film library.

We take this opportunity of thanking the publishers and reviewers for their very kind co-operation during the past year. Due to the continued paper shortage in 1947 we were able to publish only 13 signed book reviews, 61 book notes by the Institute Library, and 174 book notes by The Engineering Societies Library. However, this is an increase in signed reviews of 7 over 1946. By publishing reviews and notes of new books in the *Journal,* we bring new publications to the attention of readers, and also acquire considerable new material for the library, thus serving a two-fold purpose.

Again, use made of the Library has shown a marked increase over the previous year. An increase of 1,261 or 30.8 per cent more requests and 1,383 or 52.4 per cent more loans illustrate this point, as do the following statistics:

	1947	1946
Days Open	270½	267½
Evenings		
(5 to 8 p.m. Thursdays—winter months)	24	not open
Inquiries Received		
By Phone	2,531	2,037
In Person	1,592	1,056
By Letter	1,229	998
Total	5,352	4,091

Increase 1,261 or 30.8 per cent.

Circulation	1947	1946
Books Borrowed	1,347	620
Periodicals, etc., Borrowed	1,821	1,348
Pamphlets Borrowed	816	636
Inter-Library Loans Borrowed	36	33
Totals	4,020	2,637

Increase 1,383 or 52.4 per cent.

New Borrowers Added	180	not recorded
Special Services		
Bibliographies Prepared	95	102
Pages	236	229
Photostat Orders	26	18
Prints	177	442
Orders for Members	270	150

The work of reorganizing the Library has progressed considerably. New Library Rules and Regulations have been prepared and these will appear in the Library Notes of *The Engineering Journal,* each month commencing with the February 1948 issue.

The Library Deposits, required before material may be borrowed, have been recorded and a system set up whereby Library deposit cheques may now be deposited, and still held by the Library in the name of the borrower. Old cheques have been returned to members.

All serial material (periodicals, transactions, annual reports, bulletins, etc.) is now being recorded on a Kardex as received. In the near future, we hope to have this material catalogued and analysed, and thus facilitate reference work and use by borrowers. At that time a list will be issued of all titles received currently in the Library. This list should prove of considerable assistance to members.

The subject bibliographies, numbering 359, compiled for members during the past ten years or more have been catalogued and therefore made available for reference purposes.

The new catalogue has been set up using a coloured card system to denote types of material. Only items added to the Library in the past two years have been included in this catalogue to date, and unfortunately no subject work has been possible. The shelf reading is well under way, and with the weeding of the collection, recataloguing and reclassification will be more feasible.

There is still much to be done and although we have been fortunate in adding a third member to our staff, time and space are at a premium.

We wish to draw the following facts to the attention of members:

1. Any member, resident in Canada, may borrow or purchase material from the Library. All carrying charges are payable by the borrower or purchaser.
2. A deposit of $5.00 at par in Montreal, must be made before material may be borrowed. This is a safeguard against loss or non-return of material and is refundable on receipt in the Library of borrowed items.
3. Material may be borrowed for a period of two weeks, and may be renewed on request for a further two weeks.
4. Subject bibliographies will be compiled on request.
5. Extensive literary searches will be made at a charge of $1.50 per hour to members and $2.50 per hour to non-members.
6. For the convenience of members, the reference library will remain open until 8.00 p.m. on Thursdays and until 6.00 p.m. Monday through Friday during the winter season.
7. When requesting information, books, or special services, please indicate *clearly* what is desired.

The Library is for the use of the membership. Inquiries and suggestions are welcome.

Your Committee wishes to express its appreciation of the work of the staff rendered more difficult by reason of lack of adequate space. It is hoped that some solution of the problem of accommodation may be arrived at in the near future.

Respectfully submitted,

R. C. Flitton, m.e.i.c., *Chairman.*

Admissions Committee

The Committee held monthly meetings throughout 1947 and studied a large number of applications which culminated in recommending admissions or transfers of approximately 558 members, not including 119 admitted under cooperative agreement and some 507 Student memberships.

The Committee is gradually building up a fund of experience from which it hopes to establish a set of precedents which will be useful as a guide when considering further admissions and transfers.

Considerable progress has been made in transferring Juniors to Members.

Correspondence has taken place with British and continental engineering institutions in order to assess the value of the courses given in engineering and technical schools in other countries.

The Committee calls attention to the fact that the handling of such a large number of applications and transfers was only made possible by a great deal of hard work and assistance from Headquarters staff.

Respectfully submitted,

C. A. Peachey, m.e.i.c., *Chairman.*

National Construction Council

Following the death of Mr. D. C. Tennant, in February 1947, the undersigned was appointed to represent the Institute on the National Construction Council. During 1947 meetings were held on February 27, April 17, and October 17.

The Council considered the following questions:

(a) Construction costs,
(b) Material Shortages,
(c) Vocational training and apprenticeship,
(d) Removal of tariff on engineers' plans,
(e) Disposal of war surplus building material,
(f) Canadian Welding Bureau,
(g) Housing and Community Planning,

and many others of importance to the construction industry. Representations have been made to government authorities when indicated, and the Council has stood in readiness to advise on questions within the scope of its interests.

Respectfully submitted,

W. E. Bonn, m.e.i.c.,
Representative of the E.I.C.

Nominating Committee

Chairman, W. F. Bryce

Branch	*Representative*
Border Cities	T. H. Jenkins
Calgary	H. R. Younger
Cape Breton	W. E. Clarke
Cornwall	D. Ross-Ross
Edmonton	C. W. Carry
Halifax	A. E. Flynn
Hamilton	A. R. Hannaford
Kingston	D. S. Ellis
Kootenay	C. E. Marlatt
Lakehead	J. I. Carmichael
Lethbridge	A. L. H. Somerville
London	H. A. McKay
Moncton	B. E. Bayne
Montreal	J. J. H. Miller
Niagara Peninsula	C. G. Cline
Ottawa	E. G. Cameron
Peterborough	C. R. Whittemore
Quebec	A. E. Pare
Saguenay	K. A. Booth
Sarnia	C. F. Davison
Saskatchewan	J. McD. Patton
Sault Ste. Marie	R. A. Campbell
Saint John	G. M. Gray
St. Maurice Valley	J. F. Wickenden
Toronto	A. E. Berry
Vancouver	R. C. Pybus
Victoria	A. S. G. Musgrave
Winnipeg	G. Fansett

Finance Committee

During the year 1947, the revenues of the Institute have increased considerably due to the changes in the By-laws which became fully effective a year ago. Revenues have increased due to the higher membership fees, the automatic transfer of Students to Junior membership, and of Juniors to Members, but have been reduced by the conferring of Life Membership on approximately 300 members, and the waiving of transfer fees, all as provided for by the new By-laws.

There was also some increase in the revenue from *Journal* advertising but not as much as was hoped for, and not sufficient to keep up with the continually increasing cost of publication. Further increases in our advertising rates have been authorized and will take effect as contracts are renewed. An improved showing in our publication account is hoped for in 1948.

Expenses have also increased during the year, due principally to the following:

(a) the general increase in cost of operation due to price rises.

(b) an increase of approximately 50 per cent in the rebates to Branches as a result of the increased membership fees.

(c) The payment of the travelling expenses of the President for the first time, from Institute funds.

(d) the cost of the Annual Meeting of the Engineers' Council for Professional Development in Montreal.

(e) our share of the cost of the Conference on Community Planning.

(f) a contribution of $1,000.00 towards the appeal costs in the Perry case. This item is shown under Audit and Legal fees.

Last May, Council instructed your Committee to investigate and recommend a suitable pension plan for our staff. After thorough investigation, your Committee recommended a plan which they believe was equitable and within the financial ability of the Institute to carry. This was approved by Council in October and became effective as of December 1st, 1947. The cost of future service benefits will be carried equally by the employees and the Institute. The cost of past service benefits will be borne wholly by the Institute. The cost of the latter item will be approximately $1,400.00 a year for ten years. The first installment of this

Comparative Statement of Revenue and Expenditure

For the Year Ended December 31st, 1947

Revenue

	1947	1946
MEMBERSHIP FEES		
Arrears	$ 3,187 23	$ 3,774.76
Current	65,793.10	42,144.92
Advance	1,180.78	1,730.87
Entrance	2,148.42	2,504.58
Compounded Fees	240.00	......
	$ 72,549.53	$ 50,155.13
PUBLICATIONS:		
Journal Subscriptions	$ 14,834.22	$ 13,531.62
Journal Sales	55.00	19.50
Journal Advertising	42,328.19	39,199.57
	$ 57.217.41	$ 52,750.69
INCOME FROM INVESTMENTS	$ 1,145.64	$ 1,027.17
REFUND OF HALL EXPENSE	670.00	550.00
SUNDRY REVENUE AND PROFIT ON SALE OF SECURITIES	860.43	132.16
TOTAL REVENUE FOR YEAR	$132,443.01	$104,615.15

Expenditure

	1947	1946
BUILDING EXPENSES:		
Property and Water Taxes	$ 1,349.82	$ 1,278.43
Fuel	725.03	804.59
Insurance	203.72	151.65
Light, Gas and Power	495.83	515.51
Caretaker's Wages and Services	1,188.00	1,229.80
House Expense and Repairs	1,786.27	2,624.20
	$ 5,748.67	$ 6,604.18
PUBLICATIONS:		
Journal Salaries, Printing and Sundry Expenses	$ 49,891.36	$ 42,335.76
By-Laws and Code of Ethics	456.92	725.00
	$ 50,348.28	$ 43,060.76
OFFICE EXPENSE:		
Salaries	$ 24.909.59	$ 23,091.34
Telegrams, Postage and Excise Stamps	2.719.19	2,874.00
Telephones	1.040.31	860.03
Office Supplies and Stationery	5,621.18	4,501.18
Audit and Legal Fees	1,315.00	300.00
Messenger and Express	184.22	98.29
Miscellaneous Expense	599.58	1,046.01
Depreciation—Furniture and Fixtures	503.00	433.00
	$ 36.892.07	$ 33,203.85
GENERAL EXPENSE:		
Annual and Professional Meetings	$ 2.260.50	$ 2,098.05
Engineering Council of Professional Development	958.85	......
Commonwealth Conference	......	1,058.00
Community Planning	749.04	......
Students Conference	822.21	1,180.25
Meetings of Council	811.86	1,851.21
Travelling	1,482.16	2,421.13
Branch Stationery	193.10	146.35
Institute Prizes	538.85	493.28
Library Salary and Expense	3.697.99	2,692.39
Interest, Discount and Exchange	226.50	83.36
Committee Expenses	1,039.88	750 04
Cost of Membership in Other Organizations	945.52	853.57
Sundry Expense	721.99	666.71
Pension Plan	1,384.92	......
	$ 15,833.37	$ 14,294.34
REBATES TO BRANCHES	$ 13,810.89	$ 9,227.53
TOTAL EXPENDITURE	$122.633.28	$106,390.66
TRANSFERRED TO RESERVE FOR PAST SERVICES PENSION FUND	8,000.00	......
SURPLUS OR *Deficit* FOR YEAR	1,809.73	*1,775.51*
	$132.443.01	$104,615.15

was paid during the last year and in addition, a reserve of $8,000.00 has been set up from 1947 revenue to cover part of the future payments. The pension plan has been well received by the staff.

The Institute has improved its financial position during the year and it is expected that during 1948 it will be possible to further improve its service to the members and still build up its financial position.

R. S. Eadie, *Chairman.*

Treasurer's Report

The audited statements of assets and liabilities and of revenues and expenditures for the year ended December 31st, 1947, are submitted herewith.

In accordance with the usual practice, I have verified the investment securities by inspection and report that they are in order. The market value of these securities as of December 31st, 1947, was approximately $52,045.00 as compared to the cost to the Institute of $49,621.07.

During the past year the following securities were called for redemption:

$1000.00 Bond — Montreal Tramways (cost $950.30)	$1000.00
40 Shares Montreal Light Heat and Power Common Stock (cost $324.50)	$1000.00

and the proceeds reinvested in

$2000.00 Province of Ontario Debentures 2¾% due 1969.

Respectfully submitted,

L. C. Jacobs, M.E.I.C., *Treasurer.*

Comparative Statement of Assets and Liabilities

As at December 31st, 1947

Assets

Current:	1947	1946
Cash on hand and in Savings Account	$ 3,021.84	$ 2,657.10
Accounts Receivable—Less Reserve	6,082.43	7,448.45
Arrears of Fees—estimated	2,500.00	2,500.00
	$ 11,604.27	$ 12,605.55
Investments at Cost	49,621.07	48,895.87
(Approximate Market value as at 31st December 1947 — $52,045.00)		
Sundry Advances	662.55	250.00
Deposit with Postmaster	175.00	175.00
Prepaid Insurance	428.10	60.00
Gold Medal	45.00	45.00
Library—At cost less Depreciation	1,448.13	1,448.13
Furniture and Fixtures—At cost less Depreciation	4,523.62	3,896.98
Land and Buildings—Assessed Valuation	36,000.00	36,000.00
	$104,507.74	$103,376.53

Liabilities

Current:		1947	1946
Bank Overdraft—Current Account		$ 453.33	$ 4,094.27
Accounts Payable		5,618.68	8,524.94
Rebates to Branches		700.00	400.00
Unexpended Balance of Rehabilitation Fund		181.63	3,171.67
		$ 6,953.64	$ 16,190.88
Special Funds:			
As per Statement attached		17,134.30	16,575.58
Reserves:			
Building Fund		5,000.00	5,000.00
Building Maintenance		2,000.00	2,000.00
Contingent Reserve		5,000.00	5,000.00
Pension Fund Reserve		8,000.00	......
Surplus Account:			
Balance as at 31st December 1946	$ 58,610.07		
Add: Excess of Revenue over Expenditure for year as per statement attached	1,809.73		
		60,419.80	58,610.07
		$104,507.74	$103,376.53

Audit Certificate

We have audited the books and vouchers of The Engineering Institute of Canada for the year ended 31st December 1947 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 1947, as attached, are properly drawn up so as to exhibit a true and correct view of the Institute's affairs as at 31st December 1947 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.

(Sgd.) RITCHIE, BROWN & CO.,
Chartered Accountants.

Montreal, 19th January, 1948.

REHABILITATION FUND
As at 31st December 1947

Unexpended Balance as at 31st December 1946		$ 3,171.67
Amount received by Voluntary Assessment during 1947		77.03
		$ 3,248.70
EXPENDITURES 1947:		
Salaries	$ 2,930.00	
Sundry Travelling	107.43	
Sundry Printing etc.	29.64	
		3,067.07
BALANCE AS AT 31st DECEMBER 1947		$ 181.63
Total Amount received by Voluntary Assessment 1945-1947		$14,811.42
EXPENDITURES 1945-1947:		
Salaries	$13,232.06	
Sundry Travelling	234.29	
Sundry Printing etc.	1,163.44	
		14,629.79
BALANCE AS AT 31ST DECEMBER 1947		$ 181.63

STATEMENT OF SPECIAL FUNDS
As at 31st December 1947

LEONARD MEDAL FUND:		
Balance as at 31st December 1946	$ 609.44	
Add: 3% Interest	16.64	
	$ 626.08	
Less: Cost of Prizes	21.00	
		$ 605.08
PLUMMER MEDAL FUND:		
Balance as at 31st December 1946	$ 809.74	
Add: 3% Interest	23.65	
	$ 833.39	
Less: Cost of Prizes	21.00	
		812.39
PAST PRESIDENTS PRIZE FUND:		
Balance as at 31st December 1946	$ 7,819.80	
Add: 3% Interest	234.00	
	$ 8,053.80	
Less: Cost of Prizes	19.00	
		8,034.80
DUGGAN MEDAL FUND:		
Balance as at 31st December 1946	$ 2,783.79	
Add: 3% Interest	79.92	
	$ 2,863.71	
Less: Cost of Prizes	117.65	
		2,746.06
JULIAN C. SMITH MEMORIAL MEDAL FUND:		
Balance as at 31st December 1946	$ 911.20	
Add: 3% Interest	25.98	
	$ 937.18	
Less: Cost of Prizes	12.00	
		925.18
FUND IN AID OF MEMBERS' FAMILIES:		
Balance as at 31st December 1946	$ 3,423.25	
Add: 3% Interest	102.69	
Repayment	159.94	
		3,685.88
PIONEER OF SCIENCE—PRIZE FUND:		
Balance as at 31st December 1946	$ 218.36	
Add: 3% Interest	6.55	
		224.91
LIFE MEMBERS DONATIONS FUND:		
Donations for 1947		100.00
		$17,134.30

HARRY F. BENNET EDUCATIONAL FUND
STATEMENT OF RECEIPTS AND DISBURSEMENTS
For the Year Ended 31st December 1947

Balance as at 31st December 1946		$18,407.63
Add: Voluntary contributions during year	$ 5,196.87	
Interest on Savings Account	109.02	
		5,305.89
		$23,713.52
Deduct: Sundry Bank Charges	$ 26.95	
Sundry Printing, etc.	121.07	
		148.02
BALANCE AS AT 31ST DECEMBER 1947		$23,565.50
Cash in Canadian Bank of Commerce	$23,066.57	
Loans Outstanding	620.00	
		$23,686.57
Deduct: Owing to Engineering Institute of Canada for expenses advanced		121.07
		$23,565.50

Committee on the Training and Welfare of the Young Engineer

The conference of representatives of undergraduate Engineering Societies, sponsored by the Engineering Institute, was held at the Royal York Hotel, Toronto, on May 10th and produced the following recommendations to the E.I.C.

(a) That the local chapters of the E.I.C. should provide speakers for engineering societies to speak on technical and vocational subjects, and the local chapters and the universities should hold exchange meetings of both a social and business nature.
(b) That the E.I.C. could survey a number of existing industrial films in an effort to build up a film library which could be used to advantage by the engineering societies.
(c) That the students' prizes given by the E.I.C. should be a distinctive badge given to the top five per cent of the graduating engineering class of each university on qualities of ability and leadership.
(d) That a survey should be made to give an outline of the work of all branches of engineering. Such short "case-histories" would be available for the engineering student and should include a classified index giving names of engineers who are engaged locally in the particular field of engineering.

The initiative re (a) was left with the student societies—it being understood that local E.I.C. branches would do their best to supply suitable speakers upon request. So far as we know, no branch has been called upon as yet.

Re (b). A list of available films was obtained from a representative group of Canadian Manufacturers and Utilities, and has been distributed to the Undergraduate Engineering Societies.

Re (c). Council has approved this form of award in principle, and we expect that final approval will be given at the next meeting of Council, so that the awards may be made to the classes graduating in the spring of 1948. This form of award was recommended by your committee at a meeting held on May 8th on the following basis—

(a) To be awarded to the top five per cent or 10 per cent of each senior class in Engineering in all Canadian Universities and Technical Colleges.
(b) Determination of standing — In determining standing, equal weight shall be awarded to Scholarship and Leadership as determined by the Engineering faculty.
(c) The award—One year paid up Junior membership in the Institute plus a distinctive Institute badge.

It is felt that the above form of award will have several advantages—

1—The expenditure by the Institute will be small.
2—It will ensure that the cream of all graduating classes will automatically become members of the Institute.

3—From the viewpoint of employers, the prestige attaching to the winners of this award will ensure priority in the employment field and other advantages, so much so that it is unlikely that winners will drop their E.I.C. membership and the right to wear the distinctive badge.

4—It will be an additional spur to undergraduate effort.

5—It will tend to emphasize the Institute's all embracing interest in the Young Engineer.

Re (d). The guidance literature available today, is excellent, but is almost entirely of a general nature. The variations in the type of work that may be performed by Engineering graduates are so numerous, and so radically different one from the other that there appears to be a need for detailed descriptions of specific jobs. These case-histories of actual jobs should prove very valuable both to students and counsellors.

Your committee at the meeting held May 8th recommended that a number of these case-histories be prepared. The undergraduate conference endorsed the idea (per Item d). The Canadian Committee for Student Guidance in Science & Engineering have approved it, and the E.C.P.D. Guidance Committee are actively promoting it. A suggested framework for these case-histories has been prepared, approved and distributed.

A very important feature, the plan for publication, is not yet settled. The Canadian Committee on Student Guidance in Science and Engineering is asking the Department of Labour to undertake the publication of a guidance booklet, similar to the E.I.C. publication "The Profession of Engineering in Canada" and it is hoped that this publication will include a suitable number of case-histories.

The possibility of an oversupply of engineers as a result of our present abnormal university enrolment, has been a matter of serious concern to everyone concerned with student guidance. The opinion of Council was expressed at their meeting on November 29th — agreeing with the Canadian Committee to the effect that — "It is probable that the graduating classes of 1948 and 1949 will be readily absorbed. The picture for subsequent years is not so clear, and engineers carrying on Guidance work amongst high school students should therefore employ increased effort toward ensuring that those entering Engineering Courses have definite aptitude for the profession, and at the same time also make it clear that Engineering graduates may have to face much keener competition for the better Engineering jobs." Your Committee feels that criticism of our Universities in connection with the abnormal enrolment in Engineering is quite unjustified. There is little disagreement with the Government's position, that it will be to the advantage of the country to provide higher education for those veterans whose ambition lies along such lines and who appeared to be qualified to undertake such studies. The universities' position is quite evidently one of endeavouring to meet the desires of the Government in this regard.

The Guidance work of the E.I.C. Branches varies from very active to inactive. An appeal has been made to the inactive branches, to appoint an individual or committee. Personal contacts however, are the most effective means of stirring up interest and it is probable that a travelling field secretary could perform valuable service to this end.

It seems logical that the guidance work of the Engineering Institute of Canada should be co-ordinated with the corresponding work of the C.I.C., C.I.M.M., the Wartime Bureau of Technical Personnel, and the Canadian Council of Professional Engineers and Scientists. The Canadian Committee is sponsoring an effort to have local committees formed to include the guidance personnel of all these bodies, and to encourage them to hold joint guidance meetings. Your committee is working wholeheartedly to this end.

Respectfully submitted,

G. R. Langley, M.E.I.C., *Chairman.*

Committee on Employment Conditions

Based on the returns of the survey made in 1945, your Committee felt that the Institute's position regarding collective bargaining should be more of an observant nature than an aggressive one.

Bill No. 338 was introduced in the House of Commons of Canada for its first reading on June 17th, 1947. This legislation is meant to replace wartime order-in-council P.C. 1003.

At the request of other engineering and scientific organizations the definition of an employee was broadened to include "technical workers". An employee is now defined as follows: "employee" means a person employed to do skilled or unskilled manual, clerical or technical work, but does not include:

(i) a manager or superintendent, or any other person who, in the opinion of the Board, exercises management functions or is employed in a confidential capacity in matters relating to labour relations.

(ii) a member of the medical, dental, architectural or legal profession qualified to practice under the laws of a province and employed in that capacity".

Representation was made to the Minister of Labour that this situation did not meet with our Institute members' wishes.

This bill was referred to Committee who sat on July 1st and is to undergo its second reading during the present session.

The question of engineers' salaries was not discussed; your present committee having adopted its predecessor's views that nothing could be accomplished by the simple issuance of a schedule.

The possibility of overcrowding of the profession was studied by the Committee on the Training and Welfare of the Young Engineer. Its report was thoroughly discussed at Council Meeting on November 29th, and your Committee endorses the conclusions arrived at.

Respectfully submitted,

G. Martin, M.E.I.C., *Chairman.*

Committee on Professional Interests

The close contact which your Committee initiated with all branches of the Institute in 1946 was maintained in 1947. Almost all branches, the Quebec Corporation and several of the Provincial Associations, were visited by a member of the Committee. The benefit of these contacts cannot be overestimated.

The Ontario Division became a reality early in the year. Organization meetings were held, officers were elected and financial assistance was voted by Council. It is expected that when this Division gets fully under way much benefit will accrue from it.

The Committee has reviewed the activities of the National Construction Council on which, since its inception, the Institute has maintained representation, and has expressed the opinion that it may be well to consider whether continued support serves any useful purpose.

Removal of duties on engineers plans entering Canada, first protested on behalf of the profession by the Institute in July, 1946, continues to receive the attention of this Committee. Other organizations have given the Institute their warm support. The Canadian Construction Association is particularly active in this respect as the free entry of engineers plans has been found to operate to the detriment of the construction industry. It is also against the Government's own interests as outlined in the recent import restrictions. The Government Department concerned has undertaken to give the matter further consideration.

During the year the Canadian Construction Association asked the Institute to support its brief to the Dominion Government concerning the postponement of deferable public projects and the preparation of a shelf of projects to be used should a reactionary trend develop in our economy. It is believed that such action would be not only in the country's interest but of great importance to engineers and architects. The matter was discussed at Council meetings in Montreal, Saint John, Quebec and Halifax, and seems of such importance that it might well become one of the Institute's main objectives. The brief has been endorsed by Council.

The drastic legislation concerning the regulation of professional men which threatened to strike at the roots of the Engineers Act in the Province of Saskatchewan did not materialize. The situation continues, however, to receive the attention of this Committee.

Revisions of by-laws of several co-operating Provincial Associations due to change in Institute fees have been agreed upon.

Active contact has been maintained with the American Founder Societies. Our co-operative agreement with the American Society of Mechanical Engineers was further implemented by the presence of our President, Col. L. F. Grant, at their Annual Meeting in Chicago, at which meeting he was singled out for special honours. The 15th Annual Meeting of the Engineers' Council for Professional Development, held in Montreal in the Fall, was a particularly happy event, it being the first meeting of this eminent engineering organization to be held in Canada. It was the privilege of the Institute, as one of the constituent members of this Council, to be host on this occasion.

A suggestion was received from the Canadian Association of Scientific Workers that a Parliamentary and Scientific Committee be formed along the lines of similar organizations in Great Britain. After exhaustive study your Committee was unable to recommend that the Institute lend its support to this suggestion.

The Committee noted with pleasure the conferring by Laval University of the honorary degree of Doctor of Science upon our President, Col. L. F. Grant. This honour is a tribute both to Dr. Grant and to the Institute.

Respectfully submitted,

J. B. Stirling, m.e.i.c., *Chairman.*

Canadian Radio Technical Planning Board

In view of the fact that the preliminary frequency allocation recommendations of the Planning Board were prepared and submitted to the Department of Transport in May, 1947, for use in connection with the International Telecommunications Conferences in Atlantic City, it was considered that the first phase of the Planning Board's activities had been completed and no further meetings of Panels and Committees were scheduled for the balance of 1947 pending word as to the outcome of the Atlantic City meetings.

The Third Annual Meeting of the Board was held in Montreal on December 5, 1947, and, at that time, it was indicated that the Department of Transport were pleased with the work accomplished by the Board and were anxious that it continue in the same manner as in the past.

Copies of the findings of the Atlantic City Conference are now being printed and, as soon as these are available, they will be circulated to sponsor representatives and Panel and Committee Chairmen for review in the light of the Board's recommendations. It is expected that, when these findings are at hand, activities of the Board will be accelerated with Panel and Committee meetings to discuss the results of the Atlantic City Conference and continue the Board's work of preparing recommendations and assisting the Department of Transport at future international meetings.

Respectfully submitted,

A. B. Hunt, m.e.i.c.,

Institute Representative on the Board.

Committee on Prairie Water Problems

The Committee did not meet during the year. Nevertheless its members kept in touch with developments during this time, and groups of its members carried on informal discussions on such matters as came to their attention.

So far as the St. Mary River and Milk River Development is concerned, terms of an agreement have been discussed and an agreement has been prepared, but has not yet been signed. In the meantime construction of the St. Mary and Pothole dams has been proceeding slowly.

An agreement has also been prepared, providing for an expansion of the Bow River project (Canada Land and Irrigation Co.), to water an additional 175,000 acres, and bringing the total development up to 240,000 acres. Consummation of this agreement and the start of construction is expected at an early date.

Further investigations have been made of the Red Deer project, which is a combined irrigation and power project. It now looks as if this project will receive favourable consideration.

Additional investigations have been carried on regarding the proposed development near Outlook, Sask.

It is gratifying to the members of this committee that one day of the Banff meeting will be devoted to papers on water power and irrigation development, which is a very real problem affecting Canada.

Respectfully submitted,

G. A. Gaherty, m.e.i.c., *Chairman.*

The Ontario Division

During 1947, the Ontario Division of the Engineering Institute of Canada came into existence. In April of 1946, Ontario Councillors had expressed themselves in favour of such a Division and, with Council's approval, Ontario members voted on the question. After a majority of Ontario corporate members had voted in favour of forming the Division, Council authorized its formation, and appointed C. E. Sisson as chairman *pro tem.*

On May 10th, at the Royal York Hotel, the Ontario Division was officially organized, and the Officers were elected, with W. R. Manock being chosen as Chairman.

The first step taken by the officers of the Division was to establish a By-Laws Committee under the chairmanship of S. R. Frost. This committee prepared a set of by-laws to govern the activities of the Division and, after approval by Council, they were submitted to the Ontario membership and approved.

With the by-laws approved, the officers of the Division set to work on the first problem turned over to them by the Council of the Institute. This concerned the memorandum submitted to Council by the Toronto Branch in 1946. The Institute's Committee on Professional Interests had reported on the memorandum in September, 1946, and finally in May, 1947, it was referred to the Ontario Division for discussion and report. Accordingly, copies of both the documents referred to above were sent to all members of the Ontario Division Executive, in December, with the announcement that they would be discussed at the Annual Meeting of the Division.

Respectfully submitted,

E. R. Graydon, m.e.i.c., *Secretary, Ontario Division.*

Julian C. Smith Medal

Carrying out the instructions pertaining to the award of the Julian C. Smith Medal for 1947, the special committee consisting of Past-Presidents E. P. Fetherstonhaugh, J. B. Hayes and myself, has made a selection of two names which have been submitted by letter ballot to all councillors.

As a result, Julian C. Smith Medals for 1947 are being awarded to:

Philip Louis Pratley, Consulting Engineer, Montreal, Quebec.

Penrose Melvin Sauder, General Manager, Western Irrigation District, Strathmore, Alberta.

Respectfully submitted,

L. F. Grant, m.e.i.c., *Chairman.*

Students' and Juniors' Prizes

The reports of the examiners appointed in the various zones to judge the papers submitted for the prizes for Students and Juniors of the Institute were submitted to Council at its meeting on December 20th, 1947, and accepted as follows:

H. N. Ruttan Prize (Western Provinces) to Raymond Pillman, s.e.i.c., for his paper "The Accuracy of a Two-Minute Transit".

John Galbraith Prize (Province of Ontario) to R. N. E. Haughton, s.e.i.c., for his paper "Effects of Lightning on Buried Telephone Cables".

Martin Murphy Prize (Maritime Provinces) to Norman A. Parlee, jr.e.i.c., for his paper "Utilization of Sydney Slag for Engineering and Agriculture".

Phelps Johnson Prize (Province of Quebec—English)—to R. B. Todd, s.e.i.c., for his paper "The Manufacture of .22 Calibre Long Rifle Cartridge".

Ernest Marceau Prize (Province of Quebec—French)—to R. Riopelle, s.e.i.c., for his paper "Etude, Plans et Devis d'un Generateur de Haute Frequence pour le prechauffage dielectrique d'une poudre a mouler thermostable".

Abstracts of Reports from Branches

Note—For Membership and Financial Statements see pages 112 and 113

Border Cities Branch

During the year the Border Cities Branch held eleven executive meetings and ten general meetings. These included a Ladies' Night, a joint meeting with the Association of Professional Engineers of Ontario, the President's Visit, and a golf game and dinner with the Sarnia Branch. The following is a list of the general meetings held during the year. Attendance is noted in brackets.

Jan. 10—**The Gas Turbine** by J. W. Shaw, Allis-Chalmers Mfg. Co., Detroit, Mich. (65)
Feb. 17—**Travelogue on New Zealand and India** by A. H. MacQuarrie, M.E.I.C., Canadian Bridge Co. Ltd., Walkerville, Ont. (125)
(The ladies were present at this meeting.)
Mar. 14—**The Engineer and the State** by Dr. G. B. Langford, President of the Association of Professional Engineers of Ontario (65)
Apr. 11—**Radiant Panel Heating** by J. S. Mitchener, J. T. Wing & Co. Ltd., Windsor, Ont. (35)
May 16—**Television Station Operation** by L. A. Spragg, Chief Television Research Engineer of the Detroit News Television Station WWDT, Detroit, Mich. (32)
Sept. 5—**Presidential Visit** of Lt. Col. L. F. Grant (96)
(The ladies were present at this meeting)
Sept. 20—Golf game and dinner with Sarnia Branch (34)
Oct. 10—**Looking Ahead Through Plexiglass** by R. A. Trumper of the Special Products Division of Hobbs Glass Ltd., London, Ont. (34)
Nov. 14—**Province Wide Frequency Modulation Communication System for Ontario** by Walter G. Ward, Electronics Sales Engineer of the Canadian General Electric Co., Toronto, Ont. (37)
Dec. 12—Annual meeting and election of officers. **Some Observations of South Africa** by F. C. Ansley, M.E.I.C., head of the Construction Design Division of the Engineering Dept., of the Ford Motor Co. of Canada Ltd., Windsor, Ont. (55)

Calgary Branch

The following report of activities is submitted by the Calgary Executive for the Branch Year 1947, the attendance at meetings being shown in brackets.

The Executive met nine times during the year.

Dec. 12—"Search Unending", film on oil exploration with introductory remarks by S. G. Coultis, M.E.I.C., and "Across Canada," film from C.P.R.
Jan. 20—Annual Ladies' Night was held in the Harris Sky Room. Dancing, cards and entertainment were provided. (79)
Jan. 30—**Sewage Disposal** by J. Ivor Strong, M.E.I.C., Assistant City Engineer; and film "Clean Waters" from C.G.E. (24)
Feb. 13—**Dust Control in Terminal Elevators** by Murray Fleming, M.E.I.C. of C. D. Howe Co., Ltd., illustrated with a film. (54)
Mar. 8—Annual Meeting followed by Dinner. Election of officers. (43)
Oct. 2—**Wood Creosoting** by J. H. Palmason, General Manager, Dominion Tar & Chemical Co. Ltd. (64)
Oct. 16—Three films "Basic Electricity", "Basic Electronics", and "Minneapolis Honeywell Electronic Pilot", with introductory remarks by J. P. Rounce, Br. Aff., Manager, Minneapolis-Honeywell Regulator Co. Ltd., at Calgary. (97)
Oct. 30—**The Red Deer Natural Gas Pipeline** by B. W. Snyder, M.E.I.C., Projects Engineer, Canadian Western Natural Gas Co. Ltd., Calgary. (77)
Nov. 13—Colonel Beaman, R.C.E., spoke on present activities of the Canadian Army, and in support of the Calgary Field Squadron, R.C.E. Three films were shown, "Scotland, Land of Invention", "One World or None" and "Aquatic Sports." (100)
Nov. 27—**Short Circuit Testing Stations and their Influence on Breaker Design** by Prof. J. A. Harle, Electrical Engineering Department, University of Alberta. (52)

Cape Breton Branch

The following dinner meetings were held during 1947:

Feb. 21—**Canol Oil** by E. Baillie, manager Asphalt Sales, Imperial Oil Limited, Halifax, N.S. (35)
Mar. 18—Visit of President J. B. Hayes, (26)
Apr. 15—**Bridging the Straits of Canso** by C. P. Disney, Vice President, Intrusion Prepakt Ltd., Toronto, Ont. (114)
Oct. 6—Visit of President L. F. Grant, (20)
Oct. 8—Visit of President L. F. Grant to St. Francis Xavier University, Antigonish.

Cornwall Branch

A very successful year was enjoyed by the Cornwall Branch. For the City Planning Meeting in January, the Councils and Civic Organizations were invited to attend. The S.D. & G. Highland Regiment was invited to the Arctic Meeting. The ladies were invited to attend the inspection of the Canada Starch Plant.

The Cornwall Branch Executive met five times during the year, with an average attendance of six.

The following general meetings were held during the year, with attendance as shown in brackets:—

Jan. 20—**Exercise Musk-Ox, and the Canadian Arctic**—an illustrated lecture by Dr. J. T. Wilson, Professor of Geophysics, University of Toronto. (325)
Feb. 20—**A City Plan for Cornwall**—by N. D. Wilson, Consulting Engineer, Toronto. (175)
Mar. 18—**A Study of Stoker Fuel Beds**—by Otto de Lorenzi, Combustion Engineering Corporation, N.Y., illustrated. (49)
Apr. 22—**Electrical Maintenance** — by Messrs. Eastwood, Nickerson, and Wilson, Cornwall Branch. (39)
Sept. 27—**How Corn Starch is Made** — a tour through the Cardinal plant of the Canada Starch Company. (48)
Oct. 28—**Radiant Heating and Cooling**—an illustrated lecture by G. Lorne Wiggs, Consulting Engineer—Montreal. (40)
Nov. 18—**Laminated Plastics** — lectures and plant tour by members of Howard Smith Paper Mills, Cornwall, (50).
Dec. 18—Annual Meeting — a dinner meeting, with annual reports and installation of officers. (50)

Edmonton Branch

The Edmonton Branch Executive met eight times during the year, with an average attendance of nine.

The general meetings of the Branch, with one exception, were dinner meetings held at the Macdonald Hotel, at 6.30 p.m. The dates, programmes and attendances, which are the figures in brackets, were as follows:

Jan. 10—**The Future for Alberta in Agriculture and Industry, to be Made Possible by Proposed Programme of Water Reclamation.**—a lecture illustrated with coloured slides. The speaker was John R. MacNicol, M.P., of Toronto—a dinner meeting at Merrick's Embassy Room. (69)
Feb. 7—**Engineering Education.** by Dean R. M. Hardy, Faculty of Applied Science, University of Alberta. The annual joint dinner of the Association of Professional Engineers of Alberta, the Edmonton

Branch E.I.C., and the Northern Alberta Branch of the Canadian Institute of Mining and Metallurgy. (102)

Feb. 28—**Design of Winter Landing Gear for Aircraft.**—illustrated lecture by K. Korsak, Engineer, with the Northwest Industries Ltd., of Edmonton. (39).

Apr. 7—**Measuring Wind-Chill,** by Dr. Thomas How, Officer in charge of the Dominion Public Weather Office, in Edmonton. (36)

Apr. 22—**Engineering Organization in Canada** — speaker, J. G. Dale, Registrar of the Association of Professional Engineers of Alberta. This was the Branch Annual Meeting, including reports of retiring officers and election of new officers.—The meeting concluded with a smoker. (58)

Oct. 15—**Glacial Geology of the Barren Lands**—illustrated with coloured slides—speaker, Dr. R. E. Folinsbee, Assistant Professor of Geology at University of Alberta. (48)

Nov. 13—Films "Prospecting for Petroleum", and "Ten Thousand Feet Deep"—loaned by the Shell Oil Company, Inc.; discussed by W. J. Dick and J. A. Allan, (63)

Dec. 5—**Oil Development in the Province of Alberta**—by Hon. N. E. Tanner, Minister of Lands and Mines for Alberta. This was the annual joint dinner of the A.P.E.A., the Edmonton Branch E.I.C., and the Northern Alberta Branch of the C.I.M.M. (150)

Dec. 17—**The Young Engineer's Committee** sponsored a symposium of two papers: **Radiant Heating Design,** by D. Panar, Mechanical Engineer with the Building Branch Department of Public Works of Alberta, and **Radiant Heating at University of Alberta,** by K. Cumming, Engineer, Works Dept., University of Alberta.

Halifax Branch

During the year the Executive of the Halifax Branch held seven business meetings, in addition to the seven monthly hotel dinner gatherings listed below, with attendance shown in brackets.

Jan. 23—Combined Annual Banquet. Speaker, Rev. Dr. Stanley Walker. (245)

Feb. 20—**Reconstruction of the Halifax Reservoir,** by R. M. Doull, General Manager, Canada Gunite Company, Montreal. (82)

Mar. 20—Presidential visit of J. B. Hayes. The ladies were present at this meeting. (139)

Apr. 17—**Bridging the Strait of Canso,** by C. P. Disney, Vice-President, Intrusion Prepakt Ltd., Toronto, Ont. (84)

Oct. 10—Presidential visit of Lieut.-Col. L. F. Grant. (83)

Nov. 27—**Has the Engineer a Place in Community Planning?** by Ira McNab, General Manager, Halifax Public Service Commission. (65)

Dec. 19—Annual Meeting of the Halifax Branch.

Hamilton Branch

During the past year, the Hamilton Branch held the following meetings. Attendance is shown in brackets.

Jan. 9—The Annual Meeting and Dinner was held at the Scottish Rite Club. The guest speaker, E. T. Sterne, chose as his subject, **John Q. Engineer, Citizen.** (85)

Feb. 20—**Canada's Pulp and Paper Industry,** by A. E. H. Fair, president, Alliance Paper Mills, Ltd. (75)

Mar. 20—The Annual Students' and Juniors' Night was held at McMaster University. The following papers were presented—**Modern Engraving Practices,** by W. A. Freeman, S.E.I.C.; **Comparative Costs of Stage and Compound Dies,** by L. C. Galloway, S.E.I.C.; **Lightning Effects on Buried Telephone Cable,** by R. N. E. Haughton, S.E.I.C.; **Some Aspects of Atomic Energy,** by L. A. Cook, JR.E.I.C. (40)

Apr. 18—**Lightning Protection of Industrial Plants,** by E. W. Beck. This meeting was the annual joint gathering of the Toronto Section of the American Institute of Electrical Engineers and the Hamilton Branch. (150)

Sept. 20—The President's Visit. Lieut.-Col L. F Grant spoke on **What the Institute and the Engineer Can Do for Each Other.** (50).

Oct. 2—Plant Visit—Members of the Branch were privileged to visit the Hamilton Works of the Steel Company of Canada. (150)

Oct. 23—**Stream and Lake Pollution, and Sewage Treatment Plants,** by W. Blaine Redfern, M.E.I.C. (50)

Nov. 17—**The Electric Home of Tomorrow,** by C. B. Pearce, Manager, Laundry Equipment Section, Canadian Westinghouse Company. This meeting was the Annual Ladies Night gathering. (103)

Dec. 5—**The Effort to Increase Domestic Supply of Petroleum in Canada,** by John Ness, Imperial Oil Co. (43)

The Executive of the Hamilton Branch held eight meetings, with an average attendance of eight members.

Kingston Branch

The following meetings were held during the year 1947:

Jan. 14—Prof. J. T. Wilson, M.E.I.C., University of Toronto—**Exercise Musk-Ox and the Canadian Arctic** (illustrated).

Feb. 5—J. I. McAskill, Frontenac Wall and Tile Company, Ltd.—**Manufacture of Floor and Wall Tile.**

Feb. 24—Student Papers Night.

Apr. 9—R. M. Doull, M.E.I.C., Canada Gunite Company, Ltd. —**Reconstruction of the Halifax High Service Reservoir** (illustrated),

June 10—Social Evening. Guests of Honour—Col. and Mrs. L. F. Grant.

Sept. 16—L. F. McCaffrey, Allis-Chalmers Manufacturing Company—**The Making and Shaping of Steel,** (Courtesy U.S. Steel Corporation)

Oct. 16—Tour of R.C.E.M.E. Training Centre—Barriefield.

Nov. 19—Tour of Canadian Industries Limited, Nylon Division—Kingston.

Dec. 8—J. B. Cunningham, M.E.I.C., Canadian Locomotive Company—**The Modern Coal Burning Steam Locomotive.**

Kootenay Branch

The following report of activities is submitted by the Executive of the Kootenay Branch for the year 1947. Attendance is shown in brackets for each meeting.

The Executive met five times during the year.

Feb. 21—General business meeting. Film entitled "The Freight Yard" was shown. (16)

Mar. 10—**Electric Boilers** was the topic of F. L. Lawton of the Aluminum Company of Canada Limited. (20)

Apr. 21—General business meeting. Film entitled "Drilling for Oil" shown by A. W. Busby. Comments on Turner Valley oil were made by J. V. Rogers. (17)

June 6—General business meeting. C. E. Marlatt reported on the Annual Meeting of the Institute held in Toronto. (21)

June 21—**Snow Surveys for Forecasting Run-off** was the topic of a talk delivered by R. C. Farrow of the Water Rights Branch, Department of Lands and Forests of British Columbia. (21)

Sept. 19—**St. Mary Dam,** the story of design and construction of an earth-filled dam for irrigation project near Cardston, Alta. The speaker was A. G. Ballantyne. (22)

Dec. 22—General business meeting and luncheon. (18)

Lakehead Branch

The following meetings were held by the Lakehead Branch during the year. Attendance is shown in brackets.

Jan. 15—Dinner meeting at the Prince Arthur Hotel, Port Arthur. T. M. O'Neill, Field Engineer for the Goodyear Rubber Company gave a paper on **Long Haul and Overland Conveying Systems.** A film depicting the use of conveyers in construction of the Davis Dam, was shown. (50)

Feb. 25—Ladies Night. A very successful social evening was held at Winston Hall, West Fort William. Bowling, a movie, dancing and refreshments made up the programme for the evening. (60)

Apr. —Evening meeting held in the Council Chambers, Port Arthur. J. M. Fleming, President of C. D. Howe Company Limited, gave a paper on **Dust Con-**

trol in Modern Elevators. M. F. Mills showed his films on the demolition of Pool Terminal Elevator No. 5. (50)

July 9—The Annual Meeting was held at the Village. Sound films. "Clean Waters", Tomorrow's Timber and Salt From the Earth" were shown. The former film was shown through the courtesy of the Canadian General Electric Company, and the latter through the courtesy of the National Film Board. (40)

Oct. 10—Joint trip, with the Midwest Branch of the Canadian Pulp and Paper Assoc., Technical Section, to Red Rock, Ont., to inspect the mill of the Brompton Pulp and Paper Company, Ltd. The groups were also guests of the company at dinner. (125)

Nov. 19—Dinner meeting at the Royal Edward Hotel in Fort William. Dr. Mel Bartley, Principal of the Lakehead Technical Institute, spoke on the plans and courses to be given in this school. Several films were shown—"Caterpillar Diesel Earth-moving Equipment", courtesy Powell Equipment Company, Ltd., Port Arthur, and "A Day at Polymer and Land from the Sea", courtesy the National Film Board.

Dec. 17—Dinner meeting at the Village. The following films were shown—"The Romance of Glass" and "We Modernize Our Home"—courtesy the Hobbs Glass Company, Ltd. and "Operation Mulberry"—courtesy the National Film Board.

Lethbridge Branch

The Lethbridge Branch held eight regular meetings in 1947, with an average attendance of 44. The Branch Executive met nine times. Topics of addresses at general meetings are listed below:

Jan. 18—W. L. Foss, M.E.I.C., discussed the **St. Mary's Project-Design & Development.** (49)

Feb. 15—Ladies Night—Musical Programme. Films—Toscannini", "History of Electricity", "Road of Cuernavaca", were shown. (55)

Mar. 21—Joint meeting—E.I.C. and A.P.E. Dr. R. M. Hardy, Dean of the Faculty of Applied Science, University of Alberta, spoke of—**Engineering Education.** (52)

Apr. 19—**Meteorology Applied to Aviation**, by D. H. Smith, Officer in charge of Meteorological Division, Department of Transport. (32)

Sept. 29—**Distribution System Protection,** by M. C. Code—Distribution Engineer, Canadian General Electric, Toronto. (58)

Oct. 18—Fire Chief W. H. Short discussed **Fire Protection.** (27)

Oct. 30—Field Tour—visit to Pothole Coulee Dam and St. Mary's River Dam. Tour conducted by Supervising Engineer W. L. Foss, M.E.I.C. (42)

Nov. 15—**Life in the West Indies Oil Fields** by K. K. Balderson, M.E.I.C.—illustrated with slides. (27)

Dec. 17—Ladies' Night—Speaker, A. B. Hogg, K.C.; Subject, O Canada. (39)

London Branch

The Executive of the London Branch is pleased to report the following seven regular and special meetings.

Jan. 29—Annual Dinner—Speaker, Dr. G. H. Turner, Assistant Professor of Psychology at the University of Western Ontario spoke on **Human Relations.**

Feb. 27—**Essential Links in Sanitation**, by V. S. Baker, Plumbing Inspector for the City of London.

Mar. 27—**Conversion to 60 Cycles,** by V. A. McKillop, Assistant General Manager, London Public Utilities Commission.

May 6—Dinner Meeting—Guest Speaker R. C. Manning, Chief Engineer of the Canadian Institute of Steel Construction. His subject was **Steel in Small Houses.**

Sept. 4—President's Visit. Guests of Honour—President and Mrs. L. F. Grant.

Oct. 23—**The Relationship of Conservation to Sound Economics,** by Dr. E. G. Pleva, Ph.D., Associate Professor of Geography at the University of Western Ontario.

Nov. 26—**Operation with the R.A.F. from an Island Base in the Far East,** by P. G. W. Walker, Assistant Engineer, City of St. Thomas.

The Branch Executive and Committees met seven times during the year.

Moncton Branch

Five meetings of the Executive were held during the year. There were six branch meetings held, at which technical subjects were discussed and business transacted as follows:

Feb. 4—A meeting was held in the City Hall. G. R. Murray, Canadian General Electric Company, gave an illustrated address on **The All Electric Home.**

Mar. 12—A dinner meeting was held in the Brunswick Hotel in connection with the official visit to the branch of J. B. Hayes, President of the Institute.

Apr. 9—A meeting was held in the City Hall. E. D. Bent, Cable Development Engineer, Northern Electric Company, addressed the branch on the subject of **The Role of Synthetics in the Design and Manufacture of Electric Cables.**

June 17—A meeting was held for the purpose of nominating branch officers for the year 1947-48.

June 24—The Annual Meeting was held on this date.

Oct. 14—A dinner meeting was held at the Beaver Club. Col. L. F. Grant, President of the Institute, was the guest speaker.

Montreal Branch

The following papers were presented in 1947 (attendances in brackets).

Jan. 9—**Defeating the Buzz Bombs,** by L. T. Thwaites, M.E.I.C. (150)

Jan. 16—**Transportotion Paradox,** by S. W. Fairweather. (160)

Jan. 23—**Education for Industrial Engineers,** by Professor David Porter, M.A.S.M.E. (150)

Jan. 30—Branch Annual General Meeting. (80)

Feb. 6—**The Atom Bomb Test at Bikini,** by Air Vice-Marshall E. W. Stedman, M.E.I.C. (250)

Feb. 13—Smoker. (310)

Feb. 20—**Fluid Drives in Industry,** by J. D. Rosebrough, M.A.S.M.E. (160)

Feb. 27—Student Evening. (110)

Mar. 6—**Reconditioning of Trunk Mains,** by F. Y. Dorrance, M.E.I.C. (110)

Mar. 13—**Loudness and Quality of Musical Tone,** by Dr. Harvey Fletcher, M.A.I.E.E. (Joint meeting with A.I.E.E. and I.R.E. (330)

Mar. 20—**High Voltage D.C. Generators for Nuclear Research,** by T. W. Mouat, M.A.I.E.E. (Joint Meeting with A.I.E.E.) (110)

Mar. 27—**Economics of Water Diversion,** by F. L. Lawton, M.E.I.C. (140)

Apr. 10—**Radiant Heating,** by G. Lorne Wiggs, M.E.I.C. (210)

Apr. 17—**Direct Operating Costs of Transport Aircraft,** by Dr. J. J. Green, M.E.I.C., and H. S. Rees, M.E.I.C.

Oct. 1—Opening Meeting. (260)

Oct. 9—**Research on Reinforced Concrete Structures,** by Professor F. R. Richart. (160)

Oct. 16—**Engineering Street Lighting for Public Protection,** by Stuart R. Williams. (140)

Oct. 23—**Executive Ability and its Development,** by Dr. J. S. A. Bois. (240)

Oct. 30—**Utilization of Wood at Gatineau Mill,** by G. D. Davidson, M.E.I.C. (140)

Nov. 6—**General Description of Suspended Monorail for Rapid Transit,** by E. H. Anson. (150)

Nov. 13—**Mobile Telephone,** by D. J. McDonald. (100)

Nov. 20—**Power Circuit Breakers,** by Dr. G. R. Langley, M.E.I.C. (160)

Nov. 27—**Welding Applications in Structural Plant,** by Gordon Cape, M.E.I.C. (150)

Dec. 4—**Prince Edward Car Ferry, "Abegweit"** by H. H. German, M.E.I.C. (160)

Dec. 11—**Stainless Steel in Industry,** by G. A. Sands. (115)

Junior Section

The Junior Section adhered to its policy of last year by presenting papers on non technical subjects and met with a certain measure of success in that the attendance continued to improve both as to quantity and to the degree of interest shown by those present.

The Executive inaugurated a special students' night at which students presented papers of ten minutes duration and then were subject to criticism on their method of presentation by a professional public speaker. This type of meeting proved to be very popular.

A student membership drive is on, the results of which will not be apparent until the spring of 1948.

Our social evenings continued to be very popular, thanks to the efforts of Maurice Fast, chairman of the Film Committee, and Leo Scharry, chairman of the Entertainment Committee. The third annual dance at the Ritz Carlton Hotel was attended by about five hundred people.

The following meetings were held in 1947. The attendance varied from 40 to 170 persons:

Jan. 13—Annual Meeting—Election of Officers—Films.
Jan. 27—**How to Train Your Mind**—Dr. J. S. A. Bois.
Feb. 10—**Town Planning**—Colin B. McMillan, Jr.E.I.C.
Feb. 24—**Canada's Resources**—Dr. John S. Bates.
Mar. 10—**Appreciation of Music**—Frank Coleman.
Mar. 24—Film Night.
Apr. 7—**Export Trading—Canada's Highway to Prosperity**—D. P. Hatch.
Oct. 6—**The Importance of Selling to the Engineer**—F. W. Bruce.
Oct. 20—**Snow Research in Canada**—Col P. D. Baird and G. Klein.
Nov. 3—**Fundamental Requisites in Supervisors and Supervision**—H. B. Hanna.
Nov. 17—Students' Night—Films.
Nov. 28—Third Annual Dance.
Dec. 8—**Developments in Hydro-Power**—R. E. Heartz.

Niagara Peninsula Branch

The Executive of the Niagara Peninsula Branch of the Engineering Institute of Canada respectfully submit the following report for the year 1947.

The Branch Executive held five executive meeting and one electoral meeting during the year. The programme committee arranged for and conducted the following general meetings.

Jan. 30—Dinner meeting at the Welland House Hotel, St. Catharines, Ont. R. C. McQuire, of the International Nickel Company of Canada, spoke on the subject, **Nickel Smelting and Refining.** Films illustrated the subject.

Feb. 27—A meeting at the Red Casque Inn, Niagara Falls, Ont. This took the form of a joint meeting, with the Association of Professional Engineers of Ontario, when the President of the Association of Professional Engineers, Dr. G. B. Langford, Ph.D., was guest speaker, accompanied by Colonel T. M. Medland of the Association. This was a smoker meeting with lunch and refreshments served.

Mar. 20—A dinner meeting, held at the Queensway Hotel, St. Catharines. J. T. Thwaites, Electronics Division Engineer, of the Canadian Westinghouse Co. Ltd., spoke on the subject, **Atomic Power in Industry.**

Apr. 24—Annual ladies night was held at the Foxhead Hotel, Niagara Falls, Ont. C. B. Pearce, of the Canadian Westinghouse Company, spoke on the subject, **The Electric Home of Tomorrow.** To illustrate his topic, Mr. Pearce showed a most interesting Technicolor film.

June 13—The annual meeting, at the Club Henley, St. Catharines, Ont. President L. F. Grant, addressed the gathering. He was accompanied by the Assistant General Secretary, W. D. Laird.

Sept. 11—This meeting consisted of an inspection of the Decew Falls power development, followed by dinner in the camp dining hall, at 6.30 p.m. J. G. Montague, Hydraulic Engineer, of the Hydro-Electric Power Commission of Ontario, and G. F. Simson, gave an outline of the development of the project.

Oct. 23—A dinner meeting at the Red Casque Inn, Niagara Falls. The speaker was D. O. Robinson, Chief of Technical Staff, Canada Cement Company, whose subject was, **New Developments in Concrete.**

Nov. 20—A dinner meeting at the Queensway Hotel, St. Catharines. R. J. Anderson, Manager, Unionmelt and Heliarc Service, Dominion Oxygen Co. Ltd., spoke on the development of new welding processes. Slides were used to illustrate the discussion.

Ottawa Branch

The Ottawa Branch held the following eleven luncheon meetings, and six evening technical meetings and social functions during the year 1947. Attendance is shown in brackets:

Feb. 13—Luncheon meeting at the Chateau Laurier. Sound film entitled "The Story of Aluminum" was shown. (107)

Mar. 6—Luncheon Meeting at Chateau Laurier. R. A. Gysler, of Canada Cement Company, discussed **Concrete Houses.** Illustrated lecture. (115)

Mar. 18—Evening meeting at the National Research Council Auditorium, **Hydro Development on the Madowoska River,** by J. R. Montague.

Mar. 27—Luncheon meeting at Chateau Laurier. G. D. Mills of Canadian General Electric Company, spoke on **Industrial and Commercial Lighting.** Illustrated lecture. (108)

Apr. 8—Dinner Dance at the Copacabana, sponsored by the Engineers' Wives Association. (74)

Apr. 16—Evening Meeting at the National Museum. **Reconstruction of the Halifax High Service Reservoir,** by R. M. Doull.

Apr. 24—Luncheon meeting at Standish Hall. Edouard Fiset, Town Planner, discussed **The Basic Principles of Town Planning.** (54)

May 8—Luncheon meeting at Chateau Laurier. Dan Gasper of Canada Cement Company, spoke on **Safety Calling Leadership.** (83)

Sept. 25—Luncheon meeting at the Chateau Laurier. His Worship Mayor R. Brunet, O.B.E., Hull, Que., gave a talk entitled **A Contractor Looks Down on Engineers.** (91)

Oct. 9—Evening meeting at National Museum. **The Long Way Home,** by Stewart Richardson. (Combined with Illuminating Engineers Society).

Oct. 9—Luncheon meeting at Chateau Laurier. McNeely Du Bose, of the Aluminum Company of Canada, discussed the **Shipshaw Development.** (81)

Oct. 22—Evening meeting at National Museum. Charles Disney vice-president of Intrusion Prepakt Ltd., spoke on **Prepakt Concrete.**

Oct. 23—Luncheon meeting at Chateau Laurier. Colonel Meuser, R.C.E., Director of Engineers, N.D.H.Q., spoke on **The Corps of Royal Canadian Engineers.** (91)

Nov. 13—Luncheon meeting at Chateau Laurier. Col. J. P. Carriere, City Manager and Chief Engineer, Hull, Que., discussed **City Management, a New Field of Action for Engineers.** (78)

Nov. 14—Evening meeting at the De Salaberry Armouries, Hull, Que. Annual Smoker. (150)

Nov. 27—Luncheon meeting at the Chateau Laurier. **The Eisenhower I Knew,** by Gaj. Gen. J. F. M. Whiteley, Comd. R.M.C. (126)

Dec. 11—Luncheon meeting at the Chateau Laurier. Stewart Graham discussed **The International Commission for Air Navigation.** (94)

Peterborough Branch

Eight executive meetings were held during 1947 with an average attendance of eight. The following summarizes the Branch meetings during the year, with attendance figures in brackets.

Jan. 9—**Canadian Housing Crisis,** by J. C. Smith, Architectural Editor of McLean's Magazine. (41)

Jan. 23—**Timing of Public Investment in Construction,** by H. W. Lea, Co-ordinator of Public Projects, Dominion Government. (32)

Jan. 30—**Job Evaluation,** by F. R. Manual of Stevenson and Kellogg. (60)

Feb. 6—**Paper,** by A. E. H. Fair, President of Alliance Paper Company. (62)

Feb. 12—**New Zealand,** by C. E. Fuller of New Zealand National Electrical and Engineering Company—Luncheon meeting. (57)

Feb. 20—**Exercise Musk-Ox,** by Col. J. T. Wilson, Professor of Geophysics, University of Toronto, Deputy Director of Exercise Musk-Ox. (125)

Mar. 22—**Inductive Co-ordination of Power and Telephone Lines,** by Professor G. A. Wallace of McGill University—Dinner meeting. (101)

Apr. 3—**Cobalt,** by C. R. Whittemore, of Deloro Smelting and Refining Company. (27)
May 1—Annual meeting—addressed by Colonel T. M. Medland on the subject of **The Engineering Profession in Ontario.** (54)
June 21—Annual Field Day—Trip through Deloro Smelting and Refining Co., and picnic at Crowe Lake. (66)
Oct. 6—**Bikini,** by Forrest Nagler. (109)
Oct. 18—Trip to Steel Company of Canada, Hamilton. (40)
Nov. 5—Annual Dinner and presidential visit by Col. L. F. Grant. (61)
Dec. 4—**Planning for Use,** by E. C. S. Cox, Architect, Thorncrest Village. (70)

Quebec Branch

The Executive Committee held six meetings, with an average attendance of ten members, for the transactions of branch business.

The activities of the Branch were varied and very well attended. This year the Branch has celebrated its fortieth anniversary. On this occasion a grand ball was organized on November 28th, with our President, Lt.-Col. L. F. Grant, attending as guest-of-honour. Laval University conferred honorary degrees upon Lt.-Col. L. F. Grant, president of the Institute, and Mr. Ernest Lavigne, president of the Quebec Corporation of Professional Engineers. The Council of the Institute held its November meeting in Quebec. The president met the students of Laval on Saturday, November 29. Hearty thanks to all those who were present.

The programme of activities was as follows (attendance is given in brackets):

Jan. 22—Films—courtesy of the Provincial Service of Cinephotography. (80)
Feb. 3—**Reconstruction of the Halifax Water Reservoir,** R. M. Doull, M.E.I.C., Manager, Canada Gunite Co. Ltd. (50)
Feb. 26—**Some Recent Electrical Developments,** Jules Mercier, M.E.I.C., Canadian General Electric, Quebec. (75)
Mar. 12—**Modern Methods of Masonry Construction and Precast Concrete Construction,** W. Chester Smith, M.E.I.C., The Cookville Co., Toronto. (50)
Apr. 10—Students' night—Talk by Gerard Matte, S.E.I.C. (55)
Apr. 28—Annual meeting of the Branch. (30)
Sept. 4—Annual Golf Tournament of the Branch. (101)
Oct. 29—**Observations de voyage en Chine,** Guy Rinfret, M.E.I.C., General-Superintendent, Shawinigan Engineering Company. (60)
Nov. 28—Grand Ball of the fortieth anniversary of the Branch. Lt.-Col. L. F. Grant, guest of honour. Laval University confers honorary degrees on the President of the Institute and on the President of the Corporation of Professional Engineers of Quebec. (430)
Nov. 29—Council meeting at the Parliament Building. Visit of the President to the science students of Laval. The President meets the Executive of the Branch at a luncheon at the Cercle Universitaire.

Saguenay Branch

During the year the Branch held a total of 5 general meetings.

Feb. 20—**The History of Sulphuric Acid,** by W. H. Deblois of Canadian Industries Limited, Montreal, Que.
Mar. 20—**A Programme for Improvement of Maintenance Methods,** by H. A. Estabrook, of the Aluminum Company of Canada, Limited, Arvida, Que.
June 23—Annual Dinner Meeting held in the Grill Room of the Saguenay Inn for the purpose of meeting the Institute President, L. F. Grant and the presidential party.
Oct. 2—**Cement Dispersion and Air Entrainment in Concrete,** by Lane Knight, Vice-President of The Master Builders Company Limited, Toronto, Ont.
Nov. 24—**Heliarc Welding,** by J. S. Johnston, of the Dominion Oxygen Company Limited, Montreal, Que.

In addition to the above the Junior Section held 9 general meetings.

Saint John Branch

On behalf of the Executive of the Saint John Branch we have the honour of presenting the Annual Report of the Branch for the year ending December 31, 1947.

Six special meetings of the Branch were held during the year, five in the Admiral Beatty Hotel and one in the Royal Hotel in Saint John.

Jan. 23—Annual Joint Dinner Meeting with the N.B. Assocation of Professional Engineers. Speakers were J. N. Flood, **Conditions in London and Brussels;** and D. O. Turnbull, **Modern Methods of Handling Materials at the New Jones-Schofield-Hathaway Warehouse.** (86)
Feb. 18—Dinner Meeting with the presentation of Canadian General Electric Company's "Magic of the Spectrum", by Mr. C. A. Morrison. Ladies Night. (127)
Mar. 18—Dinner Meeting in honor of President J. B. Hayes. The President was the principal speaker. Ladies Night. (79)
Apr. 14—Dinner Meeting at the Royal Hotel. Speaker was E. D. Bent of the Northern Electric Co., on **The Role of Synthetics in the Design and Manufacture of Electric Cables.** (27)
Oct. 15—Dinner Meeting in honor of President L. F. Grant. The President was the principal speaker. Ladies Night. (72)
Nov. 20—Dinner Meeting. J. L. E. Price discussed **Modern Housing.** (36)
Dec. 12—The Annual Meeting of the Branch. A new slate of officers for the year 1948 was brought in. The Annual Report of the executive was presented, as was the Financial Statement. This was a Dinner Meeting. (27)

St. Maurice Valley Branch

Mar. 27—Lecture Meeting held at the Cascade Inn, Shawinigan Falls, Que., to hear a paper entitled **Corrosion of Metals,** presented by L. G. Van de Bogart, research engineer of the Crane Company of Chicago, Ill. (85)
Apr. 17—Annual Meeting of the Branch, held at the Laurentide Inn, Grand'Mere, Que., at which time the members heard a most interesting talk given by Guy R. Rinfret, M.E.I.C., on a recent visit he had made to China. (67)
Oct. 27—Combined Branch golf meet and industrial visit held at the Ki-8-Eb Golf Club in Three Rivers, Que. (85)
Nov. 13—Lecture meeting held with the Canadian Institute of Chemistry at the Cascade Inn, Shawinigan Falls, Que. Film **Operation Pluto** was shown. (100)
Nov. 27—President's Visit. The Branch was pleased to receive the President and his party at a dinner meeting in the Laurentide Inn. Grand'Mere, Que. Colonel Grant, Messrs. Eadie, Flitton, Beauchemin and Laird all spoke briefly after dinner.

Saskatchewan Branch

All meetings were held jointly with the Association of Professional Engineers. The respective programmes were as follows:

Jan. 17—**Soil Mechanics,** by R. Peterson, M.E.I.C.
Feb. 14—Annual Meeting, followed by dinner and address from Hon. J. L. Phelps, Minister of Natural Resources, Saskatchewan Government.
Mar. 14—**Methods of Wood Preserving,** by J. A. Palmason, Canadian Creosoting Co. Ltd.
June 4—Dinner Meeting addressed by delegates to the Annual Meeting of the Dominion Council of Professional Engineers.
Aug. 25—Special Meeting of Executive addressed by Dr. L. Austin Wright, General Secretary, E.I.C.
Oct. 27—**Romance of Railroading,** by F. J. Fryer, Division Superintendent, C.P.R., Regina.
Nov. 25—**Air Photography, its Interpretation and Application to Engineers,** by J. D. A. Mollard, M.E.I.C.
Dec. 19—Sound Film "Sand and Flame".

The average attendance at these meetings was 47. Ten meetings of the executive were held during the year.

Branches	Border Cities	Calgary	Cape Breton	Cornwall	Edmonton	Halifax	Hamilton	Kingston	Kootenay	Lakehead	Lethbridge	London
MEMBERSHIP												
Resident												
Hon. Members	...	...	...	...	...	1	...	2	...	...	...	...
Members	56	114	32	17	99	175	122	53	22	33	20	49
Juniors	24	35	5	7	35	17	41	15	6	19	5	19
Students	17	15	3	8	50	50	38	37	2	10	...	20
Affiliates	...	1	1	2	1	1	1	...	...	6	...	2
Total	97	165	41	34	185	244	202	107	30	68	25	90
Non-Resident												
Hon. Members	...	...	...	..	...	...	...	...		...	..	.
Members	12	20	34	5	20	77	20	6	8	20	17	11
Juniors	5	2	6	2	10	7	15	3	2	8	4	4
Students	4	5	8	3	6	18	18	3	2	12	...	1
Affiliates	...	...	1	.	...	...	...	...	...	...	...	...
Total	21	27	49	10	36	102	53	12	12	40	21	16
Grand Total December 31st, 1947	118	192	90	44	221	346	255	119	42	108	46	106
" December 31st, 1946	104	198	88	36	182	336	228	122	38	83	46	100
Branch Affiliates, December 31st, 1947	...	50	...	23	...	...	13	1	...	...	18	2
FINANCIAL STATEMENT												
Balance as of December 31st, 1946	409.26	174.60	698.89	99.49	238.39	697.64	89.79	61.52	45.03	135.24	70.55	131.14
Income												
Rebates from Institute Headquarters	302.54	132.45	123.86	83.10	130.63	64.60	515.28	371.76	149.20	273.99	33.85	200.75
Payments by Professional Assns.	...	330.89	21.00	...	331.82	576.20	...	...	...	...	83.12	...
Branch Affiliate Dues	...	135.50	...	47.00	...	..	5.00	2.00	...	.	54.00	5.00
Interest	10.90	34.04	...	...	...	.94	30.94	.71		6.00	...	3.00
Miscellaneous	743.39	...	252.25	...	...	77.30	...	...	.	332.00	21.20	248.65
Total Income	1,056.83	632.88	397.11	130.10	462.45	719.04	551.22	374.47	149.20	611.99	192.17	457.40
Disbursements												
Printing, Notices, Postage①	62.74	273.80	36.84	7.00	35.49	141.65	141.57	28.43	11.91	40.19	55.35	25.45
General Meeting Expense②	764.10	100.00	...	..	114.81	103.50	...	85.85	..	121.50	...	45.69
Special Meeting Expense③	...	84.35	361.45	6.00	7.26	330.06	238.97	....	5.18	283.30	27.75	292.04
Honorarium for Secretary	...	...	...	...	50.00	100.00	...	..	..	...	25.00	...
Stenographic Services	10.00	10.00	16.00	..	17.35	96.15	50.00	...	...	...	...	3.50
Travelling Expenses④	...	...	.	....	..	...	26.35	...	..	...	..	...
Subscriptions to other organizations	...	...	...	2.00	..	...	...	...	...	...	...	...
Subscriptions to *The Journal*	...	28.00	...	14.15	...	...	4.00	...	...	...	4.12	2.00
Special Expenses	44.45	20.50	...	...	...	4.75	...	35.00	...	...	14.50	16.87
Miscellaneous	.35	24.16	15.60	...	18.80	52.65	62.98	...	22.94	34.89	.50	2.10
Total Disbursements	881.64	540.81	429.89	29.15	243.71	828.76	523.87	149.28	40.03	479.88	127.22	387.65
Surplus or *Deficit*	175.19	92.07	*32.78*	100.95	218.74	*109.72*	27.35	225.19	109.17	132.11	64.95	69.75
Balance as of December 31, 1947	584.45	266.67	666.11	200.44	457.13	587.92	117.14	286.71	154.20	267.35	135.50	200.89

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.

of the Branches as at December 31, 1947

Moncton	Montreal	Niagara Peninsula	Ottawa	Peterborough	Quebec	Saguenay	Saint John	St. Maurice Valley	Sarnia	Saskatchewan	Sault Ste. Marie	Toronto	Vancouver	Victoria	Winnipeg
...	2	...	2	...	...	...	...	...	...	...	...	1	...	1	...
51	1312	79	334	39	125	57	58	76	41	124	21	543	200	53	183
15	382	30	80	24	35	27	12	44	18	26	6	219	55	9	57
18	733	21	94	8	55	14	9	21	11	6	2	364	191	11	116
1	27	9	7	...	1	1	3	1	...	...	2	9	4	...	4
85	2456	139	517	71	216	99	82	142	70	156	31	1136	450	74	360
...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
20	109	5	37	18	15	8	62	6	2	54	47	10	39	16	16
8	35	2	18	7	3	4	21	2	2	10	35	7	9	6	16
15	39	...	13	8	9	...	84	...	...	30	10	4	17	4	11
...	1	...	...	...	2	1	...	...	...	...	...	1	2	...	1
43	184	7	68	33	29	13	167	8	4	94	92	22	68	26	44
128	2640	146	585	104	245	112	249	150	74	250	123	1158	518	100	404
98	2479	144	526	131	234	106	206	122	59	261	112	1008	386	92	395
4	11	9	20	15	...	...	18	...	...	...	5	...	...	1	8

*For voting purposes only, there should be added to Montreal Branch, an additional 414 members, 249 being resident in the United tates, 112 in British possessions and 54 in foreign countries.

Moncton	Montreal	Niagara Peninsula	Ottawa	Peterborough	Quebec	Saguenay	Saint John	St. Maurice Valley	Sarnia	Saskatchewan	Sault Ste. Marie	Toronto	Vancouver	Victoria	Winnipeg
246.90	2,461.27	188.86	673.51	196.91	284.50	218.75	281.37	191.34	49.54	69.92	180.72	527.17	541.91	141.61	817.00
141.13	4,495.83	367.51	1,134.37	362.33	606.27	361.21	177.88	419.26	256.36	50.40	323.13	1,968.65	376.21	167.59	719.00
112.00	...	...	...	...	...	...	208.00	...	...	471.51	...	...	...	...	...
17.50	53.00	...	6.00	36.00	...	...	76.00	...	...	...	45.00	...	...	3.00	40.00
3.97	30.00	6.00	64.42	.92	...	...	...	...	...	...	15.20	16.77	9.09	...	25.50
91.30	1,068.09	93.95	4.00	535.80	2,913.58	81.45	...	...	434.40	...	108.00	148.69	93.50	...	67.97
365.90	5,646.92	467.46	1,208.79	935.05	3,519.85	442.66	461.88	419.26	690.76	521.91	491.33	2,134.11	478.80	170.59	852.47
29.63	1,545.57	78.83	183.58	140.42	66.80	9.55	55.91	74.53	16.77	26.03	48.50	954.95	173.18	111.31	291.67
5.50	146.75	37.60	...	150.65	43.72	44.60	19.00	267.27	38.50	218.50	123.23	228.50	113.71	26.00	14.00
133.20	1,718.36	126.75	546.44	639.54	2,985.88	198.06	124.80	.	442.98	...	71.50	209.85	112.96	2.00	108.80
25.00	460.00	80.00	100.00	...	100.00	25.00	60.00	...	...	96.00	25.00	125.00	50.00	...	75.00
10.00	120.00	15.18	...	...	...	...	15.00	5.00	...	...	...	40.00	20.00	...	...
...	170.05	...	...	...	...	...	...	10.00	...	109.35	...	...	...	...	...
...	...	...	...	...	17.50	...	...	...	2.00	...	...	...	...	...	3.00
7.15	22.00	...	...	10.00	...	...	22.00	...	...	...	10.00	...	...	...	16.00
...	98.37	4.90	25.50	...	...	...	...	...	...	...	...	49.15	...	...	20.00
73.16	93.70	5.78	83.57	1.30	53.22	.75	114.65	...	2.00	21.63	7.64	115.58	21.13	18.20	8.86
283.64	4,374.80	349.04	939.09	941.91	3,267.12	277.96	411.36	356.80	502.25	471.51	285.87	1,723.03	490.98	157.51	537.33
82.26	1,272.12	118.42	269.70	*6.86*	252.73	164.70	50.52	62.46	188.51	50.40	205.46	411.08	*12.18*	13.08	315.14
329.16	3,733.39	307.28	943.21	190.05	537.23	383.45	331.89	253.80	238.05	120.32	386.18	938.25	529.73	154.69	1,132.14

Sarnia Branch

This was the second full year of activities for the Sarnia Branch. Nine meetings were held, including a joint golf game with the Windsor Branch in Windsor. Eleven executive meetings were held. The following is a list of the general meetings:

Jan. 17—A dinner meeting at the Polymer Cafeteria at which Dr. J. J. Grebe of the Dow Chemical Company, Midland, Mich., spoke on **The Atomic Bomb Test at Bikini Atoll.**

Feb. 20—Dr. Sidney Smith, the President of the University of Toronto, addressed a joint dinner meeting at which the members of the Sarnia Branch of the Chemical Institute of Canada were the guests of the EIC. The meeting took place at Polymer Cafeteria.

Mar. 27—An informal evening meeting at the Lutheran Church during which the picture **Operation Pluto** was shown through the courtesy of the Drummond McCall Company. Considerable discussion was devoted to Town Planning.

Apr 24—A. H. Frampton, Director of Engineering for the H.E.P.C., addressed a dinner meeting at Polymer Cafeteria, his subject being **The Romance of Niagara Power.**

May 14—This meeting held annually under the sponsorship of the Junior members took place at the Hotel Vendome. Jack Garton, Jr.E.I.C., of Imperial Oil Limited, spoke on **Small Scale Enterprises for Engineers.** A round table discussion followed, led by James Blayney on **The Viewpoint of the Young Engineer.**

Sept. 6—This was the occasion of President Grant's visit to Sarnia, accompanied by his wife and W. L. Saunders of Ottawa. A noon hour luncheon was held at Kenwick-on-the-Lake. Mr. Saunders and Col. Grant addressed the members and their ladies.

Sept. 20—Twenty members of the Sarnia Branch journeyed to Windsor where they were guests of the Windsor Branch at the Lakewood Golf Club for a golf match followed by dinner. A trophy was donated by the Windsor Branch for Annual Competition between the Branches. The first year's competition was won by Sarnia by a narrow margin.

Oct. 23—The E.I.C. were guests at a ladies night meeting at Polymer Cafeteria at which the Chemical Institute of Canada were hosts. C. R. Conquergood, President of the Canada Printing Ink Company, addressed the meeting on **Order in Colour.**

Dec. 4—The annual meeting at which the reports of the various committees were presented and the election of officers for 1948 took place. Following a discussion of local problems, a social evening was enjoyed.

Sault Ste. Marie Branch

Th Sault Ste. Marie Branch of the Engineering Institute of Canada, held six general meetings and three executive meetings during the year of 1947. The general meetings were as follows:

Apr. 4—"Construction, Assembling and Firing of the V-2 Rocket", a movie presented through the courtesy of Lieut.-Col. L. H. Derrer of the Sault Ste. Marie and Sudbury Regiment.

Apr. 25—**Atomic Bomb Tests at Bikini Atoll,** also presented by Lieut.-Col L. H. Derrer.

June 13—Speaker—Col. T. M. Medland of the Association of Professional Engineers.

Sept. 8—Visit of the President. Lieut.-Col. L. F. Grant spoke on—**What the Engineer Can Do for the Institute, and What the Institute Can Do for the Engineer.**

Nov. 28—T. O. O'Neill of the Goodyear Tire & Rubber Company, spoke and showed movies on "Conveyor Belt Systems" as applied to mines and cross country operations.

Dec. 12—Annual Meeting. C. P. Disney of Intrusion Prepakt Limited, spoke on **Bridge Pier Design and Construction Using Steel H Piles and Prepakt Concrete.**

Toronto Branch

The Executive held eleven meetings with an average attendance of ten.

Regular meetings of the Branch are listed below, with attendance given in brackets.

Jan. 11—Ladies Night. (128)

Jan. 23—Student Night (Joint with Junior Section). **The Modern Low Head Propeller Turbine,** by W. M Clarkson. **Boiler Feed Water Conditioning,** by A. J. Prell. **Mechanized Harvesting of Grain,** by D. Dederer. **Engineering Aspects of Aviation Medicine,** by F. J. Humphrey. **The Photo Multiplier Tube,** by F. Weinberg. **The Gas Turbine Locomotive,** by W. G. Ratz. (175)

Feb. 19—**Research in Ontario,** by Dr. R. C. Wallace, Joint with Affiliated Engineering and Allied Societies in Ontario. (220)

Mar. 27—**Labour Relations and the Engineer,** by W. F. Clive Kidd. (82)

Apr. 23—Annual Meeting—Films, "Niagara the Powerful", and "The Telephone Hour". (103)

Oct. 1—**Industrial Research,** by Dr. H B. Speakman. (125)

Oct. 23—**Jet Engine Development in Canada,** by P. B. Dilworth. (160)

Nov. 7—Annual Engineer's Dance. Joint with Affiliated Engineering and Allied Societies in Ontario. (282)

Nov. 27—**Elimination of Overhead Wires and Cables from Streets,** a panel discussion by S. E. Schwenger, J. F. Neild, O. W. Titus, W. H. Slinn and J. D. Von Maur. (123)

Dec. 11—**The Engineer in the World of Tomorrow,** by T. M. Medland. (114)

Junior Section

The primary aims of the Junior Section have resolved themselves into a consideration of the social, economic and professional problems as well as technical problems and also into a concerted effort to promote the interests of the Institute. A special drive to obtain student interest has been launched. The secondary aim has been to point out to non-members of the Institute that they can associate themselves with the Junior Section. The schedule of meetings for the past year follows:

Jan. 23—Student Night. (175)

Feb. 11—**Trends in Labour and Management Relations,** by Mr. Sparrow. (35)

Feb. 27—Plant visit to O'Keefe's Ale Brewery. (80).

Oct. 16—**Engineers—What of the Future?** by E. P. Muntz. (220)

Nov. 13—Plant visit—Leaside Transformer Station. (132)

Nov. 26—Ajax Meeting, President L. F. Grant and Dean Young. (795)

Dec. 10—**Des Joachims Power Develoopment,** by Wm. Hogg Jr.; **Mobile Telephone,** by H. R. Sumner; **Radiant Heating,** by F. W. Chambers; **Planning a New Testing Laboratory,** by W. MacPherson. (90)

All meetings have been made more interesting by the showing of one or two movies.

Vancouver Branch

The following is a brief resumé of the meetings held by the Vancouver Branch during 1947.

Eight meetings were held in all, of which six were addressed by guest speakers and two were field trips. Amongst the guest speakers were T. M. Moran, J. W. A. Fleury, C. E. Webb, and the three student speakers on Student Night. The first field trip was to the new automatic exchange of the B.C. Telephone Company and the second to the shops of the Vancouver Iron Works to observe the construction of a 90-inch pipe and then over to the Great Vancouver Water Board project to see the installation of the pipe.

The average attendance at all meetings was approximately 88, with top attendance approximately 125.

Victoria Branch

During the year there were five meetings of the Executive and ten general meetings of the Branch, two of the latter being visits to industrial plants. The General Secretary Dr. L. Austin Wright was a dinner guest of the executive on August 20th, when an informal discussion was carried on relative to Institute affairs. A list of the general meetings with speakers and subjects follows:

Jan. 29—Addressed by A. G. Graham, Supervisor of the Provincial Regional Planning Division, his subject being **Regional Planning.**

Feb. 19—Addressed by A. L. Carruthers, Deputy Minister of Public Works, Province of British Columbia—subject **The Provincial Highway System.**

Mar. 13—**The Work of Artillery Survey Regiments in the Late War**—R. C. Farrow, Comptroller of Water Rights, B.C. Government.

Apr. 10—**The Canol Pipe Line**—Major General W. W. Foster, C.M.G., D.S.O., Member B.C. Power Commission.

May 15—A Symposium on Soil Mechanics. R. C. Farrow, Comptroller of Water Rights—**Importance of Soil Mechanics and Necessity of Rigid Approval and Inspection of Earth Structures;** J. S. Kendrick, District Engineer Water Rights Branch—**Application of Soil Mechanics to the Construction of Earth Dams;** and P. E. Cook of the British Columbia Research Council—**Testing of Soils.**

June 15 and 16—A visit was made to the B.C. Power Commission's Hydro-Electric Plant at Campbell River, Vancouver Island. Including the ladies, between sixty and seventy visited the project. On the 15th the entire party were luncheon guests of the Commission at Nanaimo, and on the 16th, of the General Construction Company, at the Plant. The visitors were divided into groups and were shown, with descriptive detail, every phase of the project which will ultimately develop 150,000 horse power. In honour of the retiring Premier of British Columbia, the project is to be known as "The John Hart Development". Mr. Hart, in the presence of four hundred guests, opened the Plant on the 15th of December 1947.

Sept. 6—Inspection of the largest passenger ship ever built in Canada—the new $3-million Canadian National Railway's Steamship, *"Prince George"*. E. W. Izard, M.E.I.C., General Manager of Yarrows Limited, and others of his firm conducted the members through the ship at the most interesting period of its construction. The ship, which has nine decks, was launched on October 6, 1947.

Nov. 21—R. Bowering of the Provincial Department of Public Health and Welfare, spoke on **Public Health Engineering.**

Dec. 4—Luncheon nomination meeting, nominating officers for 1948.

These meetings were all well attended and augur well for the successful carrying out of the 1948 programme.

Winnipeg Branch

During the year the executive of the Branch has held nine meetings, the average attendance being 11.

The following are the general meetings held by the Branch:

Jan. 9—**Installation of Distance Relays on the Transmission System of the Winnipeg Electric Co.,** L. M. Hovey, M.E.I.C., Electrical Engineer, Winnipeg Electric Co. (82)

Feb. 6—Annual Meeting of the Branch, reading of reports and installation of new officers.

Feb. 20—**Boat Woods,** by W. J. Patton; and **Tone Control,** by C. M. Fung. These two papers won the prizes offered annually by the Branch for the best student papers in civil and electrical engineering subjects. (38)

Mar. 24—**The Economics of Water Diversion,** F. L. Lawton, M.E.I.C., Electrical Engineer, Aluminum Company of Canada Limited. (76)

May 1—**Trends in Electrical Wire Insulations and High Voltage Power Cables,** O. W. Titus, Chief Engineer, Canada Wire and Cable Co. (76)

Sept 18—**Atomic Energy,** Dr. E. J. Wiggins, Section Head, Engineering Development Section, Chalk River Project, National Research Council. (350)

Oct. 23—**The Modern Trend in House Design,** D. H. L. Evans, Consulting Architect, Western Retail Lumbermen's Association. (68)

Nov. 20—**The State of the Engineering Profession,** J. M. Dymond, Director, Bureau of Technical Personnel, Ottawa. (77)

Electrical Section

During the year the Electrical Section Executive met 10 times in addition to the nine general meetings held as follows:

Jan. 9—The Electrical Section were joined by the Branch for the first meeting of the year for the purpose of hearing the Nominating Committees of both Section and Branch present their reports. L. M. Hovey, Electrical Engineer for the Winnipeg Electric Company spoke on the **Installation of Distance Relays on the Transmission System of the Winnipeg Electric Company.** His talk was illustrated by slides and a model transmission line for demonstrating fault clearance by HZ-211 distance relays. (82)

Feb. 13—The Annual Meeting of the Section. Following reports from retiring chairman H. L. Briggs, and the secretary, the meeting under the direction of the new chairman D. A. McCuaig, heard S. S. Stevens, Director of Communications for Trans-Canada Air-lines, speak on **Electronic Aids to Aviation.** (32)

Apr. 3—**Maintenance of Power Transformers.** Mr. Storey, General Superintendent i/c production for the City of Winnipeg Hydro Electric System. A good discussion period followed the paper. Refreshments served in the Snack Room. (26)

May 1—**Trends in Electrical Wire Insulations and High Voltage Power Cable.** O. W. Titus, Chief Engineer, Canada Wire and Cable Co. Ltd., spoke before a joint meeting of the Section and Branch. His talk was illustrated with slides and samples. Refreshments were served in the Snack Room. (76)

May 6—Wind-Up Dinner and Dance at the Marlborough Hotel. W. F. Sutherland, Merchandising Manager for the City of Winnipeg Hydro Electric System, spoke on **Trends in Modern Electrical Appliances,** followed by a Westinghouse film "The Dawn of Better Living". (64)

Sept. 18—The Section joined with the Branch and the A.P.E.M. to hear Dr. E. J. Wiggins, head of the Engineering Development Section of the Chalk River Project, speak generally on **Atomic Energy.** (350)

Oct. 2—The Electrical Section played host to the Winnipeg Sub-Section of Institute of Radio Engineers to hear E. Kelsey, Consulting Engineer, Electronics Engineering Department, Northern Electric Company, on **Technical Problems in Connection with Establishing a Radio Station.** Refreshments were served in the Snack Room. (60)

Nov. 6—**Operation and Maintenance of Oil Circuit Breakers,** by C. P. Haltalin, Supervisory Engineer for Winnipeg Electric Company. Mr. Haltalin illustrated his talk with slides and provoked one of the best discussion periods to date. The meeting adjourned to the Snack Room for refreshments. (57)

Dec. 11—Nominating Committee report and films. "Beyond the Pylons", introduced by S. G. Harknett of Mumford Medland Company. Discussion by H. L. Briggs and L. M. Hovey. The second film, "Everyday Miracles", was loaned by the Canadian General Electric. Refreshments were served in the Snack Room. (27)

—From Month To Month—

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

An Appeal to Engineers and Scientists

The investments which have been made and will be made by the United States and Canada in the reconstruction of Europe can be taken as an indication that those we have elected to direct our two countries' affairs must really believe we have a stake in the future of the old world.

Our governments are pouring out our resources to confine the extension of the "iron curtain" and it surely behooves the individual citizen, if he believes in the system we are seeking to protect, to look for ways in which he can be of use. During the month of February, Canadians were asked to contribute ten million dollars to the Canadian appeal for Children and they have responded generously. An aspect of this campaign which was not too generally publicized was that the appeal for children had been combined with the drive for basic educational, scientific and cultural supplies which had been planned by the Canadian Council for Reconstruction through UNESCO. A portion of the funds raised will be used to supply equipment for educational and scientific institutions in the ravaged countries of Europe.

These funds will help in meeting the most urgent needs by the purchase and immediate despatch of such basic school supplies as pencils, paper, text books, etc. The Receiving depots which were set up by the Canadian Council are to remain in operation for some considerable time for receipt of donations in kind. The schools and universities of the countries in Europe that were occupied by the enemy are desperately in need of the most elementary supplies. Most of the centres of learning were destroyed and most of the scientific instruments were rendered useless. Libraries were wrecked completely and the young would-be research worker has no reference books or even text books from which to study.

Engineering students who perhaps are needed more than any others in the reconstruction of Europe are being hampered by the lack of draughting sets, electrical and optical instruments, all types of scientific equipment and materials and of text books. While many of the older professional engineers were "liquidated" during the war, so that their knowledge and experience would not be available to help their countries afterwards, the younger men had been almost stopped too in efforts to learn what they can about this practical and essential profession.

The Canadian Council for Reconstruction through UNESCO advises that our members can assist primarily by giving what financial aid they can and also very effectively by donations of books, technical journals, or equipment for which they no longer have need.

Please write, listing what you can give, to the Canadian Council for Reconstruction through UNESCO, at 139½ Sparks Street, Ottawa; you will be advised where to address your actual contribution to the nearest collection point.

The Fiftieth Birthday
of an
Outstanding Canadian Organization

On January 15 of this year the Shawinigan Water and Power Company celebrated the completion of its first 50 years of operations. In a brief commemorative statement, James Wilson, president of the company, noted the phenomenal expansion of the organization from the original 10,000-hp. installation at Shawinigan Falls to the 1,250,000-hp. system, with upwards of 3,800 permanent employees now serving some 225,000 industrial, commercial, domestic and farm customers in the Province of Quebec. Shawinigan interests now include, in addition to the hydro-electric system, a wide range of chemical and plastic products, research facilities probably as extensive as any outside the government research establishments, and an engineering company which not only handles the programmes of the parent company but does considerable outside work on a consulting or contracting basis.

The Shawinigan organization has long been a strong supporter of the Institute, its executives and engineers having devoted a great deal of valuable time to the duties of Institute offices from President down through Council and Committees to the work of the Montreal Branch. The *Journal* takes particular pleasure in extending the warmest congratulations to President Wilson and the entire Shawinigan organization.

Town Planners Organize

Word has been received at Headquarters that the Institute of Professional Town Planners has been organized in Toronto with T. D. Le May, president; John Kitchen, vice-president, and E. Faludi, secretary-treasurer.

The purpose of the organization is "to promote the science and art of town and community planning, and the knowledge of the members in the practice of the profession of town and community planning ".

There are two classes of membership—Honorary Members and Members. The annual fee is $25.00. Membership is open to any one " who shall have been engaged for a period of five years in the active and responsible practice of some phase of community planning or who shall satisfy the council by examination or otherwise that by reason of his professional knowledge he is a person capable of promoting the objects of the Institute ".

The Washington Award

The Washington Award commission, representing five of the major U.S. engineering societies, has announced the selection of Senator Ralph E. Flanders as the recipient of the 1948 award.

The Washington Award is made annually to an outstanding engineer in the United States who has ably served human needs, and was established to encourage among engineers a broader understanding of their opportunities for public usefulness. Herbert Hoover received the first award in 1919, to head a list which includes Ambrose Swasey, Henry Ford, Arthur Compton, Vannevar Bush, Charles Kettering, and others equally outstanding.

Senator Flanders is a mechanical engineer, president of Jones and Lamson Machine Company. He has long been interested in economic and social problems and has written many articles on the subject. The citation of the award reads, " For high technical skill in perfecting the tools of industry and for distinguished service in the field of human relationships ".

Nuclear Research at the Universities

Queen's University has announced the purchase from Canadian General Electric Company of a 70 million electron-volt synchrotron to enable this university to assume a much more effective role in the Canadian programme of Nuclear Research. Only one other large machine of this type is known to be in operation in the world—at the G.E. Research Laboratory in Schenectady.

Technically, the machine is defined as a device for producing extremely high-energy X-rays. It consists essentially of a large electro magnet weighing about eight tons, which produces a magnetic field to guide the electrons around a circular path inside a highly evacuated hollow glass ring. An electrical circuit is adjusted to give the electrons a push each time they go around. Within one two-hundredth of a second, the electrons have acquired an energy corresponding to 70 million volts. Their path is then altered slightly so that they strike a small piece of metal inside the glass ring and extremely penetrating x-rays are produced. These x-rays are many times more powerful than those of more familiar radio-active substances such as radium.

Through the use of this synchrotron, Canadian scientists should be able to enhance their contribution to the research being undertaken on a broad front by nuclear scientists around the world.

Canadian Welding Bureau Lists Qualified Firms

City of Toronto Co-operates

The Canadian Welding Bureau, a division of the Canadian Standards Association, has released its first list of some fifty fabricators and contractors who have met the required conditions of C.S.A. Qualification Code W. 47 and are capable of undertaking work specified to the requirements of Code W. 59—" The Welding of Bridges, Buildings and Machinery ".

Concurrently with the publication of the list, the City of Toronto has approved of structural welding within the city limits if undertaken to the standards of Code W. 59 and by a firm approved by the Bureau. For the Bureau's approval a firm must demonstrate that they have engineering personnel competent to design welded structures and to specify and control the welding procedures used, and supervisory personnel capable of directing these procedures. In addition, proper standards must be submitted and followed and all welding undertaken with suitable equipment and by certified operators.

The Bureau's approvals cover three classifications:

(a) Structural fabrication such as bridges, buildings, handling equipment, containers and machinery which are structurally stressed and where failure might constitute a danger.

(b) Non-structural welding where failure is less hazardous.

(c) Partial or limited approval for recognition of the large group of small shops which cannot meet the engineering requirements of Code W. 47. Such approval requires full competency with respect to operators, supervisors and equipment but not of engineering personnel.

The presently released list is valid until June 30th, 1948, and is subject to cancellation with respect to individual fabricators or contractors at any time. For confirmation as to the approval of any organization reference may be made to the Bureau at 22 College Street, Toronto.

Pulp and Paper Lectures to be Held at McGill

The Pulp and Paper Research Institute of Canada has announced a series of nine illustrated lectures designed to outline the scope of the technical work of the pulp and paper industry in Canada. The lectures are to be given in the lecture theatre of McGill's chemistry building at 5 p.m. every Tuesday beginning January 20, 1948.

Some of the speakers who will contribute to the series will be S. F. Mitchell, O.B.E., M.E.I.C, manager of the Canadian Pulp and Paper Association; H. O. Keay, M.E.I.C., manager of the research laboratories, Consolidated Paper Corporation; Dr. W. Boyd Campbell, director of technical research of the Institute; J. S. Hart, research associate of the Institute; Douglas Jones, Affiliate E.I.C., technical section, Canadian Pulp and Paper Association.

U.S. Office Register for Patent Owners

Provision has recently been made by the United States Patent Office whereby the owners of unexpired U.S. Patents are assisted in establishing contacts with manufacturers.

If the patent owner is prepared to grant licenses under his patent to prospective manufacturers, on reasonable terms, he can have his patent entered in a Patent Register at the Patent Office and it will remain there for the life of the patent unless withdrawn, at any time, by the owner or deleted upon evidence of lack of good faith on his part.

Entry of the patent upon the Register will be published in the Official Gazette of the Patent Office and periodic lists of patents, classified according to the various subject matter, will be sent to trade publications dealing with the various kinds of subject matter for publication. Manufacturers making enquiry at the Patent Office for assistance in finding new products for manufacture, will be furnished with lists of patents on the Register relating to the subject matter in which they are interested and enquiries by manufacturers with respect to specific patents on the Register will be referred to patent owners.

The patent owner, when requesting entry on the Register, must state he will assign his patent or grant licenses on reasonable terms, but the specific terms used need not be stated although they can be if desired.

There is no charge by the Patent Office for the above service.

Meetings of Other Societies

The Annual Meeting of the **Society for Experimental Stress Analysis** will be held at The Roosevelt Hotel, Pittsburgh, Penn., on May 27, 28, 29, 1948.

Inquiries should be addressed to the Society for Experimental Stress Analysis, P.O. Box 168, Cambridge 39, Massachusetts.

The "All Varsity Alumni Night" is planned by the **Alumni Federation of University of Toronto** for March 12 this year. Varsity friends will be gathering in Hart House once again for another grand evening of dancing and campus entertainment.

Mail orders for tickets will be accepted by the Alumni Federation Office at 42 St. George Street as long as tickets remain available.

The Nineteenth Congress of the **International Federation for Housing and Town Planning** will take place in Zurich, Switzerland, during the week, 20-26 June, 1948. All meetings will be in the beautiful, modern Kongresshaus.

Address enquiries to the Secretary, International Federation for Housing and Town Planning, 13 Suffolk Street, Haymarket, London, S.W. 1, England.

The American Society of Tool Engineers has announced developments in the Sixth Annual A.S.T.E. Industrial Exposition to be held in Cleveland, March 15-19, 1948, coincident to the Society's Sixteenth Annual Meeting.

Should information be required on the Exposition, or details regarding the exhibitors, please write to: Jno. M. Cannon, Director of Public Relations, American Society of Tool Engineers, 1666 Penobscot Building, Detroit 26, Michigan.

Meeting of Council

Minutes of a meeting of the Council of the Institute held at Headquarters on Saturday, December 20th, 1947, at eleven o'clock a.m.

Present

President L. F. Grant in the chair; Vice-President R. S. Eadie, Councillors J. A. Beauchemin, K. G. Cameron, R. C. Flitton, C. E. Gelinas, C. A. Peachey, of Montreal, and C. F. Morrison of Toronto; Treasurer L. C. Jacobs, and Assistant General Secretary W. D. Laird.

Death of Past-President S. G. Porter

Council noted with sincere regret the death of Past-President S. G. Porter, of Calgary, which had taken place in that city on November 30th, after a lengthy illness. The president reported that he had written to Mrs. Porter, and on the motion of Mr. Peachey, seconded by Mr. Morrison, it was unanimously resolved that the following resolution be recorded in the minutes and that a copy be forwarded to Mrs. Porter:

> "This Council learns with deep regret of the death in Calgary on November 30th, 1947, of Sam Graham Porter, president of the Institute for the year 1931. Mr. Porter was a most capable executive engineer whose experience in the field of conservation and irrigation enabled him to make an invaluable contribution to the advancement of Canada.
>
> His interest in the welfare of the community was so extensive that his passing will surely be a particular loss to his numerous friends and acquaintances in Calgary. To those, and particularly to Mrs. Porter and his immediate family, this Council extends its sympathy."

In view of the fact that the minutes of the November meeting had only just been circulated, it was decided to withhold confirmation of those minutes until the January meeting.

Report of Finance Committee

PERRY CASE

Mr. Eadie reviewed the Institute's interest and association with the Quebec Corporation in this case, pointing out that at different times the Institute had proposed financial assistance to the Corporation in the costs of defending Mr. Perry. A joint committee had been established to aid in working out the defence, and after the first trial had been lost, the Institute's panel of the committee had pressed particularly for an appeal which had been agreed upon. Subsequently the panel had recommended that the Institute pay a certain portion of the cost to the Corporation of Professional Engineers of Quebec. The Finance Committee now recommended that the proposal of the panel be approved and that the Institute pay to the Corporation the sum of $1,000.00. Upon the motion of Mr. Eadie, seconded by Mr. Cameron, it was unanimously resolved that the Finance Committee's recommendation be approved.

ONTARIO DIVISION REQUEST FOR GRANT

A request was presented from the Ontario Division for a grant of $50.00 towards operating expenses for the year 1947 and $200.00 for the year 1948. On the recommendation of the Finance Committee it was unanimously resolved that Headquarters would pay the expenses of the Division up to $50.00 for 1947, and approximately $200.00 for 1948, such money to be given to the Division in the form of an accountable advance.

CANADIAN COMMITTEE ON STUDENT GUIDANCE

A request from the Canadian Committee on Student Guidance in Science and Engineering for a grant of $25.00 towards the operating expenses for the latter half of 1947 and for the year 1948 had been considered by the Finance Committee. A similar contribution was being made by the Canadian Institute of Mining and Metallurgy and the Chemical Institute of Canada, the other two organizations represented on this joint committee.

The president explained the tie-in between this committee and the Institute's Committee on the Young Engineer, and, following some discussion, on the recommendation of the Finance Committee, it was unanimously agreed that the grant be approved.

Committee on Professional Interests

ALBERTA AGREEMENT

A communication had been received from the chairman of the joint finance committee in Alberta with which he forwarded a copy of the minutes of a meeting of the joint finance committee held on October 14th and which contained three resolutions which would be presented to the Council of the Association of Professional Engineers of Alberta at a meeting to be held early in December. If the Council of the Association accepts these resolutions appropriate representations will be forwarded to the Council of the Institute.

The Committee on Professional Interests had studied these proposals, in consultation with the general secretary who had made a special trip to Calgary in August to discuss these matters with the officers of the Association. On instructions of the committee, the general secretary had written to the chairman of the joint finance committee agreeing in general to the proposals but making certain pertinent recommendations. As soon as these changes have been agreed upon by the Councils of the Institute and the Association the necessary amendments to the agreement can be drawn up and signed by the officers of each organization.

The action of the Committee on Professional Interests as outlined above was approved unanimously.

CANADIAN PARLIAMENTARY AND SCIENTIFIC COMMITTEE

This proposal had been referred by Council to the Committee on Professional Interests for consideration and recommendation and the committee now reports as follows:

> "Your committee has discussed at considerable length the proposal which originally emanated from the Canadian Association of Scientific Workers regarding the setting up of a Parliamentary and Scientific Committee and wishes to recommend that at the present time the Institute take no action in supporting this proposal in view of the fact that it cannot see what objective is to be achieved and because of the fact that the government has at its disposal a National Research Council which is thoroughly competent to deal with matters of a scientific nature and report to the proper authorities when required."

This report was accepted and approved unanimously.

BUDGET ITEM 180E

The following report from the Committee on Professional Interests was approved unanimously and it was agreed that the Minister of Finance should be communicated with immediately:

> "Having in view the recent action by the Dominion government concerning imports from the United States it was thought fitting that the matter of Budget Item 180e be re-opened and that the government be further pressed to have the taxes on engineering plans re-imposed, all as dealt with in our correspondence with the Minister of Finance."

Toronto Branch Councillor

A letter was presented from Mr. S. R. Frost advising that as he was leaving Toronto in order to take up engineering work in New Brunswick he wished to resign as councillor representing the Toronto Branch. Under the circumstances, it was unanimously agreed that Mr. Frost's resignation as councillor be accepted.

On the motion of Mr. Jacobs, seconded by Mr. Beauchemin, on the recommendation of the Toronto Branch executive, it was unanimously resolved that Mr. E. A. Cross be appointed councillor to replace Mr. Frost until the next annual meeting.

On the motion of Mr. Morrison, seconded by Mr. Peachey, on the recommendation of the Toronto Branch executive, it was unanimously resolved that Mr. W. S. Wilson be appointed councillor for the year 1948 to complete Mr. Frost's term of office, this appointment to become effective at the adjourned annual meeting in Banff when the 1948 officers will be inducted.

Annual General Meeting—1948

On the motion of Mr. Eadie, seconded by Mr. Peachey, it was unanimously resolved that the annual general meeting be convened at Headquarters in Montreal on Thursday, January 22nd, 1948, for the transaction of the necessary formal business, including the appointment of scrutineers to canvass the officers' ballot. It was also unanimously agreed that the meeting should be adjourned to reconvene at the Banff Springs Hotel, Banff, Alberta, at eight o'clock p.m., on Tuesday, June 1st, 1948.

The president explained that the present plans were to hold the president's dinner on the evening of Monday, May 31st, the annual Council meeting on Tuesday, June 1st, and the annual business meeting on the evening of Tuesday, June 1st. In this way, Wednesday, Thursday and Friday would be left free for professional sessions and trips. It was pointed out that the time of the adjourned annual meeting could be changed if found necessary.

Students and Juniors Prizes

Mr. Laird read the recommendations received from the chairmen of the examiners for the prizes to Students and Juniors for the prize year 1946-1947. These were approved as follows:

H. N. Ruttan Prize (Western Provinces) to Raymond Pillman, S.E.I.C., for his paper: "The Accuracy of a Two-Minute Transit". John Galbraith Prize (Province of Ontario) to R. N. E. Haughton, S.E.I.C., for his paper: "Effects of Lightning on Buried Telephone Cable". Martin Murphy Prize (Maritime Provinces) to Norman A. Parlee, JR.E.I.C., for his paper: "Utilization of Sydney Slag for Engineering and Agriculture".

In the case of the Phelps Johnson Prize (Province of Quebec—English), Mr. Eadie had recommended that as no award of this prize had been made last year, two awards be made this year.

Mr. Layne, chairman of the examiners for the Ernest Marceau Prize (Province of Quebec—French), inquired as to whether or not it would be in order to make two awards this year as no award of this prize had been made last year.

Discussion followed and it was the general opinion that it would be unwise to award more than one of each prize in any one year. Accordingly, on the motion of Mr. Morrison, seconded by Mr. Jacobs, it was unanimously resolved that only one of each prize should be awarded each year.

Special Awards To Undergraduates

The president reminded Council that at the June meeting a recommendation from the Committee on the Young Engineer that the Institute make special awards to the top five or ten per cent of the graduate classes in Canadian universities had been approved in principle and the committee had been asked to study the matter further and submit details.

A letter was presented from Dr. Langley, chairman of the committee, submitting definite quotations for watch charms or fobs in nickel, gold-filled or solid gold.

Considerable discussion took place, particularly as to the form of badge to be selected and as to whether it should be awarded to the first five or ten per cent of the graduating classes. In view of the diversity of opinions expressed, and of the importance of the decision to be made, it was agreed that the matter should be brought up for consideration at the Toronto meeting of Council on January 24th, and that in the meantime Dr. Langley's letter be circulated to all members of Council so that they may be informed and ready to vote at the January meeting.

Life Memberships

Mr. Laird presented a list of members who, under the terms of Section 26 of the by-laws, are now eligible for life membership. Accordingly, it was unanimously resolved that life membership be conferred upon the following members as of January 1st, 1948:

Arsene Babin, Baie Comeau, Que.; J. Boyd Baird, St. John's, Newfoundand; F. Jno. Bell, Toronto, Ont.; W. D. Black, Hamilton, Ont; Wm. R. Bonnycastle, Vancouver, BC.; Ernest P. Bowman, Guelph, Ont.; Frederick E. Bronson, Ottawa, Ont.; Wm. F. McK. Bryce, Ottawa, Ont; James S. Cameron, Montreal, Que.; Edward G. Carty, Ottawa, Ont.; Richard E. Chadwick, Montreal, Que.; Ashley A. Colter, Fredericton, N.B.; Geo. W. Coward, Argentina, S.A.; Arthur Dick, Montreal, Que.; John W. Doty, New York, N.Y.; John N. Finlayson, Vancouver, B.C.; C. Harry Fox, Winnipeg, Man.; R. DeL. French, Montreal, Que.; Augustin Frigon, Montreal, Que.; LeRoy Fraser Grant, Kingston, Ont.; Philip W. Greene, New York, N.Y.; William B. Greig, Vancouver, B.C.; Daniel Hillman, Montreal, Que.; Thomas H. Hogg, Toronto, Ont.; Frederick C. Jewett, Ottawa, Ont.; Edward B. Jost, Ottawa, Ont.; Leslie G. Jost, Los Angeles, Calif.; J. Colin Kemp, Montreal, Que.; Everett C. Kirkpatrick, Montreal, Que.; Harold R. Little, Montreal, Que.; Hugh A. Lumsden, Hamilton, Ont.; D. H. McDougall, Montreal, Que.; George K. McDougall, Montreal, Que.; Oliver T. Macklem, Kingston, Ont.; A. L. Mieville, London, England; Wm. Alex. Murray, Montreal, Que.; Arthur Benj. Normandin, Quebec, Que.; Bernard E. Norrish, Montreal, Que.; Fred. W. Paulin, Hamilton, Ont.; Thomas E. Price, Winnipeg, Man.; Herbert Wm. Read, Sackville, N.B.; Arthur G. Riddell, Hamilton, Ont.; Charles A. Robb, Montreal, Que.; Alexander K. Robertson, Kaleden, B.C.; Benjamin Russell, Edmonton, Alta.; Max V. Sauer, Montreal, Que.; D. Neville Sharpe, Winnipeg, Man.; James N. Stanley, York Mills, Ont.; Homer W. Sutcliffe, New Liskeard, Ont.; Harry W. Tate, Toronto, Ont.; Clarence P. Van Norman, Toronto, Ont.; Alfred A. Wickenden, Montreal, Que.; R. S. L. Wilson, Edmonton, Alta.; John K. Wyman, Montreal, Que.; Alexander A. Young, Victoria, B.C.; H. R. Younger, Calgary, Alta.

The president informed Council that he and Vice-President Eadie, had had dinner with the general secretary on the previous evening, and he was glad to be able to report that Dr. Wright's condition showed a decided improvement. Dr. Wright was planning to be back at the office for at least part of every day, starting at the first of the year.

It was noted that the next meeting of Council would be held in Toronto on Saturday, January 24th, 1948. On that evening the Toronto Branch is holding its Annual Ladies Night and has extended a cordial invitation to all councillors and their ladies to join with them on that occasion.

The Council rose at twelve forty-five p.m.

W. D. LAIRD,
Assistant General Secretary.

Elections and Transfers

Members

Durdan, Frederick Smith, B.Sc., (Civil), Queen's, field engr., Carborundum Co., Niagara Falls, N.Y.

Forget, Jean Maurice, B.A.Sc., C.E., Ecole Poly., engr., special trackwork, Montreal Tramways Co., Montreal, Que.

Ilott, Eric Charles, Capt., R.C.E.M.E., B.Sc., (Eng.), Univ. of London, instructor, R.C.E.M.E. School, Barriefield, Ont.

McMurray, MacKenzie, B.A.Sc., Toronto, sales engr., combustion divn., Dominion Bridge Co., Toronto, Ont.

Paton, Charles Peter, B.Eng., (Mech.), McGill, prod. supt., Aluminum Co. of Canada, Kingston, Ont.

Rochester, Stanley Herbert, mech, mtce. engr., Aluminum Co. of Canada, Ltd., Arvida, Que.

Taylor, George, Ordnance Cmdr., R.C.N., Chief Inspector, Naval Ordnance, Dept. of National Defence, Ottawa, Ont.

Walker, Paul Gore Woolhouse, B.A. (Engrg.), (Christ's Coll.), Cambridge Univ., municipal engr., City of St. Thomas, Ont.

Wingate, Thomas Roderick, vice-pres. & genl. mgr., Douty Equipment (Canada), Limited, Montreal, Que.

Wolf, Sumer, Port of Spain, Trinidad, Ingenieur Dipl., Tech. Univ., Brunn, mech. engr., Trinidad Government Railways, Trinidad, B.W.I.

Juniors

Eskinazi, Beno, B.Sc., (Civil Engrg.), Robert College (Istanbul American College), Istanbul, Turkey. (Graduate studies structl. engrg. at McGill) asst. to chief engr., T. Pringle & Son Ltd., Montreal, Que.

Gillespie, Peter Merritt, B.A.Sc., (Mech.), Toronto, project engr., Dominion Textile Co. Ltd., Montreal, Que.

Macdonald, John Cameron, B.Eng., (Mech.), Nova Scotia Tech. College, sales engr., Canadian Ingersoll-Rand Co., Ltd., Winnipeg, Man.

Transferred from the class of Junior to that of Member

Bales, Robert Phillip, B.A.Sc., (Chem.), Toronto, prod. supt., Building Products Limited, Hamilton, Ont.

Barber-Starkey, Joseph W. M., Lieut (E)., Royal Naval Engrg. College, Devonport, England, Vesuvius Marine Service, Ganges, B.C.

Bestwick, Frank Sheldon, B.Sc., (Elect.), Manitoba, application engr., English Electric Co., Ltd., St. Catharines, Ont.

Bilodeau, Francis James Donald, B.Eng., (Mech.), McGill, salesman & engr. (field work), Canadian Ingersoll-Rand Co., Ltd., Montreal, Que.

Davey, Roland Eric, B.A.Sc., (Civil), Toronto, constrn. engr., Canadian Oil Companies Ltd., Toronto, Ont.

Dunn, Russell Arthur, B.Eng., (Metall.), McGill, genl. sales mgr., Canadian Liquid Air Co., Ltd., Montreal, Que.

Knight, Curtis Lawrence U., B.Eng., (Civil), McGill, engrg. asst., Public Works Dept., St. Georges, Grenada, B.W.I.

Lindsay, Donald Lorne, B.Eng., (Mech), McGill, mech. engr., heating & ventilating design, Wiggs, Walford, Frost & Lindsay, Montreal, Que.

Macnabb, Thomas Creighton, B.Sc., (Civil), Manitoba, special engr., Canadian Pacific Railway Co., Toronto, Ont.

Magnan, Maurice J., B.A.Sc., C.E., Ecole Poly., engr., Imperial Oil Limited, Montreal East, Que.

Sweeney, John Bartholomew, B.Eng., Saskatchewan, mech. supt., Laurentide divn., Consolidated Paper Corporation, Grand'Mere, Que.

Zion, Alfred Bernard, B.Eng., (Mech.), McGill, prod. mgr., Dominion Lock Co.; i/c operations, Montreal Materials Processing Co., Montreal, Que.

Admitted as Students

Students at University of British Columbia

H. F. R. Adams
W. H. Adrian
C. K. Allan
D. C. Allen
J. D. Anderson
A. W. Ayre
A. S. Bain
H. J. Baker
G. L. Bancroft
E. T. Barnes
J. H. Cartmell
A. V. Clack
K. I. Clarke
W. G. Clarke
B. H. Clements
T. S. Cochrane
D. C. Codville
J. W. Colbert
K. M. Collins
W. S. Cooper
N. G. Cornish
P. T. Cote
F. R. Cotton
G. N. Cotton
J. L. Cowan
G. B. Davies
L. R. Dilworth
T. S. Dybhavn
G. H. Eaton
H. V. Elliott
D. A. English
L. B. Evans
R. A. Fahlman
N. Fawkes
E. L. Fearman
L. D. Fenske
R. Ford
P. L. Fowler
L. H. Fransen
R. H. Freeman
O. Friesen
H. D. L. Frith
E. A. Gallilee
H. E. Gardner
W. H. R. Gibney
J. M. Bean
T. R. Bell
R. V. Best
J. M. Bezer
J. Billings
J. H. Blackey
D. B. Bogue
N. H. Booth
P. Boyko
M. I. G. Bradwell
L. C. Hempsall
N. S. Hepburn
A. L. Hobson
J. C. Holme
A. L. Hooker
J. Horcoff
A. C. Horner
A. D. Hoskins
A. G. Hoyt
I. Hudson
J. G. R. Hutcheson
B. O. S. Johnson
F. N. Johnson
W. L. P. Johnson
C. P. Jones
A. F. Joplin
D. H. J. Kay
J. W. Kennedy
L. A. Kirkpatrick
J. Klimovich
D. Koch
D. C. Lambert
C. H. Lamberton
M. R. Lang
A. E. Latham
J. D. Little
J. D. Logan
M. Louis
K. C. Lucas
A. R. Luck
D. H. Mackay
G. H. MacKay
R. A. MacLeod
C. D. McCord
J. D McInnis
J. P. Briba
G. F. G. Brown
J. W. E. Brown
M. M. Brown
M. G. Brown
R. B. Brown
R. F. Bryant
A. G. Butler
S. J. Cadel
J. A. H. Carson
D. I. Nelson
R. V. Norman
G. D. Norris
J. L. Olsen
R. J. Owen
E. G. Parker
G. K. Petrunia
G. A. Pinsky
W. N. Plumb
B. A. Quinlan
J. A. Relf
W. S. Reynolds
G. D. Robinson
I. R. Robinson
S. C. Ross
P. J. Routledge
T. E. Rowbottom
R. A. Ruddell
D. W. Russell
J. Sandrin
H. C. Schjelderup
R. C. Shnay
A. G. Shugg
K. I. Sinclair
F. C. Slee
R. R. Smith
R. G. Smylie
R. G. Snowling
I. H. Sorensen
O. M. Steed
K. J. Steele
R. A. E. Stenberg
A. E. E. Stewart
J. A. Stickney
G. S. Storey
H. W. Glover
A. Goloubef
A. C. Goold
D. W. Gordon
F. P. Gordon
N. F. Gordon
J. C. Gornall
J. W. Gouge
J. Graham
W. J. Graham
G. A. Grant
P. G. Griffiths
W. H. Hall
D. B. Harper
E. G. Harrison
N. L. Harvey
W. F. Hastings
A. L. Hatherly
W. L. Hatton
P. J. J. Hemphill
L. M. Williams
E. P. Wilson
D. J. McIntyre
J. K. McMillan
W. J. McNicol
A. A. McPherson
C. H. Maartman
F. N. Manson
D. G. Manzer
J. Martin
A. P. Martinez
S. W. Matheson
H. J. Mathews
M. Mattuck
F. R. Mehling
R. J. Milroy
A. L. Montegani
F. H. Montgomery
H. W. Montgomery
F. P. Moran
A. C. Mullen
H. W. Nasmith
G. A. Worden
H. M. Yerex
J. F. M. Stuart
A. Sutherland-Brown
B. Tait
F. A. Tayelor
D. G. Thomspon
F. D. Thompson
G. R. Thompson
J. A. L. Thomson
S. K. Thorneycroft
E. Thorson
W. R. Tims
P. D. W. Tourner
W. J. Trembath
J. B. Twaddle
C. E. F. Underwood
D. J. Urquhart
C. S. Walker
R. L. Walker
R. C. Wannop
L. J. Watt

Students from University of Toronto

R. A. Blount
C. F. Broad
L. H. Burwell
P. L. Burgess
H. W. Butts
D. C. Cramm
H. B. Crisson
A. H. Fallis
J. P. Goodwin
A. S. Halpenny
W. K. Henshaw
R. E. Howling
D. R. Hughson
D. B. Huston
W. R. Kinnear
T. Kottick
H.L.J.Maisonneuve
G. W. Mitchell
R. H. O'Grady
W. R. P. Porter
D. G. Pyper
I. C. Rogers
F. D. Rosebrugh
A. G. Simmonds
H. F. Slade
A. B. Smieszko
W. P. Smith
E. G. F. Sweet
W. D. Tanner

Students from Laval University

C. Amirault
J. Baillot
J. Beaudoin
J. C. Bedard
R. Blais
G. Blanchet
J. P. Bolduc
G. E. Boucher
L. G. Boucher
R. Boudreau
P. Bournival
J. Brisson
C. Carbonneau
V. Caron
C. Cauchon
J. Carpentier
L. Daneault
J. J. R. DeBlois
R. Denis
L. P. Desy
G. Dion
J. Dorval
A. Drolet
C. Drouin
P. A. Drouin
L. Dufresne
P. J. Duguay
V. DuTremblay
C. W. Faessler
R. J. Feltrin
M. Gendreau
R. Gourdeau
P. E. Grenier
L. Jobidon
G. Lacroix
A. Larochelle
M. Lavallee
P. Lepinay
R. Matte
G. Meilleur
J. P. Methe
P. Michaud
M. Morency
J. O. Murray
G. Pare
L. H. Rinfret
C. E. Rochette
A. Roy
F. Roy
J. R. Tennet
R. Tessier
L. C. Thibault
R. Tremblay
L. P. Veillette
J. Veilleux
J. M. Vezina

Students from McGill University

L. J. Cousineau
M. Dancose
J. Dumas
M. Friedman
M. Lam
G. R. Morris
E. H. P. Palmer
S. Roth
M. P. Simon
M. P. M. Thomas
G. H. Thompson
G. S. Wilson
J. G. N. Woodcock

Students from Queen's University

J. W. Brisson
A. E. Benn
J. L. Donald
R. F. Plante
J. Sylvester
G. E. Tillson
W. A. Trottier
D. Veitch
A. A. Vorres
T. C. Wright
R. L. White
R. J. Wilton

Students at University of Manitoba

A. Koropatnick
T. H. Lackie
J. Marowitch
G. A. McGillivray
R. W. McKnight
W. M. Price

Students at University of Saskotchewan

D. G. M. Mollard
P. D. Wallace

Students at University of Alberta

G. Adam
R. B. Angus
M. J. Dolinsky
W. H. Milley
J. A. J. Stretton
R. J. Warmaruk
V. Webb

Studens at University of New Brunswick

R. G. Barbour
L. A. Dawson
A. Harriott
R. I. Howard
D. H. Ketch
G. L. Kimball
K. C. M. Mackenzie
D. E. MacLean
J. A. McElmon
H. R. Miller
R. G. Ryan
G. F. Ward
F. M. Weston
R. L. Wood

Students at Nova Scotia Technical College

W. P. Duggan
C. MacInnis
F. G. Murphy

Student at Mount Allison University

G. T. Small

By virtue of the cooperative agreements between the Institute and the associations of professional engineers, the following elections and transfers have become effective.

ALBERTA

Junior to Member

Poole, John John Edward, B.Sc., (Civil), Alberta, engr., Poole Construction Co., Ltd., Edmonton, Alta.

SASKATCHEWAN

Member

Bichan, William James, B.Sc., (Mining), London Univ., director, Mineral Resources, Saskatchewan Government, Regina, Sask.

Junior

Choy, George, B.Sc., (Chem. Engrg.), Saskatchewan, public health engr., Dept, of Public Health, Regina, Sask.

Students at University of Saskatchewan

G. W. Alcock	J. L. Greer	W. T. Morecraft
R. G. Allen	D. L. Fuller	D. I. Ourom
E. A. Bernard	L. R. J. Haas	T. A. Park
L. D. Blachford	H. R. Haid	D. K. Partington
J. C. Boughton	G. W. Holmes	G A. Patterson
I. Brand	W. A. Hunka	J. M. Patterson
N. B. Breen	L. E. B. Jahnke	J. A. Paxton
L. R. Bruce	F. G. Johnson	W. P. Polanski
W. J. Bunn	R. G. Johnson	D. K. Seaman
E. B. Campbell	G. Kardos	H. M. Simpson
D. F. Clark	D. J. Kelly	S. K. Smith
R. A. Collie	R. C. King	C. M. Stewart
A. Curran	H. P. Klassen	H. A. Templeton
L. A. DeRoo	R. J. Larson	H. L. Thompson
M. E. Dodds	W. C. Long	M. W. Thompson
G. S. Duffus	J. A. McKinnon	A. M. Thomson
B. M. Ellis	D. L. E. Marcoux	R. H. Tooley
H. McK. Fraser	M. Markowsky	G. A. Vinish
W. H. Garland	H. J. Moody	

Junior to Member

Hamilton, Geoffrey Craig, B.Eng., (Civil), Saskatchewan, articled pupil for land surveyor, Phillips Stewart & Phillips, Saskatoon, Sask.

Miners, Everett Laverne, B.Sc., (Civil), Saskatchewan, asst. genl. mgr., C. M. Miners Construction Co., Ltd., Saskatoon, Sask.

NEW BRUNSWICK

Junior to Member

Salmon, Kenneth Waterbury, B.Sc., (Elect.), New Brunswick, New Brunswick Telephone Co., Ltd., Saint John, N.B.

Snodgrass, J. Roscoe, B.Sc., (Civil), New Brunswick, chief engr., Diamond Construction Co., Ltd., Fredericton, N.B.

QUEBEC

Members

Hunt, Frederick Raymond, B.A.Sc., Toronto, engrg. asst. The Bell Telephone Co. of Canada, Montreal, Que.

McGibbon, Gordon Armitage, B.Eng., (Mech.), McGill, sales and design, Air Conditioning Engineering Co., Montreal, Que

Junior

Moffat, George Bruce, B.Sc., (Chem. Engrg.), Case School of Applied Science, Cleveland, Ohio, mgr., quality control, Armstrong Cork Canada Ltd., Montreal, Que.

ERRATUM

On page 44 of the January *Journal* in the list of new Student members, the following heading appeared:

Students at Carleton College (Ottawa University).

This heading should have read:

Students at Carleton College, Ottawa.

They are entirely separate organizations and were listed as one in error. Our apologies are offered to all concerned.

PERSONALS

News of the Personal Activities of Members of the Institute

Dr. C. R. Young, M.E.I.C., dean of the Faculty of Applied Science and Engineering of the University of Toronto, was awarded the Professional Engineer's Medal at the Annual Meeting of the Association of Professional Engineers of Ontario, in January. He is the second recipient of the medal.

G. H. Ferguson, M.E.I.C., chief of the public health engineering division, Department of National Health and Welfare, has retired after 24 years in the public service. He had been called to Ottawa in 1923 as engineer in charge of developing public health engineering policies for the Federal Department of Health, now the Department of Health and Welfare. There he worked on the national building code, with special attention to the work of the committee on health and sanitation of which he was chairman. 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, a past-councillor of the Institute, is a graduate of the University of Toronto, and the recipient in World War I, of the Military Cross for gallantry while serving overseas with the R.C.E. Prior to 1923, Mr. Ferguson had been associated successively with the H.E.P.C. of Ontario, the Commission of Conservation of Canada, and the Toronto Transportation Commission.

G. L. Macpherson, M.E.I.C., has been elected president for 1948 of the Association of Professional Engineers of the Province of Ontario. Mr. Macpherson, who is manager of the engineering and development division of Imperial Oil Limited, has been a member of the Association since 1938 and a Councillor for the past four years. During 1947 he held the office of first vice-president. He is also a member of the council of the Engineering Institute,, representing the Sarnia Branch. He is a University of Toronto graduate, and has been associated with Imperial Oil Limited since 1923.

C. M. McKergow, M.E.I.C., was appointed to the standing of emeritus professor by the board of governors of McGill University recently. Professor McKergow, who retired as professor of mechanical engineering in 1947, started his career as a demonstrator in civil engineering in 1903. He was made an associate professor in 1912, and was awarded the Thomas Workman professorship and the chairmanship of the department of mechanical engineering in 1921. He has been active in the Montreal Branch of the Institute, representing it on the Council from 1923 to 1928.

Dr. P. L. Pratley, M.E.I.C., Montreal consulting engineer, has been appointed to study the bridging needs of the city of Edmonton, Alta. Dr. Pratley, who designed the Lion's Gate Bridge over the First Narrows in Vancouver and the Jacques Cartier Bridge over the St. Lawrence, is a consulting engineer for the Dominion Government, and is currently working on the Peace River suspension bridge at Fort St. John, B.C. A past vice-president of the Institute, Dr. Pratley is the Institute representative on the Canadian Standards Association main committee.

Alex Wilson, M.E.I.C., electrical and mechanical engineer, has announced his resignation as manager of the Montreal Office and as a member of the staff of the Canadian Comstock Company Limited. He will resume his former practice as a consulting engineer in Montreal.

C. E. Sisson, M.E.I.C., works engineer of Canadian General Electric Company's Davenport Works recently retired after

G. H. Ferguson, M.E.I.C.

C. E. Sisson, M.E.I.C.

G. L. Macpherson, M.E.I.C.

more than 45 years engineering experience. He had been responsible, during his career, for the design of many of the outstanding transformer installations in Canada.

He was graduated in electrical engineering from the University of Toronto in 1905, and went to the Peterborough Works of C.G.E. He helped to establish and to foster the company's " Test " Course with its industry-wide contribution to the training of young engineers. He is a past-councillor of the Association of Professional Engineers of Ontario, a fellow of the American Institute of Electrical Engineers, and Ontario vice-president of the Engineering Institute.

J. L. Shearer, M.E.I.C., has been elected chairman of the Ottawa Branch of the Institute. He is engineer to the commission, Ottawa Suburban Roads Commission. He is a native of Ottawa and a graduate of Queen's University, Kingston, Ont. From 1928 until 1933 he held various positions in western Canada and on the Pacific coast in connection with municipal engineering construction work. In 1933 he returned to Ottawa and was for two years in charge of construction of large relief sewers being built by the City of Ottawa engineering department. Following this he was employed by N. B. MacRostie, M.E.I.C., civil engineer of Ottawa, in drawing up reports on flood conditions in southern Ontario. After short intervals with Donald-Hunt Limited, Montreal, and the Aluminum Company of Canada Limited, Arvida, Que., he was for two years on the staff of the Ottawa Division of the Ontario Department of Highways. He then was employed by the assessment department of the City of Ottawa, until his appointment to his present position in 1945.

S. R. Frost, M.E.I.C., of Toronto, Ont., is moving to Moncton, N.B., where he is taking a position as manager and director of engineering for a new company known as Atlantic Chemicals Company Limited. Mr. Frost had not completed the term as Councillor of the Institute representing the Toronto Branch. He is past-president of the Association of Professional Engineers of Ontario. Mr. Frost was previously with North American Cyanamid Limited, Toronto, Ont., from which firm he was on loan during the war years to the Wartime Bureau of Technical Personnel, Toronto, and the Wartime Prices and Trade Board, Montreal.

O. W. Titus, M.E.I.C., has been appointed vice-president of English Electrical Company of Canada Limited. He has been twenty-five years in the electrical industry in various sales and engineering capacities—the most recent being chief engineer of Canada Wire and Cable Company Limited, Toronto. He is a graduate of the University of Toronto.

R. K. Wills, M.E.I.C., is now assistant deputy minister of the Department of Public Works of New Brunswick, Fredericton, N.B. He had been district highway engineer for the department, located at Chatham, N.B.

W. E. Brown, M.E.I.C., chairman of the Hamilton Branch of the Institute for the year 1948, was born at Bristol, England. He is a graduate in civil engineering of the University of Toronto, class of 1932. For the first year after graduation he was engaged in highway construction. The following year he joined the staff of B. Greening Wire Company Limited, Hamilton, spending some time in the plant and later being transferred to the engineering department. He was later transferred to his present position as wire rope engineer for the company. Mr. Brown was secretary-treasurer of the Hamilton Branch from 1943 to 1945, and he represented the Institute on the junior section of the Committee on Professional Training of the Engineers' Council for Professional Development for some time.

J. L. Shearer, M.E.I.C.

S. R. Frost, M.E.I.C.

O. W. Titus, M.E.I.C.

W. C. Risley, M.E.I.C., chairman of the Halifax Branch of the Institute for 1948, is president of Rico Engineering Limited of that city. Born at Sydney, N.S., he studied at Acadia University and Nova Scotia Technical College, receiving his degree in mechanical engineering in 1932. He followed the engineering apprentice course of Imperial Oil Company, and was appointed sales engineer at Halifax in 1934. He joined Eastern Engineering Company in the same city in 1937 and the next year operated his own organization, Heating Services Company, there. From 1939 to 1941 he was with Dominion Steel and Coal Company at Sydney, N.S., and in 1941 he went to Ottawa to be a heating engineer (civil service) for the R.C.A.F. He returned to Halifax as a heating officer for the R.C.A.F. and was named mechanical officer for the Eastern Air Command R.C.A.F. in 1944 with the rank of flight lieutenant. He joined Rico Engineering in 1946.

J. M. Wyllie, M.E.I.C., has been elected chairman of the Border Cities Branch of the Institute. He was born at Kincardine, Ont., and attended Windsor Collegiate Institute. He received his training and experience in structural engineering at the Canadian Bridge Company Limited, Walkerville, Ont., spending five years as an apprentice in the draughting department, three years as a structural steel draughtsman, three as a structural steel designer and estimator. He became contracting engineer in 1940. His present position is senior estimator in the structural steel contract department of the Company.

R. H. Wallace, M.E.I.C. the new chairman of the Cornwall Branch of the Institute, is plant superintendent at Cardinal, Ont., for Canada Starch Company Limited. Coming from Staten Island, New York, he attended Royal Military College, Kingston, and McGill University, Montreal, receiving from the latter in 1926 the degree of B.Sc. in mechanical engineering. From 1926 he was with the Laurentide Paper Company, Grand'Mère, Que., and with its successor, the Canada Power and Paper Corporation, until 1932. Before leaving the company he was superintendent of the control department of the Belgo division at Shawinigan Falls, Que. He then joined the staff of the Canada Starch Company, Cardinal, Ont., becoming plant engineer in 1934. He went overseas in World War II with the First Canadian Survey Regiment, R.C.E., returning with the rank of Major, and having been awarded the M.B.E. decoration. He returned to Canada Starch, where his present position is plant superintendent at Cardinal, Ont.

Charles W. Crossland, M.E.I.C., director of development (A), R.C.A.F. Headquarters, has been promoted to the rank of Group Captain. 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 spent a few years in England with aircraft manufacturing firms. He returned to Canada and became assistant engineer in the aeronautical branch of the department of National Defence at Ottawa. He joined the R.C.A.F. in 1940.

Jean Bastien, M.E.I.C., is district engineer for the Provincial Department of Roads at Quebec City. He was formerly engineer in the Montreal Division. He has been with the Department since 1933, when he graduated from Ecole Polytechnique, Montreal.

R. W. Emery, M.E.I.C., has left his position as resident engineer of the Brompton Pulp and Paper Company, Red Rock, Ont., to serve as project engineer, supervising design and construction of a new sulphate mill and bleach plant at Sault Ste. Marie, Ont., for the Abitibi Power and Paper Company, Limited.

A. W. Ellson Fawkes, M.E.I.C., resigned from the position of city engineer for the city of Moose Jaw, Sask., on December 31, 1947, and is now engaged in private practice in Haney, B.C. He had gone to Moose Jaw in 1938, following service for the Dominion Government as representative for highways and level crossings in the province of Saskatchewan, and municipal engineering service in cities of Ontario and Western Canada.

H. H. Schwartz, M.E.I.C., has entered the consulting field in electrical, electronic and acoustic equipment. He has established offices in Montreal to undertake design and construction of equipment, and has announced the inauguration of a special service for medical electronic instrumentation. Mr. Schwartz received the degree of bachelor of engineering at McGill University in 1938, and that of S.M. (electrical), in 1942, at Massachusetts Institute of Technology, Cambridge.

Major H. Goodfellow, M.E.I.C., has now relinquished his appointment at R.C.E.M.E. Prairie Command, and has recently been appointed deputy assistant adjutant general in the Directorate of Army personnel. His duties with the Directorate include the administration of R.C.E.M.E. personnel.

C. C. Hay, M.E.I.C., is president and general manager of Hi-Way Refineries Limited, Regina, Sask. He has been with the firm since 1941, when he joined as manager. He had previously been a member of the firm of Gibbs Bros. and Hay Limited, contractors, in Lumsden, Sask.

P. J. Croft, M.E.I.C., has been appointed eastern district engineer of Canada Wire and Cable Company Limited, Mr. Croft's headquarters will be in Montreal, to serve Eastern Canada. A graduate of Central Polytechnical Institute, London, England, he spent seven years with Canadian Westinghouse Company Limited, and several as electrical engineer for the Power Corporation of Canada. He joined the electrical engineering staff of Canada Wire and Cable Company Limited in 1945.

G. V. Roney, M.E.I.C., is no longer general manager of Farand and Delorme division of United Steel Corporation, but is president of Leeds Bridge and Iron Works Limited of Montreal and Gananoque, Ont. He is also president of Montreal Metalworked Products Limited. He had joined Farand and Delorme Limited in 1935, after service with bridge and steel companies in the U.S.A. and in Canada.

L. B. Stirling, M.E.I.C., is appointed assistant general superintendent of the operating division of Shawinigan Water and Power Company, Shawinigan Falls, Que. He also retains his previous title of superintendent of the generating division of the company there.

G. G. Wanless, M.E.I.C., took employment in January with the chemical division of the Standard Oil Development Company's Esso Laboratories at Elizabeth, N. J., He had been at Sarnia, Ont., in the research and development department of Polymer Corporation. At Sarnia also, he had been for several years with the St. Clair Processing Corporation.

Lucien Allaire, M.E.I.C., has successfully completed an extension course in municipal public works administration, through the Institute for Training in Municipal Administration conducted by the International City Managers Association of Chicago. Mr. Allaire is assistant engineer for the west division of the Waterworks and Sewerage Department, City of Montreal.

T. Linsey Crossley, M.E.I.C., has been appointed technical supervisor of Champion Paper Mills, Toronto. He is special lecturer on pulp and paper at the University of Toronto. During the war he was employed by Defence Industries Limited, Nitro, Que. Since then he has been on the staffs of the Rehabilitation Institute, Toronto, and the Department of Chemistry, Ontario Agricultural College, Guelph, Ont.

G. G. M. Eastwood, M.E.I.C., has been appointed secretary-treasurer of the Cornwall Branch of the Institute. A native of Cornwall, he studied engineering at the University of Toronto, completing his course in 1937. He joined Canadian Westinghouse Co. Ltd. following the engineers apprenticeship course in 1940, and working as a draughtsman on switchboard layout until 1942. Then for several years he did technical liaison work between the engineering and sales departments. In 1945 he joined Courtauld's (Canada) Limited, at Cornwall, where he is a section engineer.

Max Gershfield, M.E.I.C., is in Chicago, Illinois, employed by M. W. Kellog Company, refinery contractors of New York City. Mr. Gershfield had been in private practice in Winnipeg for some months since leaving War Assets Corporation in Regina, Sask., where he was senior plant clearance engineer.

T. Hermanowicz, M.E.I.C., has taken a new position as metallurgist with Vancouver Engineering Works Limited, Vancouver, B. C. He had previously been with Canadian Liquid Air Company Limited, Montreal, after leaving Sorel Industries Limited, Sorel, Que., where he was chief metallurgist.

Dr. B. B. Hillary, M.E.I.C., is secretary-treasurer of the Sarnia Branch of the Institute. Dr. Hillary is from Vancouver. He attended University of British Columbia, receiving the degrees of B.A. and M.A. in 1934 and 1936. At the University of Toronto he received the degree of Ph.D. in 1939 and remained there until 1941 to do research, teaching and consulting work in chemistry, and engineering studies. He joined Polymer Corporation Limited, Sarnia, in 1942 as assistant engineer and did liaison work between the Rubber Reserve and Polymer during construction of the synthetic rubber plant, and was in charge of co-ordination of plans for the laboratory and other buildings. He went to Dow Chemical of Canada, Limited, in Sarnia, in 1943, as maintenance and process engineer, which position he still holds.

H. D. Keil, M.E.I.C., secretary-treasurer of the Border Cities Branch of the Institute, is planning and scheduling engineer for Canadian Industries Limited at Windsor, Ont. Mr. Keil is from Brooks, Sask., a graduate of University of British Columbia, class of 1937. He followed the engineering apprentice course of Canadian Westinghouse Company at Hamilton, Ont., and remained in that firm until 1940. He then joined Canadian Industries Limited at the Windsor Plant as an electrical engineer.

D. C. McCrady, M.E.I.C., is general foreman of the electrical department of the Steel Company of Canada Limited at Hamilton, Ont. He was formerly with Canadian General Electric Company Limited at Peterborough, Ont., as senior assistant engineer at the Industrial and Central Station of the engineering division.

H. T. Miard, M.E.I.C., the former secretary-treasurer of the Lethbridge Branch of the Institute, has accepted the appointment as assistant district engineer at Nelson, B. C., of the provincial Department of Public Works. In Lethbridge he was assistant district airway engineer for the Department of Transport.

L. A. Petrie, M.E.I.C., has taken a position at Montreal Cottons Limited, Valleyfield, Que. He was a senior engineer with the St. Clair Processing Corporation, Sarnia, Ont., for the past two years.

Rosaire Saintonge, M.E.I.C., has received the appointment as engineer for the city of Thetford Mines, Que. He was previously with Consolidated Paper Corporation Limited at Grand'Mere, Que., in charge of improvements in woods operations.

J. E. Thom, M.E.I.C., the former secretary-treasurer of the Kingston Branch of the Institute, was appointed in November last to the position of assistant superintendent in charge of construction at the University of Toronto. He had been resident engineer at the Kingston Works of Canadian Industries Limited.

I. M. Macdonald, Jr.E.I.C., is the new secretary-treasurer of the Hamilton Branch of the Institute. He is from Saltsprings, N. S., a graduate of Mount Allison University and of Nova Scotia Technical College, receiving the degree of B.Eng. from the latter in 1942. He followed the Canadian Westinghouse apprenticeship course from 1942-1944, and he is now a mechanical engineer for the company.

Paul-Emile Comtois, Jr.E.I.C., has been in French West Africa, since last November, where he is employed by the Aluminum Company of Canada at Bauxite du Midi, at Conakry.

A. B. Extence, Jr.E.I.C., is now employed by the California Refining Company at Perth Amboy, N.J., on economic analysis of the company's operations and proposed investments. In June last he graduated from the Massachusetts Institute of Technology with the degree of master of science in business administration.

John Gargas, Jr.E.I.C., has been in Montreal since January, where he is employed by the Northern Electric Company on power engineering work in the telephone service. He was previously a designing engineer at Dominion Engineering Works, Lachine.

B. F. Junkin, Jr.E.I.C., is in La Paz, Bolivia, where he is employed by the Bolivian Power Company. He was with the Bell Telephone Company in Montreal since his demobilization from the Canadian Navy in 1946.

William Shelson, Jr.E.I.C., is now employed as an assistant stress analyst in the structures section, Propeller Division, of Curtiss-Wright Corporation, Caldwell, N. J. He graduated from the University of Toronto in 1944, and served with the R.C.E.M.E. with the rank of lieutenant. He then studied at the department of engineering mechanics at Pennsylvania State College.

B. R. Lewis, S.E.I.C., who was with the Bell Telephone Company in Montreal, has gone to Toronto to work for the Alliance Tool and Motor Company.

Dr. J. B. Challies, M.E.I.C., vice-president and executive engineer of the Shawinigan Water and Power Company, Montreal, and 50th President (1938) of the Institute, receives from President E. M. Hastings of the American Society of Civil Engineers an honorary membership in that society. On the left is Dr. Arthur Surveyer, 37th president (1924-25) of the Institute, who proposed Dr. Challies for the award at the Annual Meeting of the A.S.C.E. in New York in January.

Obituaries

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

Dr. W. L. Malcolm, M.E.I.C.

Dr. William Lindsay Malcolm, M.E.I.C., director of the School of Civil Engineering of Cornell University, Ithica, New York, died in hospital on January 18, 1948, following a heart attack. He had been ill only a few days.

Dr. Malcolm was born in Mitchell, Ont., in 1884. In 1902 he entered Queen's University, and he graduate in 1905 in the faculty of Arts. He next enrolled in civil engineering in the School of Mining and took a B.Sc. degree in 1907. After a brief period as city engineer of Stratford, Ont., he returned to Queen's to lecture in mathematics and civil engineering. Later he dropped mathematics and devoted his time wholly to engineering, when he was able to lay the foundations of the courses in municipal engineering which he developed steadily throughout his period at Queen's. In 1908 he took the qualifying examinations for an Ontario Land Surveyor, and in 1912 those for a Dominion Land Surveyor.

The outbreak of war in 1914 found him a captain, and second in command of the Fifth Field Company, Canadian Engineers. He was promoted to the rank of major and just before the Second Canadian Division left England for France, was made officer commanding the 6th Field Company. He remained in that post until 1917, when he was promoted to lieutenant colonel and made C.R.E. of the Fifth Canadian Division which was then training in England. Later he acted as C.R.E. of the Fourth Division and of the Corps Troops.

On demobilization in 1919, he resumed his place at Queen's University as professor of municipal engineering. He taught, as well, part of the surveying and structural engineering. Throughout this period of nearly twenty years, he carried on a general practice of civil engineering and surveying as the vacation period permitted him. He went to Cornell about 1932, to follow graduate studies in the sanitary and structural groups. He secured an M.C.E. degree in 1935, and he continued toward a Ph.D. degree in sanitary engineering, which he gained in 1937. When funds were provided for erection of a modern sanitary engineering laboratory at Queen's, it was designed by Dr. Malcolm, and built in 1937, and is considered one of the most complete on the continent.

It was in 1938 that Dr. Malcolm accepted the appointment as director of the School of Civil Engineering at Cornell.

Dr. Malcolm showed the keenest interest in athletics of all kinds. Tennis and badminton, however, were his chief interests, and he was on two occasions on the team winning the Ontario Senior Doubles championship. He had been President of both the Ontario and Canadian Badminton Associations.

Dr. Malcolm joined the Engineering Institute in 1907 as a Student, transferred to Associate Member in 1909 and to Member in 1920. He attained Life Membership in 1947. He was active in the Kingston Branch, serving as its chairman in 1929 and representing it on the Council of the Institute in 1930. He also held membership in the American Society of Civil Engineers, the American Society of Engineering Education, the New York Sewage Works Association, the Canadian Institute of Sewage and Sanitation, American Water Works Association, Ontario Land Surveyors Association, and the Association of Professional Engineers of Ontario.

O. S. Finnie, M.E.I.C.

Oswald S. Finnie, M.E.I.C., a well-known figure in Canadian mining, and a former official of the Department of the Interior, died at his home in Ottawa, Ont., on January 2nd, 1948. He had been ill for several months.

He had taken an active part in mining enterprises from the Northwest Territories to Eastern Canada. He was born in Arnprior, Ont., in 1876. In 1897 he graduated with a B.Sc. degree from McGill University, and the next year did post-graduate work in geology, mineralogy, and underground surveying.

In 1898 he was appointed to the staff of the Department of the Interior under the late William Ogilvie, Commissioner of the Yukon Territory. The next year he went to Dawson City where he spent some years as mining recorder. Leaving the Government service in 1909, he engaged in private practice until he was prevailed upon to return to the Department in 1910 when. as inspecting engineer of mines, he was entrusted with supervision of field work in mining in the Western Provinces. He also aided in location of oil wells in the Turner Valley and Alberta oil deposits. He was appointed director of Northwest Territories Branch in 1920, with headquarters at Ottawa, and when this branch was later enlarged to administer Yukon affairs Mr. Finnie became a director of the district. He retired in 1931.

During December last, while confined to his bed, Mr. Finnie was presented with an honorary degree when McGill graduates met in Ottawa for their annual reunion. He had been at one time, president of the Ottawa Valley Graduates Society of McGill University.

Mr. Finnie joined the Institute in 1912 as an Associate Member, transferring to Member in 1921 and being granted Life Membership this year. He was active for some years in the Ottawa Branch, serving as chairman of the branch in 1923, and representing the Branch on the Council of the Institute in 1926. He was also a member of the Canadian Institute of Mining and Metallurgy.

Charles Talbot, M.E.I.C., former county engineer and road superintendent of Middlesex County, London, Ont., died in hospital in London on December 24, 1947. A 500-mile network of roads out of London and through Middlesex County is greatly attributable to his effort. Mr. Talbot held the combined post of engineer and road superintendent for 40 years, during which time, under his jurisdiction, the main roads now serving the county were built or adapted to automobile traffic.

He was born in North Dorchester Township, Ont., and came to London in 1899, where, following an early education at Strathroy Collegiate Institute, he entered the office of the Middlesex county engineer. He was appointed county engineer in 1901, succeeding his father to the position. Five years later he was given the added post of road superintendent. He retired in June 1940.

Mr. Talbot joined the Institute in 1921 as an Associate Member, transferring to Member in 1940, and being awarded Life Membership in 1942. Mr. Talbot was active as a member of the Woodmen of the World. He held all offices of the local branch.

J. B. Macphail, M.E.I.C., of the Shawinigan Engineering Company, Montreal, died on December 22, 1947, at his home in Montreal. *The Engineering Journal* has thereby lost a most co-operative member of the Publication Committee. To Mr. Macphail that committee had expressed appreciation in the course of the last year for the excellent work he had done in reviewing papers submitted for publication, and for valuable suggestions of an editorial nature.

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

Born in Montreal, in 1894, he was educated at Ashbury College, Ottawa, and at McGill University, Montreal, where he obtained a bachelor's degree in arts in 1914. He enlisted in the Canadian Engineers and went overseas in September 1914. There he attained the rank of captain, and was adjutant to the C.R.E. of Corps Troops until his return to Canada in 1919. He then re-entered McGill University to qualify for a B.Sc. degree, which he received in 1921.

After graduation he obtained a position with Messrs. Moran Maurice and Proctor of New York. A year later he joined Shawinigan Engineering Company Limited. and distinguished himself on a Dominion-wide scale as an investigator and designer of hydro-electric plants.

Mr. Macphail was a member of the American Society of Civil Engineers and of the Corporation of Professional Engineers of Quebec. He joined the Engineering Institute as an Associate Member in 1920, transferring to Member in 1940.

C. James Porter, M.E.I.C., prominent electrical engineer of Hamilton, Ont., died on January 7, 1948, in hospital at Kitchener, Ont. For the past seventeen years, Mr. Porter had been with the Steel Company of Canada in Hamilton, where he served as chief electrical engineer.

Born at Port Dover, Ont., in 1885, he was educated there and at the University of Toronto, where he received the degree of B.A.Sc. in 1909. After one post-graduate year in electrical engineering, he went to Portland, Oregon, where for two years he worked for the Mount Hood Railway and Power Company. He later transferred to the Pacific Power and Light Company there, and in 1913 he went to Dallas, Texas, where he was a draughtsman for the Texas Power and Light Company until 1917. He returned to Canada that year, going to Hamilton, Ont., as assistant superintendent of substations for Dominion Power and Transportation Company. He became construction engineer in 1923, and remained until 1930. He joined Steel Company of Canada in Hamilton that year and remained with the company until his death.

Mr. Porter joined the Institute in 1944 as a Member. He was also a member of the Iron and Steel Engineers, Pittsburgh Chapter. In 1940 he served as vice-president of the Niagara District Electric Club and in 1941 he was elected to the presidency of that club.

NEWS of the BRANCHES

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented

CALGARY BRANCH

J. F. Langston, M.E.I.C. - - *Secretary-Treasurer*
T. M. Parry, M.E.I.C. - - - *Branch News Editor*

A regular meeting of the Calgary branch was held on Thursday, December 11, at 8.00 p.m. in the Palliser Hotel.

The evening opened with the reading of the minutes of the last meeting. The Chairman M. W. Jennings, then called upon S. G. Coultis, of Calgary, vice-president of the Institute for Western Canada, to pay a few words of tribute to two leading and respected members of the Institute who have passed away during the past few weeks—Major P. J. Jennings, and Mr. Sam Porter. Mr. Coultis drew attention to the fact that Mr. Porter had achieved the high distinction of being President of the Institute—the only member of this branch, and the province to have done so. A few moments of silence were observed.

Varying from the customary procedure, the meeting took the form of a symposium. Four engineers employed in activities at Turner Valley oil and gas fields gave short, concentrated talks on phases of their work.

G. A. Connell, JR.E.I.C., chief petroleum engineer, Royalite Oil Company, dealt with **Drilling and Completion Practices in Turner Valley,** in which he outlined the general drilling practices employed, particularly from the production standpoint. Some interesting statistics on depths of wells, producing zones, number of oil and gas wells, yearly production, etc. were given.

The Gas Gathering System of the Madison Natural Gas Company, was described by H. W. Newby, Branch Affiliate, who is meterman for the company.

Then A. G. A. Piercey, chief chemical engineer of the same company, discussed **Gasoline Extraction in Turner Valley.** From ¼ to 1 gallon of gasoline is derived from each 1000 cu. ft. of gas. Depending upon the daily consumption of gas by customers, 700 to 1300 barrels of gasoline per day are secured. This consumption varies with the season, being highest in winter.

Preparation of Turner Valley Gas for Market, was ably discussed by J. W. Young, M.E.I.C., assistant field superintendent for the company. He dealt with the three chief operations in the preparation—compression, removal of gasoline vapors, and scrubbing, or removal of the hydrogen sulphide.

The four talks were illustrated by photographs, diagrams and flow sheets projected on the screen.

A vote of thanks to the four speakers for their interesting papers was moved by F. K. Beach, of the Alberta Petroleum and Natural Gas Conservation Board. Registered were 54 members and 27 guests.

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The first general meeting of the new year was held by the Calgary branch on Thursday, January 8, in the Palliser Hotel. There were present 77 members and guests.

The speaker of the evening was C. R. Schadlitzke, Manager of the Automotive and Industrial Lubrication Division, McColl-Frontenac Oil Co. Ltd., whose subject was **Manufacture and Application of Lubricating Oils and Greases.**

Mr. Schadlitzke prefaced his talk with the showing of a very interesting sound picture, in color, dealing with oil development work and its background in Saudi Arabia.

He then gave a comprehensive talk on oil from the manufacturing aspect, with specific references to meeting the requirements of various forms of service such as automotive, refrigeration, transformers, compressors, steam engines and turbines.

Mr. Schadlitzke explained how the key to oil and gasoline refining lay in the fortunate circumstance that each cut in the hydro-carbon series has its own boiling point; that of methane gas is at 62 degrees below zero, with the others at intervals above this.

In refining oil for any particular purpose, the selection of the proper crude oil is very important. Oils from wells in close proximity frequently differ considerably. A product found to behave perfectly in the laboratory does not necessarily do so in service. Oils and greases for special services have to go further along the refining and manufacturing line than do the low-cost lubricants which do not have to cope with special conditions.

For low pour-points, wax removal becomes increasingly important. Dehydration to increase dielectric strength is important in transformer oils. Automotive engine lubrication has to cope with extraordinary problems of cold, heat, dust, operator differences and bad moisture conditions. The use of inhibitors in automotive gasoline and oils which are produced by other than those familiar with the particular content of the fuels and lubricants in which they might be used, was questioned by the speaker on the grounds of necessity, and of possible dangerous reactions. The safe use of inhibitors requires care; each inhibitor must be compatible with the others and the elements of the oil, as well as the metal to be lubricated.

The interest of the assembly in the subject and its absorbing presentation by Mr. Schadlitzke was clearly evidenced by the lengthy question period which followed. A hearty vote of thanks on behalf of those present was moved by J. S. Neil.

Following the meeting, smokes were distributed while members took the opportunity to chat with friends and make new acquaintances.

EDMONTON BRANCH

W. W. Preston, M.E.I.C. - - *Secretary-Treasurer*

What is thought to be the most northern use of radiant heating was described in a symposium of two papers sponsored by the local Young Engineer's Committee, at a special general meeting on Wednesday, December 17, 1947, in the Arts Building of the University of Alberta. D. Panar, mechanical engineer, with the Building Branch Department of Public Works of Alberta, reviewed **Radiant Heating Design**, and E. K. Cummings, engineer, Works Department, University of Alberta, outlined the application of **Radiant Heating at the University of Alberta.** After presenting their papers, the speakers conducted a tour of the University farm buildings, where radiant heating installations were at various stages of completion.

Mr. Panar's paper on design features traced heating from nature's prototype, the human body, which produces a heat flow of about 400 Btu.'s per hour for an average person. The body controls heat flow by four devices—growth of hair, acclimatization, vaso-constriction (ability to regulate blood flow), and emergency controls of perspiration and shivering. Man retards the loss of heat by putting on clothes. His next means of control was to heat his ambient air by an auxiliary source of heat, e.g., a campfire.

Balancing the loss of human heat by the necessary input, Mr. Panar stated, is the basis of radiant heating design. Practice has shown that the heat source should be spread over as large an area as possible. Consequently heated pipes are run back and forth under the surface of a ceiling, usually, or/and the walls and floor of the room to be heated.

A design of a heating panel for a typical room was then worked out. One selects a desired air temperature for the room and estimates a normal lowest outside temperature. From them, and heat transfer factors for the various materials in the room, one calculates a weighted average temperature known as the mean radiant temperature (M.R.T.) This is taken as the temperature to which the radiant heat source must heat a body equivalent to the room. The next step is to compute the temperature of the source and finally provide a system which will produce this temperature.

The second speaker, Mr. Cumming, described the engineering features of the radiant-heated poultry houses at the University of Alberta Farms. He showed plans of the boiler house, the laying, breeding and brooder houses, and explained the unique heat requirements of each. He described the disadvantages of heating by oil stoves, hot air and cast iron radiation. Radiant heating was chosen because the poultry would be less exposed to disease, a lower air temperature could be used, and it was possible to use a central heating system, save labour and reduce fire hazards. The chief disadvantage of radiant heating is its high initial cost. Another bad feature, which may be corrected as more experience is gained, is that the heat emission cannot be adjusted to weather conditions rapidly.

Mr. Cumming described the piping grids used and their fabrication by welding. He also described the system of controls which regulate the radiant heating. These include exterior bulbs which operate, according to the outside temperature, mixing valves, and they permit constant temperatures in the laying and breeding houses by mixing hot water from the central distribution system with return water from the heating coils. Also there are motorized type valves which give variable room temperature in the brooder house.

The speaker claimed that the University of Alberta Poultry Farm is the most modern in Canada, and compares favourably with those in the United States.

Because officers of the Young Engineer's Committee were unable to be present, J. E. Cranswick, branch chairman, conducted the meeting. Attendance was 47.

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The cause of wood decay and how it can be prevented was explained by J. H. Palmason, General Manager of the Prairie Division of the Dominion Tar and Chemical Company Ltd., in a paper on **Wood Preservation,** presented to the Edmonton Branch, at the Macdonald Hotel on Tuesday, January 13, 1948. Mr. Palmason told of a low form of fungal growth that produces decay if there is proper air, moisture and food supply at the correct temperature. The organisms do not grow, he stated, if *any* of the requirements are lacking. He advocates poisoning the food in the wood cells. In this way only does creosote preserve wood from decay.

The speaker showed drawings of the cellular structure of wood, and of the penetration of preservatives. He also explained diagrammatically various treating processes. These included the non-pressure *Butt* method, and the following three pressure methods: *Bethel,* in which the wood cells are completely filled with preservative; *Lowry,* in which the cells are partially filled; and *Rueping,* in which only the shell of the cell is coated. The aim of the operator, the meeting learned, was to produce optimum penetration with minimum preservative.

In conclusion, Mr. Palmason showed a large number of samples of decayed and treated wood. Other preservatives, e.g. pentachlorophenol and copper napthenate, the speaker remarked, had the advantge of not discoloring wood, but were too expensive for general use, and their complete history is not yet known. Other aspects of his paper, which he presented earlier to the Calgary Branch, are reported on page 561 of the *Journal* for 1947.

Chairman of the local meeting was J. E. Cranswick. The speaker was introduced by W. H. Tye and was accorded a hearty vote of thanks on motion of E. H. Wright. Sixty-five were present for dinner, and several more attended the technical part of the meeting.

LETHBRIDGE BRANCH

E. A. Lawrence, M.E.I.C. - - *Acting Secretary-Treasurer*
J. A. Haberman, S.E.I.C. - - *Branch News Editor*

Members, associates and guests of the Lethbridge Branch of the Institute gathered at the Marquis Hotel on Wednesday evening, December 17, for a Ladies Night banquet presided over by Chairman A. G. Donaldson.

After dinner, R. S. Lawrence led in community singing, which was followed by delightfully rendered solos by Miss Gow and Mr. George Brown Jr. The special speaker for the occasion, A. B. Hogg, K.C., was then introduced by G. S. Brown.

During the course of his humorous, yet thought provoking, address on the subject **O Canada,** Mr. Hogg pointed out that while we hear a great deal about the vast size of our country, on closer examination, we find that over fifty per cent of it is uninhabitable. He suggested that the idea of pushing back the frontiers to populate more of our country should be superseded by one which demands greater development of the areas now populated.

Turning back the pages of history to furnish the best example of what may be accomplished in a small area, Mr. Hogg stressed how Babylon, a mere dot on the map, had been so developed as to command an extremely important position in the world at that time.

To further emphasize his remarks, a comparison was made between the heavily populated, highly industrialized and wealthy area encompassing Chicago and the sparsely settled industry-poor area surrounding Lethbridge.

The speaker singled out the coal industry of this district, indicating some of the many thousands of by-products which could be obtained from this natural resource if intensive research along this line were to be carried out with the ultimate aim of shipping these products to eastern Canada, rather than attempting to transport the raw material such a great distance. Successful completion of this research and subsequent establishing of coal by-product industries would greatly enrich the area.

Mr. Hogg cited the projected and completed irrigation systems as an example of what could be accomplished in furthering the development and thus increasing the wealth of the vicinity. The speaker said we should think, talk and utilize what we now have for Southern Alberta; and for that matter, the populated portion of Canada is an area of great potential wealth.

P. M. Saunder, on behalf of the Branch, tendered a hearty vote of thanks to Mr. Hogg for his very fine address.

MONTREAL BRANCH

Members who replied to the questionnaire which was distributed along with the Annual Report are thanked for their many excellent suggestions and for the interest shown. Results are being considered by the various committees concerned so that action may be taken where possible.

Congratulations are extended to Dr. J. B. Challies who has been made an Honorary Member of the American Society of Civil Engineers. There are only about forty honorary members of this Society, Dr. Challies being one of three Canadians chosen for this distinction.

A Student Guidance Symposium for French-speaking students was held on January 21 under the chairmanship of Henri Gaudefroy. About 175 students were present and heard a most interesting address by Mr. Paul-Emile Piché, mechanical engineer in charge, Public Works Department, City of Montreal.

Gratitude of the Branch is expressed to retiring members of the executive: A. Benoit, J. A. H. Henderson and E. B. Jubien, who have served two years and to S. R. Banks who resigned to move to England after having served one year. The Branch is also grateful to the Chairman and members of the various committees for the excellent work they have done during the year.

Junior Section

Paul-Emile Salvas was elected chairman of the Junior Section for the 1948 season, at the Annual Meeting of the Junior Section on January 23. Mr. Salvas had been the Vice-Chairman during the previous year.

In addition to Mr. Salvas the council will be made up of the other members elected the same night: John D. McPherson, vice-chairman; Léo Scharry, secretary; councillors. Fernand Noiseux, Paul Tourigny, and Joe Galli. W. C. Smith chairman of the Papers Committee, who was elected in January 1947, remains in office during the 1948 season.

Two tentative projects of the Branch Council were presented to the general assembly by Tom Scott and John Bateman. These projects consist of the establishment of a co-operative house for junior members and the organization of study groups within the membership of the Junior Section. Tom Scott and John Bateman, who have conceived both ideas, have already been working for some time on the plans of these projects but wide support of the membership is required to carry them out successfully. Committees will be set up very shortly, whose functions it will be to bring to a complete and definite realization, and as soon as possible the Junior Section Co-operative House and Study Groups.

Due credit should be given to R. J. Griesbach, retiring chairman of the Junior Section, and the members of his council during the 1947 season, for the splendid work they have turned out during the year they have been in office. Preparation of a constitution was a great achievement of last year's council.

"The Story of F.M." and "Beaverships" were two interesting films shown during the recreation period of the annual meeting programme. The first film portrayed in technicolor the triumph of ingenuity to overcome static in conventional radio receiving sets; the second film gave the story behind the design and building of C.P.R. cargo ships.

OTTAWA BRANCH

C. G. Biesenthal, m.e.i.c. - *Secretary-Treasurer*
R. C. Purser, m.e.i.c. - - - *Branch News Editor*

At the last regular noon luncheon of the year 1947, held on December 11, Stuart Graham, superintendent of air regulations, Department of Transport, Civil Air Division, gave a talk on the **International Commission for Air Navigation.** The speaker was introduced by J. A. Wilson, and thanked by D. E. Kennedy. Branch Chairman Major-General G. R. Turner presided.

The need for international co-operation was recognized when 52 nations met in 1944 to draw up a convention on civil aviation. It provided for a permanent organization to guide, and Montreal was chosen as Headquarters. Provision was made for a number of committees, of which air navigation was one. Attendance at the frequent meetings was open to all member states. Methods to be followed in achieving uniformity are deliberated periodically by experts from all states.

Mr. Graham announced ten recommendations of the Air Navigation Committee of the International Civil Aviation Organization designed to promote safety, regularity and efficiency in air operations. These, in brief, are: airworthiness of aircraft; uniform standards for licensing personnel; standardized adequate airdromes; rules of the air; meteorological services with continual co-ordinated study by all states; communications standardized and improved so pilots may land in a fog, using radar, with same confidence they would on a clear day; maps and charts specially prepared for needs of air navigation, and intelligible to all pilots; operations—personnel having wide experience in air operations should determine the various operating limits and the minimum requirements, especially where there is low visibility or where regions are remote from habitation; search and rescue arrangements should be provided for with high degree of standardization; accident investigation to ensure non-repetition of accidents of similar nature.

The diversity of problems that are likely to come up under the head of air navigation are really fantastic. The provision of common standards, however, will have a tendency to promote common thinking which, in turn, should go a long way toward promoting an attitude of peace amongst the various countries.

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The annual meeting of the Ottawa Branch was held in the auditorium of Carleton College on Thursday night, January 8. Major-General G. R. Turner, chairman for 1947, presided. Reports were presented and election of officers took place.

In line with the usual policy of the Branch, it was decided to donate prizes to leading students in engineering in Carleton College, the Hull and Ottawa technical schools, University of Ottawa, and St. Patrick college. A vote of thanks was extended to the Ottawa newspapers for their support.

Dr. L. F. Grant, m.e.i.c., Kingston, president of the Institute, was present and spoke on the aims of the organization, emphasizing the importance and necessity of close contact between the local branches and national headquarters.

Light refreshments were served at the close of the meeting.

PETERBOROUGH BRANCH

J. M. King, m.e.i.c. - - - *Secretary-Treasurer*
J. C. Allan, m.e.i.c. - - - *Branch News Editor*

Planning for Use—Modern Procedures in Residence Design was the subject of an address by E. C. S. Cox, m.r.a.i.c., before the Peterborough Branch on December 4, 1947.

Mr. Cox explained that he might be classified as a moderate modernist in residence design, and proceeded to explain why he advocated modern procedures as opposed to the traditional. "There is no *modern*. The modern of today is the traditional of tomorrow", Mr. Cox explained. "*Modern* is not a style of architecture; it is rather a relationship between a building and the use to which it is put, between its planning and the living or working habits of the people who occupy it. Design as applied to houses, is an expression of a way of living. To fit the pattern of our life today, we obviously require designing and planning that will satisfy, and complement, and embellish our present manner of keeping house. This end cannot be accomplished by the endless and uninspired copying of designs that were modern generations ago and were created to fulfil the needs of those dead or dying generations".

Mr. Cox went on to a discussion of procedure in house design, stressing the fact that the site dictates the plan and that a house is not an isolated problem but part of a community, and related to its surroundings, so that all should be planned together.

The ideal orientation in this latitude would be to have all principal rooms face south, but this rule must be tempered with regard to view. The old idea that a living room must face a street has, we hope, been completely eliminated from the minds of the majority.

The slope of the lot determines the vertical plan of a house, just as orientation and view determine its horizontal plan.

"Subconsciously we have always wanted large windows and a generous outlook on the world, but the combination of inadequate heating systems and a false sense of modesty have reduced the windows of traditional houses to mere peekholes. . . . Practical advantages of modern heating, adequate insulation, good weatherstripping and double glazing now remove restrictions to the size of window areas".

Under the subject of "Daylighting", Mr. Cox discussed control of glare and excessive sun heat as well as adequate natural light.

Kitchen layouts and built-in furniture were also discussed. Mr. Cox concluded by saying that his remarks intended as an insight into how an architect designs a house. To the layman the only instruction required is—"Get yourself an Architect".

ST. MAURICE VALLEY BRANCH

R. E. Kirkpatrick, M.E.I.C. - - *Secretary-Treasurer*

Subsequent to the President's visit to the Branch in November, Juniors in Three Rivers and in Shawinigan Falls called meetings to obtain some idea of the interest which might be shown in one or two Junior sections. The outcome was that both groups requested permission to put their cases to the meeting of the Branch Executive. An Executive meeting was held on December 12, attended by Junior representatives at which they demonstrated clearly that some form of Junior organization was desirable. The result of the meeting was that two groups were authorized on a trial basis, these two groups to be known as the Shawinigan Falls Junior Section and the Three Rivers Junior Section of the St. Maurice Valley Branch.

Since the executive meeting on December 12, the Junior Sections have both held organizational meetings at which officers were elected and interesting programmes for the rest of the Branch year were lined up. The officers of the Shawinigan Falls Junior Section are, chairman, J. W. Ince; vice-chairman, W. R. T. Wilson; secretary-treasurer, A. B. Rosetti.

The officers of the Three Rivers Junior Section are, chairman, A. T. Farmer; secretary-treasurer, Lloyd G. Symons.

SASKATCHEWAN BRANCH

D. W. Houston, M.E.I.C. - - *Secretary-Treasurer*
R. Bing-Wo, M.E.I.C. - - - *Branch News Editor*

The regular monthly meeting of the Saskatchewan Branch was held on January 16 at the Officers' Mess, in the Armories. The meeting was held jointly with the United Services Institute.

The speaker of the evening was Col. H. W. Love, O.B.E., Director of Works, Canadian Army Headquarters, Ottawa, who spoke on the work of the Royal Canadian Engineers in World War II.

Col. Love explained that the work of the R.C.E. covered all branches of engineering, although most of the work was Civil. There were in general two distinct groups, the Field Engineers and the Works Organization. The field engineers, a flexible unit, worked in the forward areas on rapid road repairs, bridge construction, demolitions, and mine clearing. The works organization did the heavier follow-up engineering work. This group was made up of road construction companies, bomb disposal units, railway units, survey units, and other units trained to do specialized work.

The peacetime R.C.E. is made up of three groups—the reserves, the supplementary reserve, and the active.

The reserve replaces the prewar N.P.A.M. The men volunteer to serve for a three year period. Their training is made up of 45 days per year, during fall, winter and spring, when they train for forward area and field engineering. At a two-week training camp during the summer practical field work is done and heavier equipment is used.

The Supplementary Reserve is a paper army. It is made up of a list of retired active force officers, reserve officers, and specialists who could be called to service in the event of war.

The Active Army is engaged during peacetime, for the most part, in four main types of work: training and field force units; development work; survey service; works service.

The training sites of the R.C.E. are at Chilliwack, B.C. and at Petawawa, Ont. Special courses are given at the camps for the reserve army and the C.O.T.C. during the summer season.

The development work is done at Ottawa. Here new equipment and methods are developed for the army engineers. Civilian equipment is also used and adapted for army use.

The Survey Service is engaged for the most part in the making of maps. The 1 in.=1 mile topographical maps of Canada are an example of the type of work they carry out.

The Works Service composes about 65 per cent of the present strength of the Corps. This service is largely responsible for the administering and maintenance of large amounts of Government property to the value of 300 million dollars. They also design, construct and maintain military buildings during peace time. Where civilian fire prevention service is not available, these are provided by the works service of the R.C.E. The great area in Northern Canada is being opened up by the engineers, who in addition to maintaining the Alaska Highway, also build and maintain emergency landing strips, conduct research work in permafrost, and build all types of bridges with special design features. This area of Canada is providing ideal training grounds for engineering personnel of the army.

Col. Love concluded the very interesting address by expressing the need for co-operation between the civilian engineering profession and the military.

Col. A. C. Garner moved a hearty and unanimous vote of thanks to the speaker.

VICTORIA BRANCH

S. H. Frame, M.E.I.C. - - - - *Secretary-Treasurer*
Jas. H. Blake, M.E.I.C. - - - *Branch News Editor*

The annual meeting of the Victoria Branch was held in the Empress Hotel on Friday, December 19, 1947, when the reports for the past year were presented and the officers elected for 1948. Charles T. Hamilton, consulting engineer of Vancouver, was the guest speaker of the evening and addressed the forty members present on the design and constructional features of the barrel-type roof of Victoria's new Memorial Arena, now under construction.

The meeting was preceded by a dinner at 6.30 p.m. for members of the Institute, which was followed by a short business meeting and election of officers. In presenting his report the Chairman, R. C. Farrow paid tribute to the retiring members of the executive and to the younger engineers for their sustained interest in the activities of the Branch during the past year. He reviewed the activities of 1947 and the prospects for the year 1948.

At the annual meeting of the Victoria Branch of the Institute December 19, 1947, officers were elected for 1948. Members pictured are: standing, Lieut.-Col. H. L. Sherwood (left), R. C. Farrow, chairman; T. A. J. Leach, O. W. Smith, J. H. Blake, S. H. Frame. Seated are: J. N. Anderson (left); Charles T. Hamilton, speaker of the evening, and Ernest Smith.

At the general meeting, which was open to the public at 8 o'clock, the chairman introduced Charles T. Hamilton who told of the unusual design of the barrel-type roof of the new arena building, stating that it was the only one of its kind in Canada, and that only one other, somewhat smaller, is to be found on the west coast of the continent. Some have been built in Eastern U.S.A. considerably larger than the one in Victoria, which is 320 feet in length and 165 feet in width. He explained the technical points in the construction with the aid of a scale model, and said the arena is being built to seat 4,160 persons as an ice arena and an additional 2,700 as an auditorium. The ice surface which is 80 by 200 feet could be de-iced in 1½ hours and replaced overnight. Ice for skating is only ¾-inch thick and about 1 inch thick for ice hockey.

Considerable delay has been experienced in the construction of the arena framework and roof, due partly to shortage of materials. Mr. Hamilton reviewed the various delays but stated that a much better building would result. Mr. Hamilton, who holds the rights for the design in Western Canada, is the engineer and superintendent of construction for the building. A lengthy discussion period followed the address.

The thanks of all present were conveyed to Mr. Hamilton by Mr. Irwin, city engineer of the City of Victoria. It is hoped that the building of this arena will be completed during 1948 in time for the winter hockey season.

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At Prince Robert House, Victoria, B.C., the Victoria Branch held a successful and interesting meeting on January 16, which featured an address entitled **Our Highway System** by Harry C. Anderson, M.E.I.C., chief engineer of the Provincial Department of Public Works of British Columbia. Also included in the programme was a showing of the film "Operation Pluto", depicting the manufacture and laying of the fuel supply pipe lines across the English Channel during the late war. This film was made available to the Branch through the courtesy of John Davidson of John Davidson and Company, Water-works Supplies, Vancouver, B.C.

Mr. Anderson's address commenced with a historical review of the British Columbia road and highway system of the early days of the Hudson Bay Company's "Brigade Trails", the wagon roads of the horse-drawn vehicle era, to the present day system, expanded in length and improved in methods of construction to meet the demands of heavy, fast traffic.

The Provincial programme of construction and maintenance, which was virtually brought to a standstill during the war years, was outlined and it was stressed that highways between heavily populated centres are being given top priority. A regular net-work, covering the entire Province, with connections to highways to the East and to adjacent States of the U.S.A. to the South, has been planned and is now in course of development at the cost of many millions of dollars. The largest project now nearing completion is the Hope-Princeton Highway which will cost some $8 millions; and this road is on a par with any on the continent in construction, grades, curves and scenic beauty. This work, together with that in hand on the Island Highway on Vancouver Island, should be completed this year.

It was pointed out that the increase in the cost of actual road construction showed an advance of some 20 per cent over 1939 figures as compared with a threefold increase in the cost of bridges, which is mainly due to the piling up of material prices. Another point of interest was the rapid increase in the number of automobiles and heavy freight units, which is so rapid that it is impossible to keep up with their need for more and better roads, with the available supplies of materials, manpower or money. The heavy freight-hauling units will have to be restricted as to size, even more so than in the past, as it is manifestly impossible to build roads which require more expensive construction, and stronger and more costly bridges, suitable for 1 per cent of the vehicular traffic. The present type of construction is more than adequate for 99 per cent.

Commercial signs will be prohibited on all major highways this year and a standard system of road signs, common to all Canada, has been adopted and introduced, to promote safer driving and avoid confusion.

Mr. Anderson's talk was very well received and was followed by a discussion period. The meeting was attended by the Hon. E. C. Carson, Provincial Minister of Public Works, civic officials, members of allied associations, and numerous Branch members.

—Library Notes—

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

GAS TURBINE CONSTRUCTION; INCLUDING OPERATION AND MAINTENANCE

R. T. Sawyer. Prentice-Hall, New York, 1947. 411 pp., illus., diagrs., charts, tables, cloth, $7.00.

Reviewed by

DONALD L. MORDELL, M.E.I.C.*

The art of producing gas turbines is still very fluid. In every type of prime mover there is considerable scope for arrangement of the components to produce various thermodynamic operating cycles, but there is no plant with as great a number of possible—and theoretically justified—arrangements as a gas turbine plant. Until many of these types have been built and thoroughly tested, there can be no standardization of design in the individual components.

The simplest turbine operates on an open cycle with one stage compression and expansion, and yet what tremendous variations are to be found between different designers' conceptions of the same basic engine!

In these circumstances any collected data of different designs is of great value. This has been provided for us by Mr. R. Tom Sawyer in his latest book "Gas Turbine Construction", published by Prentice-Hall. Here the reader will find gathered between two covers practically all the published information on construction and design, varying from jet propulsion engines to generating plants. In some cases the particulars given relate to projects rather than thoroughly tested design and it must be remembered that some may not turn out successfully, but there are sufficient details of plants with exceedingly good records of reliability to enable one to form a good idea of the best designs known at present. The author's collection of data on maintenance and testing is of value in giving some idea of what to expect. It is of interest to note that with the original turbo compressors installed by the Sun Oil Company more than a decade ago, the trouble analysis shows that blade failures accounted for only 9.5% of the total days out of operation. No less than 69% of the days were traceable to bearing and lubrication faults, while 20% might loosely be attributed to human errors or failings.

The sections dealing with operation and testing are valuable. The fact that they relate to particular types does not detract from their significance, as they are illustrative of the general techniques employed and with suitable modification might be applied to many types.

The omission of a discussion on the instrumentation problems which occur in turbine testing might well be rectified in a future edition. The book is attractively printed and, on the whole, well indexed. It will be of interest to every one concerned with the gas turbine, if only to show "what the other fellow did". It is purely descriptive and makes no attempt at being technical. The basic technology of design is no different for the gas turbine than for any other type of engine; the interest lies in observing the compromises selected, particularly by those designers able to draw on a great deal of operating experience.

*Associate Professor, Department of Mechanical Engineering, McGill University, Montreal.

RULES AND REGULATIONS

HOURS

	Oct. 1-May 30	June 1-Sept. 30
Monday to Friday	9 a.m.- 6 p.m.	9 a.m.- 5 p.m.
Thursdays (Oct. 1-Mar. 31)	9 a.m.- 8 p.m.	9 a.m.- 5 p.m.
Saturdays (closed July & August)	9 a.m.-12 noon	9 a.m.-12 noon

BORROWING & PURCHASING

Books, Periodicals, Photostats, Translations, etc., may be borrowed or purchased by any member of The Institute, resident in Canada.

Items may be borrowed for two weeks, exclusive of travel time, and may be renewed for a further two weeks on request.

A Library Deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the borrower, or purchaser. Therefore, except in the case of Library Deposits, payment should not be made in advance.

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BIBLIOGRAPHIES AND EXTENSIVE LITERARY SEARCHES

Short subject bibliographies will be compiled on request.

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Please indicate which is required.

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Give all pertinent information possible

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Alexandria, Louisiana: Street and Highway Plan:
H. W. Lochner & Co. Louisiana Dept. of Highways and the Public Roads Administration, Federal Works Agency, 1947. 30pp., illus., leather.

Callaway Textile Dictionary:
W. L. Carmichael, George E. Linton, and Isaac Price. La Grange, Georgia, Callaway Mills, 1947. 392 pp., illus., leather.

High Vacua; Principles, Production, and Measurement:
Swami Jnanananda. N.Y., Van Nostrand, 1947. 310 pp., illus., cloth.

Improving Supervision; a Discussion of Human Relations Problems for Supervisors in Industrial and Business Organizations:
Frank Cushman and Robert W. Cushman. N.Y., Wiley, 1947. 232 pp., cloth.

Jacob Integraph: Instructions and Typical Problems:
Brent C. Jacob. Bay City, Mich., Jacob, 1936. 126 pp., illus., paper.

Modern Gas Turbine; its Uses as an Exhaust Turbosupercharger or Prime Mover in all Fields of Service including Jet Propulsion; 2nd ed.:
R. Tom Sawyer. N.Y., Prentice-Hall, 1947. 224 pp., illus., cloth.

Science and Engineering of Nuclear Power:
Clark Goodman, editor. Cambridge, Mass., Addison-Wesley, 1947. 536 pp., illus., cloth.

Soil Freezing and Frost Heaving with Special Application to Roads and Railroads:
Fil dr. Gunnar Beskow. Evanston, Ill., Northwestern University, 1947. 145 pp., illus., paper. (Swedish Geological Society 26th Year Book No. 3, Series C, No. 375).

Spring Design and Calculations; 2nd ed.:
John A. Roberts. Redditch, Herbert Terry, 1947. 114 pp., illus., cloth.

Survival and Retirement Experience with Water Works Facilities; a Committee Report:
American Water Works Association, N.Y., 1947. 566 pp., illus., cloth.

Theory of Limit Design:
J. A. Van den Broek. N.Y., Wiley, 1948. 144 pp., illus., cloth.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

American Society for Testing Materials:
Proceedings, Volume 46, 1946.

Argentina. Direccion Nacional de Navegacion y Puertos:
Anuario Hidrografico, Ano XII, 1942. 2 parts.

Canada. Bureau of Statistics:
Eighth Census of Canada, 1941, Volume XI, 1947.

Canada. Bureau of Statistics:
Report on the Construction Industry in Canada, 1946.

Canada. Dominion Water and Power Bureau:
Hydro-electric Progress in Canada during 1947.

Canadian Automobile Chamber of Commerce:
Facts and Figures of the Automobile Industry, 1947.

Carnegie Corporation of New York:
Reports of Officers for the Fiscal Year ended September 30, 1947.

Conference on Nuclear Chemistry, McMaster University, May 1947:
Proceedings. Ottawa, Chemical Institute of Canada, 1947. 2 parts.

Connecticut Society of Civil Engineers:
Annual Report for the 63rd Year of the Society, 1947.

Engineering and Industrial Catalogue, 13th ed., 1947.

Ingeniors Vetenskaps Akademien:
Handlingar (Proceedings), number 195, 1947.

International Management Congress, Eighth, Stockholm:
Papers Submitted to the Sectional Meetings, Volume II, 1947.

Manitoba. Dept. of Mines and Natural Resources:
Eighteenth Annual Report on Mines and Minerals for Year ended April 30th, 1946.

National Council of State Boards of Engineering Examiners:
Proceedings of the 26th Annual Meeting, 1947.
...Reports for the 26th Annual Meeting, 1947.

Royal Society of Edinburgh:
Year Book, 1947.

Society for Experimental Stress Analysis:
Proceedings, Volume V, Number 1, 1947.

Svenska Forskningsinstitutet for Cement och Betong:
Handlingar (Proceedings), Numbers 8 and 10, 1947.

TECHNICAL BULLETINS, ETC.

Air Service Training. Pamphlets:
No. 1—Air Navigation Courses.—No. 2—Radio Operators' Courses.—No. 3—Radio Engineering Courses.—No. 4—Aircraft Engineering Courses.—No. 5—All-weather Flying and Radio Let-down Course.

Harvard University. Graduate School of Engineering. Publications:
No. 431—Pulse-type Tester for High-power Tubes, E. C. Easton and E. L. Chaffee.—No. 432—Classification and Identification of Soils', Arthur Casagrande.—No. 433—Functions Satisfying Certain Partial Differential Equations of Elliptic Type and their Representation, Stefan Bergman.—No. 434—Some Inequalities Relating to Conformal Mapping upon Canonical Slit-domains.

Institution of Mechanical Engineers. Publications:
Basic Physical Properties Relied upon in the Frozen Stress Technique, W. A. P. Fisher; Modern Applications of Photo-elasticity, R. B. Heywood.—Design of Contra-flow Heat Exchangers, Ernst Schmidt.—Development of Variable Specific Heat Charts and Graphs, and their Application to Internal Combustion Motor Problems, W. J. Walker and C. Rogers.—Fuel Systems for the Aero-gas Turbine, E. A. Watson.—Manufacture of Turbine Blades for the Whittle Engine, T. A. Kestell.—Modern Cutting Tools and Machine Tool Design, C. Eatough.—Problems Encountered by the Royal Electrical and Mechanical Engineers in the Field, E. Bertram Rowcroft.—Rocket as a Weapon of War in the British Forces, Alwyn D. Crow.

International Civil Aviation Organization. Publications:

ICAO Regional Manual—North Atlantic (Doc 4500) Amendment No. 3, December 1st, 1947.—Procedures for Air Navigation Services—Aerodromes and Ground Aids (Doc 4810 . . .).—Special Committee on Temperature Accountability. Final Report on Paris Meeting, September-October 1947 (Doc 4643 . . .).—Statistical Summary (Doc 4990 . . .).

North-east Coast Institution of Engineers and Shipbuilders. Publications:

Fire Precautions on Ships under Refit and Repair, E.L. Champness.

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

No. 9-R—Recommended Practice for Treatment of Icy Pavements; rev. ed.

University of Connecticut. Engineering Experiment Station. Publications:

No. 2—Wide-range Gaussmeter for Measurement of Steady and Alternating Magnetic Fields, Frederic P. Fischer.

STANDARDS, SPECIFICATIONS, ETC.

American Railway Engineering Association:

Specifications for Steel Railway Bridges, for Fixed Spans not Exceeding 400 Feet in Length.

British Standards Institution. Code of Practice:

CP (B) 692 (1947)—Copper Coverings for Roofs.

PAMPHLETS, ETC.

Application of Overfire Jets to Steamboats:

William S. Major. Toronto, Smoke Prevention Association of America, 1947.

Isometric Drawing Explained:

G. H. Pearson. London, Bentley, 1947.

Lubrication of Underground Mining Machinery:

Texas Company, N.Y., 1948.

Model Law for the Registration of Professional Engineers and Land Surveyors and Providing for the Certification of Engineers-in-Training:

National Council of State Boards of Engineering Examiners, Columbia, South Carolina, 1946.

Planning Factory Maintenance:

F. D. Denner. Manchester, Emmott, n.d. (Mechanical World Monograph No. 41).

Presentation of a Lecture or Technical Paper:

Jack Heggie. (In Electrical News and Engineering, v. 56, No. 24, Dec. 15, 1947, pp. 38-39).

Problems of Acclerating Aircraft Production during World War II:

Harvard University, Boston, 1946.

Radar; a Report on Science at War:

Joint Board on Scientific Information Policy, Washington, 1945.

Report on "Panel" or "Radiant" Heated Test Buildings:

C. D. Niven and A. D. Kent. Ottawa, National Research Council, 1947.

Understanding Vectors and Phase:

John F. Rider and Seymour D. Uslan. N.Y., Rider, 1947.

Unit Heaters; Types, Application, Installation, and Maintenance:

Stan. E. Nelson. Manchester, Emmott, 1947. (Mechanical World Monograph No. 40).

BOOK NOTES

The Institute does not assume responsibility for any statements made; these are taken from the preface or the text of the book.

Prepared by the Library of The Engineering Institute of Canada

BRITISH STANDARD FOR ELECTRONIC-VALVE BASES, CAPS AND HOLDERS. BS 448:1947.

London, British Standards Institution. 7/6.

This is a revision of the 1936 edition, which dealt with dimensions of the British 7-pin and 9-pin valve bases and the corresponding valve holders. In the 1947 edition the scope has been extended to include many other types of valve base which have been introduced in the interim. Such details of the bases of the electronic valves and cathode ray tubes and their associated holders as are necessary to ensure compatibility are covered.

BRITISH STANDARD FOR FUEL OILS FOR BURNERS. BS 742:1947.

London, British Standards Institution, 1947.

This standard, which supplements BS 209, "Fuels for Oil-engines", covers three categories of fuel oils for burners, namely for domestic installations, for marine installations, and for general domestic use. These three categories are subdivided into eight classes and the specification gives information on the application of these classes of oils and on points which must be borne in mind by users of the oils. The properties required for each class are specified and full descriptions of the methods of tests are given in the appendices.

BRITISH STANDARD FOR MIXING VALVES (MANUALLY OPERATED) FOR ABLUTIONARY AND DOMESTIC PURPOSES. BS 1415:1947:

London, British Standards Institution, 1947.

This standard is intended to unify the method of specifying the size of manually-operated mixing valves, to lay down a minimum standard of performance and to provide certain essential safeguards concerning the method of operation. Three sizes are dealt with—½ in., ¾ in., and 1 in.—the size being specified by means of the nominal bore through the inlets in conjunction with the performance requirements. Attention is called to the fact that the satisfactory operation of mixing valves does not depend alone upon the suitability of the design of the valves; several factors concerning the installation as a whole have a marked effect upon performance.

BRITISH STANDARD FOR PIPE FLANGES FOR LAND USE (FOR PRESSURES UP TO 400 FEET HEAD). BS 10: Part I: 1947:

London, British Standards Institution, 1947.

This is a revision of the standard published in 1928 and gives dimensions of flanges made from cast iron, bronze, cast steel, wrought iron and malleable cast iron, for maximum working water pressures up to 400 feet head (173 lb. sq. in.) at a maximum temperature of 212°F. It has been customary to regard this standard as purely dimensional, despite the fact that the flange thicknesses were varied for different materials. A feature of this revision is that the minimum properties of the flange material have been included. A number of sizes have been deleted from the tables and the outside diameters of wrought iron and steel pipes up to 72 in. nominal size have been included.

BRITISH STANDARD FOR PROTECTIVE FILTERS FOR WELDING AND OTHER INDUSTRIAL OPERATIONS. BS 679: 1947.

London, British Standards Institution. 2/-.

This standard covers filters of glass or having glass external surfaces, for eye protection during welding and similar operations, for use either in goggles or in screens. The purpose is to ensure that requirements will provide for adequate protection to wearers, and also permit the most economical production methods compatible with this protection.

CANADIAN STANDARD FIRE HAZARDS SPECIFICATION FOR THE CONSTRUCTION AND TEST OF CLASS I DOMESTIC OIL BURNING APPLIANCES FOR USE AS OR IN FURNACES, WATER HEATERS, CHICKEN BROODERS, ETC. CSA-Z 93. 2-1947.

Ottawa, Canadian Standards Association, 1947.

This specification states the minimum requirements for Class I Domestic Oil Burning Appliances. These are domestic, oil-burning, heating appliances, 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 from 28 to 40 degrees Baume —, and intended for stationary installations in locations where the appliance will be unattended and unobserved. The purpose of the standard is to outline essential requirements and minimum standards which must be met to obtain CSA Fire Hazards Listing of domestic oil burning equipment and appliances.

CANADIAN STANDARD FIRE HAZARDS SPECIFICATION FOR THE CONSTRUCTION AND TEST OF CLASS II DOMESTIC OIL BURNING APPLIANCES FOR USE AS OR IN SPACE HEATERS, ETC. CSA-Z 93.3-1947.

Ottawa, Canadian Standards Association, 1947.

This specification states the minimum requirements for Class II Domestic Oil Burning Appliances. These are domestic, oil-burning, heating appliances, 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 from 28 to 40 degrees Baume—, and intended for stationary installations in locations where the appliance wil be attended and observed frequently. There are two types of Class II Appliances—conversion type for installation in existing heating units, etc., and complete unit, which is a heating unity with an oil burning appliance installed.

CANADIAN STANDARD FIRE HAZARDS SPECIFICATION FOR THE CONSTRUCTION AND TEST OF CLASS III DOMESTIC OIL BURNING APPLIANCES FOR USE AS OR IN COOKING RANGES, ETC. CSA-Z 93.4-1947.

Ottawa, Canadian Standards Association, 1947.

This specification states the minimum requirements for Class III Domestic Oil Burning Appliances. These are domestic, oil-burning, cooking appliances, 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 from 28 to 40 degrees Baume—, and intended for stationary installations in locations where the appliance will be attended and observed frequently.

DYNAMIC MOTION AND TIME STUDY:

James J. Gillespie. London, Elek, 1947. 95 pp., illus., 8½ x 5½ in., cardboard, 7/6.

The author acknowledges the necessity for time and motion in every industry, but asserts that the study of work activity is too often unrelated to work psychology. The book is a text dealing with work psychology from many angles, both theoretical and practical.

ENGINEERING COLLEGE RESEARCH COUNCIL OF THE AMERICAN SOCIETY FOR ENGINEERING EDUCATION:

Directory of Member Institutions and Review of Current Research. Iowa City, Iowa, Engineering College Research Council, 1947. 103 pp., 9 x 6 in., paper, $1.00.

This directory provides a list of universities in the United States, their various engineering departments, and gives a short outline of their research activities in the field of applied science, and the research policies and expenditures of each university.

ENGINEERING STATISTICS; BASIC IDEAS ON THE SUBJECT AS IT IS APPLIED IN PRODUCTION CONTROL AND STANDARDISATION:

G. W. Stubbings. Manchester, Emmott, 1947. 24 pp., illus., 7¼ x 4¾ in., paper, 2/–.

The latest subject to be included in the necessary education of an engineer is statistics, which plays an important part in the modern control of production and which is likely to play an equally important part in the fixing of standards of quality and criteria for acceptance by purchasers. The purpose of this monograph is to deal with some of the conceptions of statistical theory in order to assist the engineer unacquainted with this branch of applied mathematics, to take up the study of its applications to modern engineering problems.

MANUAL OF ALUMINUM CASTING ALLOYS:

Aluminum Research Institute, Chicago, 1947. 78 pp., illus., 9 x 6 in., leather.

This book is intended to be of assistance to Design Engineers, Foundrymen, and users of castings, and contains tabular data on physical and mechanical properties of various sand and permanent mold Aluminum alloys most commonly used; general metallurgy of Aluminum alloys; properties of specific alloys; foundry practice; and heat treatment. The purpose of the discussions in the manual is to aid in the selection of the proper alloy for a given casting, and as a help in the production of high quality castings.

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.

A.S.T.M. STANDARDS on ADHESIVES. *Sponsored by A.S.-T.M. Committee D-14 on Adhesives; Specifications, Physical Tests, Definitions, July, 1947. American Society for Testing Materials, Philadelphia 3, Pa., 42 pp., diagrs., tables, 9 x 6 in., paper, $1.25 (A.S.T.M. members, $.90).*

A compilation of the American Society for Testing Materials physical tests and definitions relating to adhesives, this booklet also includes three methods of testing rubber adhesives. Tensile properties, the resistance of adhesive bonds to chemical reagents, the peel or stripping strength, and methods for determining the strength properties of adhesives in shear are among the topics covered.

ARCHITECTURAL CONSTRUCTION, the Choice of Structural Design.

T. Crane. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 414 pp., illus., diagrs., charts, tables, 9¾ x 6¼ in. cloth, $6.00.

Of interest to practicing architects and architectural engineers as well as to students, this volume presents a procedure for determining the most suitable basic structural elements for a particular structure. It is intended to fill the void between a descriptive study of materials and types of construction and the final design of individual structural elements. A comprehensive résumé is made of all the better types of construction now available in the American market, with recommendations concerning their specific applications. Many diagrams, tables and photographs illustrate the text.

ELEMENTS of RAILROAD ENGINEERING.

W. G. Raymond, H. E. Riggs and W. C. Sadler. 6th ed. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 442 pp., illus., diagr., charts, tables, 9 x 5¾ in., cloth, $5.00.

The sixth edition of this standard text has been revised and, where necessary, rewritten to include information in line with current practice, particularly with regard to speeds, curves, grades, track structure, division points, and terminal facilities. Two new chapters have been added on streamlined trains and on power and passenger equipment. The four major sections cover the following topics: the railroad industry in general; permanent way; the locomotive and its work; railroad surveys.

Fundamentals of ENGINEERING MECHANICS.

A. Sloane. Prentice-Hall, Inc., New York, 1947. 379 pp., diagrs., tables, 9¼ x 6 in., cloth, $5.65.

This volume deals with the usual material on statics and dynamics which is treated in a text on engineering mechanics. In addition, the principle of virtual work, Mohr's circle as applied to moments of inertia and products of inertia, and a brief introduction to the subject of mechanical vibrations have been included. More attention than is usual is given to engineering kinematics. The text is constructed as a guide for the student to stimulate thinking instead of learning by rote.

HANDBOOK of PERSONNEL MANAGEMENT.

G. D. Halsey. Harper & Brothers, New York and London, 1947. 402 pp., diagrs., charts, tables, 9½ x 6 in., cloth, $5.00.

A discussion of the basic principles and theories of personnel management is presented to enable the reader to evaluate the methods used. This book is devoted to the practical aspects—what the problems and objectives of personnel management are, and how these problems have been solved and these objectives accomplished in many organizations. In this college-level text, such problems as job analysis, induction of new employees, correction and discipline, wage incentives, profit-sharing plans, and labor relations are presented. References are given at the end of each chapter, and an appendix lists sources of information and help in personnel management.

ILLUSTRATED JIG-TOOLING DICTIONARY:

T. G. Thompson and R. A. Peterson. Macmillan Co., New York, Toronto, 1947. 349 pp., illus., diagrs., tables, 9½ x 6 in., cloth, $7.50 (in Canada).

Containing illustrated factual data alphabetically arranged, this volume graphically demonstrates all of the basic equipment of the tool engineer and the actual use of this equipment on the job. Mathematical procedures, tables and formulas, the properties of metals, standards and basic dimensions, and terms used in connection with plastic forming processes, welding, technical drawings and blueprints are included

INDUSTRIAL EXPERIMENTATION.

K. A. Brownlee. Chemical Publishing Co., Brooklyn, New York, 1947. 151 pp., diagrs., charts, tables, 9 x 5½ in., cloth, $3.75.

Of primary interest to those concerned with pilot-plant and plant-scale experiments on chemical manufacturing processes, this volume, British in origin, is a guide to both the planning and interpretation of experiments on an industrial scale and paves the way to efficient quality control. The subject is treated from the practical point of view. Only simple arithmetic is used with the statistical methods discussed and in the practical examples which illustrate the method. The principal additions in this second edition are two new chapters on balanced incomplete blocks and on confounding, covering the problem of restricted block size in factorial experiments.

INDUSTRIAL HEALTH ENGINEERING.

A. D. Brandt. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1947. 395 pp., illus., diagrs., charts, tables, 9¼ x 5¾ in., cloth, $6.00.

Beginning with a discussion of industrial atmospheric contaminants and their significance, this volume proceeds to describe the principles of control available and the types of equipment used: collectors, exhaust systems, respirators, etc. Design data and other aspects of interest to the practical engineer are included. The later chapters deal briefly with ventilation, air conditioning, radiant energy, industrial illumination, industrial noise, and plant sanitation. There is a twelve-page bibliography.

MAGNETIC CONTROL of INDUSTRIAL MOTORS.

G. W. Heumann. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 589 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.50.

Of interest to engineers concerned with industrial control equipment, this volume provides exhaustive coverage of electric motor performance, characteristics of control devices, and functions of commonly-used control circuits. Fundamental information is provided as well as information on new devices such as the amplidyne control and a-c hoist controls. Emphasis is placed on considerations governing the selection of controllers to perform specific jobs. A short bibliography follows each chapter.

MODERN TELEGRAPH SYSTEMS and EQUIPMENT.

W. T. Perkins. George Newnes Ltd., London, 1946. 215 pp., illus., diagrs., charts, tables, 7½ x 5 in., cloth, 10s. 6d.

Important developments in telegraph technique during the last decade are described for the use of telecommunication engineers, traffic officers, and students in electricity and radio-communication. These developments cover voice frequency, telex, sub-studio, and varioplex systems, and all types of modern apparatus such as the teleprinter, teletypewriter, and the Creed automatic 5-unit and Morne equipment. A glossary of telegraph terms and definitions is included.

ON UNDERSTANDING SCIENCE, an Historical Approach.

J. B. Conant. Yale University Press, New Haven, Conn.; Geoffrey Cumberlege, Oxford University Press, London, 1947. 145 pp., illus., diagrs., tables, 8¼ x 5¼ in., cloth, $2.00.

The purpose of this volume is to provide the layman with an effective method for finding out what science is and how to understand it. An historical view is given of a number of great scientists, of the knowledge available in each one's generation, of the problems they set out to examine, and of how these problems were solved. The reader follows the scientific method at work, with all its limitations and wonders.

PHYSICAL CHEMISTRY and the TECHNOLOGY of FUELS.

A. W. Gauger, sponsored by Phi Lambda Upsilon and the Dept. of Chemistry, Pennsylvania State College, State College, Pa., 1947. 114 pp., diagrs., charts, tables, 11 x 8½ in., paper, $2.00.

Reviewing the present state of our knowledge of fuels, this volume emphasizes the particular aspects of interest to physical chemists. The book is based on the 21st annual Priestley lecture with the addition of background material on fuels. It is divided into six sections: the composition and properties of fuels; interconversion of solid, liquid and gaseous fuels; gasification of solid and liquid fuels; the physical chemistry of combustion; fuels as chemical raw materials; and the nuclear energy power plant. A brief list of reference material is included

SCOTTISH RAILWAY NETWORK.

J. F. Pownall. Cotterell & Co., 110 Dale End, Birmingham 4, England; Simmons-Boardman Publishing Co., 30 Church St., New York, 1946. 71 pp., diagrs., maps, tables, 10 x 6 in., cloth, 8s. 6d.; $3.00.

This volume covers in detail a proposed plan for the conversion of the Scottish Railway system to provide hourly service, both express and local, by means of spaced control points. The actual changes involving new construction are considered. A map is included which shows existing and needed lines to provide for the schedules worked out in the text.

SOIL MECHANICS, Its Principles and Structural Applications.

D. P. Krynine. 2nd ed. McGraw-Hill Book Co., New York and London, 1947. 511 pp., illus., diagrs., charts, tables, 9 x 5½ in., cloth, $5.50.

Presents the principles used in the design, construction and maintenance of foundations of structures, and of structures made of earth material. The engineering applications of these principles are discussed, field and laboratory soil investigations are described, and the settlement of structures, its causes, prevention, and damage are considered. This revised edition brings both the material and the bibliography up to date and includes new sections on highway and runway subgrade.

Although not available in the Institute Library, inquiries concerning the following new books will be welcomed there or may be sent direct to the publishers.

CONTROLLED ATMOSPHERES FOR THE HEAT TREATMENT OF METALS:

I. Jenkins, with a foreword by C. J. Smithells. Chapman & Hall, London, 1946. 532 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, 50s.

The main function of a controlled atmosphere in the heat-treatment of a metal is considered to be the control of the surface chemistry, as distinct from the metallurgy, of the process. This involves the application of certain laws of physical chemistry to various gas-metal and inter-gas reactions. This book brings together the scattered data on these reactions, discusses fundamental principles, and explains the means of translating these principles into practice. The book is arranged in three sections covering respectively the generation, purification and application of controlled atmospheres, including details of industrial equipment.

ELECTRICAL ENGINEERING PROBLEMS (Solutions to Electrical Engineering Problems, Professional Engineer Examinations, New York State).

W. Glendinning, 5123 Bell Boulevard, Bayside, N.Y., 1946. 112 pp., diagrs., tables, 8¾ x 11½ in., paper, $3.00.

This manual provides questions and solutions to the electrical engineering problems of fifteen past examinations in Professional Engineering—Part III, Electrical Engineering, Group D, given to applicants for the license of Professional Engineer in New York State. Useful in preparing for professional engineering and civil service examinations, the material covers various types of problems in d.c. and a.c. machinery and in power and communication systems.

GAS DYNAMICS TABLES FOR AIR.

H. W. Emmons. Dover Publications, Inc., New York, 1947. 46 pp., diagrs., charts, tables, 9¼ x 6 in., paper, $1.75.

After presenting the general relations of gas dynamics and the shock wave equations, the technique of using the five-place tables is explained. There are four groups of Tables as follows: isentropic gas dynamics functions for air, gas dynamics functions for normal shocks, characteristics table, and acoustic velocity-temperature table. Nineteen graphs of tabulated functions follow the tables themselves. The tables were in part produced originally in connection with aircraft research.

GROUND WATER, ITS DEVELOPMENT, USES AND CONSERVATION:

E. W. Bennison with foreword by W. M. Bollenbach. Published by Edward E. Johnson, Inc., St. Paul 4, Minnesota, 1947. 509 pp., illus., diagrs., charts, tables, 9½ x 6 in., cloth, $2.25.

This volume, consisting of a series of articles which originally appeared in the "Johnson National Drillers' Journal" from 1940 to 1946, presents the basic principles of ground water hydrology and wall construction. The techniques in common use in developing and pumping ground water and its subsequent treatment are considered, as well as methods of conservation. Not intended as a scientific treatise, the book provides a wide range of practical information for the well driller or water supply engineer.

MACHINERY'S HANDBOOK:

E. Oberg and F. D. Jones. 13th ed. Industrial Press, New York, Sole distributors for the British Empire: Machinery Publishing Co., Ltd., National House, West St., Brighton 1, England, 1946. 1911 pp., diagrs., charts, tables, 7 x 4½ in., cloth, $6.00.

This standard annual reference book provides essential data and information on machine design and shop practice for the mechanical engineer, draftsman, toolmaker and machinist. New material includes recent or revised engineering standards as well as additional developments reflecting current designing and manufacturing practice. As is customary, the extensive technical and mechanical data are presented in tabular form for convenience of use. Material concerning metallurgical, hydraulic and other allied fields is given, and the whole compilation is covered by a thirty-page index.

MODERN PETROLEUM TECHNOLOGY:

Institute of Petroleum, Manson House, 26 Portland Place, London, W.1, 1946. 466 pp., illus., diagrs., charts, maps, tables, 9¼ x 6 in., cloth, 21s.

In order to make available the knowledge of the expert in one field of petroleum technology to those engaged in other branches of the industry, the British Institute of Petroleum has sponsored this volume with the intention of giving a composite picture of present conditions. Exploration, prospecting, production, refining, chemistry, utilization, distribution, measurements, tests, and economic features of petroleum are the main topics. Large topics, such as refining, are subdivided into the important phases, and different specialists write of the state of knowledge in their own sections. Some of the most important advances, made in wartime and only recently released, are included

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

January 31st, 1948

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

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

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

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

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

The Council will consider the applications herein described at the March meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

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

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

FOR ADMISSION

ANNANDALE—ALEXANDER, of Trail, B.C. Born at Shotley Bridge, Durham, Eng., Aug. 14, 1891. Educ.: Private Schools, 1899-1908; Naval Arch., Armstrong Coll., Durham, Univ., 1908-14 (part time course) Elswick Shipyard, Sir W. G. Armstrong Whitworth Ltd., as follows: 1908-13, pupil apprent., 1913-14, dftsman., 1914-24, asst. mgr. in shipyard, 1924-25, lent to civil engrg. dept., service at Corner Brook. N'fld., 1925-26, asst. mgr. in shipyard; 1926-40, clerk & dftsman., Consolidated Mining & Smelting Co. of Canada Ltd., Trail, B.C.; 1940-45, active service R.C.N.V.R. with ranks Lieut. (E), Lieut. Cdr. (E), Constructor Lieut. Cdr., Construction Cdr., as, Res. Naval Overseer, Quebec and Halifax, Mgr., Constrn. Dept., Esquimalt, B.C.; asst. to supt. of mtce. & Constrn., Consolidated Mining & Smelting Co. of Canada, Ltd., Trail, B.C.

References: A. C. M. Davy, H. H. German, A. L. C. Atkinson, J. V. Rogers, S. C. Montgomery, D. I. Moore.

BEEMAN—JOHN STANLEY, Lt. Col., R.C.E., of Edmonton Alta. Born at Magrath, Alta., Oct. 29, 1913. Educ.: B.A.Sc., British Columbia, 1935; with R.C.E., as follows: 1936-45, various overseas and home appointments; 1945-46, District Engr. Officer MD13; 1946-47, Director of Accommodation Army H.Q.; 1947 to date, Command Engr., Western Command, Edmonton, Alta.

References: N. E. Rodger, H. L. Meuser, H. W. Love, P. L Debney, H. E. Wright.

BROWN—JOSEPH, of Windsor, Ont. Born at Windsor, Ont., Sept. 10, 1920. Educ.: B.Mech.Engrg., Univ. of Detroit, 1943 (accredited E.C.P.D.); R.P.E., Ontario; 1941-43, dftsman., Truscon Steel; 1943-46, R.C.E.M.E.; 1946 to date, power, process estimating and field engrg., Canadian Industries, Limited, Windsor, Ont.

References: H. D. Keil, J. A. MacGibbon, J. G. Hoba, H. L. Johnston, G. W. Lusby.

BRZOZOWICZ—CZESLAW PIOTR, of Toronto, Ont. Born at Sokolow, Poland, June 28, 1911. Educ.: M.Sc., Politechnika Lwowska, Lwow, Poland, 1939; Licensed P.E., Quebec; 1938-39, chief engr., Dept. Forests, Kalusz, Poland; 1943-44, designer, stress Dept., Boeing Aircraft Co., Vancouver, B.C.; 1944-45, group leader, reinforced concrete design, Marathon Paper Mills Co., Ontario; 1946-47, consultg. engr., Canadian Breweries Limited, Toronto; 1947 to date, consultg. engr., H.E.P.C. of Ontario, Toronto, Ont.

References: E. P. Muntz, F. E. Wellwood, L. A. Lee, D. C Beam, T. N. Carter.

DIAL—HERMAN PONSFORD, of Montreal, Que. Born at Deming, N. Mexico, March 2, 1916. Educ.: B.Sc., (Mech. Engrg.), Univ. of Maryland, 1937 (accredited E.C.P.D.), with E. I. Du Pont de Nemours & Co., Inc., as follows: 1937-39, indus. engr., chemical process surveys at Chambers works, New Jersey and Leominster, 1939-44, chem. supvr., various chemical operating processes at Chambers works, N.J., particularly in the field of organic dyestuffs and intermediates; with Canadian Industries Limited, 1944-47, sr. chem. engr., U.S. Gov't. (A.E.C.). supervised certain field operations, constrn. and mfg. operations, as a Gov't. representative of A.E.C., acting as liaison with operating contractors, and at present, industrial engr., Montreal, Que.

References: H. B. Hanna, I. R. Tait, A. B. McEwen, C. H Jackson, H. C. Karn, H. L. Johnston, H. D. Keil.

GREEN—CHARLES VICTOR, Lieut. Cmdr., R.C.N., of Ottawa, Ont. Born at Halifax, N.S., Jan. 15, 1905. Educ.: Home study, Naval Architecture, 1924 to date; Member, Soc. Naval Architecte & Marine Engrs., New York; Member, Inst. Naval Architects, London; with Saint John Dry Dock Co., Ltd., as follows: 1924-29, apprent., ship dftng., machine-shop mould loft, fabricating shop, elect. shop practice, mtce. & operation water tube boilers, turbo-generators and elect. pumps in power house, etc., 1929-37, plant mtce. & asst. dockmaster, ship dftng. & structl. steel dftng. office, etc.; 1937-40, responsible for supvn. of constrn. of seven new ships and salvage of one casualty, German & Milne, Montreal, Que.; 1940-41, R.C.N., Lieut. Cmdr. i/c constrn. various types of naval craft in several Canadian shipyards; 1942 to date, N.S.H.Q., Ottawa as Deputy Director of Naval Construction.

References: G. L. Stephens, A. C. M. Davy, B. R. Spencer. W. H. G. Roger, J. Deane, J. Middleton.

HALLSON—KENNETH, of Winnipeg, Man. Born at Winnipeg, Man., July 28, 1923. Educ.: B.Sc., (Elect.), Manitoba, 1945; 1942-44, (summers), floorman, sub-stations, jr. engr. class "A". City of Winnipeg Hydro Electric System; 1945-46, R.C.C.S., Cadet and 2nd Lieut.; 1946 to date, jr. engr., class "C", distribution divn., City of Winnipeg Hydro Electric System, Winnipeg, Man.

References: H. L. Briggs, M. D. Young, T. E. Storey, D. C. Bryden, R. T. Harland.

HARDY—JOHN ALEXANDER, of New York, N.Y. Born at Mount Vernon, N.Y., May 10, 1899. Educ.: B.Sc., Dartmouth College, Hanover, N.H.; R.P.E., N.Y., Texas and Georgia; Member, A.S.M.E.; with George F. Hardy, consultg. engr., New York, as follows: 1925, dftsman., design simple structures for steam power plant and kraft mill, Brown Paper Mill Co., Monroe, La.; asst. to res. engr., on 24,000 H.P. extension to hydro elect. power plant, Abitibi Electric Development Co., Island Falls, Ont.; 1926. jr. engr., steam flow studies, etc. on preliminary design of dam and power house for 60,000 H.P. hydro devel'pt., Spruce Falls Co.; design of structures for paper machine extension to kraft mill, Brown Paper Co., Monroe, La. and for paper mill for Manitoba Paper Co., Pine Falls, Man.; 1926 to date, in the capacity of asst. res. engr., asst. engr. and executive engr. i/c of engrg. and finally in complete charge, on design of structures, quantity and cost estimates, preparation of concrete specifications for constrn. of earth dams, etc., etc. on kraft pulp and paper mills, hydro electric devel'pts., etc., in Canada and U.S., and at present same duties as proprietor of George F. Hardy & Son, New York.

References: J. B. Challies, W. B. Crombie, L. B. Kingston, J. A. McCrory, R. E. Heartz.

HARGREAVES—JAMES, of Ottawa, Ont. Born at Watton-at-Stone, Herts., Eng., Oct. 19, 1899. Educ.: Royal Military Academy, Woolwich; 1917-18; Cambridge Univ., 1920-21; R.P.E., Ontario; 1922-23, astronomical & meteor. research, cooperating with Royal Observatory, Greenwich; with W. Wilson & Son (Herts) Ltd., 1924-28, works supvr. 1928-32, director, W. Wilson & Son Ltd. & Wilson-Garner Ltd., Director Highways Colloidal Ltd., after 1928 was i/c of their London office concurrently with duties of managing Highways Colloidal Ltd., mfg. emulsified asphalt, road surfacing materials; 1932, moved to Canada and engaged in farming operations; 1942-45, Ordnance Mech. Engr., R.C.O.C. and R.C.E.M.E. i/c divn. workshop with tech. staff, N.D.H.Q. and last as Engr. I/C experimental workshop and engrg. problems, Field Experimental Stn., Suffield, Alta.; 1946-47, i/c expedition to observe the eclipse of sun at Araxa, M. G. Brazil; at present, private practice as mech. engr. and astronomical research, Ottawa, Ont.

References: F. A. Fleming, R. L. Franklin, C. G. Biesenthal, J. W. Young, C. E. Olive, H. V. Haight, A. O. Monk.

HOPE—JOHN LEONARD, of Hamilton, Ont. Born at St. Marylebone, London, Eng., March 5, 1925. Educ.: 1943-47, Willesden Technical Coll.; holder, Ordinary National Cert. in Elect. Engrg. and Mech. Engrg.; 1941-46, indentured apprent., switchboard assembly, machine shop, airbrake switchgear assembly, aircraft tool dftng., works drawing office, etc., etc., British Thomson-Houston Co.; at present mech. dftsman., power transformer engrg. dept., Canadian Westinghouse Co., Hamilton, Ont.

References: J. R. Dunbar, P. Ford-Smith, A. A. Moline, D. W. Callander, L. C. Sentance.

MARSH—HUGH ROBERT WARING, of Lachine, Que. Born at Woking, Surrey, Eng., Aug. 29, 1920. Educ.: Honours Degree, Mech. Sciences, Cambridge Univ., 1947; 1938, (summer), fitting & assembly shops, J. M. Voith, paper machinery, Heidenheim, Germany; 1939, (summer), paper mill, A. E. Read & Co., Aylesford, Kent, Eng.; 1939-46, R.C.S., first as 2nd Lieut. and finally with rank of Major; 1946, returned to Univ. to complete course for Mech. Sciences Degree; 1946, (6 mos.), paper mill, engrg. dept., John Dickinson & Co., Watford, Eng.; at present, asst. engr., engrg. dept., paper machinery divn., Dominion Engineering Co., Ltd., Lachine, Que.

References: J. S. Bates, G. Cape, G. M. Pitts, H. E. Cunningham, F. L. Mitchell.

MARTIN—DONALD JOHN, of Vancouver, B.C. Born at Moose Jaw, Sask., July 13, 1912. Educ.: B.Sc., (Civil), Manitoba, 1935; with Canadian Pacific Railway Co., as follows: 1929-34, chainman, rodman, topographer & instru'man., Kenora, Ont. and Ontario Dept. of Northern Dev.; 1935-41, transitman, surveys, prepare layout and detail plans covering all types rly. work incl. track, bridges, culverts, water supplies, coal docks, etc., recommendations to divn. engr., prepare draft contracts and specifications, etc., 1941-42, roadmaster, responsible for mtce. and safe operation of 150 miles of railroad, etc., 1943-45, divn. engr., responsible for mtce. and safe operation of approx. 1000 miles rly., etc.; with British Columbia Electric Railroad, as follows: 1946, asst. engr. way & structures dept., genl. engrg. assistance to chief engr., 1946 to date, engr., way & structures, Vancouver, B.C.

References: C. A. Colpitts, R. A. Emerson, A. C. Eddy, P. H. Buchan, T. E. Price, J. N. Finlayson.

NEUFELD—JAMES CORNELIUS, of Winnipeg, Man. Born in Russia, Jan. 30, 1905. Educ.: B.Sc., (Civil), Manitoba, 1931; R.P.E., Manitoba; 1928, (5 mos.), estimating, Dominion Bridge Co., Ltd.; 1929, (5 mos.), designing & dftng., Vulcan Iron Works Ltd.; 1930, (4 mos.), field dftsman., location survey, Canadian Pacific Rly.; 1931, (2 mos.), field dftsman., survey, Dept. of Mines & Natural Resources, Manitoba; 1931-32, instructor, Dept. of Civil Engrg., Univ. of Manitoba; 1932-35, misc. work during depression years not connected with engrg.; 1935-41, assessor, appraisal of bldgs., Assessment Dept., City of Winnipeg; 1941, (3 mos.), asst. engr. i/c constrn., instln. sewerage system at airschool, Fort William, Dept. of National Defence; with City of Winnipeg, as follows: 1941-44, assessor, 1944-46, designing engr. and dftsman., 1946-47, structl. engr., bldg. inspection division, engrg. dept.; at present, asst. engr. of constrn., prairie region, Central Mortgage & Housing Corporation, Winnipeg, Man.

References: W. D. Hurst, A. J. S. Taunton, J. B. Striowski, W. F. Riddell, J. N. Finlayson, E. A. Ford.

PRICE—ROBERT GARDINER, of Sarnia, Ont. Born at Calgary, Alta., July 2, 1924. Educ.: B.Sc., (Chem. Engrg.), Alberta, 1946; 1943, (summer) rodman, California Standard Oil Co.; 1944 and 1945, (summers), geophysical survey crew in southern Alta., asst. operator, British American Oil Co., Calgary, shift work, operating and topping and cracking unit; 1946, (3 mos.), chemist, routine chemical tests and analyses, Canadian Industries Ltd., alkali divn., Windsor, Ont.; with Dow Chemical Co. of Canada Ltd., as follows: 1946-47, asst. to supt. of Styrene cracking and finishing units, investigating problems to become familiar with operation of units, at present, supt. Styrene cracking and finishing units, responsible for technical operation, Sarnia, Ont.

References: F. K. Beach, S. J. Davies, R. M. Dingwall, B. B. Hillary, R. S. L. Wilson, H. E. Hansen.

SHONE—KENNETH JOHN, of Montreal, Que. Born at Wallasey, Eng., May 18, 1916. Educ.: B.A. Hons. Mech. Sciences Tripos; M.A. Cantab., Emmanuel College, Cambridge; Assoc. Member, Institution Mechanical Engineers; Thos. Hedley & Co., Ltd., as follows: 1937-39, asst. in setting up of control standards, Manchester, 1939-40, chief mtce. engr.; 1940-41, tech. engr. on special assignment in connection with starting up of the first fat splitting plant in England, Alfred Holt & Co., Liverpool; 1943-46, at sea as Sr. Engr.; 1946-47, in training and finally on design coordination for large gas works, Humphrey & Glasgow, consultg. engrs., London; at present, lecturer, Dept. of Mechanical Engineering, McGill University.

References: C. A. Robb, J. R. Groundwater, E. MacGill, R. H. Patten, D. L. Mordell.

SOLANDT—OMOND McKILLOP, of Ottawa, Ont. Born at Winnipeg, Man., Sept. 2, 1909. Educ.: M.A., Toronto Univ. and Cambridge; B.Sc., Toronto; M.D., Toronto; 1941-43, Director Medical Research Council, Lulworth, Eng., planned and directed work that led to improved ventilating systems in British tanks, work went as far as studying details of fan design and specifications, directed research on tank turret traverse mechanism which involved solution of engrg. problems; 1942, Officer I/C Army Operational Research Section, dealing with tanks and field artillery, directed research which dealt among other things with engrg. aspects of tank fire control systems, tank armour, tracks and suspension; 1943, Deputy Supt., Army Operational Research Group, 1944, Supt., group consisted of 125 scientists, who did research on operational performance of weapons for all branches of the British Army, work involved solution of many engrg. problems, particularly in anti-aircraft, radar and fire control, during period planned and conducted trials on lethality and destructiveness of weapons, effectiveness of weapons against bldgs., vehicles, aircraft, etc. which involved engrg. —as a result of this latter work was sent to Japan as a British War Office representative to study destructive effects of atomic bomb; at present, Director General of Defence Research, Defence Research Board, Dept. of National Defence, Ottawa, Ont. (Asks for Member or Affiliate.)

References: G. R. Turner, A. G. L. McNaughton, C. J. Mackenzie, N. E. Rodger, J. T. Wilson, G. L. Stephens.

TEMOIN—RENE JEAN, of Dundas, Ont. Born at Vancouver, B.C., May 26, 1915. Educ.: B.A.Sc., (Mech.), British Columbia, 1939; R.P.E., Ontario; 1939-40, jr. engr. and apprent., Standard Oil of California; 1940-43, plant mtce. in refinery, responsible for all materials and inspecn., Bahrein Petroleum Co., Ltd., Persian Gulf; 1943-45, welding and prod. engr., i/c welding in plate shop; 1945, (4 mos.), welding engr., John Inglis Co., Ltd.; 1945 to date, design engr., bldgs., bins, plants, mill bldgs. and bridges, engrg. dept., Hamilton Bridge Co., Ltd., Hamilton, Ont.

References: A. Love, W. S. MacNamara, A. L. Sutton, W. L. Hetherington, N. L. Crosby.

FOR TRANSFER FROM JUNIOR

ASSELIN—ANDRE, of Mont-Rolland, Que. Born at Montreal on Oct. 7, 1920. Educ.: B.A.Sc. (C.E.), Ecole Polytechnique, 1945, R.P.E. Que. 1945-47, jr. engr. paper machinery div. Dominion Engrg. Co., Lachine, Que.; 1947, plant engr. Rolland Paper Co. (St. 1945. Jr. 1947.)

References: H. Gaudefroy, L. Cartier.

ASSELIN—HECTOR, of Montreal. Born at Montreal on Nov. 3, 1914. Educ.: B.A.Sc. (C.E.) Ecole Polytechnique, 1939; R.P.E. Que.; 1938, summer, inspector for Ministry of Health, Dept. of Industrial Hygiene; 1939, Arthur Surveyer & Co., Consulting Engrs. 1947 to date, designing engr., steel & reinforced concrete, planning, estimating, supervision of staff at Dominion Square bldg. office, Surveyer Nenniger & Chenevert, Mtl. (St. 1937. Jr. 1942.)

References: W. L. Pugh, A. Surveyer, T. J. Lafreniere, M. Balls, E. Nenniger, M. E. Hornback, C. H. Jette, J. G. Chenevert, R. Boucher.

BABUREK—CHRISTIAN STEPHEN, of Verdun, Que. Born at Montreal on Dec. 25, 1919. Educ.: B.Eng. (Mech.) McGill, 1941; 1940, summer, dftsman. Dominion Oilcloth & Linoleum Co.; 1941-42, dftsman. British Ministry of Aircraft production, later the Royal Air Force Ferry Command; 1942-45, Royal Canadian Naval volunteer, reserve i/c machinery, minesweepers; 1945-46, plant layout, Polystyrene plant, Monsanto (Canada) Ltd.; 1946 to date, attached to factory staff of Electro Lux (Canada) Ltd., duties, product engrg. design & test work. (St. 1941. Jr. 1946.)

References: O. R. Brumell, J. L. Bieler, W. L. Todd, C. M. McKergow, R. J. McKeown, E. N. Parker.

BAIRD—EARLE MEHARG, of Toronto, Ont. Born at Scarboro, Ont., Feb. 18, 1901. Educ.: B.A.Sc., Toronto, 1923; R.P.E. Ontario; 1923 to date, engr. for Town of Scarboro, Ontario. (Jr. 1925.)

References: R. Harrison, A. E. Berry, E. M. Proctor, N. MacNicol, W. L. Dobbin.

BAKER—WILLIAM Gordon, of East Angus, Que. Born at Montreal on May 2, 1915. Educ.: B.Eng. (Chem.) McGill, 1937; with Canadian Johns-Manville as follows: 1937-39, Jr. chemist; 1939-41, senior chemist; 1941-43, chief chemist; 1943-46, R.C.A.F. overseas; 1946 to date, chief chemist i/c laboratory, inspection, control stations, Brompton Pulp & Paper Co. (St. 1937. Jr. 1946.)

References: J. A. Dickenson, K. N. Brebner, W. F. Simpson, H. B. Howe, J. B. Phillips.

BARKWELL—STEWART, of Toronto, Ont. Born at Dysart, Sask., on Oct. 16, 1915. Educ.: B.Sc. (Elect.) Manitoba, 1940; R.P.E. Ontario; with Canadian General Electric Co. Ltd.; as follows 1940-41, test course; 1941-43, manufacturing engrg. on 3.7 in. A.A. Mounting and Mark III and IV Lancaster Undercarriage, Genelco Ltd.; 1943-44, commercial engrg. sales, Aircraft Equipment, Can. Gen. Elect.; 1944-45, Royal Canadian Electrical Mechanical Engineers; 1945-47, power transformer design engrg., Can. Gen. Elect., Davenport Works; 1947, power transformer commercial engr., C.G.E., Toronto. (St. 1939. Jr. 1943.)

References: C. E. Sisson, D. Norman, I. F. McRae, B. I. Burgess, A. L. Malby, P. W. Doddridge, E. P. Fetherstonhaugh.

BALDERSON—KENNETH KINCADE, of Magrath, Alberta. Born at Magrath, Alta., on Aug. 9, 1917. Educ.: B.Sc. (Elect.) Alberta, 1939. R.P.E. Alberta; with the Trinidad Leaseholds Limited as follows: 1940-41, asst. constrn. engr., surveying, moisture control, compaction tests on rolled earth fill dam; 1941-46, asst. elect. engr., building of a large oil refinery and 15,000 K.W. power station, work consisted of checking constrn. work, blue prints, making elect. drawings, elect. testing of equipment, i/c of elect. mtce. of new plants for one year after they were commissioned; 2½ years, on elect. mtce. of old and new plants at the Refineries at Point-A-Pierre; 1946-47, field elect. engr. i/c elect. work in oil fields, power station; at present, due to ill health of father not doing engineering work temporarily. (St. 1939. Jr. 1942.)

References: H. A. Ripley, H. T. Miard, P. E. Kirkpatrick.

BARRICK—JOHN BRUCE, of Winnipeg. Born at Melville, Sask., on Dec. 19, 1913. Educ.: B.Sc. (E.E.) Manitoba, 1935; 1937-38, sales engr. Dominion Sound equipt., Toronto; 1938-39, jr. engr. R.C.A. Victor; 1939-40, asst. purchasing agent, R.C.A. Victor; 1940-41, buyer, plant equipt. C.I.L., D.I.L.; 1941-43, elect. design, D.I.L. engrg.; 1943-44, asst. elec. supt. & production foreman; 1944-45, elect. instructor, Ecole Technique; at present, elect. instructor, Kelvin Technical High School, Winnipeg. (Jr. 1943.)

References: A. Moore, E. R. Love, G. Herriot, E. P. Fetherstonhaugh, H. Tucker, J. R. Auld.

BELLAMY—KEITH LACY, of Niagara Falls, Ont. Born at Niagara Falls, on Dec. 20, 1911. Educ.: B.Sc. (Elect.) Queen's, 1935. R.P.E. Ontario; 1935-45, Canadian Cellucotton Company, elect. contractor; at present elect. inspector, Hydro Electric Power Commission. (St. 1934. Jr. 1941.)

References: D. M. Jemmett, I. S. Widdifield, W. D. Bracken, D. S. Ellis.

BLOCK—JACOB BENJAMIN, of Montreal, Que. Born at Montreal on Nov. 13, 1914. Educ.: B.Eng. (Chem.) McGill, 1937; 1937-39, British American Oil Co. Ltd., Asst. Chemist; 1943-45, St. Clair Processsing Corp., chemist, Sarnia; at present: president, Fabric Bindings Ltd., Montreal, Que. (St. 1937. Jr. 1946.)

References: R. E. Jamieson, G. Henderson, L. A. Wright, E. Brown.

BOWLES—WILLIAM SHEDDEN, of Montreal. Born at Vancouver, B.C., on June 12, 1906. Educ.: B.Sc. (Civil) McGill, 1930; 1930-31, field engr. A. F. Byers & Co.; 1932-38, Canadian Stebbins Eng. & Mfg. Co.; 1939-40, sales, W. S. Tyler Co. of Canada; 1940-41, field engr. & supt. Foundation Co. of Canada Ltd.; 1941-42 mech. engr. mgr. production planning dept. Canadian Car Munitions Ltd., Cherrier 1942-44, operating control supervisor, Can. Vickers Aircraft Ltd.; 1944-45, Victory Aircraft Ltd., Malton, Ont., i/c production bonus scheme; at present, mgr., manufacture sales of colmonoy alloys & electrodes, Wall Colmonoy Canada Ltd., Mtl. (St. 1929. Jr. 1935.)

References: E. V. Gage, H. W. Rogers, E. T. Smallhorn, G. Cape, L. Jehu.

BRANCHAUD—HENRI L., of Montreal, Que. Born at Montreal on Nov. 29, 1912. Educ.: B.A.Sc. (C.E.) Ecole Polytechnique, 1936, Ecole Superieure de Soudure Autogene, Paris, 1937; summers, survey parties, Quebec Streams Commission; 1937-39, with Canadian Liquid Air Co. as follows: 1937-39, engrg. dept.; 1939-45, asst. to general mgr.; 1945 to date, mgr,, Export Department. (St. 1935. Jr. 1940.)

References: de Gaspe Beaubien, A. Cousineau, L. A. Duchastel, L. Trudel, F. G. Kerry.

BRIDEN—LEONARD DUTTON, of Dobie, Ont. Born at Haileybury, Ont., June 17, 1915. Educ.: B.Sc. (Mining Eng.) Michigan College of Mining & Technology (accredited E.C.P.D.), 1940; R.P.E. Ont.; 1940, engrg. asst. Upper Canada Mine; 1940-41, instru'man, H. F. McLean Ltd.; 1941, constrn. eng. D.I.L.; 1941 (4 mos.) asst. engr., Carter-Holls-Aldinger Co., R.C.A.F. depot, Moncton, N.B.; 1942, (3 mos.) asst. engr., Atlas Construction Co., Gander, Nfld.; 1942-43, asst. engr. Newfoundland Light & Power Co., Hydro Elect. Construction; 1943-45, engr. constrn. & mtce. of storages, dams, ice investigation; 1946-47, engr. Bolivian Power Co. Ltd., preliminary surveys; 1947 to date, engr. Nfld. Light & Power Co. (Jr. 1944.)

References: H. F. Roberts, L. M. Howe, J. K. Sexton, J. H. McLaren, A. C. D. Blanchard, H. J. McLean, G. H. Thompson, C. Ritchie.

BROWN—GRAHAM EDWARD, of Toronto, Ont. Born at Ottawa on Dec. 3, 1918. Educ.: B.Sc. (Chem. Eng.) Queen's, 1940. 1940-41, jr. chemist, Canadian National Carbon; 1941-43, asst. chemist, Dominion Arsenal, Lindsay; 1945-47, Canadian National Carbon Co. (St. 1940. Jr. 1946.)

References: W. F. M. Bryce, G. H. Ferguson, M. S. Madden, R. C. C. Brown, J. M. Wardle.

BRYDGES—ROBERT JAMES, of Montreal. Born at Souris, Man., on Jan. 4, 1917. Educ.: B.Sc. (Elect.) Manitoba, 1938; 1938-40, post graduate student course, A. Reyrolle & Co. Ltd., Tyne, England; with Northern Electric Co. Ltd., as follows: 1940-41, general sales div., power apparatus contracts; 1941-42, wire and cable specialist, later power apparatus specialist, sales and materials, Winnipeg; 1942-45, preparing specfns. and tenders on switchgear, rectifiers; 1945-47, sales engr., general sales div.; at present, sub-station apparatus supervisor, power apparatus dept., Mtl. (St. 1938. Jr. 1942.)

References: E. P. Fetherstonhaugh, G. H. Herriot, E. S. P. Braddell, C. C. Simpson, W. B. White, T. W. Birt, D. S. Smith.

CAMPBELL—JOHN GRAHAM, of Arvida, Que. Born at Montreal on April 15th, 1917. Educ.: B.A., Queen's 1938, B.Sc. (Met.) Queen's 1940. R.P.E. Quebec; 1940, Pedlar People, shell cartridge case production; 1940-41, interm. demonstrator Queen's Univ.; 1941-43, Canadian Locomotive Co., metallurgical control and mechanical inspectn. of munitions, met. problems in iron foundry and heat treatment; 1941-43, O/C 44th Fd. Regt. R.C.A. rank temp. (Major); 1943 to date, engr. supervisor, potrooms, Aluminum Co. of Canada, Arvida, Que. (St. 1939. Jr. 1945.)

References: D. S. Ellis, A. Jackson, J. Dyck, W. F. Campbell, F. T. Boutilier, H. R. Fee.

CAREY—LESLIE CLEMENT, of Toronto. Born at Sackville, N.B., on July 13, 1915. Educ.: B.E. (Civil) Nova Scotia Technical College, 1939; R.P.E. Ontario; 1939, summer, inspector, Can. Inspection & Testing Co.; 1939-40, instru'man. inspector, Transmission Sect. Hydro-Electric Power Commission of Ont.; 1940-43, Jr. Design engr., Hydraulic Dept., H.E.P.C. of Ont.; 1943-44, group leader, Project & Development Sect., Victory Aircraft Ltd., Malton; 1944-45, design engr., Aluminum Co. of Can. Ltd., Toronto; 1945-47, stress engr., Liaison engr. Victory Aircraft Ltd.; 1945-46, design engr., H.E.P.C.; at present, engrg. asst. and inspector, Mech. div., Can. & Genl. Finance Co. Ltd., specifications and inspectn. mech. equipt. for Hydro-El. other Utilities. (St. 1939. Jr. 1942.)

References: O. Holden, E. G. Tallman, O E Johnston, F. T. Simson, W. L. Shelden.

CARMICHAEL—JOHN WILLIAM, of Ottawa. Born at Trenton, Ont., Aug. 10, 1916. Educ.: B.Sc. (Chem. Eng.) Queen's, 1938; 1938 vegetable oil refinery; Canada Packers, Toronto; with Department of Public Works as follows: 1939-42, jr. chemist, analysis of materials of contrn. lubricants, fuels used by the dept.; 1942-44, asst. chemist, plus supervisory duties; 1944-46, chief chemist; at present, chemical engr. i/c chemical testing. (Jr. 1944.)

References: K. M. Cameron, G. H. Thurber, C. Gliddon, E. Viens, L. R. Stratton.

CARSON—MERVYN SHANNON, of Toronto. Born at Landis, Sask., on June 29, 1909. Educ.: B.Sc. (Civil) Saskatchewan, 1930; R.P.E. Ont.; with the city of Saskatoon as follows: 1930-31, design, dftg. of complete storm sewerage system; May to Sept. instru'man, field engr on curb and sidewalk constrn., switches, railway curves; 1931, preliminary survey, triangulation, topographical survey, test on site of bridge over south Sask. river; 1931-33, instru'man and field engr. on same bridge; with Link-Belt Ltd. as follows: 1935-39, shop work production control; 1939-42, asst. to chief engr. design and specfn. estimates; 1942-43, asst. supt.; 1943 to date, general supt. (St. 1931, Jr. 1937.)

References: C. J. Mackenzie, C. F. Morrison, G. A. Bradford, C. W. Bell, A. L. Huber.

CHARNOCK—EDMUND THOMAS, of Fort William, Ont. Born at Fort William on April 13, 1913. Educ.: B.A.Sc. (Chem.) Toronto, 1938; 1938-42, asst. chemist, laboratory work, testing raw materials; J. R. Watkins Co., Winnipeg; 1942-47, asst. sulphite supt., cost analysis for depts. process test, intrumentation, The Great Lake Paper Co. Ltd., Fort William. (Jr. 1944.)

References: S. T. McCavour, A. J. Michelson, W. Small, W. L. Bird, J. K. Carmichael, S. Flook.

CHRISTIE—ROBERT LOUIS, of Toronto. Born at Truro, N.S., on March 23, 1912. Educ.: B.Eng. (Mech.) McGill 1935; R.P.E. Ontario; summers 1930 and 1931, instru'man, Dept. of Highways, N.S.; with Canadian Kodak Co. Ltd., as follows: 1935-36, dftsman; 1936-40, asst. master mechanic; 1940-42, dftsman; 1942-45, asst. supervisor munitions Dept.; 1945 to date, plant engr Toronto, Ont. (St. 1932. Jr. 1940.)

References: H. Tate, J. W. Swift, J. R. Kaye, H. K. Morris.

CONKLIN—MAURICE WILLIAM MURCH, of Toronto. Born at Gledhow, Sask., on Feb. 15, 1914. Educ.: B.E. (Mech.) Saskatchewan, 1938. R.P.E. Ontario; 1938-39, jr. engr. Algoma Steel, Sault Ste. Marie; 1939-40, engr. John T. Hepburn Co., Toronto; 1940-41, engr. prod. tool div. Defense Industries Ltd. Mtl.; 1941-42 engr. mech. div. Can. Vickers; 1942-44, tool engr. Can. Propellers, Mtl.; 1944-45 tool engr. Massey-Harris, Toronto; 1945-47, tool engr. Frost & Wood, Smith's Falls; 1947, engrg. checker, Toronto Iron Works; 1947 to date, manufacturing engr., Foundry, Canadian Westinghouse, West Plant, Hamilton. (St. 1938. Jr. 1942.)

References: D. Cameron, L. C. Sentance, I. M. Fraser, R. C. Flitton, C. J. Mackenzie, E. G. Tallman.

COOK—KENNETH GILBERT, of Lachine, Que. Born at Montreal on Mar. 9, 1915. Educ.: B. Eng. (Mech.) McGill, 1938; summer work as follows: 1935, rodman survey party, Montreal Light, Heat & Power Co.; 1946, Std. Cost dept. Dominion Rubber Co.; 1938-42, estimator, Canadian Car & Foundry Co.; 1942-46, Royal Canadian Electrical & Mechanical Engrs. as Lieut. and captain 3 yrs. overseas; 1946 to date, chief designer, i/c designing dies, eqpt. for roll forming operations. (St. 1936. Jr 1946.)

References: D. C. McCallum, A. Benoit, J. L. Bieler, J. H. Ingham, H. J. Racey.

CROOK—DONALD GORDON, of Vancouver. Born at Rouleau, Sask., on March 19, 1915. Educ.: B.Sc. (Civil) Saskatchewan, 1941; 1933 and 35, summers, laboratory help, Imperial Oil Ltd., Regina; 1935-40, constrn. sales, laboratory and process help, Consumer's Co-operative Refineries Ltd.; 1941-42, Aeronautical Inspection Directorate, R.C.A.F.; (8 mos.) inspection of major assembly jigs, constructed, for Patrol Bomber contracts, Can. Vickers Ltd.; 1942-45, asst. engr. responsibility for production of fine pitch precision instrument type gears, plastic moldings, engrg. of component parts tools and fixtures, mtce. of production schedules, Neon Products of Western Canada Ltd.; 1946 to date, asst. engr. of plant equipt. distribution of petroleum products, land and marine, design, cost estimating. Home Oil Distributors Ltd., Vancouver. (St. 1940. Jr. 1943.)

References: C. E. Cleveland, W. M. Stobbart, C. W. Deans, H. Brockington, J. L. Miller.

DAVIS—ROBERT ANDREW, of Islington, Ont. Born at Kingston on July 21, 1917. Educ.: B.Sc. (Mech.) Queen's, 1940; with Aluminum Co. of Canada Ltd. as follows: 1940-41, inspectn. constrn. carbon baking furnaces, Carbon Plant; 1941-42, jr engr. Carbon Plant; 1942-43, design and engrg. work layout for Carbon Plant expansion in Arvida; 1943 (3 mos.) design and layout of Soderberg Paste Plant, Shawinigan Falls, working in Mtl. engrg. office; 1943-45, supervisor, plant operations and mtce.; 1945 (3 mos.) trainee, Fabricating plants; 1945 to date, div. supervisor, industrial engrg. dept., Aluminum Goods Ltd., Toronto. (St. 1940. Jr. 1946.)

References: B. E. Bauman, M. G. Saunders, R. F. Legget, D S Ellis.

DEMCOE—JOHN WILLIAM, of Toronto. Born at Kenora, Ont., on April 18, 1912. Educ.: B.Sc. (Civil) Manitoba, 1939; R.P.E. Ont.; summer work as follows; 1934 and 35, rodman and dftsman.; Ont. Dept. of Northern Development; 1935 and 36, instru'man Ont. Dept. of Highways; 1937, dftsman., O.D.H.; 1938, asst. engr. Bankfield Consolidated Gold Mines; 1939 (2 mos.) miner; with Canadian National Railways as follows: 1939-40, structural dftsman.; 1940-42, instru'man; 1942-44, asst. engr.; 1944-45, asst. div. engr.; 1945-46, div. engr.; 1946 to date, engr. mtce. of way; Toronto. (St. 1938. Jr. 1940.)

References: B. Wheelwright, E. R. Logie, E. G. Hewson, J Ferguson.

DENOVAN—JOHN JAMES, of Lachine, Que. Born at Dalkeith, Ont., on June 13, 1915. Educ.: B.Sc. (Mech.) Queen's, 1940; summer work as follows: 1934 and 1936, dftsman. Can. Johns-Manville Co.; university experimental testing — Precipitation Co. of Canada; 1940, theoretical design of compressors, Can. Ingersoll Rand Co.; 1940-41, Canadian Army (Lieut.); 1941-45, Major i/c development special assault devices for Dept. Tank Design British Ministry of Supply; also four months at Dept. National Defence, Ottawa as chairman of screening committee on anti-tank mine clearing suggestions; (3 mos.) as technical advisor to Allied Force H.Q. in Italy; 1945-46, Design Officer, Major, Directorate Engineer Development; 1946-47, design engr. Dominion Engineering Co. Ltd.; at present, chief engr., Marchak Diesel Locomotives Co., responsible for all design and detailing. (St. 1938. Jr. 1946.)

References: J. H. Maude, F. F. Fulton, E. C. Thorne, E. Arnason, H. B. Howe.

DeSTEIN—JOSEPH LOUIS, of Montreal. Born at Regina, Sask., on Jan. 13, 1915. Educ.: B.Sc. (Civil) Saskatchewan, 1939; M.Eng. (Civil) McGill, 1946; R.P.E. Que.; summer work as follows: 1936-37, chainman, instru'man, sub div. survey N. A. Timmins Mining Corp.; 1939-40, field dftsman., Dept. of Agriculture, Ottawa P.F.R.A.; with Aluminum Co. of Canada as follows: 1940-41, structural dftsman.; 1941-43, squad leader and structural designer; 1943-44, resident engr. office and laboratory bldg., Shawinigan Falls; 1944-45, structural designer; 1946-47, lecturer, asst. prof., dept. of civil engrg., McGill Univ. (Jr. 1940.)

References: M. E. Hornback, W. L. Pugh, D. G. Elliot, R. E. Jamieson, G. J. Dodd.

DICKIE—HAROLD G., of Amherst, N.S. Born at Stewiacke, N.S., on April 5, 1916. Educ.: B.Sc. (Mech.) Queen's, 1940; summer, 1934 and 38, N.S. Highways; with Canadian Car & Foundry Co. Ltd. as follows: 1940-41, dftsman.; 1941-44, chief dftsman. Amherst, N.S.; 1944-45, chief engr.; 1945-46, lecturer in engrg. Mount Allison Univ.; 1946, partner of Kinghorn & Dickie, plastic molding and machine works, Sackville, N.B. (St. 1940. Jr. 1946.)

References: E. G. MacGill, D. S. Ellis, R. N. Dobson, H. W. MacKiel, C. D. MacDonald, J. F. F. MacKenzie.

DIXSON—GEORGE WILBERT, of St. James, Man. Born at Kindersley, Sask., on Oct. 28, 1911. Educ.: B.Sc. (Elect.) Manitoba, 1940. With Manitoba Power Commission as follows: 1940-42, jr. dftsman.; 1942-46, senior dftsman., 1946-47, engrg. dftsman.; 1947 to date distribution engr., Winnipeg, Man. (St. 1940. Jr. 1946.)

References: J. W. Tomlinson, T. L. Woodhall, A. M. Thompson, E. P. Featherstonhaugh, E. R. Love.

DOUGLAS—RALPH LOUIS, of Beaurepaire, Que. Born at Morell, P.E.I., on March 29, 1911. Educ.: B.Sc. (Mech.) Queen's, 1937; R.P.E. Que.; after graduation (8 mos.) attended Trane Co.'s Engrg. School, Lacrosse, Wis. and Toronto; 1938-43, asst. mgr. Trane Co. of Can. Ltd., Mtl. office; 1944-45 R.C.N.V.R. Lieut. (E); 1946-47, engr. i/c design, layout, installn. of air conditioning equipt., now vice-pres., Douglas Engrg. Co. Ltd. D & D Air-conditioning Co. Ltd. (Jr. 1940.)

References: R. Bruce, E. M. Van Koughnet, W. W. Timmins, R. Willis.

DOW—WALTER KERR, of Outremont, Que. Born at Glasgow, Scotland, on Oct. 10, 1913. Educ.: B.A.Sc. (Elec.) 1937, Toronto; R.P.E. Que.; 1937-38, apprentice engr. Aluminum Co. of Canada; 1938-39, project engr. (H.M. office of works Defence Engrg., London, Eng.); 1940-43, i/c projects, engrg. design and field supervision, power install. for Aluminum Co. of Can.; 1944, engrg. superv. conversion of T.S.S. Letitia to hospital ship; 1944-46, engr. i/c power and lighting install. Brompton Pulp & Paper Co., Red Rock, Ont.; 1946 to date, consulting elect. engr., Canadian Comstock Co. (Jr. 1938.)

References: J. L. Davison, M. P. Weigel, E. Cowan, A. C. Johnston, A. Wilson, J. W. Stafford, G. H. Gillett.

DUCHASTEL—PIERRE ARTHUR, of Quebec City. Born at Outremont, Que., on Dec. 5, 1915. Educ.: B.Eng., McGill, 1938; R.P.E. Que.; with Ferranti Electric as follows: 1937-39, transformer design; 1939-42, transformers and regulators, service and sales; 1942-44, Jr. research engr. war projects, National Reseach Council, Ottawa; 1944-45, asst. research engr. i/c staff conducting specific research projects; at present, elect. engr. i/c dept. Quebec Power Co. & Que. Railway Light & Power Co. (St. 1937. Jr. 1943.)

References: C. V. Christie, A. B. Cooper, W. Boyle, B. G. Ballard, E. D. Gray-Donald, A. S. Runciman, A. C. Abbott.

DUNCAN—ALLAN SIDNEY ERNEST, of Montreal. Born at Toronto on June 10, 1917. Educ.: B.Sc. (Chem.) Queen's, 1940; 1941-44, plant mgr. Oxygen Co. of Canada; 1944-45, technical advisor, Allied War Supplies Corp.; 1945 to date, engrg. staff, McColl Frontenac Oil Co. Ltd. Mtl. (Jr. 1943.)

References: G. W. Jarvis, A. G. Farquharson, E. H. Brooke, W. E. Patterson, W. N. McCann, D. Ellis.

DUTTON—VERNON LEROY, of State College, Pennsylvania. Born at Birtle, Man., on May 4, 1921. Educ.: B.Sc. (C.E.) Manitoba, 1944; summer work as follows: 1941, dftsman. Dominion Bridge Co.; 1942, topographical survey of Canada, student asst.; 1944-45, Lieut. R.C.E.; 1946 (3 mos.) constrn. supt. i/c concrete highway bridge for Mountain Road Builders of Winnipeg, Man.; 1946 to date, research asst., Engineering Experiment Station, The Pennsylvania State College. (St. 1942. Jr. 1946.)

References: G. E. Cole, R. W. Ross, G. H. Herriot, A. E. Macdonald, W. F. Riddell, J. A. McCoubrey, C. N. Mitchell.

ELLIOTT—JOHN COURTENAY, of Ottawa, Ont. Born at Shawville, Que., on May 18, 1910. Educ.: B.Sc. (Civil) 1934, Queen's; R.P.E. Ont.; with Dominion Natural Gas Co. Ltd. as follows: 1934-35, jr. engr.; 1935-39, equipt. and applications engr.; 1939-41, engr. i/c purification plants and compressor stations, Southern Ont. Div.; 1941-42, plant engr. North Dominion Div.; 1942-43, sr. asst. engr., works and buildings, Naval service; 1943-44, special lecturer, Queen's Univ. 1944-45, designing engr., J. R. Booth Ltd.; 1945-47, designing engr., E. B. Eddy Co.; at present, plant engr., National Research Council, Ottawa. (St. 1934. Jr. 1940.)

References: C. J. Mackenzie, D. S. Ellis, A. N. Ball, T. Foulkes, A. A. Young, J. Dick.

FEIFFER—FRED, of Ottawa. Born at Regina, Sask., on Feb. 26, 1917. Educ.: B.Sc. (Engrg. Phys.) Saskatchewan, 1940; R.P.E. Ont.; 1940, Amalgamated Electric, Toronto; 1940-46, engr. Research Enterprises Ltd.; 1946-47, engr. Canadian Arsenals Ltd.; at present, sales dept. Eldorado Mining & Refining Ltd., Ottawa. (Jr. 1943.)

References: D. C. R. Miller, E. G. Tallman, R. A. Spencer, C. H. Klawe.

FORSTER—ALFRED MANNING, of Montreal. Born at Chester, N.S., on Nov. 12, 1914. Educ.: B. E. (Elec.) Nova Scotia Technical College, 1938; 1938-39, apprentice engr., Saguenay Power Co.; 1939-42, Jr. engr. Aluminum Co. of Canada, work consisted of plant mtce.; 1942-45, Elect. Lieut. Royal Canadian Naval Volunteer Reserve, elect. mtce. of ships and shore establishments; 1945 to date, elect. engr., general engrg. dept., Aluminum Co. of Canada. (St. 1938. Jr. 1946.)

References: P. E. Radley, F. L. Lawton, J. M. Scott, J. L. Davison, H. Fellows.

GAMBLE—SAMUEL GILL, of Ottawa, Ont. Born at Ottawa on Aug. 20, 1911. Educ.: B.Eng. (Civil) McGill, 1933; 1935-38, jr. topographical engr. Dept. of Mines & Resources; 1938-39, underground engr. Perron Gold Mines; 1939-45, R.C.E. Canadian Army; 1945-46, plant engr. Perron Gold Mines; at present, engr. civil, Topographical Survey, Dept. of Mines & Resources. (St. 1933. Jr. 1946.)

References: E. R. Logie, H. L. Meuser, G. R. Turner.

GERSOVITZ—FRANK, of Montreal. Born at Montreal on Nov. 8, 1909. Educ.: B.Eng., McGill, 1932, R.P.E. Quebec; 1932 to date engaged in constrn. work as general contractor, self employed. (St. 1930. Jr. 1938.)

References: R. E. Jamieson, G. J. Dodds, B. Gersovitz, E. Brown.

GREEN—CLAUDE ELSON, of Montreal, Que. Born at Calgary, Alta., on Feb. 24, 1917. Educ.: B.Eng. (Civil) Saskatchewan, 1940; 1940 (3 mos.) dftsman. Ottawa Car & Aircraft Co. Ltd.; (3 mos.) production control; 1940-41 (6 mos.) asst. to project engr., Desalaberry works, Defence Industries Ltd.; 1941-42, asst. to resident engr., on constrn. Bouchard Works; 1942-43, mtce. D.I.L. Bouchard Works; 1943-45, group engr. engrg. dept. D.I.L.; 1945 to date, plant engr. Merck & Co. Ltd., Montreal. (St. 1940. Jr. 1946.)

References: C. F. Davison, J. G. Welsh, R. A. Spencer, W. E. Patterson, S. I. Gislason.

GREENWOOD—FREDERICK DWYER, of Sault Ste. Marie, Ont. Born at New Liskeard, Ont., on July 14, 1907. Educ.: B.Sc., Mech., 1941, Queen's; R.P.E. Ont.; 1931-32, tool design, Ford of Canada; 1932-33, designing dftsman. Engrg. Dept. Ford Motor; 1933-34, Vipond Cons. Gold Mines, engine room operator, crusher house operator, surveyors helper; 1934-43, designing dftsman. mech. dept. Hollinger Consolidated Gold Mines; 1943 to date, design engr. Chromium Mining & Smelting Corp. Ltd. (St. 1928. Jr. 1935.)

References: D. C. Holgate, G. W. Holder, T. F. Rahilly, A. M. Wilson, W. S. Wilson, F. H. MacKay.

HAMELIN—J. CONRAD ROGER, of Montreal. Born at Montreal on Dec. 18, 1914. Educ.: B.A.Sc. (C.E.) Ecole Polytechnique, 1940; R.P.E. Que.; summer work as follows: 1937, 38, 39, Commission Metropolitaine, Shawinigan Water & Power; 1940-41 plant engr. Viau Biscuit; 1941-42, schedule and planning supt., tool work, Westmount Tool Works; 1942-48, constructing engr. on his own, Mtl. (St. 1937. Jr. 1946.)

References: J. P. Lalonde.

HAMILTON—ALEXANDER DANIEL, of St. Catharines, Ont Born at Westmount, Que., on Nov. 13, 1917. Educ.: B.Eng. (Chem.) McGill, 1940; summer work, 1936 and 39, heat treatment dept. Simonds Canada Saw Co.; 1940, industrial engrg. dept. time study and plant layout, Dominion Rubber Co. Ltd.; 1941, (6 mos.) R.C.A.F. Aeronautical Engrg. School; 1941-42, Technical Adjutant to Chief Tech. Officer; engrg. officer, No. 406, night fighters, England; 1942-45, Chief Tech. Officer, rank Squadron Leader, responsible for mtce., repair of aircraft of unit strength; 1945-46, industrial engrg. dept. Dominion Rubber Co. Ltd.; at present, process engr., Ontario Paper Co. Ltd., St. Catharines, Ont. (St. 1939. Jr. 1946.)

References: C. K. McLeod, T. M. Moran, D. C. MacCallum, R. DeL. French, E. Brown.

HARDING—CHARLES MALCOLM, of Calgary, Alta. Born at Dauphin, Man., on Dec. 10, 1912. Educ.: B.Sc. (Elect.) Alberta, 1936; with Imperial Oil Ltd., Calgary Refinery as follows: dftsman. (3 mos.); checker, 1½ yrs., storehouse inventory; meterman (3 mos.); estimator and asst. to yard engr. 2 yrs.; process instrument engr. (6 mos.); with Calgary Power Co. Ltd., as follows: 1940-44, engr. asst. Waterworks; 1944-47, elect. engr. asst. (St. 1936. Jr. 1941.)

References: F. C. Tempest, R. W. Dunlop, W. R. Davis, J. McMillan, J. Blair, H. Randle.

HART—ERWIN EDWARD, of Toronto. Born at Toronto, on July 18, 1915. Educ.: B.A.Sc. (Civil) Toronto, 1940. R.P.E. Ont.; 1940-43, scheduling engr., mtce. work, Dunlop Tire & Rubber Goods Co. Ltd.; 1943-45, supervisor material standards, John Inglis Co. Ltd.; 1945-47, process engr. Consumers' Product Div.; 1947 to date, cost research engr. Massey Harris Co. Ltd., Toronto. (St. 1940. Jr. 1944.)

References: R. F. Legget, D. Boyd, E. R. Graydon, R. S. Segsworth.

HASTEY—WILLIAM KINGSLEY WRIGHT, of Shawinigan Falls, Que. Born at Ottawa on Oct. 8, 1916. Educ.: B.Sc. (Metallurgy) Queen's, 1940; R.P.E. Que.; 1940-42, training course in paper production; 1942-45, aeronautical Engr. R.C.A.F. responsible for all aircraft on station; 1945-46, Consolidated Paper Corp. Ltd., i/c installation of accessory equipt., conversion paper machines; 1946, Jr. tour or shift boss in paper mill; at present, sr. shift boss, paper mill dept. Belgo Div. Consolidated Paper Corp. Ltd., Shawinigan Falls. (St. 1941. Jr. 1945.)

References: E. T. Buchanan, C. T. M. Robinson, J. Fowler, W. A. E. McLeish, F. Bradshaw.

HENRY—DOWARD A., of Leaside, Ont. Born at Singhampton, Ont., on May 31, 1915. Educ.: B.A.Sc. (Mech.) Toronto, 1938; 1938-40, designer and field engr. and shop course, Massey Harris Co.; 1940-45, engr. i/c equip. design and mtce. Research Enterprises Ltd.; 1946-47, plant engr. Corning Glass Works of Canada Ltd., Leaside, Ont. (Jr. 1939.)

References: M. A. Phelan, R. C. Wiren, F. Morrison, E. A. Allcut, M. Huggins.

HETHERINGTON—WORDSWORTH LLOYD, of St. Catharines, Ont. Born at Vancouver, B.C., on May 7, 1917. Educ.: B.A.Sc. (Elect. Eng.) British Columbia, 1939; R.P.E. Ont.; 1939-40, mtce. clerk, Standard Oil Co. of B.C.; 1941, training course, sales engr., Packard Elect. Co. Ltd.; 1942-46, elect. engr., responsible for mtce., instlns. equipt. at 3 Mtl. plants, Steel Co. of Canada Ltd.; 1946 to date, transformer design engr. Packard Elect. Co. (St. 1939. Jr. 1945.)

References: E. C. Kirkpatrick, P. E. Poitras, A. G. Herr, L. B. Stacey, H. J. MacLeod.

HEWITT—HARRY NAYLOR, of Montreal. Born at Leedale, Alta., on March 14, 1916. Educ.: B.Sc. (Chem.) Alberta, 1940; 1940-44, development engr., investigation, testing laboratory supervision, C.I.L.; 1944-45, chemist, D.I.L.; 1945 to date, inspection engr., repair and mtce. of pressure vessels, lines, general inspectn. engrg., tank car mtce., Shell Oil Company of Canada Ltd. (Jr. 1945.)

References: R. H. Hobner, G. W. Lawson, R. Bruce, J. D. Chisholm, R. M. Hardy, E. L. Johnson.

HONEYWELL—WILLIAM ROBERT, of Carleton, Ont. Born at Ottawa on Jan. 19, 1916. Educ.: B.Sc. (Mining) Queen's, 1940; R.P.E. Ont.; with Preston East Dome Mines Ltd., as follows: 1941, 3 mos. sampler; 3 mos. engineer's helper, 1941-42, mine engr.; 1942-44, asst. supervisor, Fluoride Plant of Aluminum Co. of Canada; 1944-45, suprvr.; 1946-47, topographical engr., Dept. of Mines & Resources, Ottawa; at present, technical asst., Marks & Clerk, patent attorneys. (Jr. 1945.)

References: A. E. MacRae, H. R. Fee, F. T. Boutilier.

HOWARD—ALBERT WARREN, of Montreal, Que. Born at Calgary, Alta., on Nov. 27, 1913. Educ.: B.A.Sc. (Elect.) Toronto, 1935; R.P.E. Que.; 1935-39, Calgary Power Ltd.; 1940-47, Montreal Engineering Co.; at present asst. to supervisor of Northern Properties of Mtl. Engrg. Co. Ltd. (St. 1931. Jr. 1941.)

References: H. J. McLean, J. H. McLaren, G. H. Thompson J. T. Farmer, W. R. Davis, A. C. D. Blanchard.

HUNTER—LAWRENCE McLEAN, of Toronto. Born at Ottawa on May 9, 1913. Educ.: B.Sc. (Civil) Queen's, 1936; R.P.E. Ont.: 1936-37, jr. engr., General Supply Co. of Canada & M. H. Detrick Co., Chicago, Ill.; with Coca Cola Ltd. as follows: 1937-40, engrg dept.; 1940-42, asst. to Mgr. of engrg. dept.; 1942, mgr. engrg dept., Toronto. (St. 1936. Jr. 1942.)

References: G. L. Wallace, N. B. MacRostie, C. D. Carruthers, D. S. Ellis.

JAGGER—PAUL SELWYN, of Vancouver. Born at Halifax on Oct. 31, 1921. Educ.: B.A.Sc. (Mech.) British Columbia, 1944; summer work as follows: 1942, machinist Boeing Aircraft, Vancouver; 1944-45, Officer Training Course, (Lieut.) R.C.E.M.E.; 1945-46, test course, Canadian General Electric, Peterboro; 1946-47, jr. engr., The Barrett Co. Ltd., Montreal; 1947 to date, plant engr., The Barrett Co. Ltd., Vancouver. (St. 1941. Jr. 1946.)

References: W. A. Messenger, M. L. Sherwood, J. N. Finlayson, H. J. MacLeod, W. O. Scott, G. R. Langley.

JARRELL—GORDON JAMES, of Toronto. Born at Port Hope, Ont., on Oct. 18, 1911. Educ.: B.A.Sc., Toronto, 1934; R.P.E. Ont.; with the Beatty Bros., Fergus, Ont., as follows: 1935-37, 6 mos. time study, 13 mos. inspector; 2 mos. dftsman; 1937-42, equipt engr. with Willard Storage Battery Co.; at present plant engr. (Jr. 1937.)

References: W. G. McIntosh, D. Johnston, E. R. Graydon, E. A. Allcut.

KARN—WILLIAM MATHESON, of Toronto. Born at Woodstock, Ont., on Sept. 17, 1917. Educ.: B.A.Sc., Toronto, 1940; summer work as follows: 1938, Combustion Engineering Corp., 1939, erection of boiler for Ford Motor Co. of Canada, Windsor; with the Electric Reduction Sales Co. Ltd., as follows: 1940-42, on chemical sales and service; 1942-45, chemical research, plant develop., plant operation; at present, vice president and secretary, chemical sales and technical service, Toronto. (Jr. 1943.)

References: A. E. MacRae, I. R. Tait, H. C. Karn, R. M. Prendergast, O. R. Woermke, G. J. Crane.

KAY—BRUCE EDGAR ANDERSON, of Montreal. Born at Montreal on Nov. 30, 1914. Educ.: B.Eng. (Chem.) McGill, 1933; summer work as follows: 1936, laboratory chemist, Belding Corticelli; 1937, lab. chemist, Canada & Dominion Sugar; 1938-46, research and control chemist, St. Lawrence Sugar Refineries. (St. 1938. Jr. 1946.)

References: J. B. Phillips, J. C. Loiselle.

KENNEDY—THOMAS FOWLER, of Amherst, N.S. Born at Woodstock, N.B., Jan. 27, 1914. Educ.: B.Sc. (Civil) New Brunswick; summer work, 1939 and 40, topographic surveying, N.B. Dept. of Lands & Mines; 1941-45, navigator, Royal Canadian Air Force, 1944-45, chief ground instructor, R.C.A.F. station, Pennfield Ridge (Squadron Leader); 1945-46, regional representative Research & Development Branch, Dept. of Reconstruction & Supply, P.E.I.; 1946 to date, superintendent, Plant No. 2, Enamel & Heating Products Ltd., Amherst, N.S. (Jr. 1945.)

References: E. O. Turner, J. L. Gray, B. P. Scull, R. Frigon, D. M. Vye.

KERSHAW—NORMAN WILLIAM, of Allendale, N.J. Born at Saskatoon on March 14, 1913. Educ.: B.Sc. (Mech.) Saskatchewan, 1933; 1933-34, instructor in engrg. Univ. of Sask.; 1934-35, project engr. Dominion Oilcloth; with Eagle Pencil Co. as follows: 1935-38, plant supt.; 1938-39, technical advisor, London, England; 1939-47, plant engr. New York; 1941-43 also, lecturer. Defense Training Courses, New York Univ. (St. 1935. Jr. 1937.)

References: W. G. Worcester, J. M. Taylor, N. B. Hutcheon, I. M. Fraser, W. N. Papove, J. E. Underwood.

KILLAM—FRANK RICHARD, of Vancouver, B.C. Born at Sackville, N.B., on Aug. 1, 1912. Educ.: B.Eng. (Mech.) McGill, 1937; R.P.E. B.C.; 1933-39, dftsman. and engr. Fraser Companies Ltd.; 1939-44, engr. Restigouche Co. Ltd.; 1942-44, coordinator Can. Pulp & Paper; 1945, engr. Crossman Machinery Co. Ltd.; 1945-46, partner Killam & Crossman; 1946 to date, president and managing director, Industrial Coatings Ltd. (St. 1937. Jr. 1940.)

References: F. O. White, R. M. Carmichael, W. A. Bain, P. R. Sandwell, F. Allen, C. Baggs, F. H. Palmer, E. Cowan.

KING—JAMES MALCOLM, of Peterborough, Ont. Born at Toronto on April 17, 1917. Educ.: B.A.Sc., Toronto, 1940. R.P.E. Ontario; summer work as follows: 1937, Falconbridge Nickel Mines, Smelter Metallurgical Control; 1938, Cons. Min. & Smelt. Co., Trail, B.C., 1938, Ont. Research Foundation, varied metallurgical research; 1940-41, control of metallic materials and metallurgical processes, Peterborough Works of Can. Gen. Elect. Co.; 1941, chief metallurgist, and general foreman of heat treating dept., Genelco Ltd.; 1943, metallurgist for Peterborough Works of Can., Gen. Elec. and in advisory capacity for Genelco Ltd. until its dissolution. (Jr. 1945.)

References: G. R. Langley, R. L. Dobbin, A. L. Malby, I. F. McRae, F. R. Pope.

LAW—ERNEST GERALD, of Calgary, Alta. Born at Calgary on Jan. 20, 1918. Educ.: B.Sc. (Elect.) Manitoba, 1938; 1938-40, student test and design engr. Canadian General Electric Co.; 1940-41, anti-submarine equipt. instaln. officer 1941-43, material and equipt. asst. to Director of A/S warfare; 1943-44, O/C anti-submarine technical liaison between Royal Can. Navy and Admiralty; 1944-45, tech. asst. to dir. of elect. supply, N.S.H.Q.; 1945-46, tech. rehabilitation officer; 1946, asst. gov. trade commissioner, Dept. of Trade & Commerce, Ottawa; at present executive engr., Northland Home Products Ltd. (St. 1938. Jr 1946.)

References: R. T. Harland, F. A. P. Athey, G. L. Stephens R. A. Brown, J. Deane, E. P. Fetherstonhaugh, E. G. Cullwick

LEDUC—JOSEPH DONAT RENE, of Sorel, Que. Born at Montreal on Dec. 18, 1915. Educ.: B.A.Sc. (C.E.) Ecole Polytechnique, 1939. R.P.E. Quebec; summer work as follows, gravel inspector, Quebec Highway Asphalt plant inspector, Laboratoire Technique Ltee.; 1939-41, resident engr. Quebec Highway; 1941-42, survey and preparation of projects, Consolidated Paper Corp.; 1942-43, Lieut. R.C.E.; 1943-44, execution of contracts in road construction, St. Laurent Reg'd. 1944-46, asst. plant engr., Warden King Ltd.; at present asst. to superintendant of Mechanics Marine Industries Ltd., Sorel. (Jr. 1942.)

References: J. A. Lalonde, L. Trudel, P. P. Vinet, A. Gratton, A. A. Wickenden.

LEIGHTNER—DONALD BENJAMIN, of Welland, Ont. Born at Jansen, Sask., on April 10, 1908. Educ.: B.Sc. (Elec.) Manitoba; R.P.E. Ont.; with Canadian Westinghouse Co. Ltd., as follows: 1931-32, apprentice course; 1933-35, engrg. dept., transformer design; 1935-46, engrg. dept. motor design of polyphase squirrel cage, induction motors, design of wound rotor and special motors; 1946 to date, motor engr. i/c of design, Commonwealth Electric Corp. Ltd. (St. 1929. Jr. 1936.)

References: J. R. Dunbar, J. C. Nash, G. M. Bell, E. R. Fetherstonhaugh, D. W. Callander.

LEROUX—FRED CLEMENTS, of Vancouver, B.C. Born at Weyburn, Sask., on June 17, 1913. Educ.: B.Sc. (Agric. Eng.) Saskatchewan, 1939; R.P.E. B.C., 1933-38, three years shop experience, J. H. Early Motors & J. I. Case Co., Saskatoon; 1938, resident engr. and instru'man, Scott Experimental Station; 1939, mechanics instructor, Univ. of B.C. extension Dept.; 1940-41, research asst. Univ. of Missouri; 1941-42, field engr. B.C. Plywoods; 1942, resident engr. and instru'man, Dept. of Transport, air constrn.; 1942-45, navigation instructor R.C.A.F.; 1945, asst. engr. Topographical Survey of H. R. MacMillan Vancouver; 1946, plant engr. Universal Box Co. (St. 1939. Jr. 1942.)

References: J. Rattenbury, P. N. Bland, C. D. Schultz, J. L. Miller, J. E. Beamish, C. J. Mackenzie, E. A. Hardy.

L'HOMME—LOUIS PHILIPPE, of Montreal, Que. Born at Farnham on March 10, 1912. Educ.: B.A.Sc. (C.E.) Ecole Polytechnique, 1940. R.P.E. Quebec; 1940 to date, asst. distribution engr., Southern Canada Power Co. (St. 1937. Jr. 1940.)

References: D. Anderson, R. Meloche, L. Trudel, F. A. Chisholm.

McARTHUR—DUNCAN ROBERT BALY, of Vancouver, B.C. Born at Yonkers, N.Y., on July 23, 1918. Educ.: B.A.Sc. (Elec.) Toronto, 1940, R.P.E. Ont.; summer work as follows: 1937, pole and line inspector, Bell Telephone Co. of Canada; 1938, jr. engr. H.E.P.C. of Ont.; 1939, line surveyor, transmission dept., H.E.P.C.; with R.C.E.M.E. as follows: 1940-41, O/C light aid detachment; 1942-43, Tech. Office on staff, mech. engrg. Can. Hdqrts., London, England; 1943-45, Deputy Asst. Director, (Major) responsible for detailed planning of organization and administration; 1945-46, Lieut. Col. Dept. of National Defense, Ottawa; 1947 to date, management engr. Stevenson & Kellogg Ltd., installn. of efficient business method in plants, businesses, Vancouver office. (St. 1940. Jr. 1946.)

References: H. G. Thomson, C. R. Boehm, R. L. Franklin, K. H. McKibbin, P. Kellogg, N. O. Paquette.

McCAREY—JOSEPH NEWELL, of Belleville, Ont. Born at Kingston, Ont., on Feb. 19, 1912. Educ.: B.Sc. Queen's 1935; R.P.E. Ontario; 1935-37, dftg. and designing, Dominion Engineering Works; Lachine; 1937-38, dftg. and designing, Can. International Paper Co., Temiskaming; 1938-39, dftg. and designing Wabi Iron Works, New Liskeard, Ont.; 1939 (6 mos.) Hall Machinery Co., Sherbrooke, Que.; 1939-40, dftg. and designing, Stephens Adamson Mfg. Co. of Canada; 1940-42, designing and engrg., foundry production equipt. Ford Motor Co. of Can.; 1942, engrg. and dftg., June 1946, asst. chief engr., Stephens Adamson Mfg. Co. of Can. Belleville, Ont. (Jr. 1937.)

References: H. J. Whiting, A. D. Harris, W. P. Nesbitt, V. W. MacIsaac.

McCOLL—WILLIAM ROSS, of Hamilton, Ont. Born at Windsor, on March 22, 1911. Educ.: B.A.Sc. (C.E.) Toronto, 1933; 1928 and 1932 summers with McColl & Patterson Ont. Land Surveyor & Municipal Engrs. of Windsor and Walkerville, Ont.; 1935-36, Nakina (Northwest Ont.) group of unemployment relief camps constructing intermediate landing field of Trans Canada Airways, served as group instru'man, dftsman., then as foreman i/c of projects at Amesdale, Sioux Lookout; 1936-47, rolling mills div. Hamilton Works, Steel Co. of Canada Ltd.; 1936-37, materials handling studies; 1937-39, asst. supt. of Ont. works; 1939-42, on staff of supt. of mills handling various production and quality problems; 1942 to date, general turn foreman of Bloom & Billet Mills, Hamilton, Ont. (St. 1933. Jr. 1938.)

References: C. J. Porter, E. T. W. Bailey, R. E. Butt, A. E. Tuck, W. E. Brown, E. G. Wyckoff, L. C. Sentance.

McCULLOCH—URBAN FRANCIS, of Montreal. Born at Ottawa on July 27, 1919. Educ.: B.Eng. (Civil) McGill, 1942; R.P.E. Que.; summer work as follows: 1940 and 41, dftsman., Dominion Bridge Co.; 1943-45, Technical Officer, director of Artillery, NDHQ; 1945-47, designing engr., Foundation Co. of Canada; 1947 to date, designing engr., Jr. partner O. J. McCulloch Consulting Engrs. Mtl. (St. 1942. Jr. 1946.)

References: W. Griesbach, R. E. Chadwick, R. F. Shaw, A. J. Grant, A. G. S. Murphy.

McDERMOTT—BURTON DUNCAN, of Montreal. Born at Three Rivers, Que., on Feb. 12, 1917. Educ.: B.Sc. (Civil) New Brunswick, 1939; 1936 and 39, summers, New Brunswick Highway Dept.; 1939-43, instru'man, Fraser Brace Engrg. Ltd.; 1943-45, Royal Canadian Navy, (Lieut.); 1945-46, Fraser Brace Engineering Ltd.; at present, project engr. J. L. E. Price & Co. Ltd. (St. 1939. Jr. 1946.)

References: A. T. Bone, C. E. Parish, A. S. Rutherford, E. A. Ryan, G. R. Stephen, W. J. McAdam.

McINTYRE—DONALD JAMES, of Wallaceburg, Ont. Born at Chatham on June 6, 1918. Educ.: B.Sc. (Civil) Queen's, 1940; R.P.E. Ont.; 1940, structural dftg., Canadian Bridge Co. Ltd., Walkerville, Ont.; 1940-45, Officer, Royal Can. Engrs., (overseas) with National Pressure Cooker Co. (Canada) as follows: 1945-47, planning engr. i/c plant layout, expansion, methods devlpt., tool design; 1947, foundry supt.; 1947 (7 mos.) plant supt. i/c production and mtce., Wallaceburg, Ont. (St. 1940. Jr. 1946.)

References: W. M. G. Mitchell, D. G. McGorman, J. D. Lee, J. G. Hoba.

MacKAY—NORMAN ALLISON, of Montreal. Born at Sydney, N.S., on April 17, 1913. Educ.: B.Eng. (Mech.) McGill, 1939; R.P.E. Que.; summer work as follows: 1934 and 36, shop training, Dominion Steel & Coal Corp.; 1937, boiler constrn. Babcock & Wilcox; 1938 and 39, plant training, shop, engrg. depts., Canada Metal Co. Ltd.; 1939-41, engr. lubrication plant, Dominion Steel & Coal Corp.; 1941, chief dftsman. Eastern Car Co., Gun Mounting Division; 1941, asst. engr. Trenton Industries; 1946 to date, engr. car div. steel sales, Dominion Steel & Coal Corp. (St. 1937. Jr. 1940.)

References: W. S. Wilson, C. M. Anson, M. I. Bubbis.

McLEOD—ARTHUR MALCOLM, of Ottawa. Born at Calgary, Alta., on Oct. 6, 1912. Educ.: B.Sc. (Elec.) Alberta, 1936; R.P.E. Ont.; 1936-37, Dept. Trade & Industry, Province of Alberta; with Canadian Westinghouse Co. as follows: 1937, student test course; 1939-40, sales and correspondence dept.; 1940, Inspection Board U.K. and Canada, test searchlights and generators; 1941-42, tech. asst. to inspector elec. engrg.; 1942-43, inspecting officer; 1943-45, Royal Can. Navy, Elect. Lieut., designing, instaln. and inspectn. naval and merchant ships; at present, partner in Sheppard Elect. Laboratories, Ottawa, servicing and supply of elect., scientific instruments, physical testing machinery. (St. 1937. Jr. 1940.)

References: B. G. Ballard, R. M. Morris, R. E. Hayes, F. A. Fleming, R. C. Silver.

McMILLAN—COLIN BROCK, of Montreal. Born at Toronto, on March 13, 1913. Educ.: B.Sc. (Civil) Queen's, 1936; R.P.E. Que.; 1936, instru'man Ont. Paper Co.; 1937, dftsman., Aluminum Co. of Canada; later concrete inspector; 1938-40, general civil office and field work, Saguenay Power Co.; 1941-42, engrg. and economic studies, jr. asst. engr., C.N.R., Mtl.; 1942-43, design of rig. for raising sunken tug and field work on same, C.N.R.; 1943-45, R.C.A.F. Navigation instructor 1946-47, asst. engr., preparation of reports, field investigation, design equipt. C.N.R.; at present, asst. engr., C. Davis Goodman, Architect. (St. 1936. Jr. 1941.)

References: H. C. Boyd, J. D. Sylvester, P. Mathewson, W. Cooper, C. Miller.

MAIN—HARDY LAWRENCE, of Toronto, Ont. Born at Hamilton on Feb. 20, 1912. Educ.: B.Sc. (Civil) Queen's 1940; R.P.E. Ont.; summer work as follows: 1936 and 39, instru'man i/c layout, constrn., structures, Dept. of Highways, Toronto Div.; 1939, contractor's engr. on constrn., dam, canal, powerhouse, Nova Scotia Light, Heat & Power by J. Patterson Constrn. Co., Brampton, Ont.; 1940-42, R.C.E., Staff Officer (Major) Directorate of Engrg. services, National Defence Hdqts.; 1943-45, Field Park Co. and R.C.E. Cmdr., England and continent; 1946-47, resident engr., Dept. of Highways 1947, asst. div. engr. supervising constrn. assisting in adm'tn of divisional forces, Dept. of Highways. (St. 1939. Jr. 1946.)

References: H. Kennedy, H. G. Bertram, J. B. Stirling, H. A. McKay, H. W. Love, R. S. Eadie.

MALMGREN—HARVEY RUSSELL, of Winnipeg, Man. Born at Winnipeg on Mar. 25, 1917. Educ.: B.Sc. (Elect.) Manitoba, 1939; R.P.E. Ontario; summer work as follows: 1937 and 39, machinist, Gregg Mfg. Co., Winnipeg; 1939 (6 mos.) dftsman. C.I.L. 1940, dftg. instructor, Dom. Prov. Vocl. Training School, Winnipeg; 1942-45, R.C.N.V.R. Elect. Lieut., directorate of elect. supplies i/c inspection, test production and engrg. of ASDIC equip.; 1945-46, elect. engr. at H.E.P.C. of Ont. station design dept.; at present, chief engr. and asst. supt., Malmgren Implement Mfg. Co., Winnipeg. (St. 1938. Jr. 1946.)

References: A. H. Hull, E. E. H. Hugli, E. P. Fetherstonhaugh, N. M. Hall.

MALONE—WILLIS PEYTON, of Montreal. Born at Montreal on Feb. 19, 1900. Educ.: B.Sc. (Mech.) McGill, 1925. R.P.E. Que., with Northern Electric Co. Ltd. as follows: 1926-37, technical engr., telephone div.; 1937-40, inspectn. engr.; 1940-42, asst. inspectn. supt.; 1942-45, service engr.; 1945 to date, asst. inspectn. supt. telephone contract div., Mtl. (St. 1925. Jr. 1929.)

References: C. A. Peachey, J. G. Little, L. A. Duchastel, L. A. Wright, E. R. Smallhorn.

MILLER—JOHN JOSEPH, of Arvida, Que. Born at Hamilton, Ont., on Dec. 16, 1917. Educ.: B.A.Sc. Toronto, 1939; 1940-45, ore plant supervisor; 1945-47, asst. supt. of ore plants Aluminum Co. of Canada, Arvida, Que. (Jr. 1945.)

References: F. T. Boutilier, G. M. Mason, J. F. Braun, B. E. Bauman, J. W. Ward, W. F. Campbell, J. T. Nichols.

MITCHELL—DAVID ALEXANDER, of Toronto. Born at McTaggart, Sask., on Jan. 27, 1912. Educ.: B.A.Sc. Toronto, 1937; R.P.E. Ont.; 1937-38, elect. engr., Brown Corp., La Tuque; with H.E.P.C. of Ont. as follows: 1938-40, electrician and asst. supt., constrn. dept.; 1940-45, resident engr. on Burlington Transformer Station; 1945-48, asst. engr., plant div. engrg. dept., Toronto. (Jr. 1938.)

References: H. V. Armstrong, H. E. Brandon, R. C. McMordie, E. C. Higgins, D. Forgan, D. D. W. Whitson.

MOORE—JOHN BEVERLY, of Mexico City. Born at Chatham, Ont., on Sept. 1, 1918. Educ.: B.A.Sc. (Civil) Toronto, 1940; 1940 structural detailer, Can. Bridge Co., Walkerville; with Arthur G. McGee & Co., Cleveland, Ohio, since 1940; 1940-41 field engr. constrn. of aviation gasoline refinery, Trinidad, B.W.I.; 1941-42, chief field engr. constrn. of blast furnace at Inland Steel Co., Chicago, Ill.; 1942-43, design engr., design of complete steel mill, Sheffield Steel Co., Houston, Texas; 1943-44, asst. constrn. supt. of oil refinery for Atlantic Refining Co., Port Arthur, Texas; 1944-45, design engr., refinery project for Petroleos Mexicanois in Mexico; 1945 to date, chief engr. of project, constrn. in Mexico. (St. 1940. Jr. 1943.)

References: C. R. Young, R. F. Legget, C. F. Morrison, D. T. Alexander, W. G. Mitchell.

NELSON—WILLIAM Andrew, of Highland Creek, Ont. Born at Campbellford, Ont., on July 18, 1912. Educ.: B.Sc. (Mech.) Queen's, 1937; R.P.E. Ont.; 1937, 6 mos. operator in training. H.E.P.C. of Ont.; 1937-38, demonstrator, mech. engrg. Queen's Univ.; 1938-39, cadet training course, Bailey Meter Co., Cleveland, Ohio; 1939-42, sales service engr.; 1942-46, R.C.E.M.E. Can. Army overseas; 1946 to date, sales service engr., Bailey Meter Co. Ltd., Toronto. (St. 1938. Jr. 1940.)

References: A. L. Stewart, H. J. Muir, J. D. Young, W. L Thompson, H. G. Conn.

NORMANDEAU—PAUL D., of Drummondville, Que. Born at Que. on Dec. 18, 1912. Educ.: B.A.Sc. (C.E.) Ecole Polytechnique, 1938; summers, 1931, to 37, geological survey, Que. Bureau of Mines; 1938-39, sales engr. Armstrong Cork & Insulation, Mtl.; 1939-40, dftsman. aircraft div., Canadian Car & Foundry Co. Ltd.; 1940 to date, asst. mgr. Eagle Pencil Co., Drummondville, Que. (St. 1936. Jr. 1940.)

References: A. Surveyer, L. Cartier, A. P. Benoit, deGaspe Beaubien.

NUTTER—JAMES RYAN, of Montreal. Born at St. John, N.B., on Feb. 16, 1920. Educ.: B.Eng. (Civil) Nova Scotia Technical College, 1944; summer work as follows: 1938, chainman, Dept. of Mines & Resources, Ottawa; 1939, instru'man Town of Truro, N.S.; 1940, chainman, Can. National Railways; 1941-42, instru'man Dept. of Transport, Moncton; 1944-45, asst. to Officer in charge of works Naval Base, Shelburne, N.S.; 1945-46, O/C of works Naval Base; at present, bridge inspector, Canadian Pacific Railway, Mtl. (St. 1942. Jr. 1945.)

References: J. E. Armstrong, R. B. Jones, G. E. Shaw, C. Neufeld, S. Ball, H. W. McKiel.

OSTIGUY—MAURICE, of Quebec City. Born at St. Hyacinthe on Nov. 20, 1912. Educ.: B.A.Sc. (C.E.) Ecole Polytechnique, 1938; R.P.E. Que.; 1938-43, asst. divisional engr. Brome & Shefford counties, 1943 to date, asst. district eng. Roads Dept. Quebec. (St. 1936. Jr. 1942.)

References: E. Gohier, L. Trudel, J. Laurence, R. Desjardins.

PAQUET—JEAN MARIE, of Sillery, Que. Born at Quebec on Nov. 27, 1909. Educ.: B.A.Sc. (C.E.) Ecole Polytechnique, 1934; R.P.E. Que.; 1935-36, sanitary engr. 1936, engineer of J. A. Y. Bouchard Inc., Quebec City. (St. 1934. Jr. 1938.)

References: P. Vincent, H. Cimon, G. Sarault, G. Martin.

PARSONS—RONALD ALBERT, of Cap De La Madeleine, Que. Born at Calgary on May 30, 1913. Educ.: B.Sc. (Civil) Alberta, 1938; R.P.E. Que.; 1935-37, instru'man, Dept. of Mines, Ottawa; 1938-39, field engr. Power Corp. of Canada; 1939-46, field engr. i/c surveys of transmission lines, sub stations; at present, resident engr., Hydraulic Power Development, Shawinigan Engineering Co. Ltd. (St. 1937. Jr. 1940.)

References: R. E. Heartz, G. Rinfret, A. L. Patterson, J. S. Whyte, J. A. McCrory.

PHEMISTER—WILLIAM IAN, of Brampton, Ont. Born at Niagara Falls on Jan. 16, 1915. Educ.: B.Sc. (Mech.) Queen's, 1940; R.P.E. Ont.; summers, 1936 and 40, Hydro Elect. Power Commission of Ont.; 1940, jr. engr. H.E.P.C. of Ont.; 1940-41, tool design engr., Fleet Aircraft Ltd.; 1941-44, loft supervisor, Victory Aircraft Ltd., Toronto; 1944-46, Royal Can. Navy Engr. Officer (Lieut.) 1946 to date, loft and reproduction supervisor, A. V. Roe Canada Ltd. (St. 1938. Jr. 1942.)

References: W. Czerwinski, Z. S. Cyma, J. Grant, R. S. McNellis.

PITTIS—RALPH COLIN ALFRED, of Toronto. Born at Toronto at May 20, 1913. Educ.: B.A.Sc., Toronto, 1938; R.P.E. Ont.; 1938-39, field engr. Foundation Co.; 1939 (5 mos.) field engr. Can. Kellogg Co. Ltd.; 1939-40, constn. inspector, Imperial Oil Ltd.; (5 mos.) field engr. Foundation Co. of Canada; 1940-44, inspection engr. for refineries, synthetic rubber plants, condensers, etc.; 1944-46, Canadian Army, engaged in technical work, testing Odograph under cold weather conditions; 1946-47, inspectn. engr. Can. Kellogg Ltd.; at present mtce. engr. under Supt. of Buildings, Univ. of Toronto. (Jr. 1940.)

References: R. H. Self, T. Dembie, W. E. Manock, C. F Morrison.

RAYNOR—WARREN S., of Montreal, Que. Born at Toronto on Nov. 22, 1914. Educ.: B.Sc. (Mech.) Queen's, 1939; R.P.E. Que.; 1939-40, instructor, mech. engrg. dept., Queen's Univ.; with Canadian Car & Fdy. Co., as follows: 1940-41, dftsman; 1941-44, chief engr., Amherst, N.S.; 1944-46, executive engr., St. Laurent, Que.; at present, engr., Brian R. Perry, Consulting Engr., Montreal. (Jr. 1941.)

References: B. R. Perry, W. B. MacLean, H. H. L. Creighton, E. V. Gage.

REIKIE—WILLIAM THORPE THOMSON, of Niagara Falls. Born at Kaslo, B.C., on Sept. 20, 1913. Educ.: B.Sc. (Elect.) McGill, 1936; 1936, elect. crew, Falconbridge Nichel Mines; 1937, elect. crew, Price Brothers; 1940-42, elect. crew, Warfield Plant Consolidated M. & S. Co. Ltd.; 1943-44, mine electrician, Negus Gold Mines; 1944-46, elect. engr. Giant Yellowknife Gold Mines; 1946-47, elect. design & dftg., Brompton Pulp Paper Co. Ltd., Red Rock; 1947 to date, elect. dftsman. and checker, H. G. Acres & Co., Niagara Falls, Ont. (St. 1936. Jr. 1946.)

References: R. A. H. Hayes, R. W. Emery, W. G. Stuart, E. N. Walton, R. M. Hardy.

RIGSBY—DAVID LORREN, of Kingston, Ont. Born at Galt, Ont., on April 15, 1917. Educ.: B.Sc. (Mech.) Queen's, 1940; summer of 1940, jr. engr. and dftsman. Sheldon's Ltd.; fall 1940, and 1942, aircraft examiner, British Air Commission, Washington, D.C., 1942, jr. engr. Aluminum Co. of Canada, Kingston; 1945-47, intermediate engr.; at present asst. plant engr. Aluminum Co. of Canada. (St. 1938. Jr. 1946.)

References: M. G. Saunders, C. E. Craig, D. S. Ellis, H. G. Conn, A. Jackson, J. D. Lee, M. E. Hornback, N. P. Taylor, L. F. Grant.

SCOTT—JAMES MUNRO, of Montreal. Born at Quebec City on Oct. 29, 1916. Educ.: B.Sc. (C.E.) New Brunswick, 1937; R.P.E. Que.; 1937-38, instru'man, New Brunswick Dept. of Public Works; 1939, plant engr., Gulf Pulp and Paper Co.; 1939-45, Royal Canadian Engineers (Captain) at present, asst. engr., civil, Montreal Harbour, work consists of design, specification, estimates for harbour installations. (St. 1937. Jr. 1939.)

References: G. Beaudet, W. Dixon, D. L. MacKinnon, T. S. McMilllan, R. F. Sadler, H. S. Spark.

SCRIMES—WALTER ROBERT, of Winnipeg, Man. Born at Winnipeg on Aug. 24, 1917. Educ.: B.Sc., E.E., Manitoba, 1940; summer work as follows: 1937 and 39, wireless course, Royal Cdn. Corps of Signals; 1940, test course, Can. Westinghouse Co.; 1940-45, (Major) R.C.S.; 1945 to date, asst. engr. Distribution engrg. dept. Winnipeg Electric Co. (Jr. 1946.)

References: E. V. Caton, L. M. Hovey, C. P. Haltalin, S. H. Eggertson, E. P. Fetherstonhaugh, N. Hall, W. F. Riddle, G. Herriot.

SHATFORD—RALPH GRANT, of Calgary, Alta. Born at Maccan, N.S., on Dec. 16, 1911. Educ.: B.Sc., Dalhousie Univ., 1933; B.Sc. (Elect.) Nova Scotia Technical College, 1935; with Imperial Oil Ltd. as follows: 1936-37, laboratory asst.; 1937-40, asst. meter engr.; 1940-42, metals inspector, responsible for all pressure equipment in refinery; 1942-46, mtce. engr.; 1947 (6 mos.) utilities engr., i/c boilerhouse, power house and water pumping stations; 1947 to date, mtce. engr., Calgary Refinery. (St. 1932. Jr. 1941.)

References: L. E. Mitchell, F. Tempest, C. Scrymgeour, M. Fraser, K. E. Bentley.

SHERWOOD—HARRIS MITCHELL, of Brownsburg, Que. Born at Medicine Hat, Alta., on Nov. 1, 1911. Educ.: B.Sc. (Chem. Engrg.) Alberta, 1933; 1935-38, methods engr., Canadian Industries Ltd., Ammunition Div.; 1938-39, engr. production planning and work simplification; 1939-40, spec. asst. to asst. works mgr.; 1940, shift supervisor, D.I.L.; later supt. D.I.L.; 1941-46, asst. works mgr., Ammunition Div., C.I.L., Brownsburg, Que. (St. 1935. Jr. 1939.)

References: E. L. Johnson, I. R. Tait, H. B. Hanna, H. C. Karn, G. D. McTaggart.

SHISKO—NICHOLAS, of Port Arthur, Ont. Born at Hearst, Ont., on Jan. 12, 1915. Educ.: B.Sc. (Mech.) Queen's, 1940; R.P.E. Ont.; 1940 (5 mos.) mech. dftsman. Kirkland Lake Gold Mining Co.; 1940-41, lecturer in dftg., Queen's Univ.; 1941, asst. plant engr. Canadian Locomotive Co.; 1942, jr. works engr., Small Arms Ltd.; 1942-44, mech. engr. Steel Co. of Canada; 1944-46, R.C.E.M.E. Lieut.; 1946 to date, constrn. engr. Thunder Bay Paper Co., Port Arthur. (St. 1938. Jr. 1943.)

References: W. H. Small, E. G. Sellers, G. M. Lyon, T. C. Anderson, D. D. Reeve.

SMYTH—WILLIAM CHRISTOPHER, of Montreal. Born at North Bay on Jan. 25, 1914. Educ.: B.Eng. (Civil) McGill, 1935. R.P.E. Que.; summer work as follows: 1924-30, constrn. and engrg. work Welland Ship Canal; 1930, Dept. Railways & Canals; foreman, Rayner Constrn. Co., 1930-36, instru'man Angus Robertson Ltd., Chicoutimi; with H. J. O'Connel Ltd. as follows: 1936, asst. engr. Laniel & Mud Lake Highways; 1937-38, asst. supt. on Ste. Anne de la Parade; 1942, Munition Dump at L'Acadie; 1942-45, Seven Islands Airport; at present, supt. i/c for H. J. O'Connell Ltd. (St. 1935. Jr. 1940.)

References: O. Doob, A. J. Grant, E. S. Miles, O. J. McCulloch, A. O. Dufresne, R. W. McColough, A. S. Donald, F. C. Jewett.

SOICHER—PERCY ARTHUR, of Montreal. Born at Proskurov, Russia, on Oct. 16, 1918. Educ.: B.Eng. (Mech.) McGill, 1940, M.Sc. Univ. of Michigan, 1941; 1941-42, chassis designer, General Motors of Canada Ltd., Oshawa; 1942-46, R.C.E.M.E. (Lieut.), acting Capt. service in Canada, overseas as workshop officer, design and testing of Hydraulic equipt., turbines, pumps valves; 1946 to date, designer, hydraulic div., Dominion Engrg. Works Ltd., Lachine. (Jr. 1946.)

References: H. S. Van Patter, R. DeL. French, W. S. McIlquham, S. J. Aboud, A. D. Fish.

SOLES—WILLIAM E., of Quebec, Que. Born at Derby, Vt., on July 2, 1912. Educ.: B.Sc. (Mech.) Queen's, 1935; R.P.E. Que.; 1935-37, control eng. Anglo-Canadian P. & P. Mills; 1937-38, control eng. Gaspesia Sulphite Co. Ltd.; 1938-40, asst. gen. supt.; 1940-42, asst. to gen. mgr. Anglo-Can. P. & P. Mills; 1945-47, mill mgr.; 1947, asst. gen. mgr., Quebec, Que. (St. 1935. Jr. 1938.)

References: J. O'Halloran, L. Beaudry, G. F. Layne, J. O. Martineau, D. S. Ellis.

SUTHERLAND—GORDON ALEXANDER, of Ottawa, Ont. Born at Winnipeg, Man., on Oct. 31, 1913. Educ.: B.Sc. (E.E.) Manitoba, 1934; 1934-35, dftg., Fetherstonhaugh & Co., Patent Attorneys, Winnipeg; 1937-39, dftg. and design, Kipp-Kelly Ltd. Engrs.; 1939-40, engr., Western Steel Products Corp. Ltd., Mtl.; 1940-46, administrative asst. to Dr. R. W. Boyle, Dir. Div. of Physics & Elect. Engrg. National Research Council; 1946 to date, administrative asst. Elect. Engrg. & Radio Branch, N.R.C. (Jr. 1938.)

References: E. P. Fetherstonhaugh, R. W. Boyle, B. G. Ballard, R. E. Hayes, D. C. Rose.

TORRINGTON—FRANK DELBRIDGE, of Toronto. Born at Davidson, Sask., on Oct. 9, 1912; R.P.E. Ont.; 1940-41, gear inspection and investigations, Acme Screw & Gear, Toronto; 1941-43, R.C.A.F., aircraft inspection, specfn. flight engr. tests, design checking, material substitutions; 1943-46, aircraft mtce.; 1947 to date, design engr., Hydraulic Dept. H.E.P.C. of Ont. (St. 1940. Jr. 1942.)

References: E. G. Tallman, E. A. Sudden, S. W. Black, A. G. Grant.

WALL—JAMES GILBERT, of Montreal. Born at St. Stephen, N.B., on Feb. 12, 1915. Educ.: B.Sc. (Elect.) New Brunswick, 1939; 1939-41, radio engr. and operator, Radio Station CFNB, Fredericton; 1941-43, jr. radio elect. engr. Dept. of Transport, radio div. aviation section; 1943-46, asst. radio elect. engr. installn. & mtce., frequency radio range stations, experimental instrument landing; 1946-47, acting district radio aviation engr., admin. constrn. and mtce. airway radio facilities, Dept. of Transport. (St. 1939. Jr. 1946.)

References: H. J. Williamson, W. E. Fenn, A. K. Bayley, A. F. Baird, S. B. Cassidy.

WALLACE—IVAN MORROW, of Windsor, Ont. Born at Seagrave, Ont., cn Oct. 4, 1911. Educ.: B.A.Sc., Toronto, 1934; R.P.E. Ont.; 1934-36, surveys; 1937-45, dftg. estimating, designing, Canadian Bridge Co. Ltd., 1944, structural designing for architects on a consultant basis; 1946 to date, design.ng engr. and sales mgr., London Steel Construction Co. Ltd. (Jr. 1939.)

References: P. E. Adams, G. G. Henderson, W. R. Stickney, H. A. McKay, F. Ryder.

WALTER—JOHN, of Toronto. Born at Madison, Sask., on May 28, 1910. Educ.: B.Sc. (Civil) Queen's, 1933. R.P.E. Ont.; 1935-36, office design and constrn. engr. Dept. of National Defence; 1937-39, instru'man, Highway constrn.; 1939-44, testing of Highway materials; 1944-47, chief of soils and research div. of material testing. (St. 1933. Jr. 1936.)

References: R. M. Smith, A. A. Smith, D. S. Ellis, A. H. Douglas, R. F. Legget, M. W. Huggins, T. F. Francis, R. A. Low.

WESTON—JOHN FILLMORE, of Tillsonburg, Ont. Born at Tillsonburg on Oct. 28, 1911. Educ.: B.A.Sc., Toronto, 1934; summer work as follows: 1931 and 34, foundry and machine shop, Beaver Foundry & Furnace Works; 1945, distribution of costs, Borden Co.; 1935-37, experimental development, production control work, Gutta Percha & Rubber Co.; 1937-38, engrg. dept., accounting mtce. and alterations, Cellophane div. C.I.L. Shawinigan Falls; 1938-39, production costs, Aluminum Co. of Canada; 1939-45, R.C.E.M.E. technical staff officer with small arms ammunition div., Inspection Board U.K. and Canada; 1946 to date, private practice, general engrg. business consultant, design supervision of swimming pools, apt. bldg., surveying patent applications, determining rates for public utilities water system, Tillsonburg, Ont. (Jr. 1939.)

References: J. H. Johnson, J. A. Vance, V. A. McKillop, F. T. Julian, W. L. Shelden.

WIEBE—LESLIE, of Montreal, Que. Born at Herbert, Sask., on Sept. 14, 1911. Educ.: B.Sc. (Mech.) Saskatchewan, 1940; 1940, dftsman. (4 mos.) production control and tool design; (6 mos.) asst. engr. Sutton Horsley Co. Ltd., Toronto; 1941-43, chief dftsman. MacDonald Bros. Aircraft Ltd.; 1943-44, tool design engr. Neon Products of Western Canada Ltd.; with Canadair Ltd. as follows: 1944-46, furnishings section chief, design office; 1946-47, on loan to Douglas Aircraft Co. Inc., Santa Monica, Cal. as stress analyst; 1947 to date, weights group leader, i/c weight control DC-4M series of aircraft, Mtl. (St. 1939. Jr. 1942.)

References: J. T. Dyment, C. Neufeld, D. C. MacCallum, L. G. Scott, E. A. Harvey.

WRAY—ROBERT HOUSTON, of Calgary, Alta. Born at Irricana, Alta., on Aug. 22, 1913. Educ.: B.Sc. (Elect.) Alberta, 1939; 1941-42, technical storeman, National Supply Co.; 1942-46, R.C. E.M.E. Armament Officer, army field equipment; 1946 to date, elect. engr. and tech. asst. Calgary Transit System, Calgary. (St. 1939. Jr. 1946.)

References: J. F. Langston, R. MacKay, C. V. F. Weir, F. T. Gale, C. Z. Monaghan, J. W. Porteous.

Employment Service

The 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 therefore be particularly appreciated if employers would make the fullest possible use of these facilities to make known their existing or estimated requirements. Notices appearing in the Situations Wanted column will be discontinued after three insertions, and will be re-inserted upon request after a lapse of one month. Personal interviews by appointment.

Situations Vacant

CHEMICAL

SENIOR CHEMICAL ENGINEER OR CHEMIST, required by leading Paper Manufacturer in Easter Canada. Applicant should have some experience in Paper Mill Control work. This position offers plenty of scope for advancement. Salary open. Apply to File No. 4013-V.

*CHEMICAL ENGINEER OR CHEMIST, preferably with experience in production of chemicals and operation of chemical equipment such as filter presses, evaporators and vacuum jets. Required by an industrial chemical plant in the Quebec area. Salary according to qualifications. Apply to File No. 4039-V.

ELECTRICAL

ELECTRICAL ENGINEER to take charge of hydro electric maintenance involving four or five plants. Salary open. Apply to File No. 4015-V.

ELECTRICAL ENGINEER experienced in Power Station, Transmission and Distribution design and installation. Permanence and advancement depending upon performance. Salary open. Apply to File No. 4024-V.

JUNIOR ELECTRICAL ENGINEER, required by a mining company in Northern Ontario. Salary open. Apply to File No. 4028-V.

ELECTRICAL ENGINEER with minimum of 5 years experience in paper industry, between 35-45 years of age, for responsible position with large newsprint manufacturing concern in Northern Ontario. Salary commensurate with qualifications. Living accommodation assured. Apply to File No. 4032-V.

ELECTRICAL ENGINEERS with some experience in research, design, and development, backgrounds in communications, electronics, power or physics are preferred. Required for the staff of a technical college in N.Y. state. Salary and rank will be commensurate with experience and training. Apply to File No. 4038-V.

MECHANICAL

MECHANICAL ENGINEERS, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

MECHANICAL ENGINEER, required for paper mill converting department of large Paper Manufacturer in Eastern Canada. Preferably with experience in Production and Mechanical maintenance. Salary open. Apply to File No. 4013-V.

*MECHANICAL ENGINEER required for chemical plant in Ontario. Duties include production, maintenance and repairs on equipment as well as engineering the location of new equipment or in relocation of present equipment. Salary $300 to $350 or more if experience warrants it. Apply to File No. 4025-V.

MECHANICAL ENGINEERS required in Ontario by a firm specializing in machine tools. Vacancies exist for Junior Salesman with ability and interest in sales engineering also engineer experienced in Production control. Salaries open. Apply to File No. 4026-V.

MECHANICAL ENGINEER required by a road building and earth moving machinery manufacturer in Ontario. Position to eventually lead to General Plant Superintendent. Preferably veteran. Salary open. (Application by letter only.) Apply to File No. 4029-V.

MECHANICAL DRAUGHTSMAN required by large metallurgical firm in the Maritimes for simple designing, layout and detail drawings for colliery plant, screening equipment, hoists, simple steel structures, etc. Salary $240.00 up depending upon ability. Apply to File No. 4030-V.

MECHANICAL ENGINEER preferably with heating and ventilating experience required in Montreal for design and draughting. Salary depending on experience. Apply to File No. 4034-V.

MISCELLANEOUS

*ENGINEER DRAUGHTSMAN for both design and maintenance work, needed in a Montreal Brewery. A six-month preparatory course will be given on steam refrigeration, operating machinery and instrument control equipment in the plant. Starting salary $215.00. Apply to File No. 3670-V.

STRUCTURAL ENGINEER DRAUGHTSMAN, required by a firm of engineer contractors in Alberta. Duties include structural detailer and requires knowledge of major concrete foundations; to detail structural steel buildings, access tower platforms and miscellaneous small steel structures. Salary $300.00. Apply to File No. 3972-V.

DRAUGHTSMAN required by a firm of engineer contractors in Alberta for layout of pipelines and details in refinery construction. Preferably background of refinery experience or alternately powerhouse piping or heavy industrial draughting. Salary $300.00 Apply to File No. 3972-V.

DESIGNING DRAUGHTSMEN preferably graduates in mechanical or electrical engineering with at least 5 years experience in manufacture of sulphite or newsprint pulp required in Province of Quebec. Good salaries and opportunities for advancement. Permanent employment. Apply to File No. 4014-V.

* Filled since appearance in advance notice.

ASSISTANT CITY ENGINEER with experience in municipal engineering required by Sask. City. Duties include operation of pumping sewage disposal and asphalt plants also building inspection department and concrete construction. Salary $4,000 to $4,500. Apply to File No. 4017-V.

ELECTRICAL OR MECHANICAL ENGINEERS required by large Montreal firm to prepare and analyze specifications for telephone equipment manufacturing and installation. Other types of engineering work also available. Salary open. Please send photo together with particulars of education and experience. Apply to File No. 4018-V.

MECHANICAL, STRUCTURAL AND ELECTRICAL ENGINEERS, required in Trail, B.C., as Designers, Draughtsmen and Construction Cost Estimators for Mining, Metallurgical, Chemical and Fertilizer Plant Design and layout. Salary open. Apply to File No. 4023-V.

ARCHITECTURAL DRAUGHTSMAN experienced in industrial building construction, with natural aptitude for design work, wanted by large industry in Eastern Townships, good salary, permanent position to the right man. Apply to File No. 4031-V.

GRADUATE ENGINEER, CHEMICAL OR MECHANICAL. Age 26 to 29, to act as Sales Engineer for Bituminous Coal Importing Company in Province of Quebec. Previous industrial combustion experience helpful but not essential. Must be prepared to travel. Salary $350.00 per month. Application in confidence. Apply to File No. 4033-V.

PLANT ENGINEER, mechanical background, aged 35 to 40, required to modernize plant in Quebec. Duties include setting up and maintenance of paper machinery. Salary $4,500 to $5,000. Apply to File No. 4035-V.

DESIGNING ENGINEERS OR DRAUGHTSMEN, preferably but not necessarily with experience in Pulp and Paper Mill work required for paper mill in Newfoundland. Salaries $300.00 per month or better depending upon experience and ability. Apply to File No. 4036-V.

CHEMICAL OR MECHANICAL ENGINEER GRADUATE, age not over 26, required by Montreal firm for industrial combustion service. Salary $250.00 per month up, depending upon qualification and previous experience. Application in confidence. Apply to File No. 4037-V.

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

CHEMICAL

CHEMICAL ENGINEER OR CHEMIST, perferably with Ph.D., required by a pulp and paper company with plants in Eastern Canada, for research work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER required by a pulp and paper company with plants in Eastern Canada, for mill control and pilot plant work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER OR CHEMIST interested in textile dyeing required by an industrial firm in South Western Quebec. Salary open. Apply to File No. 3798-V.

CHEMICAL ENGINEER with considerable mechanic and hydraulic experience or mechanical engineer with good chemical knowledge and experience in hydraulics, required by a manufacturer in Ontario. Salary open. Apply to File No. 3928-V.

CHEMICAL ENGINEER, recent graduate, required to study and become experienced with industrial products fabricated from carbon or graphite by firm in Toronto area. Position to eventually lead to sales. Salary $180 to $200. Apply to File No. 3958-V.

CHEMICAL ENGINEER, recent graduate, is needed by a chemical manufacturing firm situated in the Province of Quebec. Some experience in oil refinery, pulp and paper, or synthetic resin manufacture would be useful. Salary open. Apply to File No. 3978-V.

Chemical or Mechanical Engineer

Age 26 to 29, to act as Sales Engineer for Bituminous Coal Importing Company, in Province of Quebec. Previous industrial combustion experience helpful but not essential. Must be prepared to travel. Salary $350.00 per month. Application in confidence. Apply to File No. 4033-V.

CHEMICAL ENGINEER OR CHEMIST wanted by large manufacturers of bleached sulphate pulp for their Technical and Development Department. Several years' experience preferably in the pulp and paper industry. Mill located in Northern Ontario. Salary open. Apply to File No. 3991-V.

CHEMICAL ENGINEER, experienced in use of physics and mathematics, under 30 years of age, required by industrial and chemical organization with Headquarters in Montreal. Duties include development work and study explosives and chemistry and hydro-dynamics. Salary open. Apply to File No. 3995-V.

CIVIL

CIVIL ENGINEER to take charge of work in a drainage district in Quebec. Must be bilingual, may be recent graduate. Salary from $200. Apply to File No. 3479-V.

CIVIL ENGINEERS with experience in detailing and designing structural steel and reinforced concrete for manufacturers are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

CIVIL ENGINEERS, recent graduate up, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

GRADUATE CIVIL ENGINEER, required by a public utility in the Montreal area, with three or four years' experience in design of reinforced concrete and structural steel. Salary $250-$300. Apply to File No. 3766-V.

CIVIL ENGINEERS with some experience on design and field work required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

CIVIL ENGINEERS required as draughtsmen in bridge department of large transport company. Preferably with experience in steel, concrete and timber construction. Location Montreal. Salary $200-$300. Apply to File No. 3884-V.

CIVIL ENGINEER required in New Brunswick. Must be qualified designer of miscellaneous public utility buildings in frame and masonry construction. Thorough working knowedge of timber, reinforced concrete and steel framing essential, knowledge of the design of various types of heating system and plumbing. Salary open. Apply to File No. 3887-V.

CIVIL ENGINEER required as Town Engineer of a town in the Maritimes. Required to supervise and layout work for Water and Sewerage Department, also construction of a general nature for the Electic Light Department. Salary open. Apply to File. No. 3930-V.

CIVIL ENGINEER, required by a Steel Company in Montreal for the design of reinforced concrete frame. Salary open. Apply to File No. 3931-V.

JUNIOR CIVIL ENGINEER, with some structural experience, required for general duties by a textile manufacturing concern near Montreal. Salary around $300. Apply to File No. 3954-V.

GRADUATE CIVIL ENGINEER with some experience in municipal work required as Assistant to the Director of Community Planning of the Province of Saskatchewan. Starting salary $200-$250. Apply to File No. 3957-V.

CIVIL ENGINEER, recent graduate, required to understudy City Engineer of a city in Western Quebec. Salary open. Apply to File No. 3966-V.

JUNIOR ENGINEER, preferably with civil background required for sales and service by a Montreal manufacturer of waterproofing compounds. Salary open. Apply to File No. 3968-V.

CIVIL ENGINEER required in Montreal with considerable experience in design of reinforced concrete and steel structures. Ability to make stability reports of wharves and retaining walls, also draft specifications, prepare estimates and economic studies. Preferably bilingual and veteran with overseas service. Salary not less than $3,480. Apply to File No. 3987-V.

CIVIL ENGINEER required in Montreal with general knowledge of re-inforced concrete and steel structures. Special knowledge of triangulation surveys, boundry surveys, also laws and procedures to be followed in regard to the purchase, transfer and registration of lands in Province of Quebec. Must be bilingual. Preferably veteran. Salary not less than $3,480. Apply to File No. 3987-V.

ELECTRICAL

ELECTRICAL ENGINEER, age 30-45, required as sales engineer in Canada for U.S. firm making special equipment for transport and industry. Must have sales training in electrical equipment instruments also experience as sales and service engineer. Salary open. Apply to File No. 3447-V.

ELECTRICAL ENGINEER, recent graduate, required for the engineering staff of a paper mill in the Lake St. John area. Salary open. Apply to File No. 3507-V.

ELECTRICAL ENGINEER with considerable industrial experience required as a safety engineer by a public utility in the Montreal area. Bilingual preferred. Salary open. Apply to File No. 3654-V.

ELECTRICAL ENGINEER, with general knowledge of a.c. and d.c. motors, switchgear, mercury rectifiers, transformers and other electrical apparatus, for sales work in Eastern Canada, age 30 to 35. Salary open. Apply to File No. 3695-V.

ELECTRICAL ENGINEER, recent graduate up, required by a manufacturer in Montreal, for sales engineering. Preferably bilingual and familiar with rotating electrical equipment. Salary $200 up. Apply to File No. 3761-V.

GRADUATE ELECTRICAL ENGINEERS, with 3 to 10 years experience in design operation, layout of substations, switching stations, and electrical machinery, together with engineering studies, including draughting for a large hydro electric power house in Quebec. Salary $225 up according to experience. Apply to File No. 3787-V.

ELECTRICAL ENGINEER required for power sales by an electrical utility in Province of Quebec. Preferably experienced. Bilingual. Salary open. Apply to File No. 3802-V.

ELECTRICAL ENGINEER with experience in layout and design of generating and transformer stations, required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

* Filled since appearance in advance notice.

SEVERAL EXPERIENCED ELECTRICAL DRAUGHTSMEN, for the design and layout of industrial power and control systems. Required by consulting engineering office in Montreal. Salary open. Good chance for advancement. Apply to File No. 3890-V.

JUNIOR ELECTRICAL ENGINEER, with practical experience in general manufacturing industries, required by an industrial organization in Ontario. Salary open. Apply to File No. 3904-V.

ELECTRICAL ENGINEERS, required for sales engineering work in Western Canada. Graduates with some selling experience preferred. Salary open, plus expenses. Apply to File No. 3915-V.

*ELECTRICAL ENGINEER wanted for new Chemical Plant in Western Ontario. Engineer must have had previous Electrical Rectification experience. Salary open. Apply to File No. 3945-V.

JUNIOR ELECTRICAL ENGINEER, age about 30, required as assistant to superintendent of light department in Montreal area. Practical experience in Hydro Distribution and Steam Turbines. General office routine of administrative nature. Salary open. Apply to File No. 3950-V.

*GRADUATE ELECTRICAL ENGINEER, age 28-32, required for sales engineering by an industrial firm specializing in products, made of carbon and graphite in Toronto area. Experience in plant maintenance or installation work or Canadian General Electric or Westinghouse test course desirable. Salary $3,000-$3,600. Apply to File No. 3958-V.

ELECTRICAL DRAUGHTSMAN required by a firm of Engineer Contractors in Alberta for layout and plotting with a minimum of supervision. Should be accustomed to working with power lines to 2,300 volts and must be able to do lighting circuits, both overhead and underground. Salary $250 to $300. Apply to File No. 3972-V.

PROFESSOR IN ELECTRICAL ENGINEERING required by a Canadian University in the Province of Quebec for second term, beginning January. Preferably with teaching and practical experience in power, electrical machinery design, lab. etc. Bilingual preferred. Attractive salary available for right man. Apply to File No. 3982-V.

RECENT GRADUATE, electrical background, preferably bilingual, required by a Montreal manufacturer of electric motors, generators, ventilating equipment and pumps. Position to eventually lead to sales. Salary open. Apply to File No. 3989-V.

ELECTRICAL ENGINEER with 2 years experience in industrial electrical maintenance and at least 1 year's supervisory experience, age 20-35, required by chemical organization with headquarters in Montreal. Duties include responsibility of all electrical and instrument maintenance also electrical distribution system and air-conditioning system. Salary open. Apply to File No. 3995-V.

ELECTRICAL ENGINEERS, age 30 to 40, required for the Commercial and Distribution Department of large Hydro Electric Utility. Must have experience in electrical distribution. Salary open. Apply to File No. 4002-V.

*ELECTRICAL ENGINEER required for Research Laboratory in Montreal. Knowledge and practical experience in electronics and electric welding desirable. Permanent position. Salary open. Apply to File No. 4004-V.

ELECTRICAL ENGINEERING GRADUATE

Required with minimum of five years' experience in Paper Industry. Between 35-45 years of age, for responsible position with large newsprint manufacturing concern in Northern Ontario. Salary commensurate with qualifications. Living accommodation assured.

Apply stating experience and background to File No. 4032-V.

GRADUATE ELECTRICAL ENGINEER

Experienced in Power Station, Transmission and Distribution design and installation. Permanence and advancement depending upon performance. Applicants should state full details of qualifications, when available and salary expected. Address: Engineering Department, Power Corporation of Canada Limited, 355 St. James St., W., Montreal.

MECHANICAL

MECHANICAL ENGINEERS, preferably with design experience, are required for armament research and development in the Quebec area in a government establishment. Salary from $190.00. Apply to File No. 3401-V.

JUNIOR MECHANICAL ENGINEER with knowledge of precision machine shop practice and aptitude for research work in metals and plastics required for an organization in Toronto for the production of artificial limbs. Must be veteran. Salary from $225. Apply to File No. 3675-V.

MECHANICAL ENGINEERS with at least five years' experience in the pulp and paper industry required by an Ontario Paper Company. Salary open. Apply to File No. 3733-V.

MECHANICAL ENGINEER with experience in heating, ventilating and air-conditioning required by a consulting engineer in Montreal. Salary open. Apply to File No. 3773-V.

MECHANICAL ENGINEERS required by a Pulp and Paper Mill at Powell River, B.C. Preferably with experience in plant design in the pulp and paper industry. Salary according to qualifications. Salary open. Apply to File No. 3796-V.

MECHANICAL ENGINEERS with experience in plant layout and design or ventilation problems or general mechanical design, required by a firm in Quebec. Salary from $250. Apply to File No. 3818-V.

MECHANICAL ENGINEER, age 35-40, with considerable experience in design and layout of machinery and equipment required by an organization with Head Office in Montreal. Salary $300-$400. Apply to File No. 3820-V.

MECHANICAL ENGINEER with six to ten years' experience in maintenance and engineering work required by alkali manufacturers in Ontario. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER, required by a manufacturer in Ontario for the plant operation staff. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER with knowledge of physical metallurgy heat treatment, ability in stress analysis and design. Required for research work in B.C. Maximum salary $4,000. Apply to File No. 3865-V.

MECHANICAL ENGINEER, age 30-38, required for northern Ontario Paper Mill. Preferably with paper mill experience or experience in general layout and design. Knowledge of pumps capacities, piping, conveyors, estimating and structural design essential. Salary open. Apply to File No. 3891-V.

MECHANICAL ENGINEER, bilingual, with 4 or 5 years' experience in sheet metal work required as Plant Manager by a manufacturer in the Province of Quebec. Salary open. Apply to File No. 3894-V.

RECENT GRADUATE, mechanical background, required by a manufacturer in Montreal for work in machine design, possibly for production in the future. Salary $225. Apply to File No. 3901-V.

MECHANICAL ENGINEER, age 25 to 35, experienced in industrial plant layout and machine design required by manufacturing firm in Brantford. Salary open. Apply to File No. 3907-V.

MECHANICAL ENGINEER, recent graduate, with some knowledge of heat exchanges, condensers, or any type of unfired pressure vessels required by an industrial organization in Montreal. Salary open. Apply to File No. 3976-V.

MECHANICAL ENGINEER, recent graduate, bilingual, with some experience in general plant work, required in Montreal Industrial engineering experience would be useful. Duties include time-study in Standards Department. Salary open. Apply to File No. 3980-V.

MECHANICAL ENGINEER age 25 to 30 is required by a company in Shawinigan Falls to eventually act as Assistant Works Manager when qualified. Salary open. Apply to File No. 3985-V.

MECHANICAL ENGINEER, with experience in plant lay-out and knowledge of re-inforced concrete, timber and steel design, required in an industrial manufacturing and processing plant, situated 75 miles from both Ottawa and Montreal. Salary open. Apply to File No. 3990-V.

GRADUATE MECHANICAL ENGINEER required by engineering concern in Montreal area engaged in manufacture of hydraulic turbines and mining machinery. Preferably with 5 or more years' experience. Excellent working conditions, free pension, group and health insurance, five day week, cafeteria service. Salary open. Apply to File No. 3992-V.

MECHANICAL DESIGN DRAUGHTSMAN with experience in reinforced concrete and structural steel required by a mining company in Northen Ontario. Housing available. Salary open. Apply to File No. 3994-V.

* Filled since appearance in advance notice.

MECHANICAL ENGINEER, with 2 or 3 years' experience, preferably bilingual, required as Mechanical Development Engineer by industrial and chemical organization with headquarters in Montreal. Duties will be conducting investigations on existing equipment and a certain amount of plant layout and draughting. Salary open. Apply to File No. 3995-V.

MECHANICAL ENGINEER with 1 to 3 years' experience in production, required as Industrial Engineer by industrial and chemical organization with headquarters in Montreal. Duties include responsibility for conducting methods, engineering studies, using methods of process charts, time and motion study. Salary open. Apply to File No. 3995-V.

MECHANICAL ENGINEER, required by a Montreal manufacturer of machines and equipment for work consisting of general engineering and design in connection with the manufacture of pulp and paper machinery. Salary open. Apply to File No. 4000-V.

MECHANICAL ENGINEER, required by a textile manufacturing concern near Montreal. Applicant after becoming acquainted with the plant would be expected to act as general follow up man on repair of mechanical and electrical equipment, also see that all material necessary is on order or on hand. Salary open. Apply to File No. 4001-V.

*MECHANICAL ENGINEER with some experience in production control methods required for a progressive furniture manufacturer in the Eastern Townships. Preferably bilingual. Salary open. Apply to File No. 4006-V.

MECHANICAL ENGINEER, must be bilingual, required by paper company for general duties in line with capabilities and interest. Position in very small community in Province of Quebec. Salary open. Apply to File No. 4020-V.

MECHANICAL ENGINEER required as assistant in Chief Engineers Department by large paper company. Paper experience essential. Some knowledge of French language would be helpful. Must be able to complete investigations and write reports. Age 28-40. Salary $350-$450. Apply to File No. 4022-V.

METALLURGICAL

METALLURGICAL ENGINEER, preferably with lab. experience, also some industrial experience would be helpful, required by large transportation company in Montreal. Salary open. Apply to File No. 3998-V.

MINING

MINING ENGINEERS, with varied experience required by a firm in Quebec for general mine operation, exploitation and development work. Salary from $250. Apply to File No. 3818-V.

MINING ENGINEER with several years experience required by a company engaged in large scale asbestos production in Quebec. Salary open. Apply to File No. 3935-V.

MISCELLANEOUS

MANAGEMENT ENGINEER with business administration and mechanical background, age 30 up, bilingual with at least 5 years practical experience, required by an industrial engineering consultant in Montreal. Salary open. Apply to File No. 3307-V.

STRUCTURAL STEEL DRAUGHTSMAN AND CHECKERS, preferably graduate engineers but any experienced men acceptable, are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

GRADUATE ENGINEERS, required by an industrial and chemical organization with headquarters in Montreal for all phases of research, design, operation development, production and maintenance. Salaries open. Apply to File No. 3588-V.

DESIGN DRAUGHTSMAN for the design of cranes and hoists of all types, capable of making and checking complete manufacturing detail drawing, required by a manufacturer in Southern Ontario. Apply by letter with full details. Salary open. Apply to File No. 3628-V.

SALES ENGINEER with wide engineering experience, wanted by a company in Toronto for the sale of textile machinery and construction equipment. Salary open. Apply to File No 3639-V.

CHEMICAL OR METALLURGICAL ENGINEERS, from recent graduates up, required by a Quebec firm engaged in metal production for employment as production and development engineers. Salaries open. Apply to File No. 3693-V.

MINING AND METALLURGICAL ENGINEER, age about 30, with considerable experience, required by a manufacturer in the St. Maurice Valley. Salary open. Apply to File No. 3723-V.

CIVIL ENGINEERS and ASSISTANT HYDRAULIC ENGINEERS required for government organization on West Coast for highway and construction. Salary open. Apply to File No. 3724-V.

STRUCTURAL STEEL DETAILER AND CHECKER with considerable experience, required for checking shop details by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

DETAILER AND DESIGNER for reinforcing steel with considerable experience, required by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

SALES ENGINEER, preferably bilingual required by a Montreal firm dealing in building materials. Salary from $200 Apply to File No. 3745-V.

GRADUATE ENGINEER, required by an electrical firm in Montreal to organize publicity department and edit trade journal. Salary open. Apply to File No. 3751-V.

STRUCTURAL STEEL DRAUGHTSMAN, qualified to detail and check all classes of structural steel, and to supervise draughtsmen in a large drawing office on the West Coast. Salary open. Apply to File No. 3777-V.

BRIDGE ENGINEER, qualified to be in charge of the design and supervision of the construction of highway bridges. Apply stating qualifications, experience, age and salary wanted Apply to File No. 3780-V.

GRADUATE CIVIL OR MECHANICAL ENGINEERS with 3 to 10 years experience in design, cost estimates, draughting and engineering studies for a large hydro-electric power house in Quebec. Salary $225 up according to experience. Apply to File No. 3787-V.

STEAM PLANT ENGINEER, for large concern in Eastern Townships, with at least 5 years practical experience. Must be familiar with thermo-dynamics, combustion control, steam turbines, mechanical refrigeration, hydraulics, etc. Permanent position and attractive salary for the right man. Apply to File No. 3791-V.

RECENT GRADUATES OR JUNIOR ENGINEERS, with mechanical background, required by a Montreal Engineering, fabricating and contracting firm for training purposes leading to sales and service. Area Montreal. Salary $175 up. Apply to File No. 3810-V.

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open Apply to File No. 3811-V.

* Filled since appearance in advance notice.

DRAUGHTSMEN required by a pulp and paper mill in the Eastern Townships for general draughting and detailing. Three or four years experience preferred but not essential Salary open. Apply to File No. 3823-V.

DRAUGHTSMAN, preferably with mechanical background, required by a manufacturer in Montreal for design work on electrical equipment. Salary open. Apply to File No. 3829-V

CITY ENGINEER required by City of Moose Jaw, Saskatchewan. Salary open. Apply to File No. 3856-V.

DRAUGHTSMAN of the following classes: Architectural, piping layout, equipment layout, mechanical design, steam plant, heating, and ventilating electrical and plumbing required by an industrial organization in Montreal. Salaries open. Apply to File No. 3860-V.

STRUCTURAL STEEL CHECKER AND ONE DETAILER CHECKER, wanted for large fabricating plant in Vancouver, B.C. Age between 30 and 40 years preferred. Must be experienced. Give full information and references. Salary open. Apply to File No. 3862-V.

MECHANICAL CHEMICAL OR CIVIL, recent graduate up, required for sales and service in Toronto by a Montreal manufacturer. Salary open. Apply to File No. 3867-V.

MECHANICAL OR CHEMICAL ENGINEER, recent graduate, required by a firm in Montreal. Ability to do simple drawings, such as layout of piping and instruments. Some experience in oil refinery or chemical plant or pulp and paper would be useful. Position to eventually lead to sales. Salary $200. Apply to File No. 3879-V.

GRADUATE ENGINEERS required for all phases of research, design, operation, and development by an industrial organization with Head Office in Montreal. Salaries open. Apply to File No. 3882-V.

*SALES ENGINEERS, required by established Canadian manufacturer of fabricated steel products. Some construction experience an advantage. Wanted for Maritimes, Ontario and Manitoba. Salary open. Apply to File No. 3883-V.

*GRADUATE ENGINEER, familiar with industrial processes, metallurgical and chemical engineering as applied to steel, copper, mining and chemical plants. Broad general experience in estimating and designing. Salary open. Toronto area. Apply to File No. 3886-V.

CIVIL OR STRUCTURAL ENGINEER, 24-35 years, required for Northern Ontario Paper Mill. At least 2 years construction and 2 years design experience. Opportunity to train junior personnel. Salary not less than $350. Apply to File No. 3891-V.

STRUCTURAL ENGINEER, preferably a graduate civil engineer with experience in the design of mill buildings required by a paper manufacturer in Eastern Ontario. Salary open. Apply to File No. 3896-V.

DETAILERS OR JUNIOR DESIGNERS on mechanical or sheet metal design required by an industrial organization in Ontario. Salary open. Apply to File No. 3904-V.

INDUSTRIAL ENGINEERS, with production experience required by a firm of industrial consultants in Montreal. Preferably with experience in time study, cost control etc. Salary around $400 depending on qualifications. Apply to File No. 3910-V.

RECENT GRADUATES in Electrical or Mechanical Engineering can still be offered the opportunity of being trained by large Hydro-Electric Utility. Very good opportunities for regular employment in various departments at the completion of training period. Minimum salary 1st year $200: 2nd year $215. Apply to File No. 3912-V.

GRADUATE ENGINEER, Mechanical, Electrical or Civil, about 30 years of age, required by a large Hydro-Electric Utility in Montreal for Field Testing Hydraulic Turbines. Salary open. Apply to File No. 3932-V.

RECENT GRADUATE required by a Montreal contractor for survey and making of plans. Must be bilingual. Salary $175 up according to experience. Apply to File No. 3933-V.

TWO METALLURGICAL ENGINEERS AND ONE CHEMICAL ENGINEER, required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No. 3942-V.

SALES ENGINEER required by well known manufacturer of mechanical equipment to solicit industrial accounts throughout the Province of Quebec. Applicants must reply giving full details, age, training, etc. Salary open. Apply to File No. 3951-V.

INDUSTRIAL ENGINEER thoroughly experienced in time study, standard data and wage incentive installation and administration required for firm in Quebec. Salary open. Apply to File No. 3952-V.

JUNIOR ENGINEERS, preferably with mechanical background required for general duties by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 3954-V.

CITY ENGINEER, required by a City in Saskatchewan to take full charge of its utilities which include electric light, power, sewer, water, sidewalk, etc. Salary open. Apply to File No. 3955-V.

*GRADUATE ENGINEER, experienced in work analysis and job simplification. Should be bilingual and experienced in handling staff. Permanent position in Montreal. Salary $350 with good prospects for advancement. Apply to File No. 3959-V.

INDUSTRIAL ENGINEER to act as assistant in the Engineering Department of Meat Packing firm with plants throughout Canada, Headquarters in Calgary. Requires knowledge of building construction, mechanical maintenance and power plant work. Experience in refrigeration desirable. Salary open. Apply to File No. 3960-V.

JUNIOR ENGINEER preferably chemical background required for Alberta refinery. Duties include plant tests, inspection of equipment and assistance on designs and specifications. Opportunity for supervised training in all phases of refinery operations. Salary open. Apply to File No. 3961-V.

Engineer for McGill

McGill University requires for its department of buildings and grounds a junior graduate engineer with civil or mechanical qualifications. Moderate salary with excellent prospects for advancement.

Reply by letter only, giving in first instance full particulars as to age, education, experience, marital status, address and telephone number to FILE NUMBER 4057.

*DRAUGHTSMAN preferably with electrical or mechanical background required for industrial plant layout and electrical and mechanical equipment of buildings, by a firm of consultants in Montreal. Salary open. Apply to File No. 3964-V.

JUNIOR SALES ENGINEERS with production experience required by a firm of industrial consultants in Montreal. Salary $300 depending on qualifications. Apply to File No. 3965-V.

PRODUCTION SUPERVISOR, age 30 to 45 years, with experience in sheet metal fabrication required by established Canadian manufacturer in Ontario. Salary open. Apply to File No. 3970-V.

*GRADUATE ENGINEERS, age 20-35, with training in one or more of the following lines—foundation work involving reinforced concrete; structural steel; steam and process piping; oil refinery experience boilers; pumps and heat exchange equipment and miscellaneous machinery; required by oil company in Montreal. Salary open. Apply to File No. 3974-V.

ENGINEER with estimating and cost experience, able to read blueprints, take off and price materials, evaluate general machine and assembly shop operations and fully capable of organizing and installing a Standard Cost System. Required by a manufacturer in Southern Ontario. Salary according to qualifications and ability. Apply to File No. 3977-V.

GRADUATE ENGINEER, with some experience in a manufacturing industry, required by Hamilton company. Some knowledge of production operations, mill scheduling, job evaluation, time study, job methods, industrial relations would be helpful. Salary open. Apply to File No. 3981-V.

*GRADUATE ENGINEER, interested in sales, preferably with electrical background, required in Montreal. Salary around $275. Apply to File No. 3983-V.

ELECTRICAL OR MECHANICAL ENGINEER, recent graduate, bilingual preferred, required for Public Utility in Quebec City Salary open. Apply to File No. 3993-V.

GRADUATE ENGINEER, age 32 up, preferably bilingual and with 10 years experience in industrial design required by chemical organization with headquarters in Montreal. Duties include supervision of Works Design Department, supply draughting and design service for plant, prepare appropriation requests, maintain cost estimating units etc. Salary open. Apply to File No. 3995-V.

GRADUATE ENGINEER, three to five years plant experience, required by chemical organization in Montreal. Duties include assisting in developing and carrying out in various plants training programs in subject and related fields for junior industrial engineers. Develop and apply such office routine as may be necessary. Salary open. Apply to File 3995-V.

MECHANICAL ELECTRICAL OR CIVIL ENGINEER, age 23-30, preferably single and bilingual with some experience in maintenance required by an industrial and chemical organization with headquarters in Montreal. Duties include construction project and design studies. Salary open. Apply to File No. 3995-V.

GRADUATE ENGINEER, with some experience in industrial building design to supervise construction of the railway buildings and allied structures of a large railway terminal project in Montreal. Salary $300 to $350. Apply to File No. 3996-V.

*SENIOR ENGINEER for layout work on construction job required by construction firm in Montreal. Location of job around 300 miles west of Montreal. Salary $300 to $350. Apply to File No. 3997-V.

CIVIL OR MECHANICAL ENGINEERS with up to five years design experience required by an engineering firm in Montreal for hydraulic work. Salary open. Apply to File No. 3999-V.

CIVIL OR MECHANICAL ENGINEER wanted with 5 to 8 years experience for key position in moderate size plant in Manitoba doing fabrication of Plate Work and Light Steel Work, also Grey Iron Foundry and Machine Shop. This will lead to key position in a growing organization. Salary open. Apply to File No. 4003-V.

JUNIOR SALES ENGINEER, preferably with a few years sales experience required by Montreal branch of a firm manufacturing industrial products. Salary open. Apply to File No. 4007-V.

SALES ENGINEER required by a manufacturer of industrial building products in the Toronto area. Preferably with sales experience and knowledge of building products. Salary open Apply to File No. 4008-V.

* Filled since appearance in advance notice.

CHIEF CHEMIST

To co-ordinate and supervise quality control, research and development work in laboratories of large industrial organization engaged in manufacture and processing of soaps, cosmetics, dentifrices, edible fats and oils, glycerine and frozen foods.

In addition to having a thorough knowledge of all phases of laboratory work and the chemistry of oils and fats, the applicant must have the ability to handle staff and be capable of correlating marketing problems and assuming administrative responsibility.

Apply in writing, giving full particulars of education, experience, present position and age to:

C. R. BAKER, *Technical Director*

Lever Brothers Limited

299 Eastern Avenue, Toronto

General Contractor Requires Chief Engineer

A large firm of General Contractors, with Head Office in Montreal, invites applications for position of Chief Engineer.

Applicants should be graduate engineers, 35 to 45 years of age, with extensive and successful office and field experience in estimating, general designing, making working drawings and engineering supervision on construction of hydro-electric developments, wharf, bridge and heavy foundation construction.

Knowledge of French essential.

Minimum salary $500 per month.

File 4060-V

SENIOR SALES ENGINEER required as District Manager by a firm manufacturing industrial products in Ontario. Must have considerable sales experience. Salary open. Apply to File No 4008-V.

MECHANICAL AND CHEMICAL ENGINEERS, interested in entering the Pulp and Paper industry, required in Newfoundland. Vacancies in Technical Department and studying process work and improved methods of operation. Pulp and paper experience is not necessary. Salary open. Apply to File No. 4009-V.

SAFETY SUPERVISOR required for South America. Age 25-40 years. Single. To supervise safety activities, promote safety first and inspect operations to assure proper installation and use of safety devices. Salary $350 U.S. currency. Apply to File No. 4011-V.

RESERVOIR ENGINEER, required for South America. Age 25-35. Should be experienced in reservoir and production cost analysis. Capable of determining efficient flow rates for reservoirs and wells. Salary approximately $400 U.S. currency. Apply to File No. 4011-V.

MAINTENANCE ENGINEER, required for South America. Age 35-40. Duties include, refinery maintenance, inspection of units, metal inspection work. Responsible for engineering calculations, design of equipment and pipefitting work. Salary $375 U.S. currency. Apply to File No. 4011-V.

POWER PLANT SUPERVISOR required for South America. Age 30-40, single preferred. To supervise steam power plant including operating, boiler cleaning and minor repairs. Salary $375 U.S. currency. Apply to File No. 4011-V.

*SALES AND SERVICE ENGINEER, preferably a graduate in mechanical or chemical engineering required for power plant field in the Toronto area. Possession or ability to obtain an automobile for transportation essential. Starting salary $250 to $325 according to experience. Apply to File No. 4012-V.

*ENGINEERING DRAUGHTSMAN, with mechanical background required by large paper company in the Province of Quebec. Salary $250-$300. Apply to File No. 4019-V.

GRADUATE ENGINEER, required as Assistant to Manager of Sawmill and Woodlands operations. Position located in Ontario. Good commercial sense essential also some sales ability Salary $300-$350. Apply to File No. 4021-V.

Situations Wanted

MECHANICAL AND CIVIL ENGINEER, M.E.I.C., Queen's, 48. 5 years hydro-electric power development construction, 1 year industrial building construction, 2 years sales engineer and estimator architectural iron works concern, 14 years oil refinery on initial construction, on operations and maintenance, last 6 years refinery engineer in charge of maintenance, safety, equipment inspection, design and construction of plant changes and extensions, industrial buildings. Resigned to undertake private venture. Desires to re-enter industry. Apply to File No. 166-W.

MECHANICAL ENGINEER. Jr.E.I.C., McGill University. Eight years experience Tool and Production Methods Engineer. Age 38. Married. Presently employed. Desires employment as Production Manager or Materials Engineer for large company. Preferably Montreal area. Apply to File No. 551-W.

PART TIME WORK — Senior Civil Engineer P.E.Q., M.E.I.C. Montreal area, available part time where consultant or engineer staff short handed. Preliminary plans, estimates, reports, industrial or engineering projects. Apply to File No. 1021-W.

MECHANICAL ENGINEER, B.Sc. Queen's '35, M.E.I.C., M.I.A.S., P. Eng. Que. Married, age 37, over twelve years experience including design, stress analysis, maintenance, inspection, administration and 5½ years as an R.C.A.F. Engineer Officer. Presently employed desires permanent position with good future prospects. Preferably in an English speaking locality. Apply to File No. 1042-W.

ELECTRICAL ENGINEER, Jr.E.I.C., P.E. Que., McGill '44, single, bilingual, ex-naval officer, two years experience as assistant electrical superintendent in a large industrial plant. Desires change in position. Apply to File No. 1450-W.

CIVIL ENGINEER, P. Eng. Jr.E.I.C., McGill graduate, would like spare time work at design of reinforced concrete or structural steel on a fee basis or otherwise. Also qualified for checking drawings and estimating quantities and cost. At present employed in the Montreal district. Apply to File No. 1552-W.

GRADUATE MECHANCIAL ENGINEER, M.E.I.C., P. Eng. Que., M.A.S.T.E. Stuttgart 1924, married. 18 years experience in experimental work, plant maintenance, aircraft, jig and tool design, mechanical equipment and handling fixtures. Available at short notice. Montreal area preferred. Apply to File No. 1862-W.

CIVIL ENGINEER, C.E., B.Sc., M.E.I.C., age 32, married, with experience in road construction; surveying; industrial plant lay-out, including steel tank erection; piping design and installation, equipment installation; building construction such as offices, warehouses, service station; costings; estimates; administrative control. Working knowledge of cost and operational studies, inventory work, material necessary for all types of construction work. Will accept responsible position anywhere. Salary in accordance with responsibility and living conditions. Apply to File No. 1914-W.

ELECTRONICS ENGINEER, Jr.E.I.C., B.E.E., McGill, 1938, S.M.-M.I.T. 1942; P. Eng. Que., with 10 years general design and supervisory experience in electronics desires position or partnership with consultant or manufacturing firm with view towards exploiting the field of electronics and electronic controls in industry. Location anywhere, but preferably Montreal. Apply to File No. 2492-W.

EXECUTIVE ENGINEER, M.E.I.C., B.A.Sc., R.P.E. (B.C.). Veteran, age 35, married. 15 years civil engineering and construction over 7 years in executive capacity. Interested in position with construction or industrial firm in British Columbia or Ontario. Apply to File No. 2515-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.E.Q. B.Sc. Age 32, married. Presently engaged in Montreal area would prefer position in Eastern Ontario. Experience includes machine design, jig, tool and die design, methods engineering, design development, plant layout, engineering department organization. 4½ years as chief engineer. Also experience in construction industry on building, mechanical and electrical trades. Salary $415 per month. Available one month's notice. Apply to File No. 2682-W.

ELECTRICAL ENGINEER, B.Eng. Honors, McGill 1943, Jr.E.I.C., A.I.R.E., P.Eng. (Que.), 26, married, presently employed, desires change to smaller organization with more general scope, broader future responsible outlook, in Ontario or B.C. Experience in heavy manufacturing, radio production, standardization, specification, audio design. Apply to File No. 2727-W.

* Filled since appearance in advance notice.

ELECTRICAL ENGINEER, M.E.I.C., Graduate I.E.E., thorough grounding in cable and transformer manufacture, development and estimating. Also extensive instrument making experience in Government Laboratories. Anxious to contact companies re-openings in application sales, maintenance or production engineering. Age 26, single. Apply to File No. 2876-W.

MECHANICAL ENGINEER, Jr.E.I.C., McGill '44, age 26, bilingual, single, good health. Due to an unusual situation, have not been employed in work of an engineering nature since graduation. Would prefer to locate with organization building custom-built automatic industrial machinery. Available on short notice for assignment in Canada or U.S.A. Apply to File No. 2882-W.

CHEMICAL ENGINEER, Jr. E.I.C., B. Eng., McGill '45, age 24, single. 2½ years experience in quality control general office work and for over a year with pulp and paper mill (sulphite) on process control working in conjunction with the foreman. Desires position in production, planning, or sales engineering requiring initiative. Prefer Montreal or vicinity. Available on one month's notice. Apply to File No. 2899-W.

GRADUATE CIVIL ENGINEER, B.Sc. Alberta, 1947, S.E.I.C., married, desires position doing structural design work. Preferably in reinforced concrete or steel. Two years experience in draughting and half year practical work in field. West Coast area preferred. But would consider other localities. Presently employed and residing in Edmonton. Apply to File No. 2907-W.

CIVIL ENGINEER, B.A.Sc. (Toronto) S.E.I.C., P. Eng. Ont. with some experience in reinforced concrete and structural steel design including detailing of reinforced concrete and estimating. Would accept part time work during evenings and weekends. At present employed and residing in the Toronto area. Apply to File No. 2910-W.

ENGINEER, (27), graduate of London (England) University, ambitious and energetic with five years industrial experience, lately Deputy Works Manager in a large chemical works. Familiar with design, production control, costing, job evaluation and factory lay-out procedure. Handled a great variety of equipment, tactful leader of men, but keen and able to get results. Willing to accept responsibility. Living at present in Toronto, Ontario, but willing to go to any part of Canada or abroad. Apply to File No. 2912-W.

SUPERINTENDENT, GRADUATE ENGINEER, P. Eng. (Ont.), M.E.I.C., 12 years' experience with men and cost control in casting, fabricating and machining brass, aluminum and grey iron. Available immediately. Apply to File No. 2913-W.

YOUNG GRADUATE CIVIL ENGINEER, S.E.I.C. Presently employed seeks part time work of such nature that it may be done at home i.e. Estimates etc. Apply to File No. 2914-W.

CIVIL ENGINEERING STUDENT, S.E.I.C., 3rd year at McGill University would like part time work with firm in Montreal vicinity, dealing with design or construction of structural steel or reinforced concrete; 25-30 daytime hours per week available, plus evenings if necessary. Experienced in foundation construction. Apply to File No. 2916-W.

GRADUATE ELECTRICAL ENGINEER, McGill '24, M.E.I.C., Prof. Eng. Que.; over 20 years experience in High Voltage Transmission line, design and construction. Interested in part time or temporary position in general engineering or transmission line work. Location preferably Montreal or in B.C. At present residing in Montreal area, due to certain physical defects the type of work that can be undertaken is limited. Available at once. Apply to File No. 2918-W.

MECHANICAL ENGINEER, M.E.I.C., P. Eng. (Que.) B.A.Sc., Ecole Polytechnique '44. Presently employed with R.C.E.M.E. Canadian Army. To be released from engagement in one month or two. Age 24, married, bilingual, 2 years experience in automotive engineering, job evaluation, supervision, management and administrative work. Also experience in designing mechanical testing apparatus. Would consider any kind of work with industrial firm. Willing to learn. Apply to File No. 2919-W.

MECHANICAL ENGINEER, M.E.I.C., P. Eng. Que., B. Eng. '40 McGill, age 33, married. Presently employed, desires experience in heating and ventilating. Experience with boilers, piping, construction, machine shop and plant maintenance. Available 1 month. Apply to File No. 2922-W.

GRADUATE MECHANICAL ENGINEER, Ph.D. (London), M.E., A.M.I. Mech. E., age 36, single, 10 years' experience in plant maintenance, plant layout, production control, industrial administration, research and development. At present employed in the Montreal district. Apply to File No. 2929-W.

CIVIL ENGINEER, M.Sc., M.I.T., Jr.E.I.C., interested in part time work in steel and reinforced concrete design. Presently employed as instructor at a Canadian University. Four years practical experience in design. Must be Montreal area. Apply to File No. 2930-W.

GRADUATE, Institution of Mechanical Engineers (England), age 25, seeks position of Junior Engineer with a firm engaged in producing consumer goods. Five years engineering apprentice; one year draughting; and three years as junior metallurgist mainly occupied in solving production problems from a metallurgical aspect. Apply to File No. 2933-W.

GRADUATE ENGINEER, M.E.I.C., age 30, veteran, married. Experience includes maintenance, construction, production, etc. Toronto area preferred. One month's notice. Apply to File No. 2934-W.

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Sec.-Treas., R. T. HARLAND,
P.O. Box 541 Winnipeg, Man.

BUSINESS & INDUSTRIAL BRIEFS

A Digest of Information received by The Editor

Hobbs Glass Open New Branches

Hobbs Glass Limited has announced that during recent months new branches have been opened at Moncton, Trois Rivieres, Peterborough, Oshawa, Sudbury and Kitchener. These branches have been opened to provide better and faster service in the adjacent communities.

Complete stock will be carried at all points.

For further details communicate with Fred Jones, Director in charge of Sales, Hobbs Glass Limited, London, Ontario.

New Company Formed

A new company, International Rectifier Corporation, has been formed and a plant, at 6809 Victoria Avenue, Los Angeles, California, has been opened. The new firm is equipped for research and manufacture in the field of colorimetric equipment, photo-electric cells and selenium rectifiers.

For further information communicate with the Company at the address given above.

New Type Heater

The Young Radiator Company, Racine, Wisconsin, has announced the introduction of a new type of circular vertical discharge unit heater to be known as the " Vertiflow ". The manufacturer claims that this new type of heater will increase heating efficiency, reduce operating noise to a minimum and save 35% in total unit weight.

For complete details communicate with Young Radiator Company, Racine, Wisconsin.

A New Low Alloy Steel

The Steel Company of Canada Limited, P.O. Box 460, Montreal, Quebec, has announced the introduction of a new Nickel-Copper-Molybdenum steel which will be known as " Steelcoloy ".

The manufacturer states that this new material will be produced in the form of plates, sheets and bars. It is claimed that it possesses sound weldability and great resistance to corrosion, shock and abrasion. It has good tensile and elastic properties.

This new product is particularly recommended for the construction of railway freight, hopper and gondola cars and coaches, mine cars, buses, truck bodies and marine use. For further information communicate with the manufacturer at the address given above.

New Boiler Catalogue

The Dominion Bridge Company Ltd. of Lachine, Que. have produced a new catalogue of Water Tube Boilers.

The catalogue is attractively designed and very informative. It measures 11" by 8½". For copies of the catalogue communicate with the Dominion Bridge Co. Ltd., P.O. Box 280, Montreal, Que. Ask for publication No. B 103.

Toronto Firm Becomes Limited Company

The Hamilton Gear and Machine Company, which has been operating under that name since 1911, is now a Limited Company. There is no change in operation or ownership. The Toronto City authorities are changing the name of Van Horne Street, on which the Company's plant and offices are located, to Dupont Street, so that although this Company has not moved, it now has a new address.

The correct mailing address is The Hamilton Gear and Machine Company Limited, 950 Dupont Street, Toronto 4, Ontario.

B.A. Oil Plans Huge Expansion

W. H. Whiteford, president of the British American Oil Company Limited has announced an expansion programme in Canada, which, he said " will increase the company's overall fuel output by 25 per cent ". At a press conference Mr. Whiteford announced a $15,000,000 expansion programme for the Company's refinery at Montreal to be completed early in 1950. He also announced a $2,500,000 expansion programme at the Company's lubricating oil plant at Clarkson, Ontario, to be completed within, approximately, one year.

English Electric Receives Offer

The Directors of the English Electric Company of Canada Ltd. have approved a proposal made by John Inglis Co. Ltd. which will bring about a closer integration of the companies' operations with economies which should be reflected in improved earnings.

At the time of going to press this matter was being considered by the shareholders of the English Electric Company.

For further details communicate with the English Electric Company of Canada Limited, St. Catharines, Ont.

New Plastic Mortar

A new mortar sealant has been formulated, by the American Flursit Co. Inc. of 635 Rockdale Avenue, Cincinnati 29, Ohio, for use between glass blocks.

The manufacturer claims that it will form a tight flexible bond to the glass and that it can readily be applied with a caulking gun or thinned down, with suitable solvents, to brushing consistency.

For further details communicate with the American Fluresit Co. Inc., at the address given above.

Chain Belt Company Announces New Pavers

The Chain Belt Company of Milwaukee has announced two new Rex Pavers. From an appearance standpoint, they are radically different from their conventional counterparts. They are streamlined and the streamlining has been designed to afford protection and easy access to all working parts. Special mechanical innovations permit the operator to sit comfortably and operate the paver at top speed throughout the day. The manufacturer claims many other advantages for this equipment. For complete details communicate with the Chain Belt Company, 1600 W. Bruce Street, Milwaukee 4, Wis.

Canadian Vickers Limited Manufacturing Tractors

A crawler type tractor and bulldozer is being manufactured by Canadian Vickers Limited, Montreal. The firm has been licensed by Laurentide Equipment Company who will handle distribution. The new tractor will be known as the " Laurentide Beetle ". Dealers and agents are to be appointed.

For specifications and delivery dates please communicate with Laurentide Equipment Company Limited, 440 Beaumont Avenue, Montreal.

International Nickel Promotions

Ralph D. Parker, J. Roy Gordon and Herbert G. Fales have been elected as Assistant Vice-Presidents of The International Nickel Company of Canada Ltd.

Mr. Parker will continue as General Superintendent of the Company's Mining and Smelting Division. Mr. Gordon was previously Technical Assistant to Mr. Beattie, Vice-President and General Manager. Mr. Fales is Vice-President and Director of the International Nickel Company Inc., the United States subsidiary of the Canadian company.

New Battery-Charger Announced By General Electric

A new motor-driven battery-charging unit designed for charging 6-cell lead-acid, and 10-cell Edison batteries has been added to the line of General Electric Battery-charging equipment. Starting, charging and shut-down are performed automatically by the new unit. It can be used on 220 or 440, 3-phase, 60-cycle power supply. For complete details communicate with Canadian General Electric Company Limited, 212 King Street W., Toronto 1, Ontario.

New Booklet on Metal Protection Issued by Arco

A new booklet entitled " Lasting Protection for Metal Surfaces " has just been released by the Arco Company, Cleveland, Ohio. It presents the manufacturer's claims for " Dum Dum " for metal, a new type of water-repellent coating. For copies, communicate with The Arco Company, 7301 Bessemer Avenue, Cleveland 4, Ohio.

Light Weight Aluminum Safety Ventilator

A new light weight, aluminum portable safety ventilator is announced by the United Electric Motor Company, 178 Center Street, New York City. It is called " SAF-T-AIR ". It is motor driven with a capacity of 425 cubic feet per minute and weighs 50 pounds. It is spark proof and can be connected to the nearest lighting or power supply outlet without danger of overloading. It can be used as a blower or exhauster.

Write to the manufacturer for descriptive bulletin number B148.

New Agent Appointed

Adolph Gottscho, Inc., manufacturers of labor-saving marking and code-dating machines have announced the appointment of Richardson Agencies, Ltd., of 454 King Street West, Toronto, and of Vancouver, as their Canadian representatives.

Copies of a brochure illustrating the equipment manufactured by this company may be obtained by application to the Canadian agents.

" Abegweit " Wheelhouse Is Non-Magnetic

The Aluminum Company of Canada Limited have informed the editor of the *Journal* that the Abegweit, the world's largest ice-breaking car ferry, has a wheelhouse constructed of aluminum. Aluminum was specified for this purpose because it is non-magnetic and thus will not affect the compasses and other delicate navigational instruments.

Northern Electric Appointment

L. P. Stiles, assistant Central District Manager of the Northern Electric Co. Ltd., Toronto, will replace W. R. Ostrom as Central District Manager, Toronto. Mr. Ostrom has retired.

" Speedaire "

The Cleveland Worm & Gear Company of Cleveland, Ohio, are featuring a fan-cooled " Speedaire " unit—a new worm gear speed reducer.

The manufacturer states that it is " air conditioned ". It is built with a double-walled housing, and an induction fan; which is installed on the coupling end of the worm shaft and draws a high velocity air stream between the inner and outer walls of the housing. This continuous action removes the heat generated by the unit.

It is claimed that this new unit "doubles the horsepower ", saves space, weight and money. For details communicate with the manufacturers' Canadian agent, Peacock Brothers Limited, Montreal, Que.

An Electric Salt-Bath Furnace

The Canadian General Electric Company of 212 King Street West, Toronto 1, have produced a four page illustrated pamphlet on the Ajax-Hultgren Electric Salt-Bath Furnace.

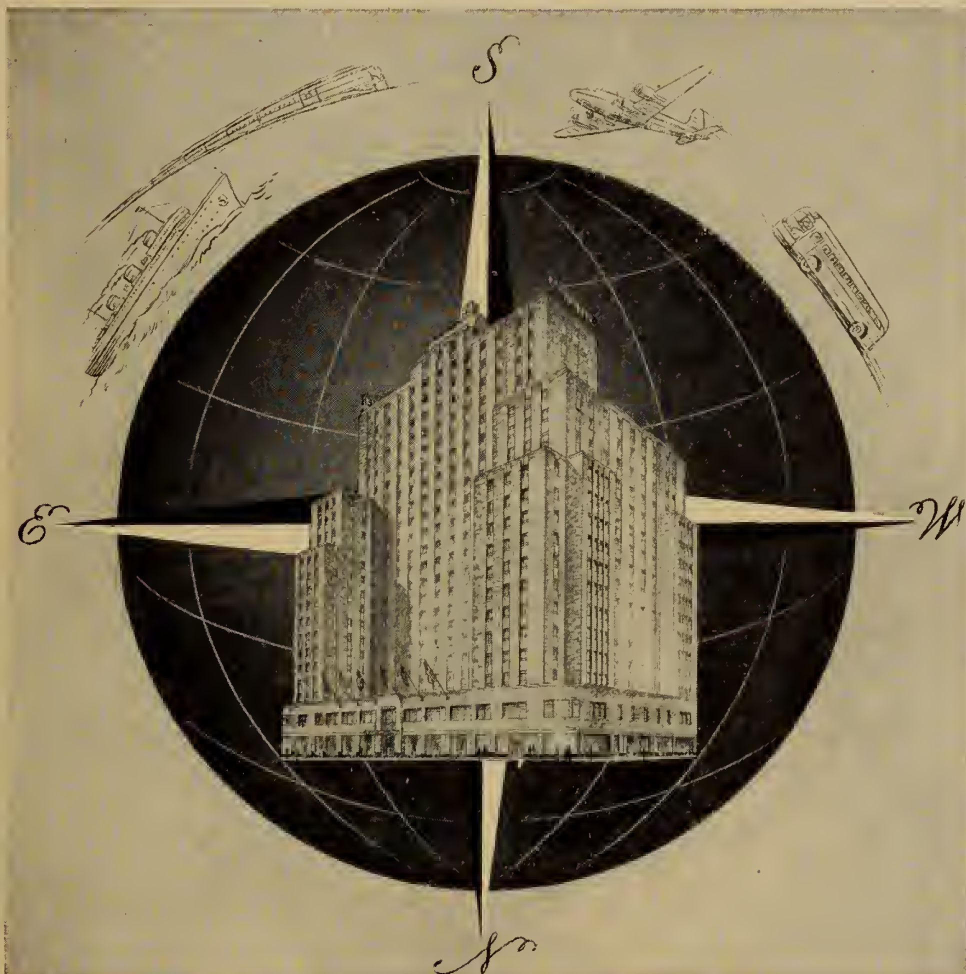
The furnace operates on an entirely new principle of immersed-electrode design and offers many advantages in installations requiring heat treatment within a broad range from 300 to 2400 deg. F. Write to the manufacturer and ask for illustrated pamphlet No. 4402.

Worthington Appointment

The Worthington Pump and Machinery Corporation, of New Jersey, have announced the appointment of Henry H. Ritchotte as Regional Manager in charge of sales of Worthington Construction Equipment and Mining Products in Canada. Mr. Richotte will make his headquarters in Toronto at the offices of John Inglis Co., Limited.

New Inter-Comm System

The Talk-A-Phone Company, of 1512 S. Pulaski Road, Chicago, 23, Ill. have announced " Elsie ", a new two - station inter - communication system. They claim it is suitable for installation in homes, farms, professional offices, etc. For a complete descriptive folder on this system communicate with the manufacturer.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Grasp the potentials of

AIR PRESSURE

—air working to get free—striving to return to its natural volume

Pushing, forcing, cleaning, turning wheels, drills and grindstones—these are but few of the myriad tasks air will do, always that its power may be released.

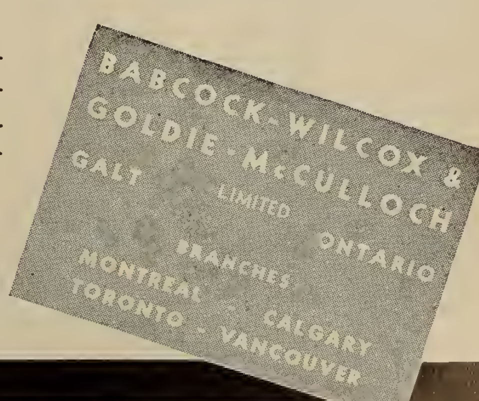
Man's technical and engineering best is required to enslave this power giant with safety. Making equipment for compressing air is a job for skilled men with wide experience—the type who, by their precise workmanship for over 85 years, have made Babcock equipment famous for dependability.

Our Engineers will welcome the opportunity to discuss with you your Compressed Air Problems.

BABCOCK

VERTICAL AIR COMPRESSORS

are built to suit your individual requirements and in single and two stage designs for pressures up to 125 lbs. per sq. in.



A SYMBOL OF SERVICE...

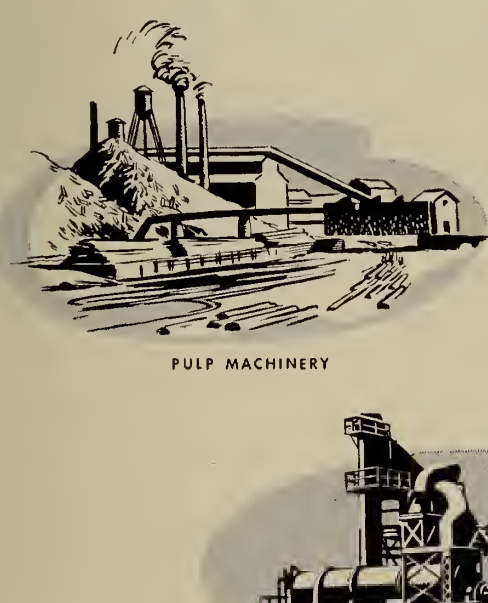
WATEROUS LIMITED
BRANTFORD ONTARIO CANADA
BRANCH PLANT AT EDMONTON, ALBERTA

MINING MACHINERY

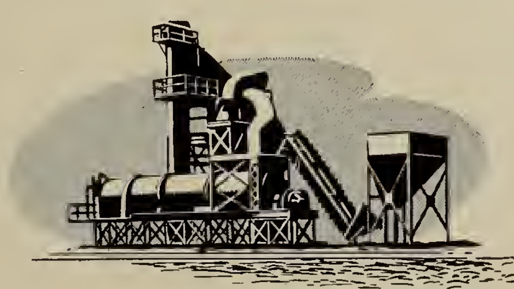
SAWMILL MACHINERY

...THROUGHOUT INDUSTRY

Buyers of Waterous machinery know our trade-mark as a promise of soundly engineered, carefully made, and properly tested equipment, that is built for efficient, reliable service. They have specified and approved Waterous products for over 100 years, secure in the knowledge that their choice will always be justified by the service that will be rendered.

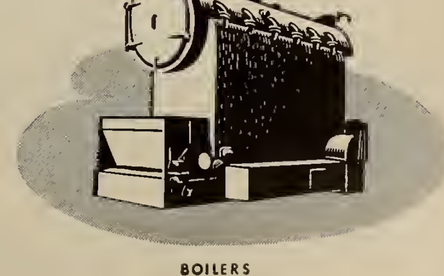


PULP MACHINERY



ROAD MACHINERY

WATEROUS
SINCE 1844



BOILERS

POLYMER *looks to* BAILEY

for the all-important factor of

POWER PLANT CONTROL

(Left) Individual Boiler Panel showing Meters, Recorders, Controllers, Gauges, Selector Valves, Ammeters and Pushbutton Stations.

(Below) View at Front of Boilers showing Boiler Metering and Control Panels.

Canada's largest steam generating boilers, installed in the Polymer Plant at Sarnia, Ontario, are equipped with a complete quota of Bailey meters, three-element air-operated feedwater control, and automatic combustion control. The automatic control of feedwater flow and combustion includes provision for remote manual control by air pressure from the individual boiler panels, of the various factors involved, such as, feedwater flow, fuel feed, forced draft air supply and induced draft fan speed. On certain of the boilers which are equipped to burn refinery gas as well as pulverized coal, the automatic control system governs the burning of these two fuels in the proper proportions and with optimum combustion efficiency, and incorporates necessary safety interlocks.

The generated steam on its way from the boilers to the steam turbines, to the feedwater treating system, and to the main process headers, passes through Bailey reducing and desuperheating stations which automatically control its pressure and temperature as required for each of these services. All of this distributed steam is measured by Bailey steam flow meters which also record its pressure and temperature in the different distribution headers. Bailey meters record the quantity and temperature of the feedwater to the boilers, the desuperheating water, condensate returns and continuous blow-down. The various meters, recorders, controllers, indicators and selector valves are mounted on panels strategically located in the turbine room and water treating plant.

UNDIVIDED RESPONSIBILITY IN DESIGN, MANUFACTURE, INSTALLATION AND SERVICE OF OUR METERS AND EQUIPMENT ENSURES *Lasting Satisfaction to our Customers.*

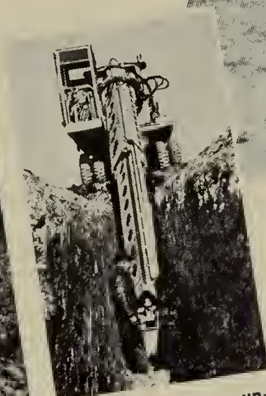
Bailey Meter Company Limited

HEAD OFFICE: 1980 CLAREMONT AVE., MONTREAL

BRANCH OFFICES: HALIFAX TORONTO WINNIPEG VANCOUVER

GRÂDALL COMES TO CANADA

Foundations are dug with clean-cut sides and floored to perfect grade, eliminating the expense of extra operations. Utility and sewage trenches can then be dug, with equal efficiency.



Isolated locations, unfavourable terrain, cramped quarters, are no problem for the Gradall.

The Gradall is invaluable for highway work. With its various implements it is suited to a wide variety of road construction and maintenance jobs. Widening, grading, sloping, ripping and loading are routine for the Gradall.

A new and highly efficient tool for the contractor, the Gradall is basically a mobile combination of interchangeable tools operated entirely by hydraulic power. The light, strong, welded boom moves in and out, up and down, tilts 45° each way, and the turntable swings up to 360°. Quick-change scraper blades, digging buckets, rippers, ditching and trenching tools, and loading buckets can be carried with the Gradall and interchanged in less than 15 minutes. Versatility is one of Gradall's major assets . . . it rolls under its own power at truck speed . . . does the excavating, trenching, back-filling, and grading . . . plus " extra dividend " tasks like pipe-laying and light crane work.

It does things ONE MACHINE Never Did Before!

TRENCHING EXCAVATING BACK-FILLING
DITCHING CHAMFERING GRADING

Write TODAY for Complete, Descriptive Literature

GRÂDALL

. . . . the machine that provides a NEW WAY to do OLD JOBS *PROFITABLY!*

CANADIAN DISTRIBUTORS

W. L. BALLENTINE CO. LIMITED
Head Office: 380 Fleet Street, TORONTO 2B.
Branches: OTTAWA & LONDON

CHAS. CUSSON LIMITED
Head Office: 284 Ontario St. W., MONTREAL 18
Branches: QUEBEC CITY & VAL d'OR

KANE-MARR LIMITED
Head Office: 701 Henry Avenue, WINNIPEG
Branch: KENORA. ONT.

Professional Cards


Burlington
RAIL STEEL
REINFORCEMENT
for
DECEW FALLS
EXTENSION
Designed and constructed by
H. E. P. C. under the direction of
R. L. Hearn
General Mgr. & Chief Engineer
Dr. O. Holden
Ass't General Mgr. — Engineering
R. H. Frampton
Director of Engineering
J. R. Montague
Hydraulic Engineer
A. R. Hull
Electrical Engineer

Index to Advertisers

The revenue derived from the sale of advertising space enables the *Institute* to publish the *Journal* on a regular monthly basis. Listed below are the names of the Companies and Individuals whose advertisements appear in this issue.

Please mention "THE ENGINEERING JOURNAL" when writing to Advertisers

The RIGHT INSULATION, correctly applied, NEVER GROWS OLD

ENGINEERING: In planning your insulation job, first call in an experienced insulation engineer. Johns-Manville . . . Insulation Headquarters for more than 75 years . . . maintains a staff of insulation experts. Each man knows how to take the guesswork out of your job . . . make it "*right* the *first* time."

RIGHT INSULATION: Any insulation will save money—but only the *right* one will save the most for the longest period of time. J-M 85% Magnesia is the most widely used of all industrial insulating materials . . . and one of a wide range of J-M insulations for every service and temperature.

CORRECT APPLICATION: No insulation is better than the man who installs it. J-M Insulation Applicators are industry's first choice for completely efficient jobs because: (1) They are trained in all phases of insulation application; (2) They employ skilled mechanics and up-to-date application methods. You can rely on them for thorough, dependable and speedy workmanship.

JOHNS MANVILLE JM PRODUCTS

35 YEARS YOUNG! J-M 85% Magnesia was applied to pipes of this mill, back in 1912. Because this job was *engineered right* and *applied right,* it is still providing dependable insulation . . . still keeping fuel costs low. Get expert help with *your* insulation problem by writing to Canadian Johns-Manville, Toronto, Montreal, Winnipeg or Vancouver.

JOHNS-MANVILLE *First in* INSULATIONS

I-646

Generating AIR POWER

Night and day these two 14½" stroke XVHE-2 Air Compressors deliver over 5000 c.f.m. of Air Power at 100 lbs. pressure.

WITH "XVH" *Heavy Duty* COMPRESSORS

- Sizes from 75 to 1000 hp.
- Air cushioned Channel Valves for higher compression efficiency.
- Automatic load control.
- Heavy-duty roller type main bearings for long life.
- Positive pressure lubrication to all moving parts.
- Rigid one-piece frame ensures proper alignment of all parts.
- Suitable for any type of drive.

WHEN you require a compressor for continuous full-load service where large volumes of air or gas are to be handled, install the Canadian Ingersoll-Rand Class "XVH" Compressor.

High overall efficiency and low power consumption are characteristics of this modern, heavy-duty compressor. Freedom from maintenance troubles is assured by self-aligning spherical roller bearings and pressure lubrication to all moving parts. With automatic three- or five-step control the compressor may be locked for any maximum load, thus limiting electrical peaks. For easy starting and stopping, manual control of the regulator is provided.

Wherever AIR POWER goes to work . . . in mines, collieries, steel, textile and paper mills, chemical plants, railroad shops, shipyards and automotive plants . . . C-I-R "XVH" Compressors have proved their many operating advantages and reliability.

Canadian Ingersoll-Rand Company Limited

HEAD OFFICE: MONTREAL, QUE..... WORKS: SHERBROOKE, QUE.

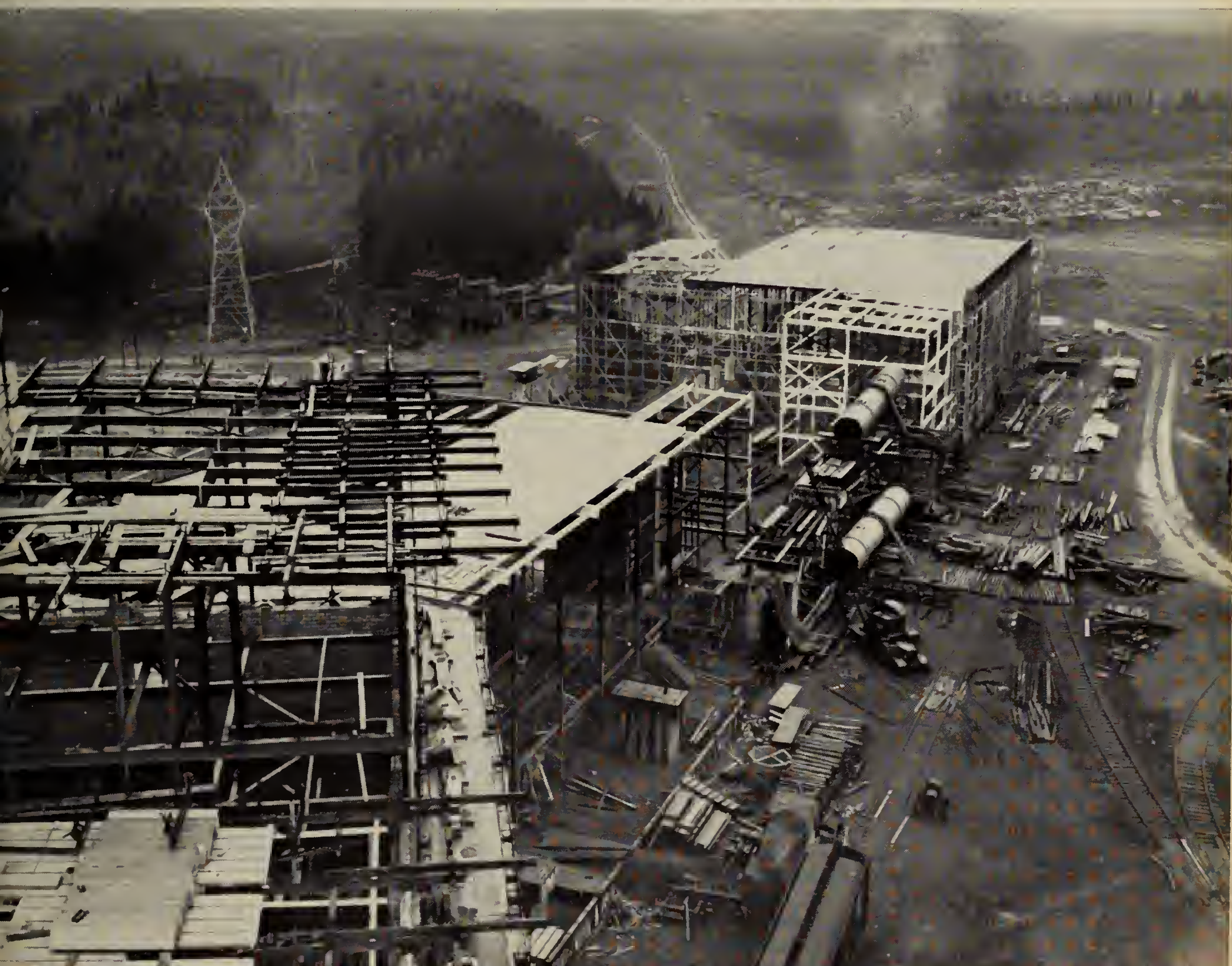
B-2

AIR AND GAS COMPRESSORS • ROCK DRILLS • HOISTS • PUMPS • BLOWERS • CONDENSERS • AIR TOOLS

THE ENGINEERING JOURNAL

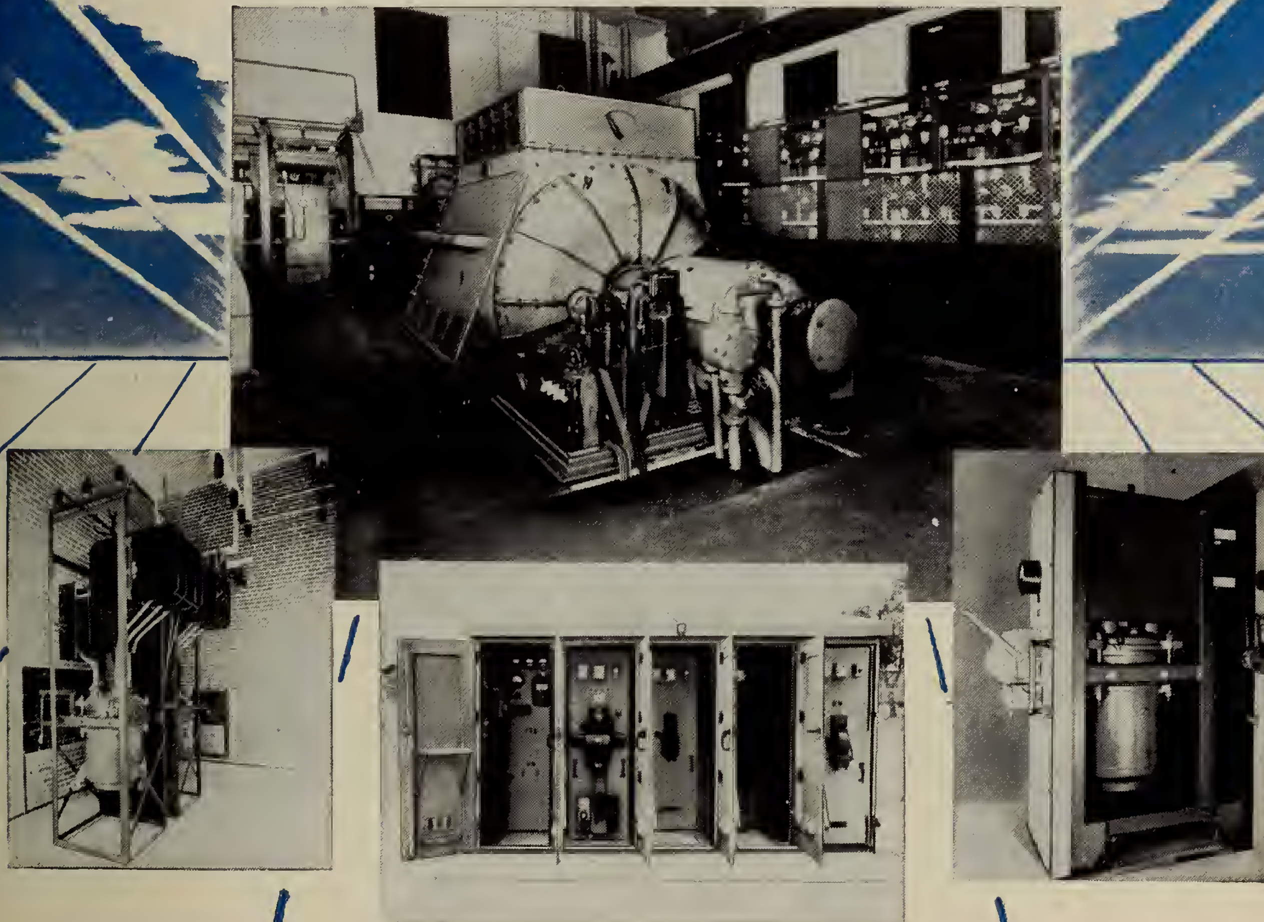
VOLUME 31 NUMBER 3
MARCH 1948

THE ENGINEERING INSTITUTE OF CANADA FOUNDED 1887



PUBLISHED MONTHLY BY
THE ENGINEERING INSTITUTE of CANADA

BEHIND BEPCO SWITCHGEAR



THE 'CROMPTON' SHORT-CIRCUIT TESTING STATION

This Testing Station is located at our Crompton-Parkinson Works. Here performance-certificates are issued through the British Association of Short-Circuit Testing Authorities.

Our research engineers have constant access to the facilities of this station. As a result, our oil circuit breakers are conservatively rated from tests under actual and sustained short-circuit conditions.

The March issue of the "Bepco Journal" contains a complete article, giving full details on the 'Crompton Short-Circuit Testing Station'. We will gladly send you a copy if you haven't already received one.

2-24

BEPCO CANADA LIMITED

TORONTO

VANCOUVER

MONTREAL

Do this

That's the Steelox Joint –

Erect a Structure a Day!

GIVE four men a shipment of ARMCO STEELOX! You will be surprised how quickly they will have the building erected. This special patented ARMCO STEELOX Joint is the reason.

ARMCO STEELOX panels fly together . . . just like cupping your fist . . . and they are strong as a steel ox. They are tough, too . . . tough enough to stand all the weather you want to give them. And STEELOX panels are light, easy-to-handle . . . fire-resistant . . . and take and hold paint. Then when you want the building moved or dismantled, just uncup the STEELOX "fists". It's as easy as that.

See for yourself how easily and economically STEELOX buildings can solve the most difficult building problems. Use them for offices, tool houses, utility buildings . . . wherever you need permanent or semi-permanent buildings. STEELOX Buildings are prefabricated in a wide range of standard sizes. Write for prices and complete information to Armco Drainage & Metal Products of Canada Limited, 358 George St., Guelph, Ontario.

ARMCO

148A-7

ARMCO DRAINAGE & METAL PRODUCTS
OF CANADA LTD.

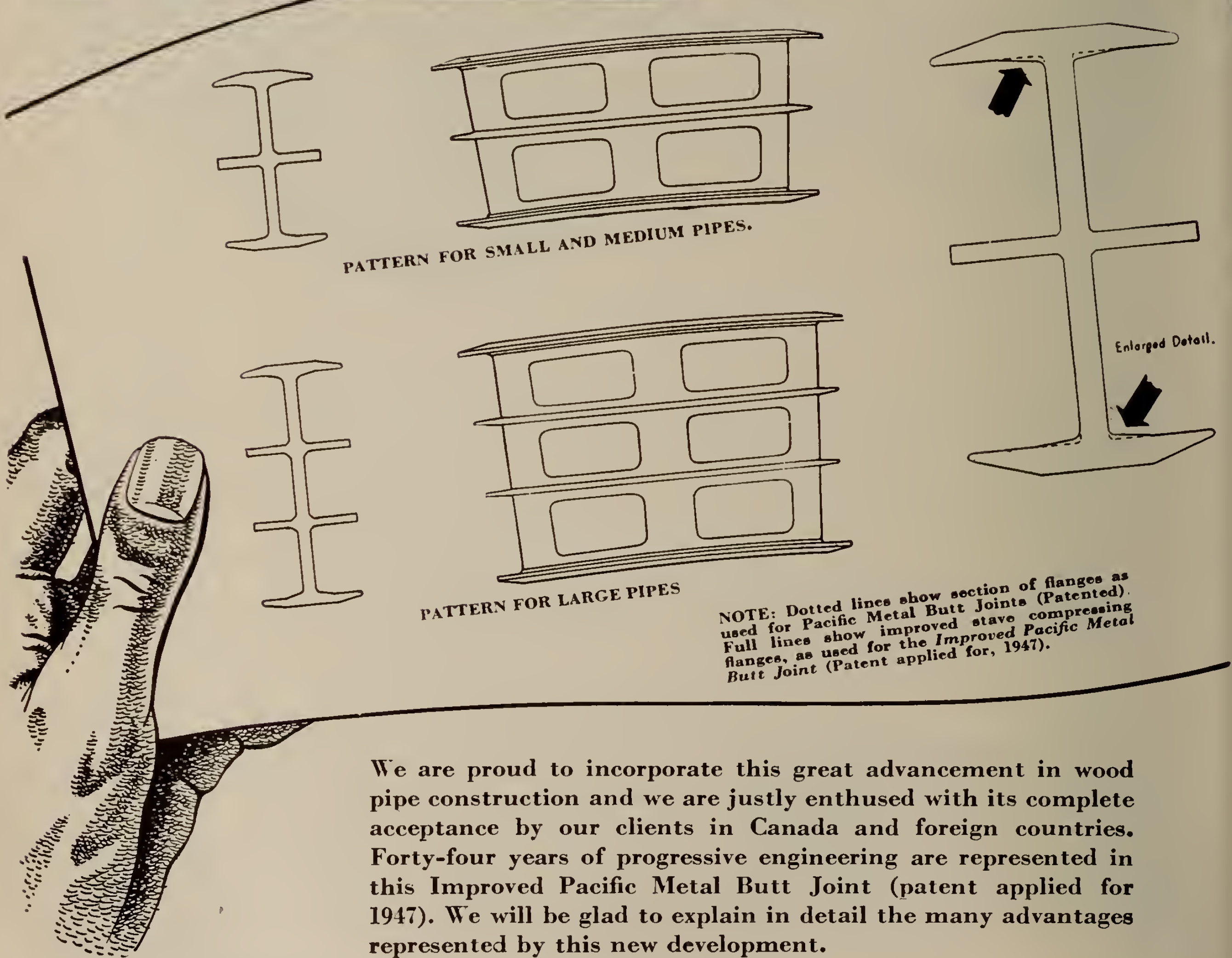
LENNOXVILLE GUELPH WINNIPEG
REGINA EDMONTON CALGARY VANCOUVER

PACIFIC COAST PIPE DEVELOPS *IMPROVED*

PACIFIC METAL BUTT JOINT

(*PATENT APPLIED FOR 1947*)

FOR CONTINUOUS WOOD STAVE PIPE



We are proud to incorporate this great advancement in wood pipe construction and we are justly enthused with its complete acceptance by our clients in Canada and foreign countries. Forty-four years of progressive engineering are represented in this Improved Pacific Metal Butt Joint (patent applied for 1947). We will be glad to explain in detail the many advantages represented by this new development.

Pacific Coast Pipe Co. Ltd.

1551 GRANVILLE ST. *Established 1904* VANCOUVER, CANADA


It takes a WORLD of products to make a ton of STEEL
BETHLEHEM STEEL

TO GET MORE POWER FROM LESS FUEL—

Many Canadian manufacturers are installing **BABCOCK** *"INTEGRAL-FURNACE" BOILERS*

because these power units are guaranteed by their past performance. The Babcock service of designing and building complete steam-generating units under one responsibility pays dividends to our customers in long, trouble-free, economical service.

Let Babcock engineers show you the advantages of these better power units - - adaptable, efficient, high producers of low-cost steam.

BABCOCK-WILCOX & GOLDIE-McCULLOCH
GALT LIMITED ONTARIO
BRANCHES:
MONTREAL - CALGARY
TORONTO - VANCOUVER

COGHLIN SPRINGS
FOR QUALITY AND SATISFACTION
With seventy-nine years' Canadian reputation and experience, you can safely specify COGHLIN'S for all your spring requirements.
B·J·COGHLIN CO. Limited
3320 ONTARIO STREET EAST
MONTREAL, CANADA
Established 1869
Agents:
Filer-Smith Machinery Co., Ltd., Winnipeg   Gordon & Belyea, Ltd., Vancouver.

WOOD PRESERVES ITSELF
OSMOSE
PROCESS & COMPOUNDS PATENTED
PENTOX
TRADE MARK

Features

- ★ Rugged frames—heavy duty bedplate of welded structural steel.
- ★ Improved type guides, gears, bearings and roll adjusting mechanism.
- ★ Chilled iron rolls—cored for cooling or heating—ground bodies and journals.
- ★ Flood lubricated roll neck bearings—separate sump tank, pump and motor.
- ★ Cut gearing—torch hardened staggered tooth connecting gears—fine pitch drive gears.
- ★ Easily operated safety bar with switch operates all-electric braking arrangement.
- ★ Can be equipped with anti-friction bearings (Pioneered by Dominion on plastics mills)
- ★ Provided with Dominion standard heavy duty speed reduction gear units.

Standard sizes—6" x 13" to 26" x 84" for laboratory and production work.

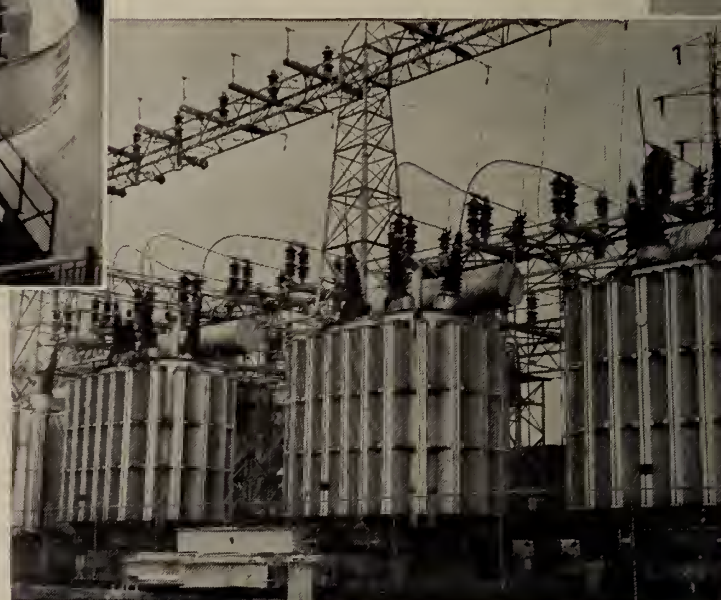
• "Dominion" is Canada's foremost manufacturer of Rubber and Plastics Mills. Extra rugged in design, these mills are built to operate with smoothness and efficiency, to provide the fullest measure of trouble-free service. For rubber applications, mills are available for mixing, warming, break-down, cracking, washing, refining.

Other DOMINION Equipment for the Rubber and Plastics Industries . . .

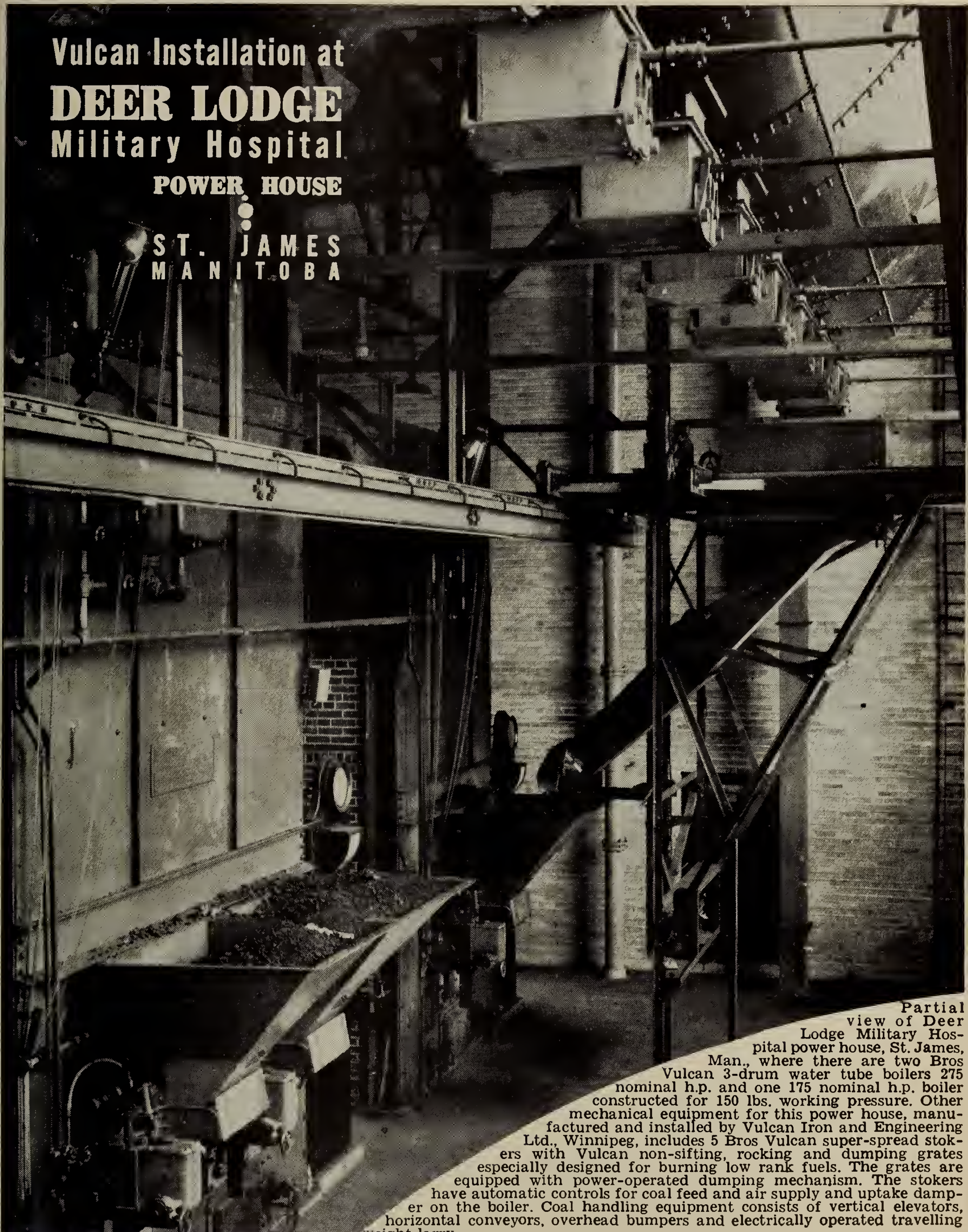
DOMINION CALENDERS
BANBURY MIXERS.
EXTRUDERS AND TUBERS.
ROLLS—CHILLED AND ALLOY IRON.
GEAR UNITS, CONNECTING AND DRIVE GEARS.
HYDRAULIC PRESSES
SPECIAL MACHINERY.

For further information about any Dominion Equipment listed—write P.O. Box 220, Montreal.

DOMINION ENGINEERING COMPANY LIMITED




SKF
The World's Finest Ball and Roller Bearings are made from Swedish Steel



Partial view of Deer Lodge Military Hospital power house, St. James, Man., where there are two Bros Vulcan 3-drum water tube boilers 275 nominal h.p. and one 175 nominal h.p. boiler constructed for 150 lbs. working pressure. Other mechanical equipment for this power house, manufactured and installed by Vulcan Iron and Engineering Ltd., Winnipeg, includes 5 Bros Vulcan super-spread stokers with Vulcan non-sifting, rocking and dumping grates especially designed for burning low rank fuels. The grates are equipped with power-operated dumping mechanism. The stokers have automatic controls for coal feed and air supply and uptake damper on the boiler. Coal handling equipment consists of vertical elevators, horizontal conveyors, overhead bumpers and electrically operated travelling weight larry.

VULCAN IRON AND ENGINEERING LTD.

Winnipeg **Manitoba**

EST. 1874

NEWALLS 85% MAGNESIA PIPE COVERING

for temperatures up to 600° F.

Provides a ready-made insulation for medium and high temperature pipe lines. May be fitted to cold pipe lines without the internal heat necessary to dry out excessive layers of plastic insulation.

Standard length 3 feet. For pipes ½″ to 10″ inclusive — made in half pipe sections. Over 10″ made in radiused and bevelled lags.

NEWALLS 85% MAGNESIA BLOCKS

for temperatures up to 600° F.

Provides a rigid, lightweight, economical insulation that does not lose volume or settle down under working conditions. Differs from 85% Magnesia Coverings only in form.

36″ long, 6″ wide, thicknesses 1″ to 4″. Weight 12 lbs. per cu. ft.

ATLAS

TRADE MARK

ATLAS ASBESTOS CO. LIMITED

Manufacturers of Asbestos Goods, Packings, Pipe Coverings, etc.

110 McGill St., Montreal, Que. | 35 Mutual St., Toronto, Ont. | 261 Stanley St., Winnipeg, Man.
110 Alexander St., Vancouver, B.C.

"I saw it in The Journal"

Advertisers use the *Journal* as an advertising medium because they know it reaches nearly 10,000 engineers and engineering students each month.

The advertisements are written for *your* information.

If *you* would like to have further details on any of the services or products mentioned in this, or other, issues please write to the advertisers concerned and mention —

THE ENGINEERING JOURNAL

2
3
1
Dodge-Fafnir Ball Bearings
A properly designed and accurately manufactured ball bearing is a scientific achievement, far surpassing any other type of bearing in the reduction of friction. Dodge-Fafnir Ball Bearings, designed and manufactured to rigid specifications, are being applied successfully to all types of mechanical high speed production equipment used by modern industry.
9
4
1. Type "SCS" Single Ball Bearing Hanger Unit for use with maderate laads.
2. Wide Inner Ring Bearing used in Standard hausings. Self-lacking collar assures pasitive lacation and grip.
3. Type "SA" single pillaw black far general industrial service, also made in heavier duty constructian.
4. Double Ball Bearing pillaw black. Type "DSA", far heavier laads.
5. Mechani-Seal Flanged Bearing, specially sealed against dust and dirt, available in fractianal sizes up to 2.
6. Floating Type Single "SAL" pillaw black. Also made in fixed type for maunting in pairs.
7. "GLLB" unit far Mechani-Seal pillaw blacks and flanged bearings.
8. Mechani-Seal Pillow Block, Light Series, Type "LAK" to 2 7/16" diameters.
9. Double Hanger Bearing, Type "D", for use in Dadge and Universal drap hangers.
8
5
710
6
7
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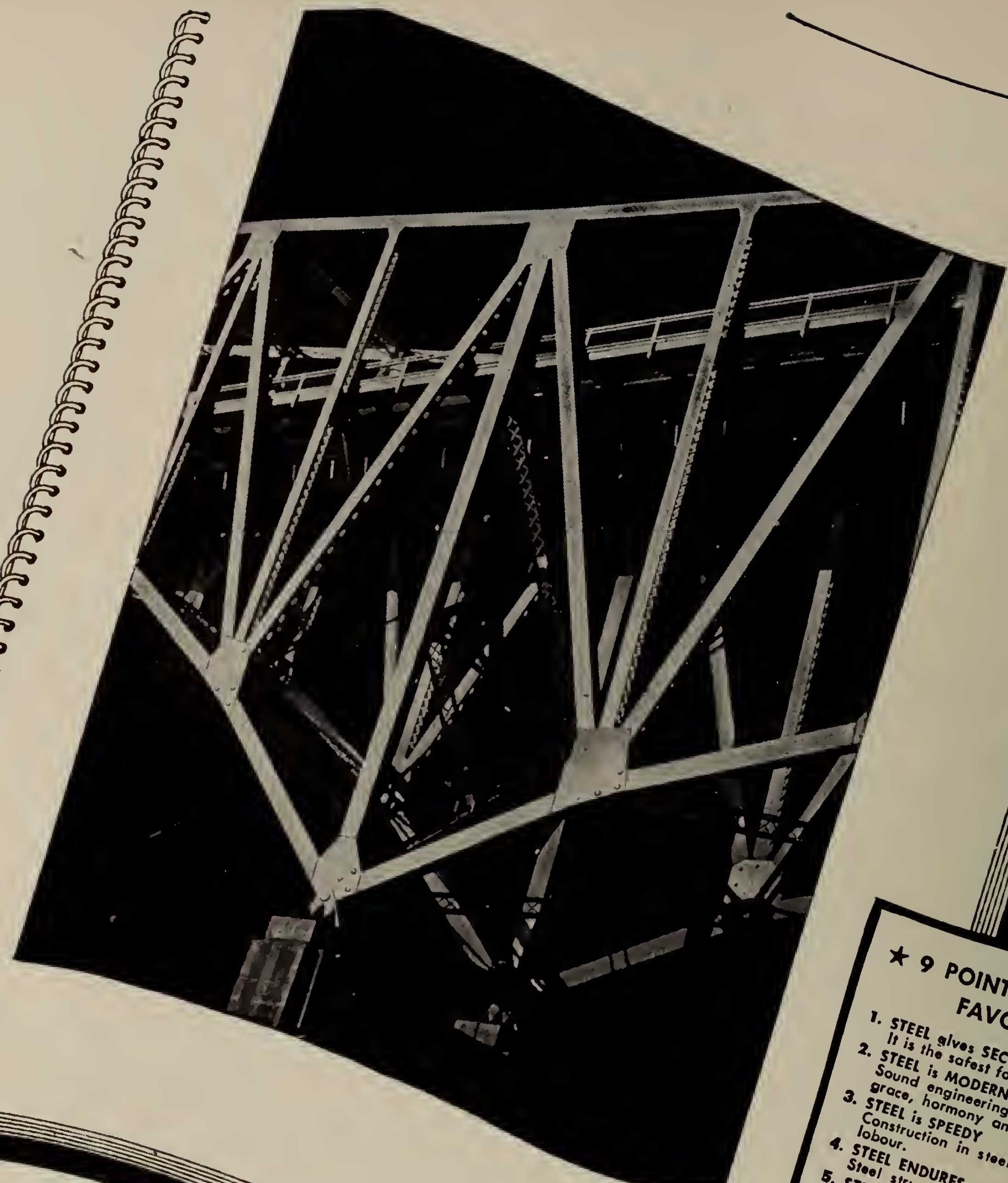

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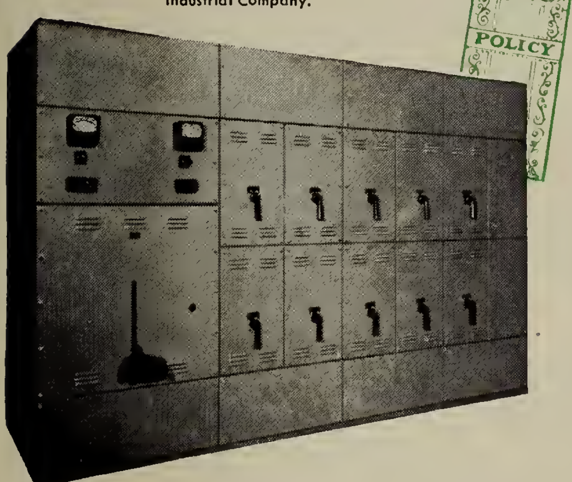

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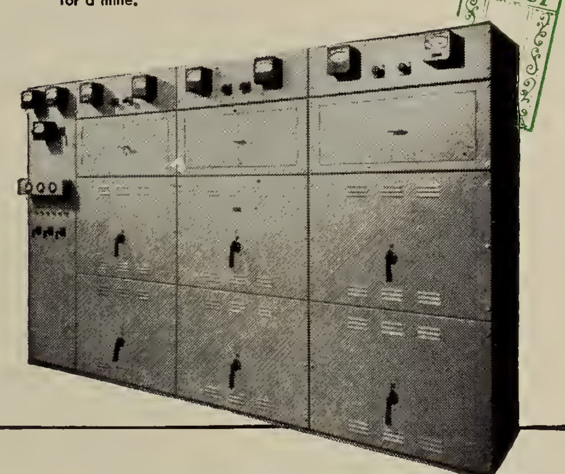

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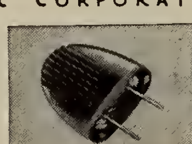

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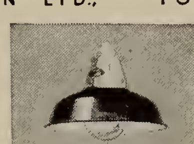

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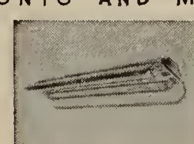

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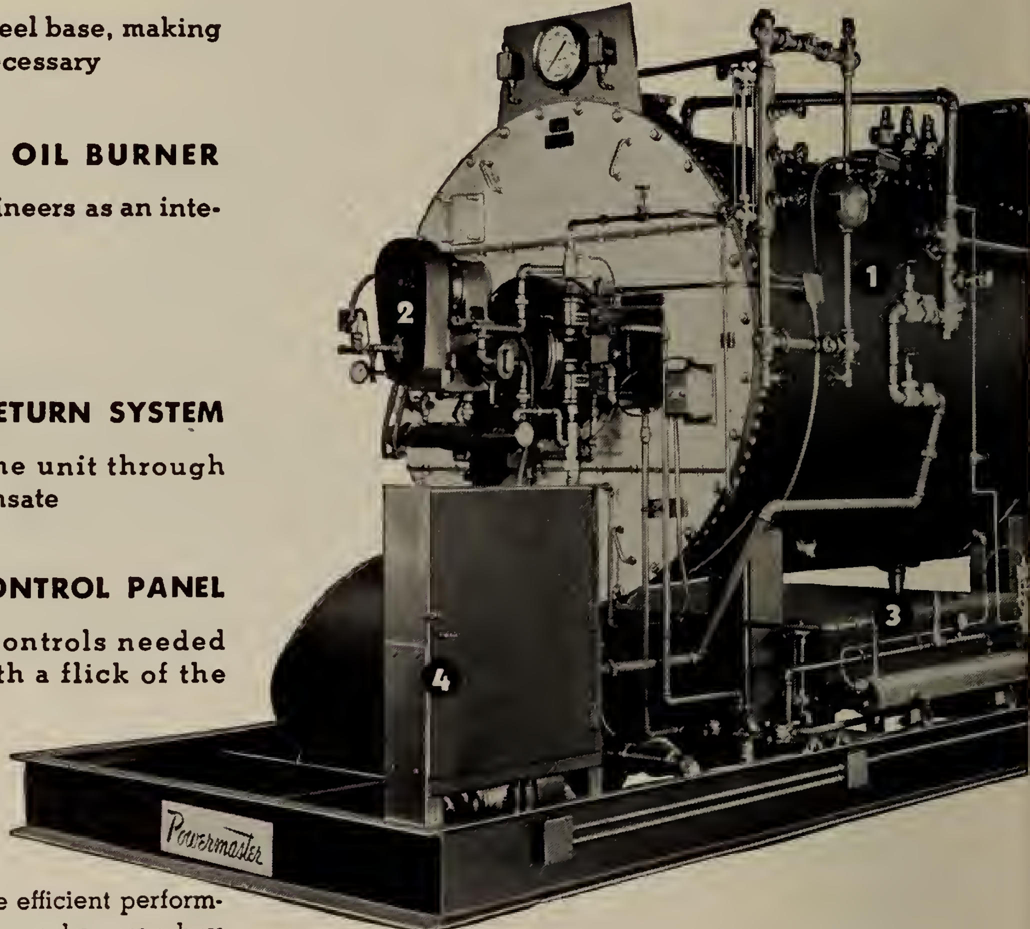

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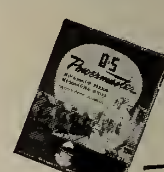

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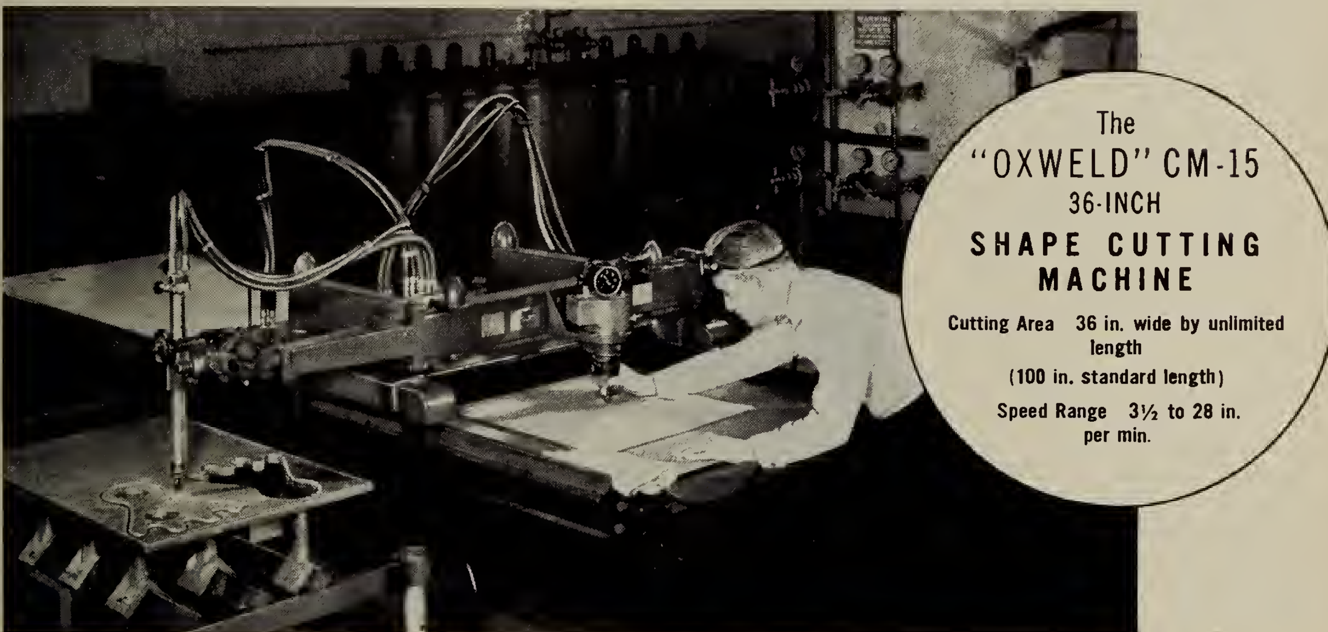

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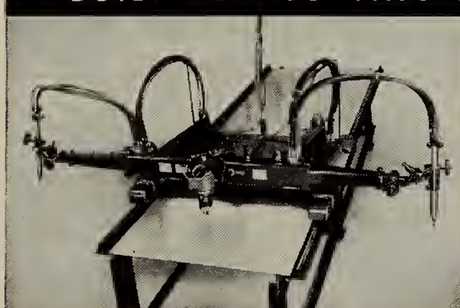

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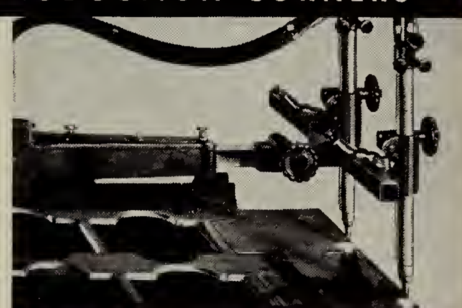

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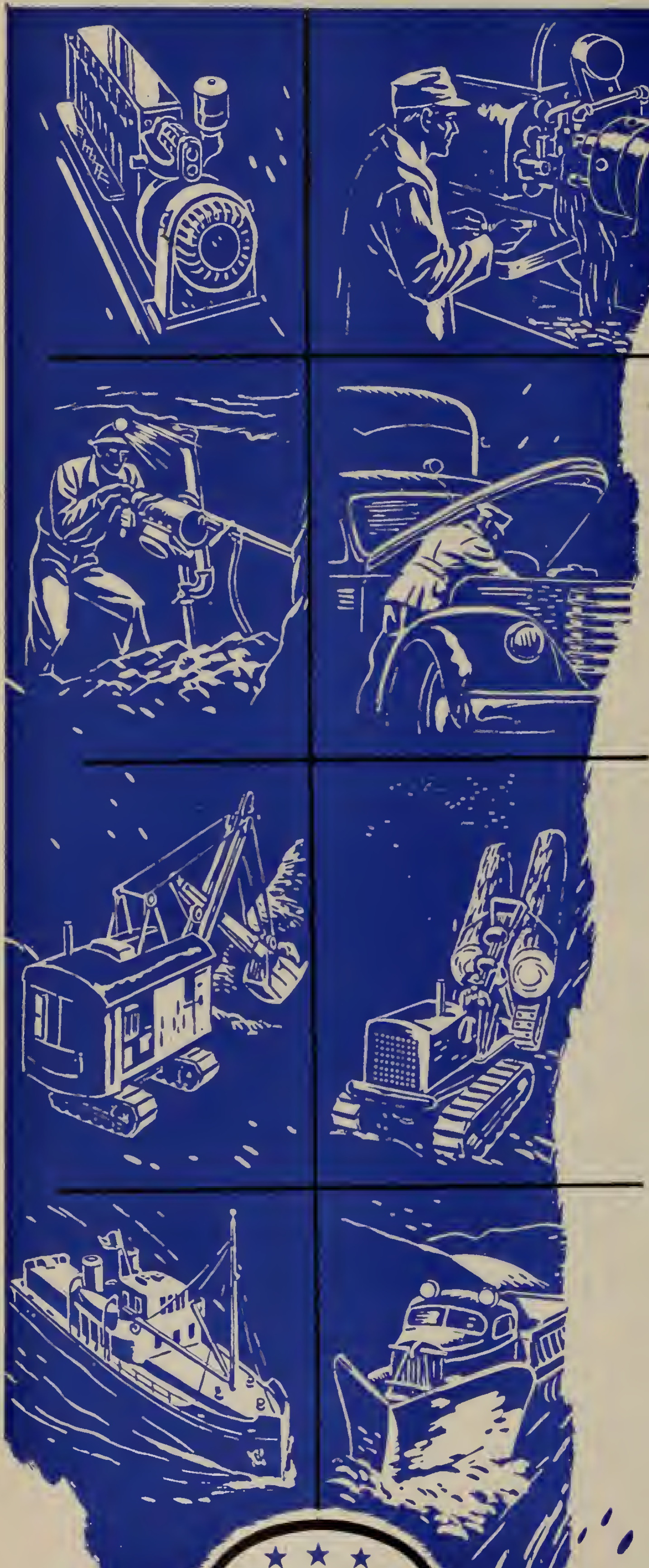

THE ENGINEERING JOURNAL

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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."

★ ★ ★

CONTENTS

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COVER PICTURE

The cover photograph is a view of the main mill building of the Long Lac Pulp and Paper Company's new plant near Terrace Bay on the north shore of Lake Superior. The two large tubes at right centre of the photo are sections of a 300-foot rotary kiln. Calcium carbonate sludge from the recausticizing system will be burned in this kiln to recover approximately 75 tons daily of lime for re-use in the process.

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Radiation Safety Measures in an Atomic Energy Plant

by

KARL Z. MORGAN,

Director, Health Physics Division,
Monsanto Chemical Co.,
Clinton Laboratories, Oak Ridge, Tennessee.

A paper presented before the National Safety Congress, Chicago, Illinois, on October 7, 1947

SYNOPSIS—Giving the chronology of scientific discoveries leading to the release of atomic energy in 1942, the author enumerates events leading to the formation of the Health Physics Department, a newly developed and specialized branch of Radiology. Permissible exposures to radiation are discussed, as well as the probable percentages of fatalities for various exposures. The various detection instruments now in use are described, and illustrations given. Methods of detecting radiation in surrounding areas, and of disposal of waste radioactive materials are shown. The author emphasizes the needs for physicists that would arise in the event of an atomic war, to detect radiation.

The Atomic Age was born here in Chicago on December 2, 1942 when the first chain reacting pile was set in operation by man. This, of course, was not the first atomic machine, because the sun and all the stars are believed to maintain their incandescence from heat generated by atomic reactions, perhaps making use of a number of transmutations of the various elements. However, this was a great event in the history of man. It was, in fact, a crowning achievement of about fifty years of scientific effort by men from many nations. Roentgen, a German, had discovered X-rays in 1895; Becquerel, a Frenchman, discovered the radioactivity of uranium the following year; Rutherford, an Englishman, discovered alpha and beta rays in 1897; Villard, a Frenchman, discovered gamma rays in 1898; Chadwick, an Englishman, discovered the neutron in 1932; Anderson, an American, discovered the positron in 1933; Fermi, an Italian, shot deuterons into uranium and observed some peculiar phenomena in 1935; Bohr of Denmark announced the fission of uranium by Hahn, Strassman and Meitner of Germany in 1939, and finally the atomic age was born with the assistance of scientists of many nations in 1942. This date marks the beginning of the end; the end of war through the establishment of international cooperation and world government—or the end of civilization as a result of an atomic war. It is perhaps not unfitting to remind this organization, which is devoted to national safety and to the welfare and happiness of people, that we still have time to act; that we are obligated to direct our every effort toward the establishment of a system of control of weapons of mass destruction and world federal government with sufficient power to prevent war. This is a problem which concerns the safety of the people of all nations. Against the atomic bomb there is no defense; we have no monopoly in manpower or raw materials; there is no lasting secret of importance.

Health Physics—Specialized Branch of Radiology

When the Plutonium Projects were first organized, it was recalled that hundreds of people had been injured and many had been killed during the past two decades by the small quantity of radium in the world which altogether amounted to only about two pounds. Yet here in Chicago, at Oak Ridge and at Hanford, it was proposed to construct atomic piles. It was proposed to engage in a new kind of chemistry which meant working with hundreds of radioactive isotopes, and was equivalent in terms of radiation to operations with many millions of pounds of radium.

The question was asked by some whether or not it was safe to proceed with these plans. They reasoned that if the accidents due to radium exposure in the past should be scaled up in proportion to the potential radiation exposure, then all of the atomic energy workmen and atomic scientists might be killed. It was as a result of these considerations that Dr. E. O. Wollan, then of Chicago, was called on to organize the first Health Physics Department during the summer of 1942. Dr. R. S. Stone of San Francisco shortly afterwards was made Associate Project Director for Health of the Plutonium Projects. Health Physics was a new name applied to a newly developed and specialized branch of Radiology.

The purposes of the Plutonium Project were threefold: (1) Develop chain reacting piles, (2) Separate plutonium chemically and (3) Obtain theoretical and experimental data for effecting an explosive chain reaction. Health Physics had and still has only one goal, to make a study of radiation problems, and to develop means of preventing radiation damage. The need for this science actually began when Roentgen discovered X-rays, because one of the first producers of X-ray tubes, Mr. Grubbe of Chicago, noticed the X-ray damage to his hands as early as 1896, one year after the discovery of X-rays. He then began seeking skin treatment and devising means of preventing further overexposure.

Permissible Exposures

One of the first considerations of Health Physics was to decide how much radiation would be considered a permissible tolerance dose. The International Congress of Radiobiology in 1934 had set tolerance at 200 milliroentgens per day (mr/day), and the American Advisory Committee on X-ray and Radium in 1936 had set tolerance at 100 mr/day for X and gamma radiation. Fortunately, the latter more conservative value was adopted at the beginning of the project in this country. Rather recent chronic experiments, being conducted by E. Lorenz, L. O. Jacobson and others at the University of Chicago, have indicated that this level of 100 mr/day definitely should be considered as a maximum permissible level of radiation exposure. This should not be the amount of radiation a person would be willing to receive routinely each day for the rest of his life. A person exposed continuously to this rate of radiation exposure will experience a certain amount of biological and genetic changes. So far, however, animal experiments and the limited observation on man do not indicate that this level of radiation will produce harmful results due to extended exposures. The Chalk River atomic energy project in Canada has recently chosen half the American permissible dose, or 50 mr/day, as its tolerance value.

All life on this planet is subjected to a continuous bombardment of cosmic rays from remote reaches of space where nature's atomic machines are operating. In addition, the air we breathe and the food we eat contain about fifty natural radioactive isotopes, which become a part of our bodies and continually blast our living cells during the period of our existence. We do not measure radiation damage, therefore, by the fact that it destroys some of our body cells, but rather, we say harm results to man from radiation when cells are destroyed at a rate exceeding the rate of repair, or when sufficient radiation is received to disturb normal body function and development or when the hereditary effects on our children and children's children become readily perceptible.

Admitting these uncertainties, and at the same time recognizing that all men have always been exposed to some radiations, it has been the practice of the laboratories on the Plutonium Project to maintain a factor of safety of ten. As a result very few of their personnel are believed to have averaged an exposure exceeding ten milliroentgens equivalent man per day (mrem/day). This latter unit is defined as that amount of any kind of radiation (alpha, beta, gamma, X or neutron) that produces the same damage to man as one milliroentgen of X or gamma radiation. This new unit was necessary because the roentgen is defined only in terms of X and gamma radiation, and because all these other types of radiation are dealt with in the atomic energy plants. Of course, the mrem is not as easy to use in practice as in theory since, for example, it is difficult to compare the body damage of an erythema resulting from an overexposure to the beta rays of radioactive phosphorus-32 with a leukemia that is caused by overexposure to the penetrating gamma rays from a pile.

Some of the radiations are much more damaging than others, due to the variation in specific ionization. In fact, the tolerance values seem to vary approximately inversely as the cube root of the specific ionization in air. An alpha radiating substance will probably produce no damage when it is on the hands. If it gets inside the body, however, it is about ten times as hazardous as beta or gamma radiation of the same energy dissipation per gram of tissue. The relative effectiveness of radiation in respect to energy absorbed per gram of tissue is expressed in terms of another new project unit called the roentgen equivalent physical (rep). It is defined as that amount of radiation (alpha, beta, gamma, X or neutron) that is absorbed in tissue at the rate of 83 ergs per gram. Table I shows the relative effectiveness of the various types of radiation. The values of flux are only approximate values as indicated.

TABLE I

Tolerance or Maximum Permissible Exposure to Radiation at Clinton Laboratories

Type of Radiation	mr. day	mrep. day*	mrem. day*	Flux for 24 hr Exposure
X or gamma rays	100	100	100	2200 protons of 1 Mev/cm²/sec
beta rays	—	100	100	32 beta/cm²/sec
fast neutrons	—	20	100	66 neutrons of 2 Mev/cm²/sec
thermal neutrons	—	~50	100	1500 neutrons of 0.02 ev/cm²/sec
alpha rays	—	10	100	0.007 alpha/cm²/sec.

*These two units were introduced into project literature by H. M. Parker of Hanford, Washington.

Percent Damage from Overexposure

There is no cure known for overexposure to radiation, and the medical profession can do little to help a person who has been overexposed. The radiosensitivity of persons varies somewhat, perhaps in a manner similar to the variation of susceptibility of persons to sunburn. There is not much quantitative data available regarding man's chances of survival of various doses of total body irradiation. Perhaps when more data is available from Hiroshima and Nagasaki we will have the needed information. For the present discussion, however, I might hazard the guess that the pattern is somewhat as follows:

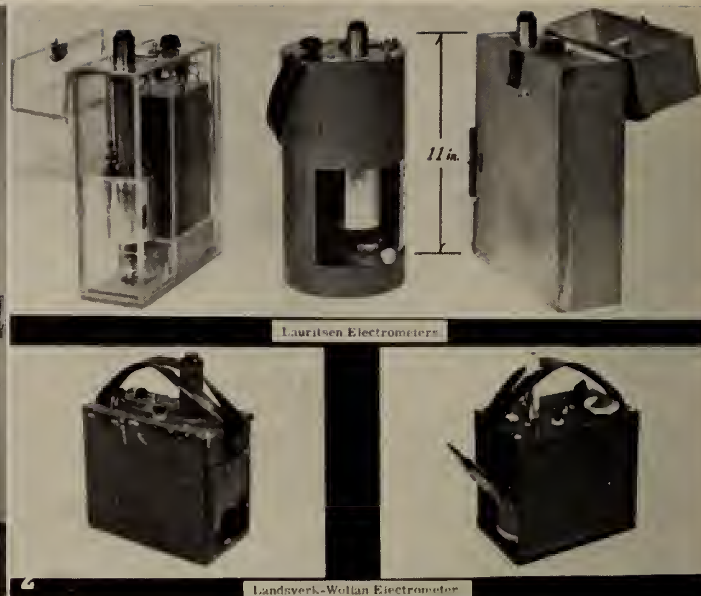
TABLE II

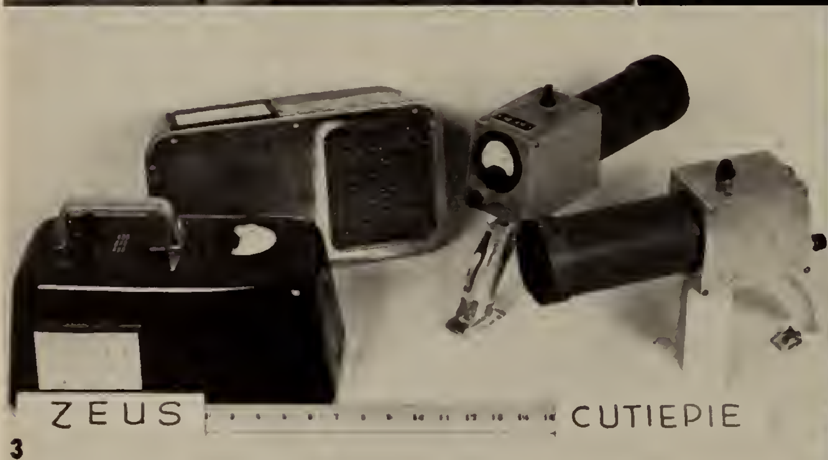
Total Body Exposure to gamma rays in Roentgens	Result
0-50	No readily detectable damage
50-100	Detectable damage
200	Probably kill 10% of persons
400	" " 50% " "
600	" " 75% " "
800	" " 90% " "
1000	" " 95% " "

It should be pointed out here that although a single dose of 200 roentgens might give only one chance in ten of killing a person, if it is followed in a few hours by another dose of 200 roentgens, the result will probably be about the same as a single dose of 400. On the other hand if there is a lapse of a week between the two doses, or if the 400 roentgens is given at the rate of 10 roentgens per day for 40 days, the consequences are much less severe.

Prevention, Not Cure, the Objective

The problems of the health physicist, like those of a safety engineer, are not to effect a cure for those who have been careless and received excessive radiation exposure, but rather it is his responsibility to use





EQUIPMENT OF THE HEALTH PHYSICIST

1. The fish pole meter for detection from safe distances.

2. Electrometers for measurement of beta and gamma radiation.

3. The Zeus and "Cutie Pie" electronic detectors.

4. Portable Geiger counters.

5. A hand and foot Geiger counter.

6. The precipitator (left) and air filter monitor (right) for measurement of air contamination.

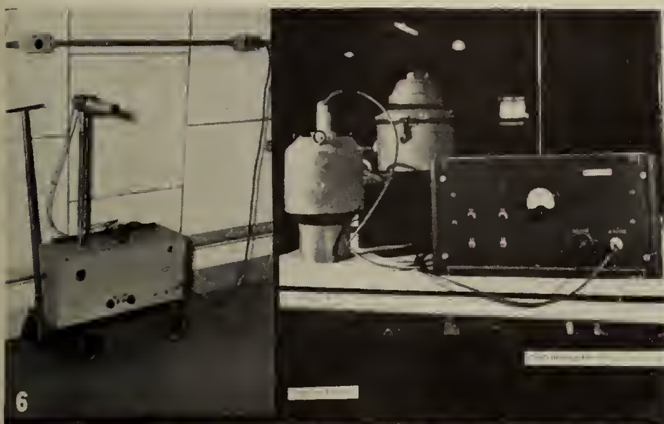
7. A submarine counter.

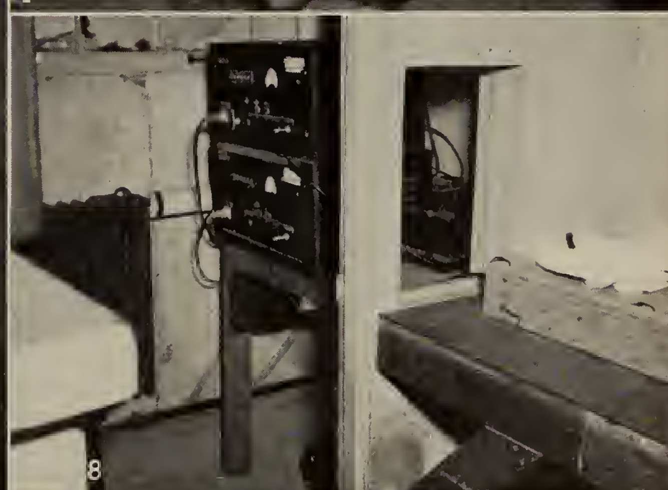
8. Equipment for contamination measurement of clothing.

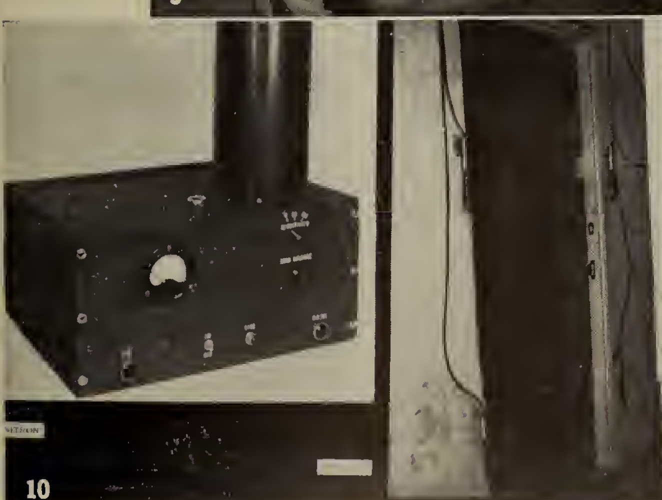
9. Types of film and pocket meters.

10. The "monitron" and "octopus" alarm-sounding meters.

11. Removal of radioactive samples from an atomic pile at Oak Ridge.







every means available to prevent overexposure. The problems of the health physicist differ from those of the safety engineer in that his work has become very specialized and applies only to radiation problems.

Even as late as the fall of 1943, when the Clinton Laboratories pile at Oak Ridge began operating, it was hoped that radiation surveys would be done primarily by operations men, production supervisors and scientific personnel. However, a few nearly serious accidents caused a change in plans, and it became evident that an independent group of Health Physics surveyors should be made available as soon as possible. These men, consisting of junior physicists, chemical engineers, biologists and others were rounded up. They were trained in the proper use of about thirty different instruments; they learned how and when to sample the air to make certain the radioactive argon never exceeded tolerance levels in the air of the pile buildings; they learned how to construct neutron shields that would stop the neutrons without scattering serious amounts of gamma rays; they became familiar with how a properly functioning hood should operate; they became acquainted with the use of the various protective devices such as remote control apparatus, protective clothing, pressure masks, etc.

Instruments for Measuring Local Radiation

Figure 1 shows one of the Health Physics surveyors wearing protective clothing and an army assault type mask. The instrument in his hand is a Fish Pole meter which can be used to measure high radiation levels at a distance or from around a shield, without getting into the beam of radiation. Figures 2 through 10 show other typical instruments which were developed by the Health Physics Department, or with the assistance of other departments of the Plutonium Project. Figure 2 shows various types of Lauritsen and Landsverk-Wollan electrometer mountings. These electrometers are the most reliable of all the survey meters, and serve as the standard instruments for measuring beta and gamma radiation. Some of the electrometer chambers have thin windows which make them suitable for alpha measurements. A few of the electrometer chambers are lined with boron, which makes them very useful for measuring thermal neutrons.

Figure 3 shows two of the most useful electronic instruments. The Zeus has sliding windows of varying thickness so that it can be used to measure alpha, beta and gamma radiation. The Cutie Pie with the pistol grip is useful for measuring beta and gamma radiation over the edge of lead radiation shields, which are frequently placed around hoods in which " hot " work is being carried on. Figure 4 shows three types of portable Geiger Counters. The large one with the loud speaker is called a Walkie Squawkie and the instrument with the ear phones is a Walkie Talkie. The smaller pocket size one is a Simpson low voltage GM counter.

Geiger Counters are very useful as detectors or indicators of the presence of radiation because of their high sensitivity, but contrary to information given in many of the recently published popular news articles, they are not the ideal instruments for radiation surveys. They have many serious limitations, and complete dependence should never be placed on their readings. Figure 5 is a Hand and Foot GM Counter. A person steps up on the platform and places his hands in the two pigeon holes, and the apparatus automatically starts and stops, the five registers on top giving the hand counts on each side of the hands and on the feet in only 24 seconds.

Detecting Radiation in Surrounding Areas

The health physicist's task does not end with his measurements of defects in shielding. It is not complete with his spotting of contamination of table tops, floors, hoods, etc., and his study of experimental arrangements and laboratory techniques that might lead to radiation exposures inside the various buildings. He is responsible for measurements in the neighborhood of the plant, as well as those made inside the buildings. Figure 6 shows two types of instruments for measuring the radioactive material suspended in the air. The instrument on the left is a precipitator, while the one on the right is a continuous air filter monitor. These instruments are used both inside and outside of buildings. Careful measurements are made continuously of the air activity, extending to a distance of several miles from the plant, to make certain that the concentration of radioactive materials suspended in the air does not exceed safe tolerance limits at any time.

In addition, all the waste water is monitored continuously to guarantee that its level of activity is within safe limits. The extremely radioactive waste material is retained in large underground tanks, but the less active waste is sometimes discharged into rivers such as the Clinch at Oak Ridge, Tennessee and the Columbia at Hanford, Washington. The standard maintained by Plutonium Projects is that the radioactive waste, before it enters these rivers, must be so diluted that it is safe for one to drink it exclusively for a life time, or to swim in it 24 hours a day continuously. The latter precaution is to safeguard the fish. In addition to these precautions, the waste water is diluted many more times the moment it enters these rivers. Figure 7 shows a submarine counter for measuring the radioactivity directly in the water, as well as a double pail method of analyzing water samples. The mud in the discharge systems is also analysed for radioactivity, to determine how much radioactive material is retained by the mud. The solid objects that are too contaminated to decontaminate are buried in especially designed and guarded " hot " burial grounds.

Disposal of Waste Radioactive Material

One of the biggest problems connected with the use of radioisotopes by the laboratories outside these Plutonium Projects, which receive radioactive shipments from Clinton Laboratories or produce them with their own cyclotrons and other accelerators, is how to dispose of radioactive waste material. Instructions on proper use and disposal of radioisotopes are furnished users. Improvements in methods of handling are constantly being studied. Health Physics representatives have been instrumental in setting up suitable national regulations for the safe shipment of radioactive materials by rail, plane and motor express. These same representatives no doubt will be called on to assist in setting up additional safeguards for the use of radioisotopes.

One of the most unique operations in an atomic energy Health Physics organization is the decontamination laundry. Here, all clothing used in " hot " areas is washed with detergents and a weak solution of citric acid to remove the radioactive material. Figure 8 shows one of the counting devices used in checking the level of contamination of the clothing before it leaves the laundry.

Personnel Monitoring Service

The operation in Health Physics that is most apparent to regular employees and visitors alike is the personnel monitoring service. A Film Meter and two Pocket Meters are worn by everyone who works in the restricted areas of the Plutonium Projects[1]. The pocket meters are read at the close of each shift, and the films are developed immediately if high pocket meter readings are found—otherwise they are developed only once a week. Regular dental type films are used in the film badge to indicate the beta and gamma ray exposure. The beta exposure is estimated from a measurement of the film density of a portion of the film that was worn in front of an open window in the badge meter. The gamma reading is estimated from a density measurement of a portion of the film that was behind a 1 mm. cadmium shield in the film badge. A special alpha emulsion film is used to detect thermal and fast neutron exposures. The neutrons produce proton recoil tracks in this film, which are counted with the aid of a dark field microscope. The density of these tracks on the portion of the film that was worn behind the cadmium shield is proportional to the fast neutron exposure. The track density on the film that was behind the open window indicates the total neutron exposure capable of producing proton recoils.

Whenever a person receives an exposure in excess of 50mrems/day, both he and his supervisor are notified early the next day so that the exposure will not be repeated. Figure 9 shows some of the types of pocket meters and film meters that are in use on the projects. A very careful record is kept of all the radiation exposure received by each person employed, and this record indicates that most persons are receiving no more excess radiation exposure than they would receive if they lived in Denver, Colorado, because the cosmic ray intensity in Denver is greater than at sea level, due to the elevation and consequently less atmosphere absorption. Less than one per cent of the employees on the project are averaging as much as a tenth of the tolerance dose of radiation.

In addition to all the above instruments, there are a number of alarm type instruments which sound an alarm whenever the radiation in a given area exceeds a predetermined rate. Figure 10 shows two instruments typical of this class. The monitron continually monitors many working areas at Clinton Laboratories and guards against failure of the human element. The octopus consists of GM tubes around a portal so that it rings a bell if a person passes through with contamination on his body or clothing.

Research on New Instruments

All the above efforts are insufficient without the assistance of a research group in Health Physics. One of the most important problems of this group is to develop new types of radiation monitoring instruments as they are needed. For example, there was an urgent need recently for a survey meter suitable for detecting the presence of radioactive carbon-14 contamination. The problem was assigned to the Health Physics research group, and it solved the problem by making

TABLE III

Tolerance Concentration of Radioactive Substances in the Air and Water at Clinton Laboratories

Element	Tolerance Concentration in Air (μc/cc)	Tolerance Concentration in Water (μc/cc)
General β or γ emitters	10^{-7}	5×10^{-4}
General α emitters	3×10^{-11}	10^{-5}
General equations for β or γ submersion tolerance	$\frac{2.1}{E}$	$\frac{1.6}{E}$

The two above equations apply to most of the radioisotopes and can be used in determining tolerance concentrations in cases in which the external exposure is greater than the internal exposure. These equations should not be used in determining the tolerance values of radioisotopes like Sr^{90}, Sr^{89}, Ba^{140} or I^{131} which have a large retention factor in the human body. The term E in these equations is the average energy in Mev.

revisions to the meter called Poppy, which had been initially developed for alpha monitoring. Thus its usefulness was extended to measure the very low energy beta radiation from carbon-14. In general, the problem of this group is to develop such instruments before a dangerous situation exists. Another important task assigned them is to calculate the tolerance levels for the various radioisotopes in the air and in the water. Table III gives the general tolerance levels and Table IV[3] the tolerance levels for some of the particular radioisotopes. Table V[2] indicates the tolerance levels used for hand and shoe counts, laundry counting, body and thyroid counts, table tops, floors, smear tests, boxes for shipment, etc.

The most important part of any successful Health Physics Radiation Protection Programme is the full co-operation and the active participation in the safety efforts by all persons subjected to potential radiation exposure. Radiation is very insidious in its methods of attack, and all kinds of instruments and services of the Health Physicists are not sufficient counteracting agents for carelessness and forgetfulness. In fact, these protection measures have been so successful that some personnel are inclined to become indifferent to this hazard. As a result, educational programmes are conducted occasionally to remind people of why they must be alert constantly and to point out to them their responsibility, not only to themselves, but also for the protection of others with whom and near whom they work.

Figure 11 is a typical scene in the Clinton Pile Building. The six-foot thick concrete pile shield is shown in the background. The square holes in the concrete are plugged to protect the two persons in the foreground. Radioactive samples have just been removed by remote control devices into the lead tunnel and have been transferred with long tongs to the lead shipping containers, in which they will be sent to various research laboratories and hospitals for peacetime research and perhaps for the saving of lives. The Health Physics surveyor in the center is checking the level of the radiation with a Cutie Pie and the instrument on the left is a monitron which sounds an alarm if the radiation reaches the level of 12 mr/hour. Shields, remote control devices, survey meters, Health Physics surveyors, and monitrons are all a vital part of a successful radiation protection programme, but in addition something else is necessary. There is no sub-

[1]Plutonium Projects is used in this discussion to mean the Metallurgical Laboratories of the University of Chicago, Clinton Laboratories of Oak Ridge, and Hanford Works at Richland, Washington.

[2]Table V was given by K. Z. Morgan in *Chemical and Engineering News*, Vol. 25, 51, December 1947.

[3]Table IV was discussed in paper by K. Z. Morgan in *Journal of Physical Chemistry*, Vol. 51, July 1947.

TABLE IV

A comparative Summary of Some of the Values Determined in the Preceding Examples

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Element	Grams per Curie	Assumed Effective Half Life	Method of Body Intake	Organ affected & Fraction of Amt. in Body that is in organ	Fraction taken into Body that reaches Organ	μc in organ to produce tolerance rat when t = 0	μc in Organ to produce an av. tolerance during year	One year tolerance concentrations rate (μc/sec)	One year tolerance concentration in air		One year tolerance concentration in water		Effective Energy
									μc/cc	μgm/cc	μc/cc	μgm/cc	Mev
Ra^{226} pdts	1	~ 2 wks.	Breathing	Lungs (.5)	0.25	.013	.23	7.5×10^{-9}	2.0×10^{-10}	2.0×10^{-10}			14 α γ
Ra^{226} pdts	1	~ 10 yr.	Ingestion	Bone (.6)	0.05	.155	.16	5.1×10^{-9}			4.4×10^{-6}	4.4×10^{-6}	14 α γ
Pu^{239}	16	2 mo.	Breathing	Lungs (.3)	0.25	.035	.15	4.7×10^{-9}	1.3×10^{-10}	2×10^{-9}			5.16 α
Pu^{239}	16	10 yr.	Ingestion	Bone (.6)	0.0003	.42	.43	1.4×10^{-8}			2.0×10^{-3}	3.1×10^{-2}	5.16 α
Pu^{239}	16	10 yr.	Breathing	Bone (.6)	0.0375	.42	.43	1.4×10^{-8}	2.5×10^{-9}	4.0×10^{-8}			5.16 α
Natural U	1.47×10^{6}	2 mo.	Breathing	Lungs (.3)	0.25	.041	.17	5.5×10^{-9}	1.5×10^{-10}	2.1×10^{-4}			4.43 α
Enriched U	2.7×10^{4}	2 mo.	Breathing	Lungs (.3)	0.25	.039	.16	5.1×10^{-9}	1.4×10^{-10}	3.8×10^{-6}			4.7 α
U^{233}		2 mo.	Breathing	Lungs (.3)	0.25	.037	.156	5.0×10^{-9}	1.3×10^{-10}				
Po^{210}	2.24×10^{-4}	82 d.	Breathing	Kidneys (.05)	0.011	.010	.033	1.0×10^{-9}	6.4×10^{-10}	1.4×10^{-13}			5.3 α
Po^{210}	2.24×10^{-4}	82 d.	Ingestion	Kidneys (.05)	0.001	.010	.033	1.0×10^{-9}			4.5×10^{-5}	1.0×10^{-8}	5.3 α
Sr^{89}	3.7×10^{-5}	43 d.	Ingestion	Bone (.5)	0.075	32	190	6.0×10^{-6}			3.4×10^{-3}	1.3×10^{-7}	0.6 β
$Sr^{90} \rightarrow Y^{90}$	7.74×10^{-3}	Sr - 197 d. Y - 2.49 d.	Ingestion	Bone (.5)	0.075	88 (20)*	34	1.1×10^{-6}			6.2×10^{-4}	4.8×10^{-6}	.22, .8 β
C^{14} (graphite)	0.23	2 mo.	Breathing	Lungs (.3)	0.25	32	130	4.3×10^{-6}	1.2×10^{-7}	2.6×10^{-8}			.05 β
C^{14} (CO_2)	0.23	10 d.	Breathing	Total Body (1)	0.25	2260	5.7×10^{4}	1.8×10^{-3}	4.8×10^{-5}	1.1×10^{-5}			.05 β
H^3 (water)	2.59×10^{-4}	2 d.	Breathing	Lungs (.02)	0.25	320	4×10^{4}	1.3×10^{-3}	3.5×10^{-5}	9×10^{-9}			.005 β
I^{131}	8×10^{-6}	6.3 d.	Ing. or Br.	Thyroid (.2)	0.20	2.0	81	2.6×10^{-6}	8.5×10^{-8}	6.8×10^{-13}	5.5×10^{-4}	4.4×10^{-9}	.2 βγ
Na^{24}	1.13×10^{-7}	14.8 hr.	Submersion	Body					6.3×10^{-7}	7.1×10^{-14}	4.9×10^{-4}	5.5×10^{-11}	3.3 βγ
Na^{24}	1.13×10^{-7}	14 hr.	Ing. or Br.	Blood (.25)	0.25	2.2	960	3.0×10^{-5}	8.1×10^{-7}	9.1×10^{-14}	5.2×10^{-3}	6.0×10^{-10}	3.3 βγ
Na^{24}	1.13×10^{-7}	11.5 hr.	Ing. or Br.	Lungs (.037)	0.037	0.5	258	8.2×10^{-6}	1.5×10^{-6}	1.7×10^{-13}	9.5×10^{-3}	1.1×10^{-9}	3.3 βγ
P^{32}	3.48×10^{-6}	14.3 d.	Submersion	Body					4.2×10^{-6}	1.5×10^{-11}	3.2×10^{-3}	1.1×10^{-8}	0.5 β
P^{32}	3.48×10^{-6}	13 d.	Ing. or Br.	Bone (.9)	0.09	39	750	2.4×10^{-5}	1.8×10^{-6}	6.2×10^{-12}	.011	4.0×10^{-8}	0.5 β
$Ba^{140} \rightarrow La^{140}$	1.33×10^{-5}	Ba - 11.75 d. La - 1.51 d.	Ingestion	Bone (.6)	0.06	48	170	5.3×10^{-6}			3.8×10^{-3}	5.1×10^{-8}	.4, 2.3 βγ
S^{35}	2.3×10^{-5}	25 d.	Ing. & Br.	Skin (.2)	.05 (.1)**	150	1500	4.7×10^{-5}	3.1×10^{-6}	7.3×10^{-11}	.041	9.4×10^{-7}	.05 β
Ca^{45}	6.15×10^{-5}	150 d.	Ing. or Br.	Bone (.99)	.15 (.4)**	190	400	1.3×10^{-5}	2.1×10^{-7}	1.3×10^{-11}	3.6×10^{-3}	2.2×10^{-7}	0.1 β

The tolerance values in columns 9, 10, 11, 12 and 13 are for continuous exposure. If the exposure is for a 40 hour week, multiply these values by 4.2.

Column 9 is the tolerance concentration rate, P, in μc/sec, to the body organ that will produce a tolerance rate of exposure, after 365 days of consumption.

It should be noted that values given in column 6 depend on the chemical form and in the case of inhalation they depend upon the size particles. Until the most likely forms of these elements in a given laboratory are known, it is difficult to assign typical values of tolerance concentration in columns 10, 11, 12 and 13.

Values in column 9 can be obtained directly from equation 14 or by dividing values in column 8 by the seconds in a year.

Column 8 is the μc in the lung, bone, kidney or blood required to irradiate the organ with 3.65 roentgens of α or 36.5 roentgens of beta-gamma in a year. It is the μc in the thyroid required to irradiate it with 365 roentgens of beta-gamma in a year.

* The Sr-Y activity reaches a maximum after 15 days. The 88 μc is required to produce tolerance exposure rate soon after Sr reaches the bone. Only 20 μc is required to produce tolerance exposure rate on the 15th day. The 34 μc produces an average yearly tolerance dose. (See Fig. 4)

** It is assumed that the fraction reaching the skin by way of the gut is 0.05 and by way of the lungs is 0.1 in the case of S^{35}. For Ca^{45} it is assumed that 0.15 reaches the bone by way of the gut and 0.4 by way of the lung.

TABLE V

TOLERANCE LEVELS OF RADIOACTIVE CONTAMINATION AT CLINTON LABORATORIES

Measurement	Instrument Used	Tolerance Levels
1. Hand	Four fold hand counter Poppy	100 scaler units = 700 counts/min $\simeq$ 1 mr/hr of β and γ. 0 disintegrations/min of α from area of 150 cm^2.
2. Shoe (outside)	Foot counter	30 scaler units = 10,000 counts/min $\simeq$ 14 mr/hr of β and γ.
3. Shoe (inside)	Shoe probe	1,000 counts/min $\simeq$ 1/3 mr/hr of β and γ.
4. Clothing	Laundry counter	500 counts/min $\simeq$ 1/3 mr/hr of β and γ.
5. Clothing, shoes, etc.	Poppy	1,500 disintegrations/min of α from area of 150 cm^2.
6. Body	Poppy	500 disintegrations/min of α from area of 150 cm^2.
7. Thyroid	G. M. Probe counter	800 counts/min with counter against throat ($\sim$1,000 mr/24 hr in thyroid).
8. Table tops, floors, etc.	Poppy	2,000 disintegrations/min of α from area of 150 cm^2.
9. Table tops, floors, etc. but protected from handling	Poppy	10,000 disintegrations/min of α from area of 150 cm^2.
10. Inside intermittently used hood	Poppy	30,000 disintegrations/min of α from area of 150 cm^2. (A hood containing $>$ 1 μ gm of plutonium or isotopes of a similar hazard shall be marked "High Level Hood."
11. Smear tests on table tops, floors, apparatus, etc.	2 sq. in. filter paper smeared over $\sim$ 12 sq. inches and counted with β and γ and α counters.	0 disintegrations/min of α. 200 counts/min of β and γ.
12. Boxes for shipment by air or rail.	Smear tests Electroscope	0 disintegrations/min of α, β and γ. $<$ 50 mr/hr at the surface of package.
13. Truck shipments	Electroscope	50 mr/hr at rear wheels of truck and less than 100 mr/day in cab for trip.
14. All laboratory and operating areas	Electroscopes, C.P. meters, etc.	All areas with radiation $>$ 12.5 mr/hr shall be roped off and have signs posted.

stitute for alertness, caution, and a proper understanding and appreciation of the problems.

Sensitivity to Radiation

In conclusion, we should admit that there is a great deal about radiation and its effects on man that we do not understand completely. It is believed that the damage resulting from overexposure to radiation is proportional to the ionization produced in tissue. It is approximately proportional to the cube root of the specific ionization of the primary particle, and to a limited extent it is proportional to the rate the radiation is received. Some tissue is more sensitive than others, and the damage increases rapidly with the area irradiated. Some of the damaging effects of excessive radiation exposures appear within a few days or weeks. Animals have been killed in a matter of minutes by exposure to many thousands of roentgens. Some of the ill effects, like cancer, which can result from very large accumulated doses of radiation may not be observable for 10 to 20 years after exposure began. The effects on the genes may not be observed until many generations hence.

All these observations compel us to say that alpha, beta, gamma, and neutron radiations present serious hazards. On the other hand, these dangers are no greater than high voltage is to the electrician or a hot iron is to a housewife. These radiations are constantly bombarding all of us from natural sources, as explained earlier. Personnel in the atomic energy plants are engaged in operations in which the intensity of their radiation exposures would be increased enormously if certain precautions just discussed were not taken. Man

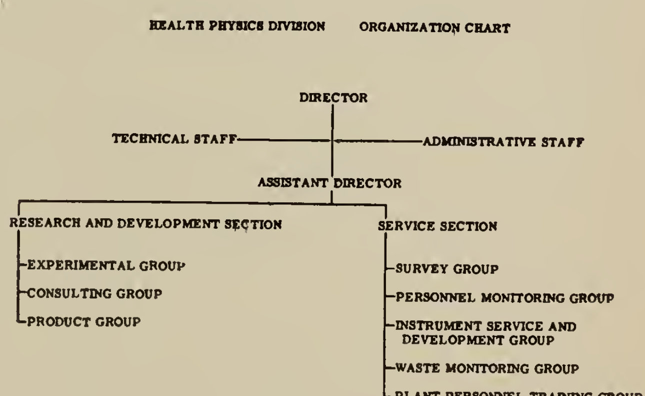


Fig. 12

fears radiation, perhaps because it is a relatively new hazard to human life. If it is handled properly, like other forms of energy, it will bring us happiness and a much better way of life. An induction furnace is not dangerous, so long as it is surrounded by shields and insulating material and equipped with protective devices. The same is true regarding a pile, with the exception that man's reaction to heat warns him of danger when he nears a furnace, while man's senses do not cause him pain when he over-indulges in gamma radiation.

Many Health Physicists Needed

If we do not discharge our responsibilities properly as world citizens; if we do not insist on the establishment of international law and the creation of a world

(Continued on page 166)

Rocket Propulsion

A paper specially prepared for
The Engineering Journal by

K. R. STEHLING, S.E.I.C.

President, University of Toronto
Rocket Society

Tracing the history of rockets and showing why modern rockets must have liquid fuel for a propellant, the author discusses the theory of rocket design and shows how the various rocket components are designed. Future potential uses for rockets, both military and scientific, are enumerated and a plea made for Canadian scientists to take more interest in the subject.

History

There are few modern inventions and mechanical developments that are not based on the extensive work and research of scientists and inventors through the ages. The rocket, so often thought to be a product of the 20th century, actually has a history as extensive as gunpowder, and may be traced back many centuries.

Its beginning is not certain. However, the most ancient manuscripts in Chinese literature reveal the apparent use by that people of rockets, as far back as 500 B.C. Wherever the art of pyrotechnics spread, so did the use of the rocket, and with the introduction of gunpowder in Europe the art gradually became a science. Displays of fireworks were often held on a lavish scale, which boosted their manufacture and laid the foundations for the science of rocketry.

The military potential of the rocket was soon recognized, but it was not used on a wide scale in warfare until the beginning of the 19th century. At that time Sir William Congreve, in England, thoroughly investigated its possibilities as a weapon. His resulting designs for powder rockets have been only slightly improved upon since then. Although rockets were used with good effect in various battles of that time, their inaccuracy and instability, coupled with the development of more effective weapons, hastened their growing obsolescence as a military device. It remained for the second World War to revive them in a more fearful and potent form than ever, improved by modern scientific research.

The year 1919 marked the beginning of a new phase of reaction motor development. Professor Goddard of Clark University in the United States successfully burnt a mixture of oxygen and gasoline in a rocket motor with encouraging results. His subsequent researches, and those of others in Europe, laid the foundation of the liquid fuel propulsor, which has lifted the rocket from the level of a toy to the point where thundering giants weighing several tons ascend scores of miles into the ionosphere.

Rockets Need Liquid Fuel

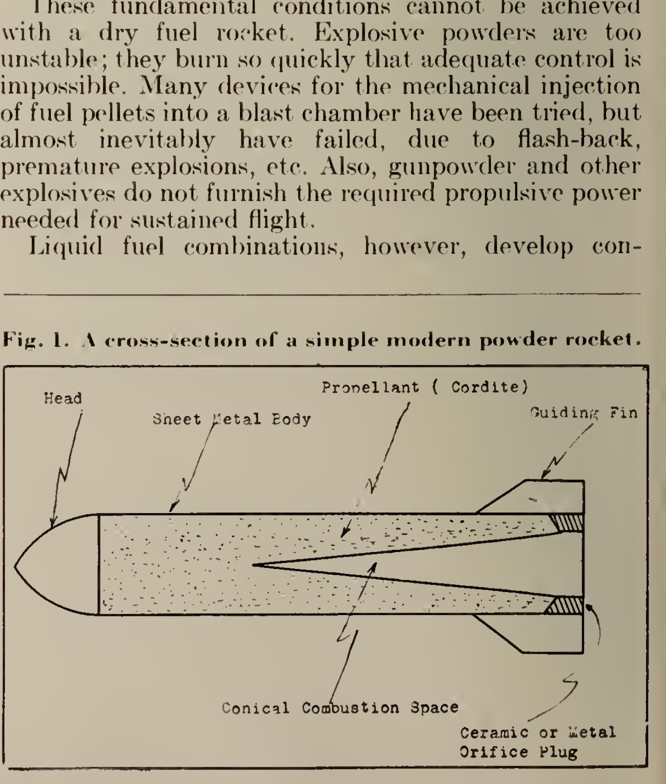
A simple dry fuel rocket usually consists of a tube filled with gun- or smokeless-powder, built and designed on principles established hundreds of years ago. The tube is of some light material and is fireproofed. A conical head of heavier material and a long wooden stick or vanes are attached for balance. A clay plug with an orifice is inserted in the open end of the tube, and the powder is distributed in the form of an open cone. (Fig. 1)

When the powder is ignited, great quantities of gas are created, which exert a back pressure or thrust upon the body of the rocket, as they escape through the clay orifice. Thus, a rocket consists merely of an expansion chamber, designed to withstand the great pressures and temperatures of expanding burning gases. This chamber or "motor" should be scientifically designed to provide for adiabatic expansion, and for the increased exhaust velocity of the ejected gases. The fuel must be gradually introduced into the blast chamber or motor, so that a steady burning or rapidly intermittent explosion occurs. The fuel must be capable of sudden expansion into a much larger volume, yet its flow into the chamber should be controllable if the rocket is to be guided over any great distance.

These fundamental conditions cannot be achieved with a dry fuel rocket. Explosive powders are too unstable; they burn so quickly that adequate control is impossible. Many devices for the mechanical injection of fuel pellets into a blast chamber have been tried, but almost inevitably have failed, due to flash-back, premature explosions, etc. Also, gunpowder and other explosives do not furnish the required propulsive power needed for sustained flight.

Liquid fuel combinations, however, develop con-

Fig. 1. A cross-section of a simple modern powder rocket.



siderably greater thrusts, weight for weight, and higher efficiencies, since a thermodynamically sound expansion chamber may be utilized. Furthermore, since the rate of burning can be varied, the velocity of the rocket can be controlled, a refinement almost impossible to incorporate in a powder rocket. However, the use of liquid fuels has created new problems in chemistry, metallurgy and allied fields which have complicated the work of the research worker, although the rocket (or reaction motor) is basically a very simple device.

The same thermodynamic processes occur in the interior of a rocket engine as those in an automobile cylinder. A fuel (gasoline, alcohol, butane, etc.—liquid) or (carbon and sulphur—solid) is brought into contact with oxygen (liquid, or solid as nitre). The mixture is ignited, the resulting explosive expansion exerts a pressure upon the surrounding walls. However, here there is no piston to push; instead, the gases rush out through an orifice at great speed, pushing the rocket away from them. "This is in accordance with the principle of conservation of momentum; a certain quantity of motion being imparted to the leaving gases, an equal and opposite reaction must act upon the rocket body."

Theory of Rocket Design

For practical purposes, many of the ordinary equations of hydraulics and gas flow may be applied to reaction motor design. A thorough mathematical treatment is both lengthy and complicated. Thus, an empirical equation (derived from Zeuner's equation) for evaluating the reaction developed by a nozzle, assuming a gaseous jet, may be used. It reads:

$$R = 2\,AP_1 \sqrt{1 - \left(\frac{P_2}{P_1}\right)^{\frac{S-1}{S}}} \quad \sqrt{\left(\frac{2}{S+1}\right)^{\frac{2}{S-1}} \frac{S^2}{S^2-1}}$$

where R = reaction in ft. lbs.
A = nozzle area in ft.².
P_1 = abs. initial pressure lb./ft.² of an expanding gas jet.
P_2 = abs. final pressure lb./ft.² of an expanding gas jet.
V_1 = initial specific volume of gas ft.³/lb.
V_2 = final specific volume of gas ft.³/lb.
S = an exponent, experimentally determined for a variety of gases and conditions.

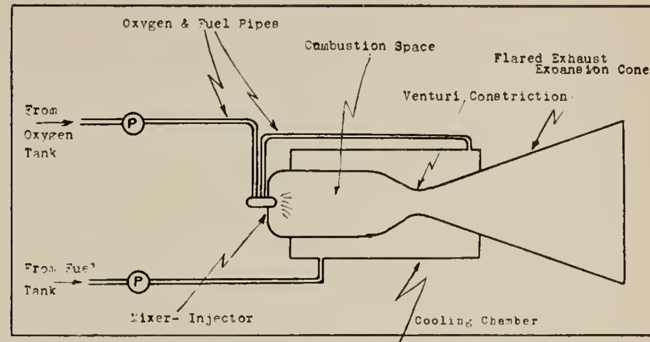


Fig. 2. Simplified diagram of the essential components of a regeneratively cooled rocket motor.

Since the expansion in a rocket nozzle takes place at almost constant entropy (and considering the high temperature prevailing here) the exponent "S" may be taken as $\simeq 1.3$. The exhaust gases consist largely of steam and CO_2. This formula permits the calculation of thrust, and precludes the necessity of measuring exhaust gas velocities directly—an almost impossible feat.

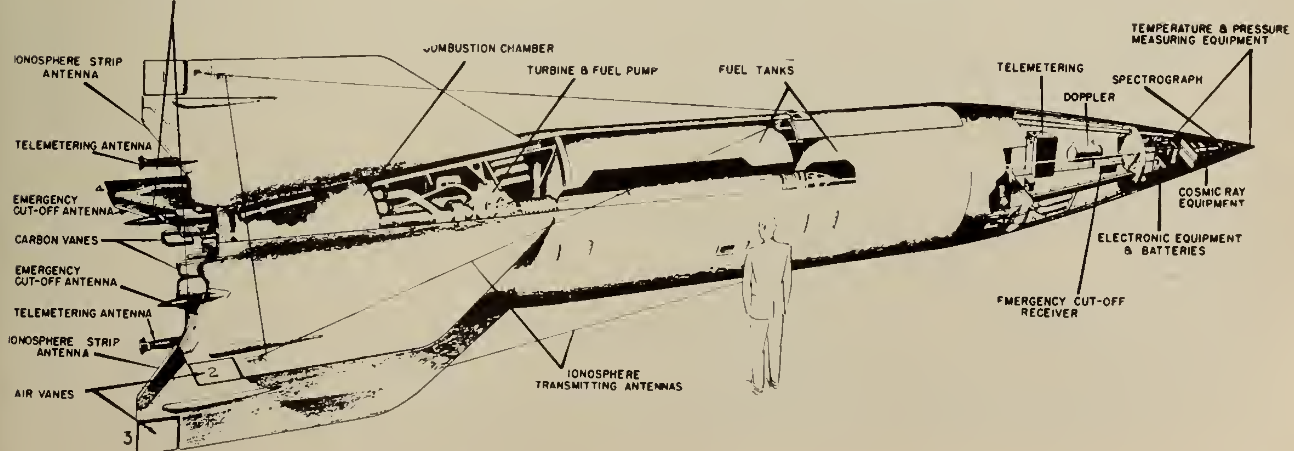
Design

Basically, modern liquid fuel rockets are all very similar, whether the rocket is a small model built by the University of Toronto Rocket Society, or the U.S. Army's converted V-2's. The two most important elements are:

(1) *The fuel reservoir.* This usually consists of two tanks, one containing so-called liquid air or oxygen, the other, some fuel such as alcohol, etc. These liquids are pumped or forced under pressure into the motor, wherein the fuel reacts with the oxygen.

(2) *The motor or blast-chamber.* The term "motor" as used in a rocket is not incongruous. It is true that there are no moving parts as in an aircraft jet engine, nevertheless, like any other motor it is an apparatus wherein force (i.e. expanding gas), is translated into motion, this motion being the forward movement of the rocket. Its thermodynamic characteristics can be calculated and determined experimentally, just as its thermal and mechanical efficiencies can be.

Fig. 3. V-2 equipped for upper atmosphere study. ***Official U.S. Navy diagram***



There are three integral sections in a typical motor:

(a) *The expansion chamber.* A space where the gases are mixed, exploded and expanded initially. Very high temperatures (2000 deg. C) exist in this section, and it is usually lined with some refractory material.

(b) *The constrictor or throat.* Its cross-sectional area must be carefully designed to increase the velocity of the exhaust gases, and yet not to impede their flow unduly.

(c) *The nozzle or expansion cone.* Ideally, a nozzle should be designed to discharge the gases axially, and at the pressure of the surrounding medium, without added frictional re-heating. If the mouth is too small the full expansion is not obtained. If it is too large, turbulences and eddies are set up which cause a back-pressure and decrease the velocity.

For determining the expansion ratio of the flared nozzle, Meyer's empirical equation may be used:

$$\frac{\text{Mouth Area}}{\text{Throat Area}} = 0.172\left(\frac{P_1}{P_2}\right) + 0.7 \left(\text{when } \frac{P_1}{P_2} < 25\right)$$

$$= 0.172\left(\frac{P_1}{P_2}\right)^{0.94} + 0.7 \left(\text{when } \frac{P_1}{P_2} > 25\right)$$

where P_1 = chamber pressure.

P_2 = pressure of surrounding medium.

(The above equation also shows that a rocket is most efficient in vacuum).

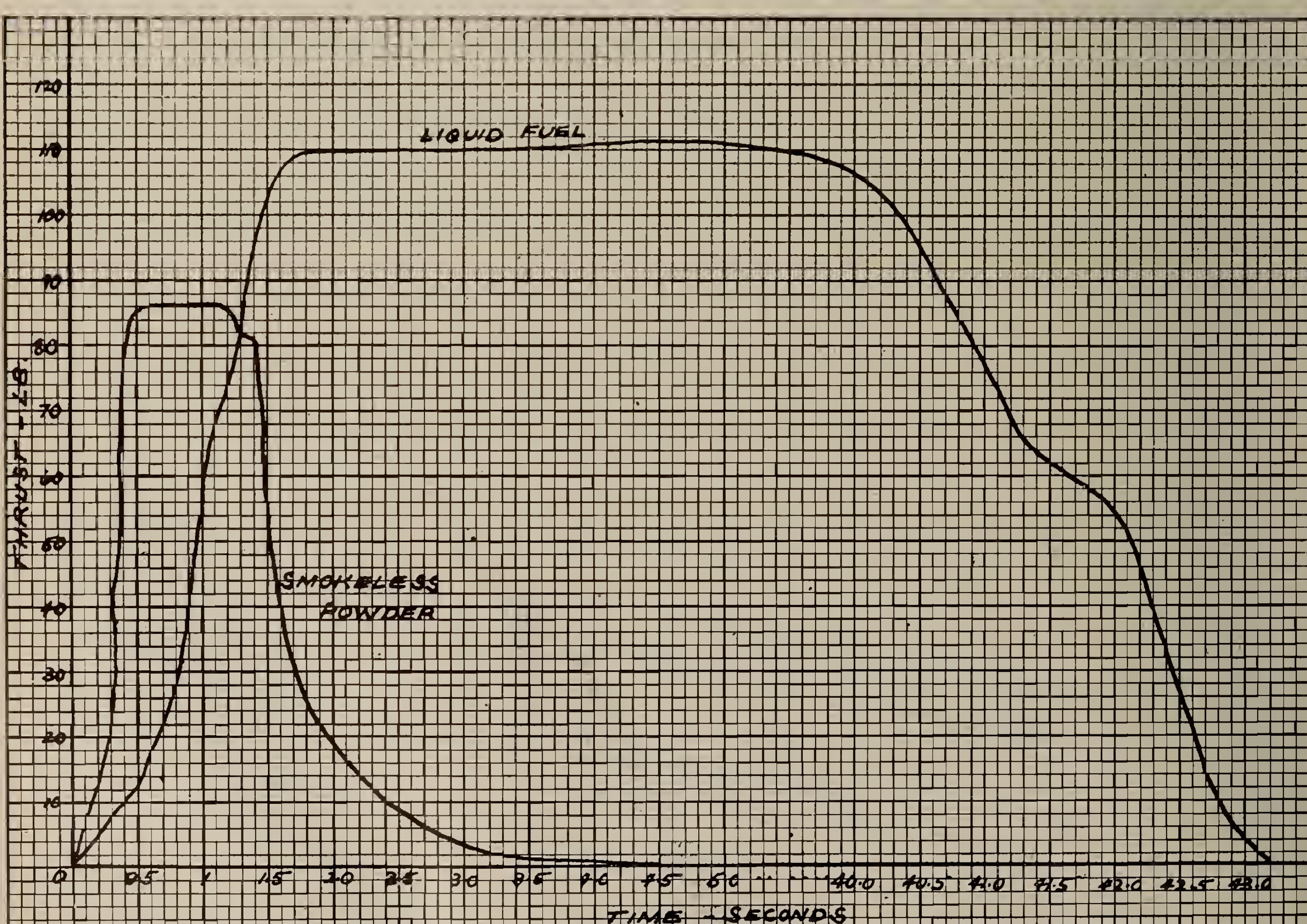
The purpose of the flared nozzle is to develop a high exit velocity for the escaping gas molecules, and consequently, thrust, as resulting from the increase of momentum. (See Fig. 2).

Considerable research with various nozzle shapes and chamber designs has shown that a venturi-shaped motor is the most efficient under most circumstances. Due to the high temperatures encountered, it has been found necessary to cool the motor, especially around the chamber and throat. Water and air cooling have been tried and discarded. Most liquid fuel rocket engines today are regeneratively cooled, i.e.—the fuel is circulated externally around the outer walls and cools the affected areas, being preheated during this process, with a consequent gain in overall efficiency. Also, it is thus possible to construct the motor of some easily machinable metal such as copper or aluminum, which are good heat conductors even though the melting point of these metals is far below the temperature of the burning gas.

To sum up, the motor should have the following properties:

1. High melting point of the metal used. Not less than approx. 1000 deg. C.
2. Good thermal conductivity.
3. High specific tensile strength at high temperatures.
4. Resistance to erosion of exhaust gases.
5. Practical fabrication possibilities.

Fig. 4. A comparison of the duration and amount of thrust between a liquid and dry fuel rocket motor.



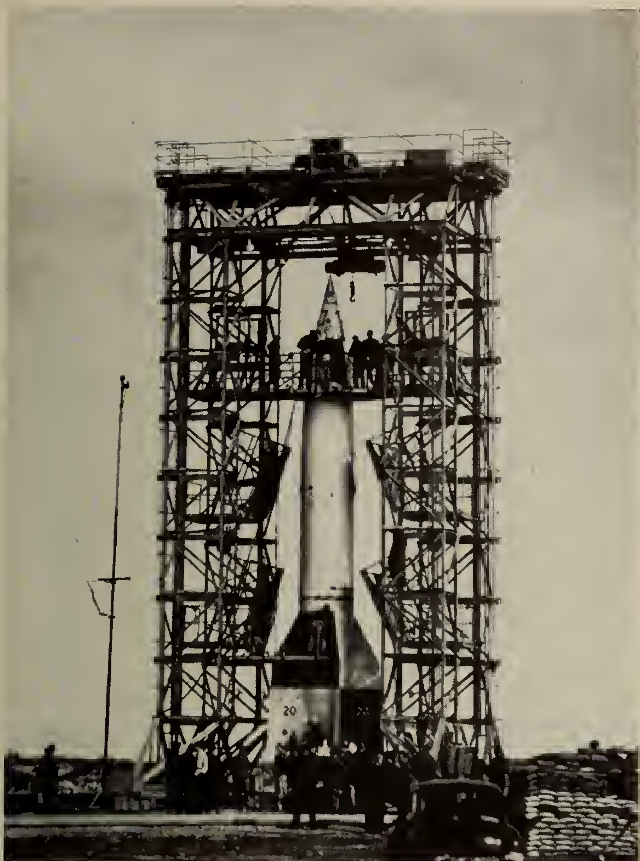


Fig. 5. Final instruments are placed in V-2 by technicians prior to flight into Ionosphere.
U.S.A.A.F. Photo

6. Good thermodynamic design.
7. Reasonably light weight.

It is obvious that the above conditions are difficult to achieve in practice, but present and future research will undoubtedly produce rocket motors far more efficient and durable than any in existence today.

If the thrust of the exhaust gases were acting truly along the longitudinal axis of the rocket, and if there were no atmosphere or gravity to contend with, its motion would be along a straight line. Since these conditions are not met with in practice, it is necessary to stabilize the rocket with some mechanical device such as a gyroscope. This is needed only if great heights and distances are to be attained. The Germans employed elaborate gyroscopic stabilizers along with movable vanes in their V-2's. The Americans are building rockets with movable motors which can change the rocket's direction when it deviates from the normal line of flight.

Future Developments

The science of rocketry is a relatively young one, and there is a great need for extensive research. Consider the problem of fuels. For many years experimenters have burned hydrocarbons, such as gasoline, alcohol and butane, in an atmosphere of pure oxygen carried along as a liquid, in the rocket. Lately, other combinations have been tried, such as aniline and nitric acid, nitromethane (which reacts explosively at certain temperatures) and hydrogen peroxide. (See Table I).

If rockets are to reach greater altitudes, and in fact, escape from the earth, much more powerful fuels than existing ones are required. Most rocket experimenters (or Astronauts) openly or secretly hope that the rocket will some day leave our planet and reach outer space (where it would be most efficient).

Using known or theoretical fuel combinations, none of which permits a greater exhaust velocity than 10,000 ft. per second, it would require a complex rocket weighing hundreds of tons to escape from the gravitational field of the earth, as may be seen in the next paragraph. The most powerful and largest rocket in existence, the V-2, weighs eight tons, and reaches a maximum height of 130 miles, and a maximum velocity of 3,000 m.p.h., truly a great engineering achievement. Therefore, to construct a rocket weighing hundreds of tons, and having a maximum speed of 26,000 m.p.h. (in order to counteract gravity—i.e., a terminal velocity) would seem to be an almost insurmountable feat.

It may be asked how a space rocket can reach the required maximum speed of 26,000 m.p.h. (or seven miles per sec.) if the exhaust jet has a velocity of only two m.p.s. approximately. The answer lies in the construction of a "step-rocket." This is a large multiple rocket, consisting of two or more parts. The first or largest section would carry the other sections. At a

Fig. 6. This 10-ft.-long "GAPA" (Ground to Air Pilotless Aircraft), made by Boeing, is a potential defence against high altitude enemy aircraft.
U.S.A.A.F. Photo

certain altitude, say 100 miles, when the rocket has reached a speed of say two m.p.s., the second section would be ejected. This would have an initial velocity of two m.p.s., plus the velocity it could develop by itself, namely two m.p.s. The second section's final velocity would therefore be four m.p.s. This process can be extended until the desired velocity of seven m.p.s. is reached. Obviously the above system is too cumbersome to be practical, and we may have to wait until atomic energy can be harnessed.

While it is fascinating to speculate upon space and

Table I

Table showing some properties of certain common propellants.

Nitro-methane is a very promising fuel developed at the California Institute of Technology.

Fuel	Oxidant	Btu./lb. Fuel	Exhaust Vel. Meters /sec.
Hydrogen.......	Oxygen	51900	5170
Methane........	"	21400	4490
Pentane.........	"	19300	4000
Ethyl Alcohol	"	12100	4180
Gasoline.........	"	19100	4500
Aniline..........	"	?	5500

interplanetary travel, there are more immediate and obvious uses to which rockets may be put. Some such uses are:

Military—the smokeless powder dominates this field, due to its compactness and ease of handling. The Bazooka, A-A rockets, aeroplane rockets, etc., are all potent weapons developed during the late war. The German V's may be the portent of the shape of things to come. The Germans had developed a rocket, the A-8, capable of crossing the Atlantic Ocean. It needs little imagination to foresee the use to which such missiles could be put in any possible future war.

Scientific—High altitude rockets capable of travelling hundreds of miles into the stratosphere can gather invaluable data on cosmic ray activity, weather conditions (useful for long range forecasts), and other phenomena, which, when understood, can shed new light on radio propagation, etc.

Conclusion

Many of the future advances of rocket science will be made by engineers. Canada and the Empire as a whole are lagging in rocket research. From a defensive and scientific viewpoint it will be necessary for Canadians to interest themselves in this useful and portentous science. Why shouldn't we use our native initiative and do more original work, instead of imitating or improving on the work of other countries?

The rocket, a machine unfettered by atmosphere or climate, will surely conquer the vacuous space beyond our atmosphere. To deny this fact is to deny the power of pure and practical science and the ingenuity of man. Interplanetary travel may seem impossible at present; but no more so than did an aeroplane trip across the Atlantic ocean seem in 1910.

Radiation Safety Measures

(*Continued from page 161*)

federal government with sufficient authority to enforce this law, another world war will come, and it will be an atomic war. Millions of people in our big cities will be destroyed and millions less fortunate will be left suffering the consequences. Thousands of Health Physicists would be needed under these trying circumstances to determine what areas in the cities were safe for occupation, whether the city water supply was safe for consumption, whether trains and busses were decontaminated sufficiently for use, etc.

Today there are only about 300 Health Physicists in the U.S. They would not have sufficient instruments to make a good start with this terrible task. Figure 12 shows the Health Physics Organization Chart at Clinton Laboratories. Some writers have suggested that we need an Army furnished with Geiger Counters. I insist that this would be the worst of mistakes. If there were a scarcity of doctors in the Army, we would not furnish several companies with medicine kits and surgical instruments and turn them loose unless the men had had the years of necessary training and unless their instruments were proven to be those needed for the job.

On the other hand, if we can eliminate war, we can expect many new advances in the use of atomic energy. There is probably not a single important industry that will not use atomic energy or some of its products. Many of the secondary advances in pure science as a result of the tools of atomic energy, such as an understanding of photosynthesis, may in the long run be more important than the power application of atomic energy itself. Needless to say, all these peacetime developments will require a better appreciation of radiation protection problems by all concerned.

We must all learn to respect radiation, but not to fear it. The fact that many million man days have been spent on the Plutonium Projects without a single case of radiation damage attests the safety of such work if proper precautions are taken. We are proud of this record, and believe that one of our employees stands a better chance of being struck by lightning than suffering from the effects of excessive radiation. This statement is made with our fingers crossed, and in the knowledge that these standards can be maintained only if Health Physics continue to be vigilant and keeps ever alert to its developing responsibilities.

Opportunities in the Welding Engineering Field

by

Charles E. MacQuigg

Dean, College of Engineering, Ohio State University, Columbus, Ohio

A paper presented before the 47th Annual Convention of the International Acetylene Association, Cincinnati, Ohio, May 20-21, 1947.

This paper outlines the gradual growth of the welding industry and the factors that have contributed to its growth. The opportunities for young engineers in the welding field are discussed and the need for educational activity in this field is stressed. The Welding Engineering Course at Ohio State University is described. The author proposes a systematic study of the field of structural design to permit this field to make fullest use of the weight-saving advantages of welding.

The newer forms of welding, as distinguished from the age-old forge or hammer welds, go back scarcely beyond the memories of those present. It is not strange therefore that the welding engineer is a newcomer in the ranks of the engineering profession. It is true that from the start of autogenous welding almost with the beginning of the present century, technical men have guided the development from an art to a science. Nevertheless it is also true that few if any technical men purposely directed their formal education towards the acquiring of a professional competence, which would supply the elements believed to be so necessary to the designing and making of the highest quality of weldments.

This is not to say that the great welding industry, with all of its multiform accessories and applications, has just been " allowed to happen." But it is evident that, aside from the manipulatory instruction given in our technical schools, the civil engineer was taught too little metallurgy and the metallurgist knew too little of the intricacies of structural design. He could not meet the real need of a rational and truly engineering approach to the development of welding techniques. The engineer who planned to practice welding had perforce to learn the hard way. Let the thought be emphasized that welding has been developed along sound technical lines. It is believed, however, that the time is here when the engineering aspects are more clearly seen and the framework of this field of engineering can be more clearly visualized. It is the purpose of this brief paper to attempt to set down some thoughts which may be helpful to the young engineering student, and indicate a promising field for a professional career.

Growth of the Welding Industry

In the first place, what of the industrial position of welding today? While the major interest of the Association is in the application of gas welding, electric and gas welding do complement each other, and have so many intimate points of contact that what is said here in the discussion of " welding " is in the generic and not the specific sense. Welding will be used in ever increasing applications, but a few principles are fundamental, namely, that the developments must be scientifically and economically correct, and that no fog of prejudice be permitted to cloud engineering judgment.

As at the time of the First World War, the past few years have seen another upward swing in the applications of welding. Inspection of data reflecting the activity in welding sales, as compared with all construction during and since the close of World War II, leads to the conclusion that the falling off in welding was by no means in proportion to the slump in general production. This, in spite of the serious handicaps enforced on welding activity by the shortages of metals. From this one may conclude that, all factors considered, welding has edged still higher, relatively, in the scale of usefulness.

Increase of sales volume alone is hardly as significant as the result of effort to push across new frontiers of application. Among many advantages of the processes in which we are especially interested are simplicity and versatility. Simplicity permits the process to be applied at inaccessible points. With respect to versatility, readily portable containers of oxygen and acetylene with lightweight equipment of hose, gauges and torches, permit that combination of speed and " on the spot " service so essential in emergencies of almost any description. The contribution of this equipment to the work of salvage in those cases of lamentable catastrophes in recent months has made the products of your industry as indispensable as gauze is to the surgeon. Moreover, the same equipment and component gases serve with equal facility for taking apart and for putting together! This can be said of few other tools in common use and with so little effort of operation and expenditure of time, to say nothing of low capital cost and economy of operation.

To these amazing advantages of cutting and welding may be added unique features which the engineer must count among his powerful aides to achieve special ends in modern construction. Such varied uses as in low temperature stress relieving by means of flame, in welded structures as large as ships; flame-cleaning; the use of ring burners in welding of large diameter pipelines; pressure welding; all these can only be mentioned in passing, and many others could be discussed did time permit. These demands for gases at high pressures and in such large quantities call for new techniques in piping and manifolding to accomplish safe and efficient distribution at points of application.

Need for Educational Activity

From this sketchy outline of some of today's state of affairs in the field of welding, it must be apparent that there is a fine chance for constructive engineering talent to become interested in any one of the several areas mentioned. As an example of the possibilities which exist for pioneering, just one case may be cited to illustrate how an idea conceived by a young engineer abroad was developed by scientific research into a useful tool for industry, and especially for a long felt need in transportation. Reference is made to pressure welding, a process invented by a Hungarian engineer, and brought to this country some ten years ago for use particularly in welding rails.

With the healthy and expanding situation sketched above, it is natural to inquire about the type of technical assistance which the welding engineer can contribute to the wider and firmer establishment of welding, and to its growth in, and indispensability to our national economy. We believe that the following fundamental contribution can and should be made by the welding engineer:

He should be able to overcome the ignorance which so lamentably exists even today on the part of design engineers who fail to specify the use of welding where properly indicated in so many kinds of structures. Far too long, it is feared, have our college departments charged with the responsibility of teaching structural design been slow to give proper recognition and emphasis to the place of welding.

Those engineers with responsibility for construction must visualize the design as being built to accommodate the advantages of welding, and not attempt to fit the weld into a strait jacket of design. As a practical detail, this adjustment must always be a matter of " give and take " in working out the most efficient end result. What is meant is, that the completed structure must be patterned to make use of welds, which in turn will be technically correct for the given metal to be joined.

How can this gospel of the proper place of welding be spread? One obvious way is to see that our areas of design teaching are reached, some way or other, not with propaganda but with facts respecting the advantages of welding. It is not enough that sales development be prosecuted through the regular channels of advertising, but some intimate contact must be established with those who are teaching our future engineers. They are the ones who will specify or exclude welding. We cannot expect them to *think* welding unless they have been taught welding theory!

Welding Course at Ohio State University

Through the vision of an alumnus joined with active financial support of this Association, several years ago the University was enabled to establish the first curriculum leading to a degree in Welding Engineering. It may be of interest to you to know something of the pattern that was established and how it has succeeded.

The underlying principle of the Welding Engineering curriculum conforms to that of other curricula of the College, namely, a thorough grounding in the science fundamentals of mathematics, physics and chemistry, to which may be added the equally important subjects of English and engineering drawing. The student then specializes in the principles of the particular branch of engineering which he has selected, and coincidentally with these disciplines a thread of non-technical or " broadening " subjects. Theoretically the pattern for the College is;—84 quarter hours of fundamental courses; 50 hours of " broadening " subjects; 19 hours of required general work, such as military science, physical education, and survey courses; 120 hours of departmental work;—a total of 274 to 280 hours.

Just after getting well started with an interested student group, the war period intervened with the attendant decimation of student attendance. In spite of these vicissitudes, by next month we will have graduated some thirty men and from the best information we have, about 80 per cent of these engineers are engaged in the practice of their specific profession. The last statement indicates a real need for the engineer with the background outlined above.

Proposal for a Research Project

I am going to take this occasion to state a thesis which has been the subject of much of my thought for many years. It has been the topic of discussion with experts far better informed than I in the technical details involved. My belief is that today engineers are not practically or theoretically capitalizing, to anything like the fullest possibilities, the savings in weight which are potential through the use of stronger materials and welded designs. All through industry today are evident savings in weight of material, time of construction, streamlining of design, as the result of welding. The great wonder is that progress is yet so restricted and we can only conclude that the gospel has not yet been sufficiently preached in the places where it will do the most good, i.e., in the classrooms. When structural engineers become as well grounded in the theory and practice of welding as they are in riveted construction, the whole area may be expected to benefit.

It is therefore proposed that a research project be organized and sponsored by a group selected from certain agencies which are properly constituted to have a recognized responsibility in this and related areas of engineering. Such sponsorship could be responsible for the selection of a small group of engineers of unquestioned reputation as advisors on the plan of the research. Among the groups which might probably be interested are a number of technical societies, and corporations, such as those manufacturing steels, welding equipment and supplies, ferroalloys and others. Certain commercial interests might be expected to join actively in the prosecuting of the research. The interest of railroads and shipbuilders is self-evident.

It is suggested here and now that this Association might well act as the catalyst in such a movement. Not only would the manufacturers of welding essentials gain, but the adoption of designs to stronger alloys would be benefited by having the new knowledge. And finally the public would gain in obvious ways through more satisfactory structures, especially where lighter weights result. The public is now ignorantly paying a staggering price for the movement of mobile constructions because of the lack of knowledge of more rational design able to use high tensile alloys fabricated by welding.

Some Mechanical Aspects of Exercise "Musk-Ox"

A paper specially prepared for The Engineering Journal

by

Major A. G. Sangster

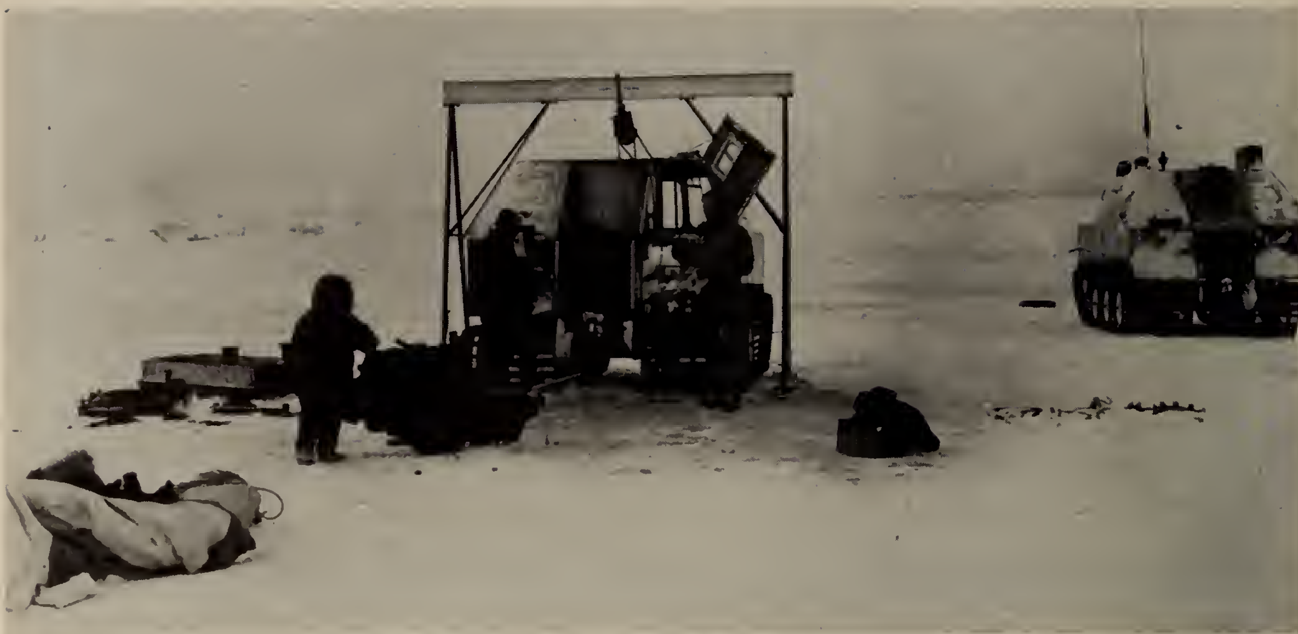
Directorate of Vehicle Development, Department of National Defence

This paper deals with mechanical aspects of the experience gained from Exercise Musk-Ox, and it describes the vehicles and the conditions under which they operated. The problems of lubrication, cooling, starting, and protection from cold are discussed, as well as methods of carrying out maintenance and repairs. The knowledge and experience gained is valuable in the design of suitable vehicles for Northland transportation.

Exercise Musk-Ox was a non-tactical exercise, held by the Canadian Army and the Royal Canadian Air Force, in the Arctic and Sub-Arctic regions of Canada during the period February to May 1946. It consisted of a small party travelling in snowmobiles from Churchill, Man., to Edmonton, Alta., via Cambridge Bay, Coppermine, and Fort Norman, N.W.T. Supporting organizations were established at various bases along the route and the moving party was supplied by air throughout the trip.

One of its primary objectives was the study of mechanical vehicle performance and maintenance under different conditions of cold and terrain encountered in the Canadian North. It had been hoped that much detailed information would be gathered from the trip. It was found that most of the observations were of a qualitative rather than a quantitative nature. Many factors contributed to this; chief among which were the great rush to keep up with the time schedule and the ever-present problem of keeping alive under Arctic conditions.

However, it was established that it was possible to travel by tracked vehicle under conditions of wide variations of temperature and over terrain consisting of barrier ice, wind-packed snow, boulder-strewn ground, mountains, sea-ice and muskeg. This article presents a general picture of the Exercise insofar as



Changing engines on the ice of the Arctic Ocean at Cambridge Bay, using light alloy gantry. ***Canadian Army photo.***

vehicle performance is concerned. Detailed analysis of the effects of the sub-zero conditions on components can be done accurately only under the controlled conditions of a cold-room.

Description of Vehicle

The vehicles used were Canadian built snowmobiles, popularly called "Penguins", and developed from the Bombardier snowmobile which is well-known in and around Valcourt, Que. "Penguin" is a fully tracked vehicle with a gross weight of 5 tons. It has a closed cab, big enough to hold 5 persons in relative mechanical discomfort, but protected from the weather. It is powered by a Cadillac V-8 engine coupled to a hydramatic transmission, essentially the same as the corresponding units currently used in private motor cars. The steering unit is a controlled differential of the "Cletrac" type. The drive sprocket is in front and there is no rear idler. The suspension consists of four pairs of pneumatic tired wheels on each side with no track return rollers. Each pair of bogie wheels is carried on an articulating arm and the bogie arms are arranged in pairs on transverse cross-tubes running through the vehicle and extending on either side of it. A pair of coil springs is located between each pair of bogie arms.

Tracks are made up of longitudinal strips of commercial conveyor belting, joined by transverse metal members shaped to form a path for the wheels to run in. The lower hull is essentially a steel plate box, with the engine at the rear, the differential at the front and the suspension cross-tubes passing through it transversely at points calculated to give suitable wheel spacing and ride stability. The cab consists of a skeleton of aluminium alloy extrusions, a skin of aluminium alloy sheet outside in contact with an inner skin of plywood, and "Thermopane" double windows. This structure is riveted throughout with the exception of the windows, which are bolted in position. Access is through a door at the rear of the vehicle and a hatch in the roof.

Operating Conditions

The first leg of the trip on leaving Churchill, was on the overflow ice of Hudson's Bay. This ice was very rough and restricted speed. Even at low speed the suspension was given a good workout, and the engines had to run in the lower gears, in spite of the low power demand, in order to maintain control. The automatic transmission "hunted" badly on this rough terrain, the sudden torque output variations on gear changes adding to the pitching caused by the rough going.

Heading inland from Eskimo Point, the travelling conditions improved, but from time to time vast boulder fields, partly snow-covered, slowed the vehicles down and the same conditions of "hunting" and pitching prevailed. Intervening stretches of wind-packed snow and lake ice permitted speeds of over 20 m.p.h. for short periods. The terrain became more rolling as the Force moved on.

From Baker Lake to the Arctic the country gradually became more mountainous and the sheltered sides of the hills, where the snow was less windpacked, introduced a traction problem. It frequently became necessary to uncouple the snowmobile from the sleds in order to climb a hill. When the top was reached a cable was used to pull the sled up the slope. It was also observed that in loose snow, steering control, with a towed load, was frequently reduced.

Approaching the Arctic, the party followed frozen river beds for a time until the vehicles began breaking through shell ice. The ice being non-resilient, the value of low ground pressure was lost and although no vehicles were lost, much time was wasted in recovery work. The sea ice of the Arctic Ocean was relatively smooth travelling, with the exception of occasional pressure ridges and their upheavals of ice blocks. From Coppermine south to the Dismal Lakes, the snow changed in texture and was loosely packed. The country became mountainous and the party climbed several thousand feet and crossed numerous deep gullies with steep sides.

On Great Bear Lake, one vehicle broke through the ice at a crack but was recovered. This suggests that in crossing ice, the unit ground pressure is not as critical as the all-up weight of a vehicle. From Ft. Norman south, Exercise Musk-Ox travelled under spring conditions through bush country, and the snow became progressively softer, finally giving way to mud and muskeg. This slowed down the party considerably and the river crossings brought out the importance of waterproofing vehicles for deep wading. Owing to the trees, movement was restricted to tractor trails.

Weather

The lowest temperature encountered was about minus fifty degrees Fahrenheit. For the first thirty days the mercury did not rise above zero degrees Fahrenheit, and it was two months before it rose to the freezing point. The wind was seldom below ten m.p.h., with frequent peaks of 40 m.p.h. or higher. The worst condition was minus forty degrees Fahrenheit with a wind velocity of forty miles per hour. Owing to blowing snow restricting visibility, movement normally ceased when the wind was high. On one occasion movement under these conditions was attempted but we covered only fourteen miles in a day, and that only with the aid of scouts walking ahead on foot. There was no mechanical failure common to all vehicles which was directly attributable to the weather and which prevented movement.

Operation of Components

During halts engines were kept from stiffening by diluting the lubricant with engine fuel. The diluent would boil or burn off to a negligible minimum after a very short run under load, after which time the engine would become warm enough to maintain a suitable viscosity in the lubricant. A 60/40 mixture of glycol and water was used in the radiators, and no trouble occurred which was directly attributable to frozen coolant.

Starting presented no problem, provided that the batteries were properly maintained and kept active by running the engine at a charging speed every 12 hours when halted. Carelessness in dilution, or failure to prime the engine before starting, resulted in some delays. When properly handled the engines would start quickly. However, occasionally a driver would flood the engine and run down the battery by continuous cranking. The battery output when cold was very low and sometimes required a boost from a neighbouring vehicle or a " Chore Horse ". For most of the journey, the engines were running at, or near, governed speed as opposed to the varying speeds at which they normally run in commercial service.

Due to the low vehicle speeds maintained throughout the trip, the transmission operated mainly in its lower gears, with occasional step-ups to 3rd and 4th gears. This gearbox was originally designed to operate mainly in its higher gears, with the lower ratios being used for starting and emergency power demand. This low gear operation constituted a severe abuse of the hydramatic transmission and in the last thousand miles some failures resulted from this overwork.

Track and suspension proved to be reliable, but pneumatic tires lost their resiliency in the extreme cold. Maintaining air pressure was impractical, and it was found that the frozen tire casings were strong enough to carry the load. The body of the vehicle was a windbreak and derived some heat from the engine. Without a heater in operation in the cab, personnel were still required to keep warmly dressed. The hundreds of rivets and bolts used in construction and passing through the skin, provided a direct metal path for heat conduction partly neutralizing the insulating effect of the plywood inner skin.

If the interior of the cab was warm enough to maintain a layer of warmer air next to the inner glass the Thermopane double windows remained clear of frost. Generally speaking, little trouble was encountered at temperatures higher than minus thirty-five degrees Fahrenheit. Many variables such as pressure, relative humidity, and bulk and nature of vehicle load, affect

Improvised shelter for repairs in the middle of Coronation Gulf. *Canadian Army photo.*

this condition also, but quantitative analysis of these factors was not feasible.

Much was learned which only becomes evident as design problems arise. It will remain to be seen how new vehicle designs, based on the lessons of Musk-Ox, will react to Arctic tests. Although much of the component development can be done in a cold room, it is the user trial that gives the final answer, especially in respect of any compromises in vehicle design.

Maintenance and Repairs

All maintenance and repair operations were done in the open without shelter. Occasionally when the windchill was severe and the job was prolonged, a tarpaulin wind-break was improvised, or a snow wall built. Usually, in order to save time, no shelter was used. On the trail the party was broken down to two groups of five vehicles. Each group had a maintenance vehicle at the rear for stragglers, carrying a limited number of light spare parts, some special tools and a technical officer and N.C.O. When additional help was required, drivers assisted. Normal maintenance was done by the driver, assisted as required, by other crew members. Maintenance crews only acted as inspectors except in event of breakdown.

Time was of prime importance if the river crossings at the western end of the trip were to be made. The start was delayed and adverse weather stole further time, so the vehicles were hard pressed all the way. As a result, there were many improvisations on the trail and the maintenance crews, who had to work at night, in addition to doing stop-gap repairs by day, had an average of 3 to 5 hours sleep per night.

One interesting development during Exercise Musk-Ox was the fabrication of a light alloy gantry, used for handling front ends and engines. This consisted of a Duralumin I-beam supported by an "A"-frame at either end. A chain block was suspended from the centre of the I-beam. The whole frame could be assembled in minutes, and was flown in with a replacement engine or axle. Where possible an ice footing was selected, but hard ground with a light snow cover was suitable.

Major repair work was generally saved until the party arrived at a settlement, where the repair crews could work by day and sleep by night. At these points it was usually possible to land a plane and get replacement component assemblies brought in. On occasions, broken-down vehicles were towed in by another vehicle for 50 miles or more. Except in emergencies, no stripping of sub-components was done, replacement of component assemblies being more practical. Probably the most irksome trouble encountered was fuel stoppages. This was largely due to dirt and sludge plugging the fuel filters, but water in the fuel also played its part to an indeterminate extent.

The desirability of having a vehicle designed so that a maximum of maintenance operations can be done without dismounting from the vehicle and exposing oneself to the elements while making repairs, was apparent to all on the trip. A high reliability factor is of course essential to such a vehicle.

Conclusion

Canada's Northland presents a challenge to transportation engineers which can and will be met. So far the demand for ground transportation has not been great enough to interest much capital in the development of suitable vehicles. However, as exploration continues, and the potential mineral wealth of the country becomes more and more evident, the demand for such transport will arise. At that time the knowledge and experience acquired on Exercise Musk-Ox should be of invaluable assistance in the design of a suitable vehicle.

Nomograph for Concrete Slabs With One-way Reinforcing

by

J. Morrow Oxley, M.E.I.C.

Chapman & Oxley, Architects, Toronto

This nomograph has been prepared to give quick and convenient information on reinforced concrete slabs without the necessity of referring to several tables. It gives the effective depth and steel area required for any combination of total load per square foot, effective span and bending moment co-efficient within the limits shown.

It complies with the provision of the National Building Code 1941 and with the codes of a number of Canadian cities.

In operation it requires only two settings of a straight-edge as indicated in the key, or as follows:

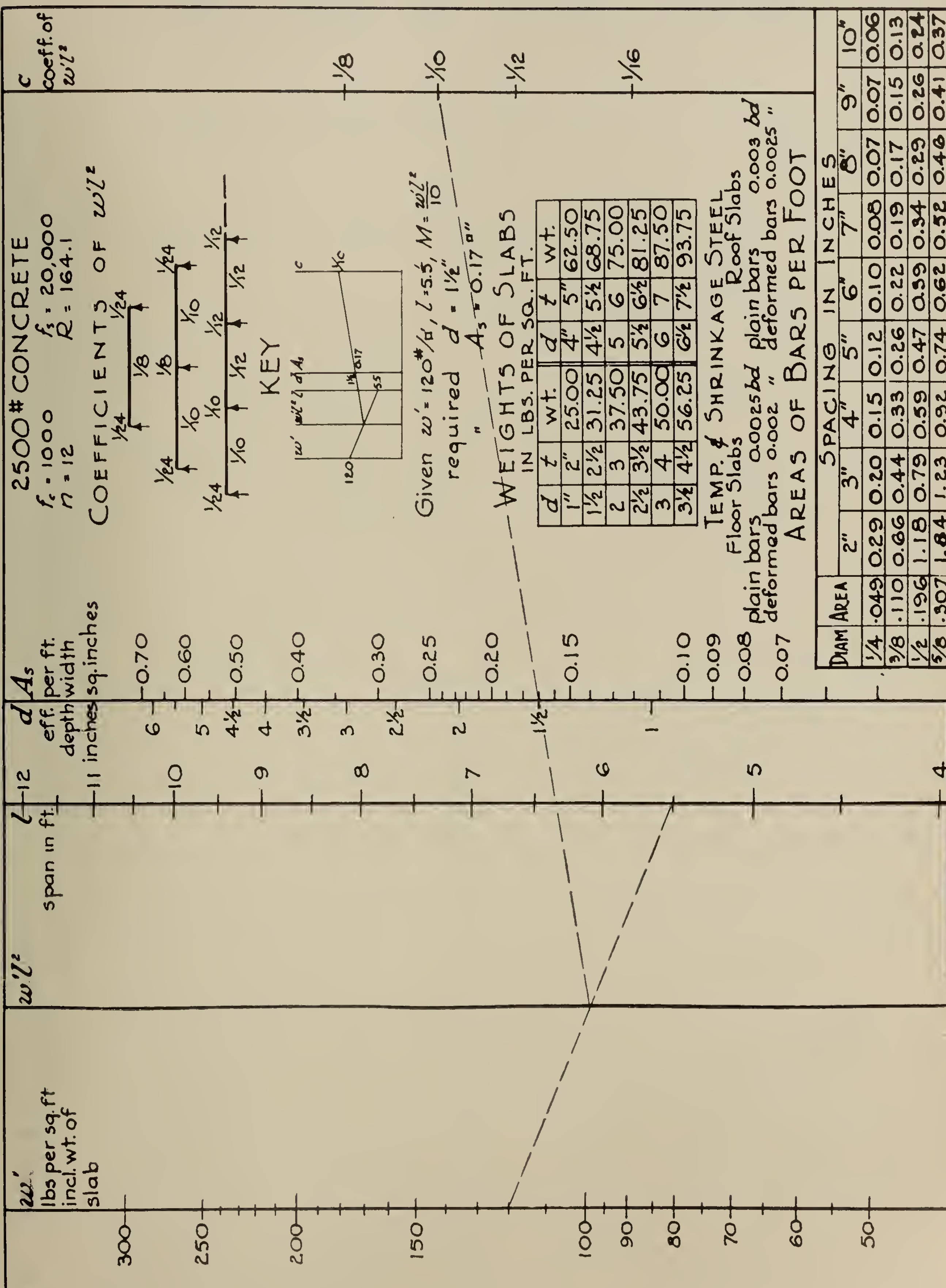
First:—locate with straight-edge laid from w' (total load per square ft.) to l (effective span in ft.) the intersection on line $w' l^2$.

Second:—locate with straight-edge laid from this intersection to line c (the application co-efficient) the intersection on line d (effective depth of slab). A_s (the steel area required for balanced reinforcement) will also be found on this line.

As in most cases the intersection on line d will not fall exactly on any depth noted the next greater depth will probably be used, but the steel area can be taken directly from the intersection and the result will be on the side of safety.

Similar nomographs for 2000-lb. and 3000-lb. concretes are available to anyone interested on application to the author, who was assisted in the design and construction of the diagram by L. A. Oxley.

NOMOGRAPH FOR SLABS WITH ONE WAY REINFORCING



WEIGHTS OF SLABS
IN LBS. PER SQ. FT.

d	t	wt.	d	t	wt.
1"	2"	25.00	4"	5"	62.50
1½	2½	31.25	4½	5½	68.75
2	3	37.50	5	6	75.00
2½	3½	43.75	5½	6½	81.25
3	4	50.00	6	7	87.50
3½	4½	56.25	6½	7½	93.75

TEMP. & SHRINKAGE STEEL
Floor Slabs — Roof Slabs
plain bars 0.0025bd plain bars 0.003 bd
deformed bars 0.002 " deformed bars 0.0025 "

AREAS OF BARS PER FOOT

DIAM	AREA	SPACING IN INCHES 2"	3"	4"	5"	6"	7"	8"	9"	10"
1/4	.049	0.29	0.20	0.15	0.12	0.10	0.08	0.07	0.07	0.06
3/8	.110	0.66	0.44	0.33	0.26	0.22	0.19	0.17	0.15	0.13
1/2	.196	1.18	0.79	0.59	0.47	0.39	0.34	0.29	0.26	0.24
5/8	.307	1.84	1.23	0.92	0.74	0.62	0.52	0.46	0.41	0.37

BANFF

The Annual General *and* Professional Meeting

JUNE 1-5 1948

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Note...

Registration material has been mailed. Please return yours promptly to let us arrange the best meeting ever!

The Arrangements

SPECIAL TRAINS

• Will leave Montreal and Toronto on Saturday evening, May 29th. Delegates may join these trains at the starting points or points west.

PLANES

• Fly T.C.A. to Calgary and join the special train on the morning of Tuesday, June 1st.

CARS

• Many western members will be driving and our hosts — the Calgary Branch — expect to have cars available for touring the magnificent country in the Banff National Park.

ACCOMMODATION

• The entire hotel is reserved and there should be no necessity for crowding. Rates of $15.00 per day single and $12.00 double are all-inclusive and will, therefore, be only slightly — if at all — above the costs of past annual meetings.

—A Programme of Real Interest!

The Programme

● **TUESDAY — June 1**

9.30 a.m.—Registration.

5.00 p.m.—Informal Reception.

8.00 p.m.—Annual General Business Meeting of the Institute.

Trains arrive at Banff in the afternoon and there will be no formal programme until the evening. This will allow for relaxation after the trip and an opportunity for delegates to get acquainted with each other and with the luxurious atmosphere of Banff.

● **WEDNESDAY — June 2**

9.30 a.m.—Morning and afternoon will be devoted to a symposium by the Institute's Committee on Prairie Water Problems. Papers will deal with the St. Mary's Dam and the Milk River Power and Irrigation Project; Benefits of Irrigation and Conservation in the Prairie Provinces and the Conservation measures for the East slopes of the Rockies. There will be an inaugural luncheon, informal dinner and a variety of entertainment in the evening.

● **THURSDAY — June 3**

9.30 a.m.—Symposium on Canada's Petroleum Industry.

Luncheon will be informal and no professional sessions have been arranged for the afternoon—delegates and guests will be free to take advantage of the superlative recreational facilities of Banff. A golf tournament and sightseeing drives will be arranged.

● **FRIDAY — June 4**

9.30 a.m.—A full day of papers of a more specialized nature—to afford engineers in all fields a real inducement to attend the meeting. Some of the subjects which will be treated by eminent authorities will be: Scientific Management, Highway Engineering, Rural Electrification, Community Planning, Electronics, Pulp and Paper, and others still under consideration.

7.30 p.m.—The Annual Banquet.

10.30 p.m.—The Annual Dance.

● **SATURDAY — June 5**

Free for recreation until train departures in the afternoon. A visit to the Cascade Plant of the Calgary Power Company or a motor trip to Lake Louise will probably be arranged. There are numerous other points of great interest to engineers and it will probably be possible to arrange motor or rail trips to these points in conjunction with departures from Banff. Some of the most interesting possibilities are the gigantic plant of the Consolidated Mining and Smelting Company Ltd., at Trail, B.C., the Spiral Tunnels on the C.P.R. main line in the Kicking Horse Canyon, the Bridge River Power Development of the British Columbia Electric Railway Co. near Lillooet, B.C., and the St. Mary's Dam on the Milk River near Lethbridge, Alta.

For the Ladies!

As always, the ladies are welcome and are invited to all functions on the general programme. Special events will be arranged by the ladies' committee.

—FROM MONTH TO MONTH—

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

Life Members

Not many innovations brought about by Council have been as well received as the privilege of Life Membership for all members. Of all the by-law changes authorized by ballot in 1946 this was by far the most popular. Life Membership now becomes an honour and in due course every member becomes eligible for it.

This exalted group now numbers about 500, and each January additional names are added to the list. The great advantage is that a Life Member pays no more annual fees. This is his reward for almost a lifetime of support of the Institute. A person 70 years of age who has been a Corporate Member for 30 years or one who has been a Corporate Member for 35 years regardless of age automatically becomes a member of this new " club ".

It has been a real pleasure to read the letters of acknowledgment as each new " graduate " is notified. Almost without exception at least one reaction is uniform throughout, i.e. each one is pleased to become a Life Member but is surprised to know that so much time has elapsed since he joined. After all it seems that 30 or 35 years passes quickly.

Many members have taken the occasion to say nice things about the Institute and all seem to be satisfied with their experience. Doubtless it would be heartening to young members to see these letters and to know that eventually the burden of fees is lifted. The maintenance of membership is advocated by many, and one letter typical of others says " membership in the Institute has always been a pleasure, a privilege and a benefit ".

The roster of Life Members reads like the " Who's Who " in engineering in Canada. By far the greatest majority are in the vigor of life and occupy the most important positions in industry, government and education. In their new and select classification these senior statesmen of the profession are both honoured and envied by their fellow members.

More Sources of Education

There appears to be a steady and substantial increase in the number of institutions in Canada teaching engineering and science. It is too bad they were not organized in time to meet the avalanche of students coming from the services. The apex of that crescendo has been reached and it is not likely there will be such demands for facilities for many years to come. Under such circumstances it may be that the new colleges will be slow to build up their student bodies.

Carleton College at Ottawa was the first in the field and has helped greatly with the veteran problem. Only the first two years of engineering are taught but arrangements have been made for the completion of the course at McGill.

Ottawa now has a second institution for the study of engineering. Ottawa University has inaugurated courses to cover the first two years and similarly has arranged for their students to complete the courses at other universities. Thus the capital city robs Montreal and Halifax of their distinction of being the only cities in Canada to have two colleges or faculties for the teaching of engineering.

Announcement has been made recently of the inauguration of a science college at Hamilton as one of the activities of McMaster University. It will be known as Hamilton College and will concentrate on science teaching and research.

The Council of the Institute has examined the curricula of the two colleges in Ottawa and has authorized their inclusion in the list of " recognized " institutions.

In view of the difficulties of older institutions in securing competent staff and equipment one may well be concerned with the problem facing these new enterprises, but it will be the wish of all that they shall succeed and that their contributions to the educational attainments of our people shall be substantial.

Progress of Electric Locomotive

A Correction

On page 14 of the January *Journal* we included a note entitled " Progress of the Electric Locomotive ". This item was printed in good faith—but with insufficient research—from a press release and it included unwarranted superlatives in describing 5,000-hp. locomotives as " the world's two largest single-cab electric locomotives ". Our attention has since been directed to bulletins 265 and 266 of the Oerlikon Company of Zurich, Switzerland, in which are described, electric locomotives of 6,000 to 12,000 hp. The latter are articulated, but are nonetheless single locomotives intended to be used only as 12,000-hp. units.

The *Journal* tenders its sincere apologies to the Oerlikon Company and to any other organization whose products may have been treated unfairly by the unfortunate wording of the item.

Correspondence

Dear Mr. Wright:

Mr. J. A. Walker makes the assertion in your November *Journal* that Point Grey was the first Canadian Municipality to enact a zoning law. I am obliged to challenge that statement. In 1896 I drafted a zoning law which was passed by the Nova Scotia Legislature and is still in force. It provided for residences only, fixed a minimum value, minimum distance from street, prohibited hotels, shops, boarding houses etc. in the zone. At the first Canadian Town Planning convention (held in Toronto) it was admitted that our law was the first in America. Halifax learned to walk before Vancouver.

With the best wishes of the season.

Yours sincerely,

F. W. W. Doane, M.E.I.C.

Dear Mr. Wright:

Your letter of 21st January last, enclosing a copy of a letter dated 17th January from Mr. F. W. W. Doane of Halifax, is acknowledged.

It is noted that Mr. Doane challenges an assertion I made in my paper, "The Engineer's Part in Community Planning" which appeared in the November, 1947, issue of the *Journal*. The statement, to the effect that Point Grey was the first Canadian Municipality to enact a Zoning By-law, (Town Planning By-law No. 44, 5th September, 1922) was made, I wish to assure Mr. Doane and your readers, in good faith. Naturally, in making it, I had not heard of the Nova Scotia enabling legislation — on the contrary, I had always been given to understand from legal authorities whom I considered competent, that such was the case. Since I have made this assertion on previous occasions, I am grateful to Mr. Doane for having enlightened me. It is only natural that he should have considerable pride in the fact that his was the first Canadian City to have regulations enforced—in 1896—which were equivalent in meaning and value to a Modern Zoning By-law. As nearly as I can ascertain, the term "zoning", per se, was not used universally until some time after 1912.

Unfortunately I was unable to attend the National (U.S.A.) Conference on City Planning held in Toronto in 1914, as at the time I was in charge of work in Northern British Columbia. It may be of interest to record that two gentlemen who have served for several years on the Vancouver Planning Commission were present at this meeting. They evidently had not heard of, or had not remembered, the prestige that Halifax enjoys with respect to zoning in Canada. Otherwise, I am sure they would have checked me in making this statement.

While there are evidences that the art of zoning was practiced centuries ago, it is generally conceded that its first real development occurred in Germany in 1894. It is recorded however, that the City of Modesto, California, is credited with the first legislation pertaining to zoning. In 1885, it enacted an ordinance somewhat similar to that mentioned by Mr. Doane. In 1903, Boston was authorized by its state legislature to regulate building heights. In 1909, Los Angeles passed an ordinance to protect its residential districts. In 1916, New York City adopted fairly comprehensive zoning regulations and from then on, many cities in the United States and Canada have passed zoning ordinances and by-laws as we know them.

Your courtesy in forwarding a copy of Mr. Doane's letter is much appreciated.

Yours sincerely,

J. Alexander Walker, M.E.I.C.

Meetings of Other Societies

The dates June 21 to 30 have been set for the second **International Conference on Soil Mechanics and Foundation Engineering,** which takes place this year in Rotterdam. Further information can be obtained from the Secretary of the Canadian Committee, F. Lionel Peckover, JR.E.I.C., at the National Research Council, Ottawa.

The third annual congress of the **Canadian Association of Physicists** will be held in Ottawa, May 26 to 29, 1948, at the National Research Council. Chairman of the Congress Committee is F. H. Sanders of the Association.

The 1948 annual meeting of the **American Society for Testing Materials** will take place in Detroit, Mich., June 21-25 inclusive. Headquarters of the Society are at 1916 Race Street, Philadelphia, Pa.

Preliminary programme is now available for the Atlantic City Conference of the **American Water Works Association,** May 3 to 7, 1948. Harry E. Jordan, secretary of A.W.W.A., 500 Fifth Avenue, New York, N.Y., will supply further information.

Meeting of Council

Minutes of a regional meeting of the Council of the Institute held at the Royal York Hotel, Toronto, on Saturday, January 24th, 1948, convening at nine thirty a.m.

Present

President L. F. Grant (Kingston); Vice-Presidents R. S. Eadie (Montreal), W. R. Manock (Fort Erie), and W. L. Saunders (Ottawa); Councillors P. E. Buss (Niagara Peninsula), E. A. Cross (Toronto), J. R. Dunbar (Hamilton), R. C. Flitton (Montreal), Drummond Giles (Cornwall), A. R. Jones (Peterborough), W. H. M. Laughlin (Toronto), V. A. McKillop (London), C. F. Morrison (Toronto), C. A. Peachey (Montreal), J. B. Stirling (Montreal), and General Secretary L. Austin Wright.

There were also present by invitation—Past-President C. R. Young (Toronto), Past Vice-Presidents R. L. Dobbin (Peterborough), E. P. Muntz (Hamilton), and C. E. Sisson (Toronto); Past Councillors H. E. Brandon, J. G. Hall and W. S. Wilson of Toronto, and J. A. Vance of Woodstock; W. E. Brown, chairman, E. G. Wyckoff, immediate past chairman, and W. A. T. Gilmour, councillor-elect, of the Hamilton Branch; M. F. Ker, chairman of the Niagara Peninsula Branch; D. G. Geiger, chairman, R. A. Muller, secretary-treasurer, W. E. Gladney, assistant secretary, and D. D. Whitson, member of executive, of the Toronto Branch; also the following members of the Institute's Committee on Community Planning —A. E. K. Bunnell, J. S. Galbraith, C. A. Meadows, and H. M. Scott, all of Toronto.

Vice-President Eadie took the chair, reporting that as the train from New York on which the President had expected to arrive that morning at eight o'clock was not expected until about noon, it would be necessary to start the meeting without him. Following the usual custom, Mr. Eadie asked each person present to introduce himself to the meeting.

Mr. Eadie explained that certain items on the agenda, in which the president was particularly interested, would be held over until he arrived.

C.I.G.R.E.

The general secretary reported that Mr. R. A. H. Hayes had been approached by the president and had expressed his willingness to act as the Institute's representative on C.I.G.R.E. (International Conference on Large Electric Systems), and it was unanimously resolved that this nomination be approved.

Maritime Professional Meeting

The general secretary reminded councillors of the Maritime Professional Meeting to be held in St. Andrews, N.B., on Wednesday, Thursday and Friday, September 8th, 9th and 10th, 1948. The professional meeting held in Digby, Nova Scotia, in September 1946, had been so successful, that it had been decided at that time to hold such a meeting at least once every two years. Plans were now under way and it was suggested that members should keep these dates in mind when making their plans for the year.

Annual Meeting—Banff—June 1948

The general secretary reported that plans were now proceeding for the annual meeting to be held at the Banff Springs Hotel, Banff, Alberta, during the first week of June. He outlined briefly the proposed programme of events starting with the president's dinner on Monday, May 31st, and continuing through the week until Saturday, with three days of professional sessions. The first draft of the programme is as follows:

Monday, May 31—7.00 p.m. President's Dinner.

Tuesday, June 1—Morning: Council Meeting; Afternoon: Council Meeting; Evening: Annual Business Meeting.

Wednesday, June 2—Morning: Professional Sessions; Noon: Luncheon with speaker; Afternoon: Professional Sessions; Evening: Dinner with speaker. Movies, entertainment, etc.

Thursday, June 3—Morning: Professional Sessions. Noon—No luncheon arrangements; Afternoon: No formal programme—left open for golf, drives, etc. Evening: Entertainment.

Friday, June 4—Morning: Professional sessions. Noon: Luncheon with speaker; Afternoon: Professional Sessions; Dinner: Annual Banquet of the Institute; Evening: Annual Dance.

Saturday, June 5—No programme arrangements—left to individuals to decide. Possibly tour to Lake Louise—golf tournaments.

Civil Service Commission Requirements

The General Secretary reported that there still had been no satisfactory answer to the question placed before the Civil Service Commission by Mr. MacRostie and himself last January. However, he was planning to go to Ottawa again shortly to take up the matter and see if some decision could be reached.

Committee on Professional Interests

Alberta Agreement—At Mr. Stirling's request the general secretary outlined the situation in Alberta where a meeting had been held last August to discuss with the officers of the Association amendments to the joint agreement. Mr. Wright reported that complete agreement had been reached on all points except on the amount of the joint fee for Juniors. The committee had requested that this fee be raised fifty cents beyond that recommended by the Association, the additional amount going to the branch as a rebate.

Mr. Wright reported that the chairman of the joint finance committee, Dean Hardy, had reported that the Alberta association had already printed and issued all the accounts for 1948 and that therefore it would be difficult to make any change.

Mr. Stirling moved that the fees as adopted by the Council of the Association be approved by the Institute for the year 1948. This was seconded by Mr. Flitton and carried unanimously.

Budget Item 180e—Mr. Stirling reviewed briefly the actions of the Institute in proposing to the Minister of Finance that the customs tariff on engineers' plans coming into Canada should be reimposed. He reported that the Canadian Construction Association, at its annual meeting, was preparing to present a resolution to the Minister urging the same thing. He presented a draft of the resolution to Council. He reported further that he understood other delegations were going to interview the Minister and that he hoped the provincial associations would also join in the effort.

Mr. Eadie reported that there had been a meeting of the joint EIC-PEQ Committee at which the whole situation was reviewed. At this meeting Mr. Beaubien had agreed to call on the Minister again in order to press home the wishes of the engineers.

At this point the general secretary presented a letter from Mr. Beaubien reporting on his interview which indicated that there was still some hope of a reimposing of the tariff.

Mr. Saunders questioned whether or not the engineers needed this additional protection and Mr. Eadie pointed out the effect that the change in tariff has had already. He emphasized that there is no endeavour on the part of the Institute to oppose the free entry of plans covering special processes and special equipment but at the moment plans of many kinds were coming in free of duty which could have been made with equal satisfaction by Canadian engineers in Canada. He pointed out, too, that architectural plans still carry the tariff as they were not altered in any way at the time the engineers' tariff was removed.

Mr. Stirling stated that the officers of the Quebec Corporation were very emphatic in their wishes to have the tariff restored. He did not see why the industries which demanded a high tariff to protect their own products should ask the government to remove a tariff which protected the engineers. Finally, on the motion of Mr. Stirling, seconded by Mr. Morrison, it was unanimously resolved that the matter be referred back to the Committee on Professional Interests for further study in co-operation with other interested organizations.

Report of Finance Committee

Financial Statement for 1947: Mr. Eadie, chairman of the Finance Committee, referred to the audited financial statement for the year 1947. This showed a surplus of $1,809.73 as compared to a deficit in 1946 of $1,775.51. He pointed out that an amount of $8,000.00 had been set aside as a reserve to partially cover the past service benefits of the newly instituted pension plan. Another item of $1,000.00 appeared with legal fees. This was the Institute's contribution towards the cost of the appeal in the Brian Perry vs. The Architects case. Following an examination of the statement by the councillors and some further discussion, it was unanimously agreed that the report be accepted.

At this point, Mr. Eadie asked Vice-President Manock to take the chair.

Report of Council, Committee and Branch Reports

The general secretary reported that most of the committee and branch reports for the year 1947 had been received. These will be included in the report of Council and will be published in the February *Journal* and presented to the annual meeting in June.

Mr. Wright read the report on membership which showed a net increase for the year of 752, bringing the total membership up to 9159, another new high in the history of the Institute. During the year, under the provisions of the revised by-laws, over nine hundred members had been transferred from one class of membership to another, over five hundred from Student to Junior and almost four hundred from Junior to Member. It was unanimously resolved that the various reports be received and accepted for publication in the *Journal* and for presentation to the annual meeting.

Nominating Committee

The membership of the Nominating Committee for the year 1948, as submitted by the various branches, was noted. It was unanimously resolved that Mr. W. F. M. Bryce, of Ottawa, be asked to accept the chairmanship of this committee.

ASME-EIC Joint Committee

Mr. John G. Hall outlined the history of the activities of the joint committee pointing out the reason for its formation and the work which it had done in the last four years. The latest meeting was held during the annual meeting of the ASME at Atlantic City at which meeting it was agreed that the membership of the panels for each society should be four instead of three, and that certain further studies should be made with regard to the extension of services by both organizations to students of mechanical engineering at Canadian universities.

Mr. Hall also pointed out that the provisions of the joint agreement included co-operation with the ASME committees on research. It was expected that shortly the Institute's representatives would be appointed for this work.

The general secretary reported that since the annual meeting in Atlantic City he had had a long discussion with Colonel Davies, the secretary of the ASME, at which definite suggestions were evolved with regard to the activities of the students. Colonel Davies felt that where a branch of the Institute interested itself sufficiently in the mechanical student it would not be necessary for the American society to organize a student section of their own. It was proposed that an experiment along this line be made at one of the universities where there are several members of both organizations.

Mr. Hall presented to Council a report of a special committee which had been examining the student situation. This was the basis of the discussions in Atlantic City at which time the recommendatons were accepted. Mr. Hall asked that a panel be reappointed for further activity. It was agreed that Messrs. J. G. Hall, W. A. Newman, and O. W. Ellis be reappointed and that Professor R. C. Wiren be added to make up the full complement.

Harry Bennett Fund

The general secretary announced that Mr. J. B. Macphail of Montreal, one of the three trustees of the Harry Bennett Fund, had died recently and that therefore it became necessary to appoint a successor.

It was pointed out also that Mr. Buchanan's term of office had expired at the end of 1947 but that he was eligible for reappointment. Therefore it was agreed unanimously that Mr. Buchanan be re-elected for a further period of three years and that the appointment of the third trustee be made by the president in consultation with the two remaining trustees.

University of Ottawa

The general secretary presented a letter from the the University of Ottawa asking that their newly organized School of Applied Science be given official recognition by The Engineering Institute of Canada as an engineering school. Official recognition had already been obtained from McGill University, Ecole Polytechnique, and Laval University, where their students are admitted to the third year in the engineering courses.

Dean Young reported that since the letter to the Institute had been written, the University of Toronto had agreed to accept University of Ottawa students in most of the branches of engineering provided they were highly recommended and subject to certain conditions. He thought the Institute would be justified in accepting their students for Student membership in the Institute.

Following some discussion, on the motion of Mr. Morrison, seconded by Mr. Buss, it was unanimously resolved that students in the School of Applied Science at the University of Ottawa be accepted as eligible for student membership in The Engineering Institute of Canada.

Sarnia Branch—Suggestion re Entrance Fee

The general secretary presented a letter from the Sarnia Branch wherein it was suggested that serious consideration be given to lowering the entrance fee "as this was a definite detriment in trying to attract new members". The general secretary pointed out that the usual purpose of the entrance fee was to meet the overhead cost of "processing" an application. A great amount of work was involved and the present ten dollar fee for Members and five dollars for Juniors would not begin to cover it.

The general secretary pointed out that under the recent by-law changes it was possible for a Student to enter the Institute without any entrance fee and transfer to Junior and then to Member without any transfer fee. It was expected that most applications from now on would follow that procedure. It was pointed out also that in five of the provinces persons could join the Institute without an entrance fee because of the workings of the co-operative agreement.

After some further discussion it was agreed unanimously that the information developed at the Council meeting should be forwarded to the Sarnia branch.

Column Research Council of Engineering Foundation

The general secretary reviewed the events which had led up to the forming of the Council and of the Institute's participation in it. He explained that a proposal had come to the Institute recently that along with other constituent members it should subscribe an amount towards meeting the overhead costs. A figure was mentioned of "up to $500". Mr. Wright reported that at the request of the chairman of the Finance Committee he had discussed the proposal with certain officers of other organizations on the Council in the United States and had been informed that they did not propose to make any contribution. After further discussion, it was agreed unanimously that the Institute would not make a contribution.

C.I.M.M. Fiftieth Anniversary

The general secretary informed Council that the Canadian Institute of Mining and Metallurgy was celebrating its fiftieth anniversary in April at Vancouver and suggested that a congratulatory message be sent by the Council. It was agreed unanimously that this procedure should be followed, the nature of the message to be left in the hands of the general secretary.

Ontario Association of Architects

Attention was called to the fact that the Ontario Association of Architects was holding its annual meeting in another hall in the Hotel, and it was agreed unanimously that a message of goodwill should be transmitted from the Council of the Institute to the Council of the Association. Mr. A. E. K. Bunnell, who was to attend the Architects' meeting later in the afternoon, agreed to carry the greetings on behalf of the Institute.

A.S.M.E.-Applied Mechanics Reviews

The general secretary reported that the American Society of Mechanical Engineers was arranging to publish in 1948 *Applied Mechanics Reviews*, a monthly publication containing about two hundred reviews of articles collected from approximately five hundred publications. The ASME was establishing a co-operative advisory board to aid and to guide the publishers. The Engineering Institute of Canada was invited to be one of the co-operating organizations and to name a representative on the board.

The general secretary stated that an announcement about the publication would appear on the inside front cover of the January *Engineering Journal*. Subscription rates were $12.50 a year but to members of the Institute the rate would be $9.00. It was agreed unanimously to accept the offer of the ASME, and to appoint a representative to the board, the determination of this representation to be left with the president.

Engineering Journal

The general secretary informed Council that a complete survey had been made into the finances of the *Journal*. It was shown readily that the increasing costs had made it impossible during the year to show a profit unless the allotment from subscriptions was included as income. He emphasized the necessity of the advertising income more than meeting the cost of publication as this was the only way in which a real profit could be developed. He explained that the rates for advertising had been increased substantially from the beginning of 1948 and that it was expected that the volume of advertising would be increased materially throughout the year. Already more pages of advertising were in the hands of the printer for the January issue than had been the case for the same issue last year.

The general secretary's figures showed that the cost of publishing the *Journal* was not less than $7,000.00 a month. This made the matter of great importance to the Institute. So much money was involved that the entire financial framework of the Institute could be wrecked if the *Journal* is not handled properly. He pointed out that under the new arrangement it was expected that the situation would be corrected within a reasonable period of time.

This was accepted as a progress report.

At this point, President Grant took the chair, explaining that his late arrival was caused by two wrecks ahead of his train from New York.

Request for Grant from Toronto Branch

Mr. Eadie referred to a request from the Toronto branch that a contribution of $50.00 should be given to the Junior Section as a prize to be awarded on Students' Night. The Finance Committee had considered the matter and for several reasons did not approve of the appropriation. However, in view of the fact that this meeting of Council was to be held in Toronto the Finance Committee had asked that the matter be put on the Council agenda for a full discussion.

Several councillors favoured the grant mainly because it was felt that the work of Junior Sections among students should be encouraged.

Mr. Eadie spoke of the good work done by Junior sections. He referred to the Montreal Section pointing out that the branch there was spending something over $400.00 a year on its Junior Section but that the money came entirely out of branch funds.

He pointed out that this request had come up every year for three years and on each of the two previous occasions the grant had been made on the understanding that it was not creating a precedent. The committee felt that in all fairness to the other branches in all parts of Canada it could not approve of the special grant. He expressed the hope that there would be some clarification of the whole subject, particularly in view of the fact that prizes given by the Toronto branch on their student nights were out of proportion to the well established student prizes being given by the Institute itself. He felt that if this contribution were to be given as a regular thing, there should be some integration of it into the prize programme of the Institute.

Finally a motion was submitted by Mr. Stirling that the request of the Toronto branch be granted and that the whole question of students' prizes be reviewed by the Finance Committee and the Committee on the Young Engineer. This was seconded by Mr. Flitton and carried unanimously.

Committee on The Young Engineer

New Awards to Undergraduates: The president explained that this question had been up before Council twice previously. He explained that the proposal was to award distinctive prizes to the top five or ten per cent in the senior year of engineering at all Canadian universities, the selection being based not only on academic standing but also on other qualifications, including leadership. The general secretary outlined the statement of the various awards which had been prepared by Dr. Langley, the chairman of the committee.

Mr. Eadie explained that the matter had been before the Finance Committee and that it had been agreed that it would not be feasible for the Institute to purchase gold-filled or solid gold pins. He emphasized again that such prizes would cost much more than other prizes of the Institute which were already well established.

Mr. Saunders thought that the present arrangement for prize giving was satisfactory and he did not see where the proposal for this new award was going to enhance the situation.

Mr. Wilson enquired as to how the non-academic qualifications were to be determined. He pointed out that if five or ten per cent of the class at Toronto were selected it would be an almost impossible task for the staff to make recommendations with regard to non-academic qualifications. In the present fourth year there would be 130 students to be selected if ten per cent was to be the figure. He thought a great deal of attention should be given to this phase of the subject before a decision was reached.

Finally, it was moved and seconded that authorization be given for the award this year of nickel pins at an estimated cost of approximately $70.00; that the matter of determining qualifications other than academic be given further consideration, and that the whole matter of student awards be reviewed in connection with the other prizes of the Institute. On being put to the meeting the vote resulted in a tie, the deciding vote then being cast by the chairman in favour of the motion.

Committee on Community Planning

In opening this subject Mr. Dobbin, chairman of the committee, presented the annual report of the committee for inclusion in the annual report of Council to appear in the February *Journal*. Mr. Dobbin then explained that a panel of his committee located in Toronto had been established to make a special report to Council as to what the Institute's further interests should be in community planning. He asked Mr. Hew M. Scott, chairman of that panel, to make the report. Mr. Scott reported as follows:

In view of the fact that the main interest during the Institute's recent conference on community planning was related to housing, the panel makes the following recommendations:

RECOMMENDATION I

1. Whereas, individual incentive to build and own houses has been almost destroyed by a variety of causes, and the production of houses at a cost that reasonably may be carried by people in the lower income bracket, is not being undertaken at the present time:
2. Whereas, the underlying reasons for that condition are many and complex, comprising Provincial legislation, municipal enactment, the present system of assessment, and taxation, antiquated methods of construction, and the attitude of Labour, therefore:—

The Toronto panel of the Committee on Community Planning recommends that the Institute supply leadership by preparing a comprehensive outline of the difficulties which exist, legislatively and in industry, and suggest the remedies which should be supplied.

RECOMMENDATION II

1. Whereas, the present need of houses, particularly low cost houses, makes it essential that action to obtain adequate housing should be taken without further delay.
2. Whereas, at this stage of industrial development, the problem of mass house construction may be solved only by the application of scientific methods and industrial processes to the construction of houses.
3. Whereas, at present the house building business is not on an industrial basis, the solution of the problem of the lower priced house is essentially an engineering problem.
4. Whereas, in our opinion, it is the duty of the senior society of the Engineering Profession to accept responsibility for leadership in engineering low cost house construction, which must be established on an industrial basis if the need is to be met.
5. Whereas, Part 5 of the National Housing Act, 1944, authorizes the Federal Government to utilize funds for the purpose of research and investigation in the fields of housing and planning, therefore:—

The Toronto Panel of the E.I.C. Committee of Community Planning recommends that the council of the E.I.C. request financial aid from the federal government for the purpose of enabling the E.I.C. to develop designs and construction methods, appropriate to the different environments found in the national community, and suitable for the construction of houses on a mass production basis.

In submitting these recommendations the Toronto Panel wish to make it clear that it is their considered opinion that the minister in responsible charge of Housing at Ottawa, would welcome the Institute's participation because it is a scientific body outside of politics, and is able, therefore, to relieve the Government of any embarrassment in negotiating for the necessary co-operation of Labour and Management, and also because the E.I.C. is the body most likely to achieve the results that other organizations have, thus far, failed to accomplish.

All of which is respectfully submitted.

The president emphasized that the report broke into two specific sections, the first one dealing with possible leadership which might be supplied by the Institute in attacking the serious difficulties of a legislative nature which were handicapping progress in the housing field. The second proposed that the Institute set up an organization to develop designs and construction methods that would be suitable for the mass production of houses.

In amplifying the recommendations of the panel, Mr. Meadows, a member of the panel, outlined many of the legislative difficulties, recounting in some detail his own experiences in this field. He thought that housing was the country's No. 1 problem, which was being ignored by most people and organizations which might assist in its solution. He thought the Engineering Institute was excellently constituted to provide the leadership such as had been recommended in the panel's report.

The president dealt with the second recommendation, summarizing the situation and asking the panel if it was their intention that the Institute would set up a sort of research group providing funds were made available by the Federal government. On behalf of the panel, Mr. Scott replied that this was the intention.

Mr. Galbraith further expanded the ideas of the panel and described in some detail deplorable conditions which were continued in almost all parts of Canada due to the failure of the authorities to solve the housing problem.

The president again summarized the situation, explaining that as he saw the report it would require the setting up of a committee made up partially at least of full time persons working on designs and methods. He thought, also, the first recommendation would involve the establishment of a committee to study the problem and to consult other bodies in order to determine the best method of providing the leadership.

The members of the panel agreed with the president's summation and contributed some further information based on their personal experiences. Mr. Scott said that in his opinion it was a question of whether or not the Institute felt prepared to accept such responsibilities. He thought the precise recommendations of the panel were of less importance as the method would be determined once the Institute decided to proceed with the task. He explained that the panel had been asked to make specific recommendations and it had now done so and asked that it be dismissed.

The president asked for a further analysis of the responsibilities which the Institute would assume if it took on these duties. Mr. Bunnell agreed with what the previous speakers had said with regard to the unwise basis of assessment, and stated that this situation would have to be bettered before the housing problem could be solved. He thought that as the problem had been placed fairly before Council it should be thought out very carefully before a decision was made. He indicated that other organizations were interested in taxation, such as the Tax Institute of Canada and the Bureau of Municipal Affairs, and he thought that the Institute might with equal appropriateness, give its attention to the subject.

He expressed the hope that the Institute would take the matter to the government and he pointed out that under such circumstances the government officials were very likely to indicate that as far as engineering problems are concerned these are already before a newly established government agency of the National Research Council. He was of the opinion that progress through this agency would be slow in view of the fact that it was just now being established and that certain restrictions might be placed upon it.

He reviewed the problems established by taxation and admitted that he did not know the answers, but he pointed out that the panel had suggested that as a measure of public service the Institute should study these problems and do everything it could to assist in their solution. He thought that the possibility of co-operating with other groups should not be overlooked.

The president stated that he could see that this was a very serious and wide proposal. It appeared that there was a big job that was very badly in need of being done, but whether or not the Institute was in the best position to do it should not be decided until councillors had been given a further opportunity to study it all.

Accordingly, it was moved by Mr. Dunbar, seconded by Mr. McKillop, and approved unanimously that the report be received and distributed as part of the minutes of this meeting and be discussed at the next meeting of Council.

Ontario Division—Secretarial Services

Mr. Manock, chairman of the Division, explained to Council that there had been some discussion as to the possibilities of securing secretarial services for the Ontario Division. These had been outlined in detail by the secretary of the Division in his letter of November 26th addressed to Headquarters, which letter had been presented to Council at the November meeting and held over until the president had had an opportunity of discussing the matter with Mr. Manock, the chairman of the Division.

Mr. Manock stated that he realized that considerable expense would be involved in such an appointment which could not be justified by the work to be done for the Division alone. The officers of the Division now hoped that with the appointment of a field secretary their problems would be solved, providing his headquarters were made in Toronto or some other Ontario centre. He recognized that so far it had not been possible for Council to find the proper person for the work and that therefore no further action could be taken at the moment. He hoped that when the time came to appoint the field secretary the interests of the Ontario Division could be kept in mind.

Mr. Saunders questioned the necessity of a secretary for the Ontario Division. He did not know of any problems that were peculiar to Ontario that would not apply to the membership at large.

The president explained that the problems of the Ontario branches would be simply part of the problems of all the branches that would make up the field of activity of a field secretary.

R.C.E. Proposed Book of Remembrance

The general secretary read parts of a letter written by General G. R. Turner to a councillor of the Institute, which letter had been turned over by the councillor for consideration by the entire Council.

In the preamble General Turner recounted that the fallen Canadian engineers of the First War were commemorated by a Book of Remembrance placed in the Kitchener Memorial Chapel in St. Paul's Cathedral, London. This book was described in *The Engineering Journal* for January 1947, pages 30 and 31. It is now proposed that those who fell in the Second World War are to be commemorated in three different ways.

(a) An Educational Scholarship Fund;

(b) A Granite Cenotaph at Chilliwack, B.C. (Already erected);

(c) A Book of Remembrance to contain the names of the 700 odd members of the Corps who fell in the Second World War. This will be on the lines of that described in the *Journal* and will be placed in St. Paul's along with similar books now in preparation in other parts of the Commonwealth.

General Turner's letter goes on to state that he is chairman of a Dominion committee of the Military Engineers Association of Canada set up for the purpose of raising the necessary funds for Item (c) above.

The following is quoted directly from General Turner's letter:

"The point I would like you to consider, if you will, is whether the E.I.C. might make a subscription of say $500 to $1,000 towards this project. As you know the fallen, particularly the officers, were a cross-section of the engineering profession throughout Canada and it might be that such a subscription from the Institute would react strongly in favour among the members of the engineering profession who are in any way associated with the Army, either Active or Reserve. . . . If you consider that a subscription of some size from the Institute has any merit, perhaps at your convenience you would be good enough to raise the matter at a Council meeting or with the Finance Committee . . ."

The president pointed out the many matters involved in considering this proposal and he asked that further consideration be postponed until the next meeting of Council and that the proposal itself be reported to all councillors so that they would be properly informed for discussion.

Cornwall Branch By-laws

A letter was presented from the Cornwall Branch submitting certain proposed changes in the branch by-laws. Mr. Wright advised that these had been examined and were all connected with branch policy and were in complete conformity with the Institute by-laws. On the motion of Mr. Dunbar, seconded by Mr. Manock, it was unanimously resolved that the proposed amendments to the Cornwall Branch by-laws, as submitted, be approved.

Canadian Standards Association

On the motion of Mr. Eadie, seconded by Mr. Peachey, it was unanimously resolved that Dr. P. L. Pratley be nominated to represent The Engineering Institute of Canada on the Main Committee of the Canadian Standards Association for a three year period, commencing on April 1st, 1948.

Alternate Educational Requirements for Membership

Mr. Peachey explained the procedure which had been followed for many years whereby membership in the three British Institutions, Civil, Mechanical and Electrical, or the passing of their examinations for Associate Membership, had been accepted as qualifying for membership in the Institute, but there appeared to be no minute of Council substantiating this procedure.

Following some discussion, on the motion of Mr. Peachey, seconded by Mr. Dunbar, it was unanimously agreed that persons who have passed Sections A and B of the Associate Membership examinations of any of the three British Institutions, (Electrical, Mechanical and Civil) or who have been given credit for Sections A and B of these examinations would be accepted as meeting the educational requirements for membership in the Institute.

On the motion of Mr. Saunders, seconded by Mr. Manock, it was unanimously resolved that a hearty vote of thanks be extended to the officers of the Toronto Branch for having made it possible for Council to meet in Toronto and for the splendid hospitality which has been extended to members of Council and guests on this occasion.

It was decided that the next meeting of Council would be held in Montreal on Saturday, February 21st, 1948.

The Council rose at five o'clock P.M.

L. Austin Wright,
General Secretary.

Elections and Transfers

Members

Adams, Fred Robert, B.A.Sc., Toronto, dist. mgr., Canadian Liquid Air Co., Vancouver, B.C.

Cazalet, Francis Mott, B.A.Sc., (Mech.), B.C., gas engr., research dept., B.C. Electric Co., Ltd., Vancouver, B.C.

Dawson, Howard Day, municipal engr., Corp. of District of Saanich, Victoria, B.C.

Goldstone, James Sydney, B.Sc., (Elect.), Man., elect. supt., Dow Chemical Co. of Canada, Ltd., Sarnia, Ont.

Heim, Wallace Clare, B.A.Sc., (Chem. Engrg.), B.C., chief engr., rly. dept., Aluminate Chemicals Ltd., Toronto, Ont.

Lewicki, Wladimir Peter, Engr., Dipl., Akademia Gornicza, Cracov, Poland, Algoma Steel Corp., Sault Ste. Marie, Ont.

Murton, James Henry, Petroleum Engr., Colorado School of Mines, plant engr., Imperial Oil Limited, Calgary, Alta.

Nonnenman, William Kenneth, B.Sc., N.B., M.Sc., M.I.T., sr. designer, Aluminum Laboratories, Montreal, Que.

Olsen, Otto, M.Sc., Tech. Univ. of Denmark, design of reinf. concrete constrns., Dominion Bridge Co. Ltd., Winnipeg, Man.

Pugh, James Gillespie Blaine, B.Sc., (Civil), N.B., asst. chief dftsman., Dept. Lands & Mines, New Brunswick, Fredericton, N.B.

Sanger, Frederick James, B.Sc., (Eng.); M.Sc., (Eng.), Univ. of London, Professor and Head of Dept. Drawing, Faculty of Applied Science, Univ. of N.B., Fredericton, N.B.

Sucharov, Bert, B.Sc., (Civil), Man., Vice-pres., Marchak Diesel Locomotives, Inc., N.Y.; pres., Montreal; pres., Sumac Ltd., Montreal, Que.

Whittaker, John Dean, Major, R.C.E., B.A.Sc., (Civil), B.C., Structl. Engr., Directorate of Works and Accommodation, Q.M.G. Branch, Dept. National Defence H.Q., Ottawa, Ont.

Juniors

Ferguson, John McWilliam, B.Sc., (Civil), Sask., tech., officer, grade I, Dominion Water & Power Bureau, Vancouver, B.C.

Grosskurth, Robert Arthur, Lieut., R.C.N., B.A.Sc., (Civil), Toronto, Telecoms Officer, N.S.H.Q., Ottawa, Ont.

Hughes, Roger Caudwell, B.A.Sc., (Chem. Engrg.), B.C., Courtenay, B.C.

McGill, Donald Russell, B.Sc., (Elect.), Alta., jr. engr., Canadian Utilities Ltd., Calgary, Alta.

Transferred from the class of Junior to that of Member

Anderson, Paul Chenery, B.A.Sc., (Elect.), Toronto, elect. engr., Canada Electric Ltd., Toronto, Ont.

Berringer, Ormus Benjiman, B.Sc., (Mech.), B.Eng., (Civil); B.Eng. (Elect.), N.S. Tech. Coll., asphalt sales engr., Imperial Oil Limited, Halifax, N.S.

Cosgrove, Edward T., B.Eng., (Mech.), N.S. Tech. Coll., rep., tech. information, National Research Council, Halifax, N.S.

Kraft, Robert W., B.Sc.; M.Sc., (Chem.), Queen's devel'pt. engr., Aluminum Co. of Canada, Arvida, Que.

McQuire, Ralph Douglas, B.Sc., Queen's, asst. supt., ore plant No. 1, Aluminum Co. of Canada, Arvida, Que.

McRae, William Robertson, B.Sc., Wash. State Coll., managing-dir., Western Clay & Chemical Co., Ltd., Calgary, Alta.

Schofield, William, B.Eng., McGill, plant engr., Alliance Paper Mills Ltd., Merritton, Ont.
Smith, Owen Leonard, B.Eng., (Elect.), N.S. Tech. Coll., elect. engr., Price Bros., Riverbend, Que.
Vatcher, Chesley Holmes, B.A.Sc., (Elect.), Toronto, asst. to mgr., industrial products sales dept., Canadian National Carbon Co., Ltd., Toronto, Ont.

Transferred from the class of Junior to that of Affiliate

Layton, Michael Shakespear, B.Sc., McGill, asst. works mgr., Steel Co. of Canada Ltd., Montreal, Que.
Safran, Nathan, B.Sc., (Arts), M.Sc., (Org.Chem.), Alta., head, science & maths. dept., Institute of Technology, Calgary, Alta.

Admitted as Students

Students at Nova Scotia Technical College

P. R. Brown
W. A. Burgess
F. D. Butler
R. A. Butts
A. E. M. Cameron
B. J. Hamm
R. P. Harrison
J. P. Henderson
R. F. Hirtle
R. D. MacCready
J. A. G. MacDonald
J. E. Peters
N. P. Wallace
J. A. Wilmot

Students at University of Toronto

R. E. Boston
J. R. Clendening
H. E. Cole
W. W. Duncan
W. E. Emmerson
G. E. Garrett
D. M. Giffin
J. J. Heffenran
W. F. Hull
W. A. Inman
G. H. Kenyon
J. C. Kirkup
E. A. Lalor
O. T. Linton
J. A. Maine
H. A. Moir
J. W. O'Neill
S. B. Panting
J. M. Rasberry
J. W. Richmond
J. J. Shoemaker
D. E. Smith
W. B. Sproule
J. H. Thorne
E. A. West
C. S. White

Students at McGill University

R. L. Baird
J. Bordan
C. B. Cooper
F. M. Corbett
G. A. P. Filiatrault
K. S. Flitton
N. C. Gansner
G. T. Giguere
K. P. Gould
J. C. Gravel
J. F. Harris
K. H. Jones
F. F. Kieran
L. Orbane
P. N. Outerbridge
H. F. Pragnell
N. Rudnick
L. Shrum
W. D. Staniforth
J. S. Swietanski
D. R. Walsh
F. N. Walsh
C. Zehnwirt

Students at Queen's University

J. L. Armstrong
T. W. C. Dobson
A. Fields
R. J. Gourley
K. Haraldsen
B. G. Hardy
L. H. Harper
E. L. Harris
K. W. Hawkins
J. G. Hooper
K. E. Hunt
E. G. A. Jorgensen
G. R. Kartzmark
R. B. Lees
H. T. Lingham
A. G. Macpherson
E. R. Quinn
M. N. Shanas
D. A. Shanks
W. I. Slywchuk
F. P. Tagliamonte
G. D. Thomas
N. A. Walker
S. F. Warwick
A. R. Wood
J. B. Woods

Students at University of Manitoba

V. Burtynk
S. Cherry
T. A. Copeland
D. B. G. Dutton
J. Ediger
H. T. Halsall
C. E. Leonoff
G. O. Lamb
H. P. Laskoski
A. F. MacDonald
J. H. Macdonald
V. A. McGregor
I. E. McIntosh
K. E. McKenzie
D. H. McNaughton
G. G. Marshall
O. C. Norris-Eyle
C. E. Pontifex
W. M. Riches
L. E. Rodway
D. J. Trifunov
H. J. Wallace
H. N. Yeomans

Students at University of New Brunswick

J. W. Holmes
J. R. McMackin
D. L. Payer

Students at Mount Allison University

H. J. Bourque
G. Gow
W. Hendry
G. A. Wright

Students at Laval University

R. Barry
Y. Boivin
L. St. Pierre
J. J. P. Whissell

Students at University of Alberta

L. E. F. Snow

Students at University of British Columbia

N. L. Donatt

Students at University of Saskatchewan

D. J. Allan

Students at St. Francis Xavier University

G. O. MacLellan
H. A. Roy

Student at Dalhousie University

J. B. Morrow

By virtue of the cooperative agreements between the Institute and the associations of professional engineers, the following elections and transfers have become effective:

ALBERTA

Member

Crawford, Russell S., trans. & protection engr., Alberta Gov't. Telephones, Edmonton, Alta.

Junior to Member

Copp, Stanley Seymour, B.A.Sc., (Civil), B.C., sanitary engr., Dept. of National Health & Welfare, Edmonton, Alta.

SASKATCHEWAN

Member

Gillie, Kenneth Beresford, B.A.Sc., (Chem. Engrg.); M.Sc., (Chem.); B.C., chief steward & pur. agt., Sask. Anti-Tuberculosis League, Fort San, Sask.

NOVA SCOTIA

Members

Akin, Edwin K., B.Sc., (Elect.), N.S. Tech. Coll., supt., steam dept., Nova Scotia Light & Power, Halifax, N.S.
Brown, Alexander, field engr., Dominion Steel and Coal Co., Ltd., Sydney, N.S.
Bulley, John Edward, B.Eng., (Mech.), N.S. Tech. Coll., engrg., J. E. Buckley, Halifax, N.S.
Harrison, George Edward, elect. supt., N.S. Hospital, Dartmouth, N.S.
Kenney, Seymour William, vice-pres., Kenney Construction Co., Ltd., Truro, N.S.
Lowe, Donald McNicol, Manager, Civil Engr. & Mtce., R.C.N., Halifax, N.S.
Prince, Edward John, research metall., Dominion Steel & Coal Corp., Sydney, N.S.

Junior to Member

Bowes, William Henry, B.Eng., (Mech.), N.S. Tech. Coll., assoc. professor, engrg., Dalhousie Univ.; provincial land surveyor, Halifax, N.S.

QUEBEC

Members

Krol, Joseph, M.E., Tech. Univ. of Warsaw; Ph.D., (Eng.), Univ. of London; Stadler-Hurter, Montreal, Que.
Kursbatt, Isaac, B.Sc., (Eng.), London Univ., consultg. engr., Montreal, Que.

Personals

Notes of the Personal Activities of Members of the Institute

The Canadian Construction Association's executive officers for the year 1948 were elected in January at the annual meeting at Quebec City. Institute members included are:

Allon C. Ross, M.E.I.C., president of the Association. He is president of Ross & Meagher Limited, Ottawa.

Robert Drummond, Affil.E.I.C., of Toronto, is vice-president. Mr. Drummond is managing director of A. W. Robertson Ltd., and was recently elected president of Toronto Builders Exchange.

Fronk Flett, M.E.I.C., Toronto, district manager of Truscon Steel Company of Canada Ltd., Toronto, is Ontario vice-president of the Association.

T. N. Carter, M.E.I.C., is honorary treasurer. He is vice-president and chief engineer of Carter Construction Co. Ltd., Toronto, Ont.

R. C. Pybus, M.E.I.C., is Pacific vice-president. He is western manager of Commonwealth Construction Company Limited in Vancouver.

E. V. Buchonon, M.E.I.C., general manager of the London, Ont., Public Utilities Commission, and general manager of the London and Port Stanley Railway, was confirmed as the recipient of the George Warren Fuller Memorial Award of the Canadian Section of the American Waterworks Association for the year 1948. The honor will be conferred on Mr. Buchanan at the annual meeting of the Canadian Section of the Association at Niagara Falls, Ont., in April. He is a past chairman of the Section, and the citation approved by the Executive of the Section marks "his outstanding service in the administration of waterworks and public utilities, and for development of public relations".

J. H. Johnston, M.E.I.C., district engineer for many years at Peace River, Alta., for the Provincial Department of Public Works, has been promoted to be assistant superintendent of maintenance for the Department at Edmonton, Alta. He had been associated with Peace River country for 36 years, since his graduation from Queen's University, Kingston. He was at first employed on surveying for the Dominion government, and later as resident engineer on highway construction for the Provincial government. He received his appointment as district engineer in 1926.

R. M. Richordson, M.E.I.C., of Saint John, N.B., was elected president of the Association of Professional Engineers of New Brunswick in January. Mr. Richardson is with the New Brunswick Telephone Company Limited, having gone to the Maritimes in 1941 after many years of service with the Bell Telephone Company in Ottawa and Montreal. He joined Bell Telephone soon after graduating from McGill University in 1924 with a B.Sc. degree.

C. K. McLeod, M.E.I.C., Montreal consulting engineer, was named president of the Montreal division of the Navy League of Canada at the Division's recent annual meeting. For the past two years Mr. McLeod had been a member of the League executive.

D. Roy Cameron, M.E.I.C., has retired from the Dominion Forest Service and has accepted a position with the Food and Agriculture Organization of the United Nations. He is located at Geneva, Switzerland, at the European Office of the Organization.

G. W. Holder, M.E.I.C., has been elected chairman of the Sault Ste. Marie Branch of the Institute. He is a field engineer in the engineering department of the Abitibi Power and Paper Company Limited, Sault Ste. Marie. Coming from Ottawa, Ont., he worked on surveying parties as assistant engineer for the federal Department of Public Works from 1912 to 1917. He was draughtsman, instrumentman and resident engineer on the Heyworth Power House and dam at Sault Ste. Marie in 1917-18. He was then associated with Fraser Brace for a time on construction of the Big Eddy dam, and later with G. L. Ramsey, Ontario land surveyor. He then spent a number of years as engineer in charge of storage developments for the Spanish River Pulp and Paper Mills hydraulic department. In 1929 he joined the Abitibi Power and Paper Company Limited, remaining as manager of the Sturgeon Falls, Ont., division until 1941. He then went to the Iroquois Falls, Ont., for the Company. For a time he was on loan to Wartime Prices and Trade Board in Montreal as engineer to the Newsprint Administrator. He returned to Sault Ste. Marie in 1945.

B. G. Bollord, M.E.I.C., is head of the new Radio and Electrical Engineering Division of National Research Council. The creation of the new division was necessitated by the great expansion of research activities in the fields of electronics and electrical engineering.

Mr. Ballard graduated from Queen's University, Kingston, Ont., in 1924 and was with Westinghouse Electric and Manufacturing Company at East Pittsburgh, Pa., until 1930. Then he joined National Research Council staff and has been in charge of the electrical engineering laboratory since that time. During the war his activities were largely devoted to the development of mine sweepers for magnetic mines and the protection of ships against these mines, and it was for his contributions in this field that he was awarded the O.B.E. decoration in 1946.

Dominion and Nova Scotia government authorities have announced the appointment of a board of engineers to review plans of the transport department for betterment of transportation facilities at the Strait of Canso. Members of the board are **Professor D. S. Ellis,** M.E.I.C., dean of the Faculty of Applied Science of Queen's University, Kingston, Ont., and **Dr. Arthur Surveyer,** M.E.I.C., and **Dr. P. L. Pratley,** M.E.I.C., both Montreal consulting engineers. Dean Ellis and Dr. Surveyer are appointed by the Dominion Government, and Dr. Pratley by the Provincial government.

Errata

Two items appearing in the Personals Section of the January issue were found to be incorrect. We apologize to all concerned, and offer the following corrected "Personals":

J. J. Miller, M.E.I.C., the recently appointed secretary-treasurer of the Niagara Peninsula Branch of the Institute, is electrical and mechanical superintendent of the Niagara, St. Catharines and Toronto Railway at St. Catharines, Ont. He is from Winnipeg, Man., a graduate of the University of Manitoba, receiving the degree of B.Sc. in electrical engineering in 1937. 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 accepted his present position at St. Catharines.

J. A. Izord, Jr.E.I.C., has been an assistant superintendent at Yarrows Limited, Victoria, B.C., for the past year. He was demobilized from the Navy in 1945, graduated from McGill University, Montreal, in 1946, with the degree of B.Eng. (chemical), and has been with Yarrows ever since.

E. R. Jarmain, M.E.I.C., chairman of the London Branch of the Institute for 1948 is a native of London. He studied at Beal Technical School there, and at University of Toronto where he received the B.A.Sc. degree in 1930. He later studied chemistry at University of Western Ontario, and also received the degree of M.A. in Business Administration.

He was at Windsor, Ont., a sales engineer for Fuel Saving Equipment and Engineering Company for a time, before becoming manager and production engineer and later proprietor of the Forest City Laundry in London, which he still owns and operates. In 1942 he was chief consultant on laundry and dry cleaning for the Department of Munitions and Supply. He also became associated that year with the Kelco Engineering Limited, as consulting engineer. He is still president of that Company. From 1943 to 1945 he was assistant associate director of War Industries for the Department of Labour, Ottawa. Mr. Jarmain practices as a consultant in design, construction and operation of laundry and dry cleaning plants.

R. N. Coke, M.E.I.C., was elected chairman of the Montreal Branch of the Institute at the annual meeting in January. He is vice-chief engineer and general superintendent, Quebec Hydro-Electric Power Commission, Montreal. Mr. Coke is from Jamaica, B.W.I., a McGill University graduate, having received the degree of B.Sc. in electrical engineering in 1914. He took a position then with the Northern Ontario Light and Power Company but enlisted soon after for service overseas with the armed forces. He returned to Canada in 1919 and joined the engineering department of the Saskatchewan Provincial Telephone Company in Regina. The next year he joined the Bell Telephone Company at Toronto as assistant traffic engineer. In 1921 he went to the staff of Canadian Westinghouse Company at Hamilton, Ont., as erecting engineer, and in 1922 he became associated with Winnipeg Electric Railway Company. He later transferred to the position of electrical engineer for Northwestern Power Company and in 1929 came to Montreal to the staff of the Montreal Light Heat and Power Company. He was assistant general superintendent for some years and received his present position in 1934.

S. R. Muirhead, M.E.I.C., is appointed general manager of Saskatchewan Government Telephones, and deputy minister of telephones for the Province. He joined that department in 1924 on graduating from University of Toronto with the degree of B.A.Sc. He was successively equipment supervisor, plant superintendent, engineer and, prior to his recent appointment, chief engineer.

C. W. Sparrow, M.E.I.C., of Moose Jaw, Sask., succeeds Mr. Muirhead as chief engineer of the Saskatchewan Government Telephones. Mr. Sparrow was formerly transmission and equipment engineer. He is a graduate of the University of Manitoba, class of 1928, receiving the B.Sc. degree in electrical engineering. He entered the employ of the Saskatchewan Government Telephones as an apprentice switchman the same year. He became assistant engineer in 1930 and transmission and equipment engineer in 1940.

Promotions announced in January by the City of Winnipeg Hydro-Electric System included the following Institute members:

H. L. Briggs, M.E.I.C., formerly chief engineer, is now assistant general manager. A past-councillor of the Institute, representing the Winnipeg Branch, Mr. Briggs has been with the Winnipeg Hydro since graduation in 1928 from University of Manitoba with the degree of B.Sc. in electrical engineering.

T. E. Storey, M.E.I.C., formerly general superintendent in charge of production, is now chief engineer. Immediate past-chairman of the Winnipeg Branch of the Institute, Mr. Storey is a University of Manitoba graduate, having received the B.Sc. degree in 1928, and has been with the Hydro ever since.

D. C. Bryden, M.E.I.C., is now general superintendent in charge of production. He is news editor of the Electrical Section of the Winnipeg Branch of the Institute. He graduated from the University of Alberta in 1928, and was with Canadian Westinghouse Company Limited at Hamilton, Ont., until joining the Winnipeg System in 1930.

R. T. Harland, M.E.I.C., who was made electrical design engineer, is secretary-treasurer of the Winnipeg Branch. Mr. Harland received the degree of B.Sc. (electrical) from the University of Manitoba in 1938, and that of S.M. (electrical) from Massachusetts Institute of Technology in 1940. He was with the Winnipeg Hydro for two years prior to service with the R.C.A.F. He returned to his position in 1946.

G. W. Moule, M.E.I.C., is contract engineer. Mr. Moule is another University of Manitoba graduate, class of 1937. He worked in Montreal for Canadian Industries Limited until 1941, when he was transferred to the Winnipeg plant of Defence Industries Limited. He joined Winnipeg Hydro in 1945 as designing engineer.

L. A. Bateman, Jr.E.I.C., is appointed operating engineer. He has been with the Hydro since his graduation in 1942 from University of Manitoba with the degree of B.Sc. in electrical engineering. Mr. Bateman is secretary of the Electrical Section of the Winnipeg Branch.

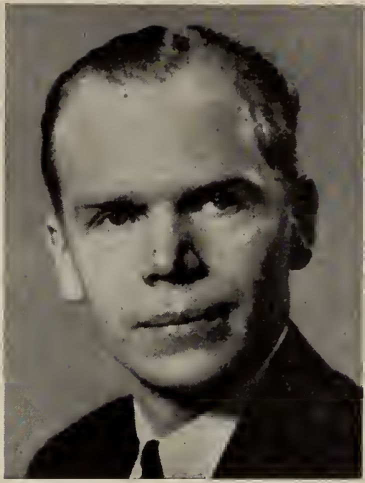
N. J. W. Smith, M.E.I.C., has been appointed secretary-treasurer of the London Branch of the Institute. He is from Toronto, and a graduate of Royal Military College and McGill University, receiving from the latter the degree of B. Eng., in 1932. He followed military engineering courses in England in 1932 and 1933 and served with the R.C.E. in Toronto and Ottawa until 1936. Then, attached to the Royal Engineers, he was in England and Singapore until 1938. He remained in Ottawa for the next three years, and went overseas in 1941 as second in command of the 4th Battalion R.C.E. He was promoted to commanding officer in 1942. He became C.R.E. of 1st Canadian Corps Troops in 1942, and C.R.E. of the 2nd Canadian Infantry division in 1943. In 1945 he received the rank of colonel. Colonel Smith was demobilized in 1946 and entered the employ of McKay-Cocker Construction Limited, in London, Ont.

E. R. Jarmain, M.E.I.C.

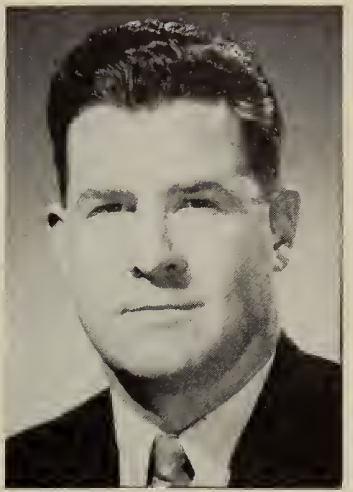
H. L. Briggs, M.E.I.C.

R. N. Coke, M.E.I.C.

T. E. Storey, M.E.I.C.



R. A. Emerson, M.E.I.C.



W. F. McMullen, M.E.I.C.

R. A. Emerson, M.E.I.C., of Vancouver, B.C., has been appointed engineer of track for the Canadian Pacific Railway. He had been stationed at Vancouver since 1944 as assistant district engineer and as district engineer. He graduated from University of Manitoba, and undertook post-graduate studies at Yale University in 1933-34. His career with C.P.R. began permanently in 1935 as a transitman at Kenora, Ont. In 1939 he became roadmaster at Portage, Man., and he was appointed division engineer at Brandon, Man., in 1941, moving to Moose Jaw, Sask., in the same capacity in 1943.

W. F. McMullen, M.E.I.C., has recently returned to Canadian General Electric Company as manager of its Conduit Products Section, following seven months service as a commercial assistant with C.E.M.A. He is a graduate of the University of Toronto, class of 1935. He worked as a demonstrator at that university for a term, and later took the C.G.E. " test " training and served in several departments at Peterborough and Toronto. He served in the recent war with the R.C.A., rising to the command of the 3rd Anti-Tank Regiment, and was mentioned in despatches. Upon demobilization in 1945 he returned to C.G.E., being made manager of the Laundry Equipment Division at the Royce Works.

D. G. Tapley, M.E.I.C., has joined the sales staff of English Electric Company, St. Catharines, Ont. Mr. Tapley is a graduate in electrical engineering from Nova Scotia Technical College. His electrical engineering experience in air conditioning and refrigeration, ventilation and general apparatus sales was acquired in Toronto and Western Canada.

L. G. Scott, M.E.I.C., recently resigned from the position of plant engineer at Canadair Limited in Montreal, and has been appointed superintendent of construction, Retail Stores Department, Hudson's Bay Company, with headquarters at Winnipeg, Man.

W.E. Jefferson, M.E.I.C., has been appointed secretary-treasurer of the Halifax Branch of the Institute. He is from Moschelle, N.S., a graduate of Nova Scotia Technical College in the class of electrical engineering of 1915. He spent some years teaching at Mount Allison University, at King's University, and with the Soldiers Civil Reestablishment Department. In 1921, he entered the engineering branch of the Maritime Telegraph and Telephone Company and now holds the position of chief engineer with that organization.

D. B. Barry, M.E.I.C., was transferred in November last by the Imperial Leaf Tobacco Company of Canada, Limited, from Montreal to Hamilton, Ont., to take up duties there as Ontario district engineer of the Company.

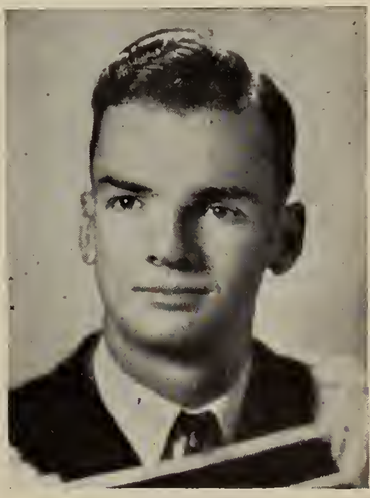
R. P. Fraser, M.E.I.C., is now assistant superintendent of the Light and Power Department of the city of Regina. He had been with the Winnipeg Electric Company since 1935, and had been appointed in 1937 assistant to the distribution engineer. He is a University of Manitoba graduate with the degree of B.Sc., electrical, class of 1931.

J. H. Lemieux, M.E.I.C., is now an active member of the Corporation of Land Surveyors of the Province of Quebec. He is still chief engineer for National Granite Limited of St. Joseph d'Alma, Que., and practices as a consulting engineer in association with Emile Lamarre, M.E.I.C. He intends, also, to practice as a land surveyor.

F. D. Greenwood, JR.E.I.C., the new secretary-treasurer of the Sault Ste. Marie Branch of the Institute is a mechanical engineer and designer with the Chromium Mining and Smelting Corporation Limited, Sault Ste. Marie. He is a graduate of Queen's University, receiving the degree of B.Sc. in mechanical engineering in 1931.

L. P. Doncose, JR.E.I.C., has been working since January 1948 for the Canada and Gulf Terminal Railway Company at Mont Joli, Que., as engineer and assistant superintendent. He has left the service of Canadian National Railways, Quebec, Que., where he was assistant division engineer.

Donald F. Cootes, S.E.I.C., who was selected for one of the 1948-49 Rhodes Scholarships, is in his final year of engineering at McGill University, Montreal.



D. F. Coates, S.E.I.C.

Born at Prince Albert, Sask., he entered McGill engineering, but interrupted his studies to join the R.C.A.F. in 1943. He was discharged as a pilot officer, General List, in 1945.

His goal is to continue studies which will help in a career directed toward the development of Canada's northland. He has already worked in the north. In the spring of 1946 he joined the Geodetic Service of Canada and worked around the Keewatin area. In the spring of 1947 he was picked to head a government party and sent to the James and Hudson Bay area. His schooner was wrecked but he managed to salvage most of the supplies. Chartering a plane, his party carried out its summer mission.

Mr. Coates has interested himself in sports, and has been prominent in student organizations. He represented the engineering faculty on the Students' Executive Council at McGill.

Obituaries

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

Richard M. Charlton, M.E.I.C., who had been residing at St. Gabriel de Brandon, Que., for some years, died in December 1947 at St. Lambert, Que. Mr. Charlton had been in retirement for several years from a lengthy career in engineering, conducted largely in the Province of Quebec.

He was born at Quebec City in 1871. Early in his career he worked on the railway lines of the province. Before his retirement he was vice-president of the contracting firm of Leger and Charlton, Lachine, Que.

Mr. Charlton joined the Institute in 1905 as an Associate Member, transferring to Member in 1940, and being awarded Life Membership in 1947.

Francis W. Cooper, M.E.I.C., president of Engineering Materials Limited, Montreal, died in Montreal on February 6th, 1948, after a long illness.

He was born in London, Ont., in 1880, and was educated at London schools and at London Collegiate Institute. He attended McGill University, where he obtained his engineering degree in 1901, later entering the service of Canadian Pacific Railway. After considerable service with the railway, he entered the supply field, and formed several companies. He was also associated with various mining companies, holding executive positions and directorates until ill health forced his resignation last year.

Mr. Cooper was president of the Steel Rail Anchor Company, and of Engineering Materials Limited, and vice-president of the P. and M. Company Limited. He joined the Institute in 1907 as an Associate Member, transferring to Member in 1940. He was awarded Life Membership in 1947.

F. C. Dyer, M.E.I.C., formerly of the staff of the University of Toronto, died in Toronto on December 15, 1947. Born in Manchester, England, in 1872, he left home at the age of nineteen and came to Canada, first establishing himself in Manitoba in 1891. There he operated a wheat farm for some years.

He came east to enter Toronto University and graduated in 1909 with the degree of B.A.Sc. Shortly thereafter he joined the staff of the University of Toronto in the Department of Mining Engineering, where he remained until his retirement in 1938 due to ill health. He was then professor of ore dressing. During his long term on the staff, he carried on considerable research, including work on ore dressing and the application of mining methods to seed cleaning processes. When possible, he also did research for leading mining companies, on ore dressing and process design. He did surveys and reports on mining fields and claims, at various times, and carried on a private practice in mining engineering.

After World War I he served on the Soldiers Civil Re-establishment Commission as chief inspector of vocational classes. He was a member of a number of technical and professional associations. He joined the Institute in 1920 as a Member, becoming a Life Member in 1939.

Thomas Lockhart McCall, M.E.I.C., died in February 1947 after completing twenty-five years of service to Dominion Steel & Coal Corporation Ltd., and to the mining industry of Nova Scotia.

He was born in 1885 at Largs, Scotland. He was an articled apprentice in 1903 to Messrs. John and G. H. Geddes, mining engineers of Edinburgh. He trained in coal mining, and in 1910 had became assistant to the managing director of the Ormiston Coal Co. Ltd. In 1913 he became manager of the Malayan Collieries, Ltd., Federated Malay States, developing and equipping the first colliery there.

In 1921 he came to Nova Scotia to become assistant mining engineer for the "Dosco" subsidiaries, the Acadia Coal Company at Stellarton and the Cumberland Coal and Railway Company at Springhill Mines. In 1929 he became chief mining engineer for the coal mines of the Corporation in three counties in Nova Scotia, and the iron-ore mines in Wabana, Newfoundland. He was appointed general manager of the Dominion Coal Company Limited in 1941, still retaining his duties as chief mining engineer for the Corporation. He was compelled in 1946, by ill health, to relinquish his duties.

Mr. McCall was a past-president of the Mining Society of Nova Scotia and past-vice-president of the Canadian Institute of Mining and Metallurgy. He held membership also in the Mining Institute of Scotland, the Institution of Mining Engineers (London), the South Wales Institute of Engineers, The American Institute of Mining and Metallurgical Engineers, and the Association of Professional Engineers of Nova Scotia. He joined the Engineering Institute as a Member in 1930.

He contributed works of importance to the literature of the Canadian mining industry, publication being made in the transactions of the Canadian Institute of Mining and Metallurgy from 1923 to 1944. He was the recipient in 1937 of the Institute's Leonard Medal.

W. H. Kelly, M.E.I.C., civil engineer and general contractor, died suddenly on February 7, 1948, at his residence at Aylmer, Que. Born in Montreal in 1893, he was educated here, graduating from McGill University in civil engineering in 1916.

He was employed for a short time with the Abitibi Power and Paper Company at Iroquois Falls, and then he enlisted in the Engineering Corps and went overseas, with the rank of lieutenant. On his return he was engaged for a short time with his father in the lumber business and then joined the engineering staff of the Riordon Paper Company. He later formed the Canada Construction Company, undertook logging contracts, and built roads for the Quebec Provincial Government. On the firm's dissolution he went into business for himself as a general contractor. He was a specialist in road building and municipal contracting. He carried out many projects of this nature in towns in the Montreal and Ottawa districts, and in recent years installed municipal waterworks at St. Sauveur, Ste. Adele and Morin Heights in the Laurentians. During World War II he constructed roads, buildings and waterworks for air fields and munitions factories in Ontario and Quebec.

Mr. Kelly joined the Institute as an Associate Member in 1937.

Burton L. Parker, M.E.I.C., city engineer of Liverpool, N.S., passed away on February 7th, 1948.

Mr. Parker was born at Stewiacke, N.S., in 1885, and studied at the Nova Scotia Technical College. From 1905 to 1907 he did railway work in western Canada, but he returned to Sydney, N.S., as superintendent of streets and assistant city engineer in 1909. Three years later he worked for the Department of Railways and Canals, Ottawa, as assistant engineer on reconstruction of St. Peters Canal. In 1918 and 1919 he was in private practice as a provincial land surveyor, and for several years he was engineer and manager of lumbering and pulpwood operations at New Glasgow, N.S. In 1922 he started the organization of the pulpwood operation at Guysboro, later purchased by the Sonora Timber Co. Ltd., who appointed him manager of Guysboro district. From 1932-35 he was in private practice as a land and timber limit surveyor. Later he became employed by W. P. Morrison, C.E., in general engineering practice.

Mr. Parker served with the Royal Canadian Air Force in an engineering capacity during the Second World War and came to Liverpool as town engineer following his discharge early in 1946.

Mr. Parker joined the Institute in 1940.

—NEWS of the BRANCHES—

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented

CALGARY BRANCH

J. F. LANGSTON, M.E.I.C. - - *Secretary-Treasurer*
T. M. PARRY, M.E.I.C. - - - *Branch News Editor*

A general meeting of the Calgary branch was held on Thursday, January 22, at 8.00 p.m. in the east dining room of the Palliser Hotel. The chairman, M. W. Jennings, presided.

The minutes of the last meeting were read and adopted, and there being no business requiring attention by the meeting, the programme of the evening was presented. As an item added to the original programme, an interesting film dealing with the development, construction, operation and application of the Fawick Air-flex Clutch was presented to the gathering.

The chairman then called on F. T. Gale, superintendent of rural electrification, Calgary Power Company, who gave an interesting, comprehensive talk on **Farm Electrification**.

In his opening remarks, Mr. Gale pointed out that five major problems to be faced in rural electrification schemes are engineering problems, financing, rates, utilization and social considerations.

Engineering studies must take the responsibility of assuring adequacy of power lines and electrical equipment not only for the present but also for future growth. Also of importance is the adequacy of farm implements and devices to assure use of the electrical energy. A study of density of population per township coupled with a similar study of soil productivity zones indicates a remarkable coincidence between the two in both location and general shape.

Farm electrification system development and expansion is dependent on the present existing network of power lines. The present network in Alberta means that some 40,000 out of 60,000 farms are in sufficient proximity to be embraced by such a system. For various reasons, 15,000 of these farms may be eliminated, leaving some 25,000 as prospective customers.

Twenty million dollars could well be invested in power lines and requisites, with a similar amount for farm wiring and appliances. Instead of the usual spread of time, this money should be spent within the next 7 to 10 years so as to take advantage of the present period of prosperity.

An experimental farm electrification programme started by the two utility companies of the province before the end of the war, now embraces some 2000 farms. Costs of line construction per mile were $634.00; connecting the farmer to the line cost him $250.00, with about $720.00 being necessary to wire and equip the buildings of the average farm. Prospects of continuing price increases on equipment and materials complicate the future picture. The establishment of a rate satisfactory to all concerned, for good times and bad, could be best secured with a plan whereby the farmer capitalized his own portion of the line.

Considerable educational work has been found necessary to make farmers, in general, aware of what electrical power can actually do for them. Electricity should not be considered by them as merely a convenience, but more as a productive tool capable of appreciably increasing farm income.

Mr. Gale continued his talk with the showing of a film entitled, **Farm Life in Wartime,** which pictured numerous applications of electrical power to help in the daily chores and labour of the farmer.

The gathering took advantage of a question period to continue the discussion with Mr. Gale. A hearty vote of thanks to the speaker for his interesting presentation was moved by Jack Dale, of Canadian Utilities Ltd. The register indicated that 63 members and 35 guests had signed for the evening.

CORNWALL BRANCH

G. G. M. EASTWOOD, M.E.I.C. - *Secretary-Treasurer*
T. B. WEBSTER, JR.E.I.C. - - - *Branch News Editor*

An illustrated talk on **Prestressed Concrete Pipe** was presented to the Cornwall Branch on January 20 by R. M. Doull, general manager and director of the Preload Company of Canada and the Canada Gunite Company.

W. P. Nesbitt introduced the speaker, who said that the City of Montreal had contracted for a length of about 2 miles of 84-in. prestressed concrete pipe to provide four intake lines for city water. Designs were made by the Preload Company of Canada and a joint agreement for the manufacture of the pipe was made with the Atlas Construction Company. The latter had built a special plant solely to produce the large prestressed pipes in 18-foot lengths.

A concrete core 5-in. thick is poured around 24 longitudinal prestressed reinforcing steel bars. After setting and steam curing, the core is wound on a specially-developed winding machine where cold drawn steel wire is wound around the core inducing a stress in the concrete of 725 pounds per square inch. After winding, the pipe is sprayed with a ¾-in. covering of Gunite to develop the bonding of the wire and to protect the wire from corrosion.

Mr. Doull outlined the severe tests that were made on the pipe which showed that it was capable of withstanding severe punishment. He quoted figures that indicated an 80 per cent saving in steel compared with the conventional steel diaphragm concrete pipe. Manufacturing operations were clearly illustrated by a technicolour film.

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The February meeting was held on the 17th, with Chairman R. H. Wallace presiding. The speaker for the evening was J. R. Montague, hydraulic engineer of the Hydro Electric Power Commission of Ontario, who discussed **Power Development on the Madawaska River.**

The talk was illustrated by lantern slides and Kodachrome pictures showing the map of the watershed which has a potential of 330,000 horsepower for power development. There are several possible sites for dams and powerhouses but one development has already been completed at Barrett Shute and another one at Stewartville is being rushed to completion.

The Kodachrome slides showed the stages in the construction of both the Stewartville and Barrett Shute developments. At Stewartville, a tunnel was cut through the rock bank to by-pass the Madawaska River so that a cofferdam could be built to allow for excavating the dam site to bedrock. The Commission has developed a huge automatic concrete mixing machine that is being used to pour 250,000 cubic yards of concrete for the Stewartville dam. Continuous pours as high as 50 feet are made.

The colour pictures of the Barrett Shute project showed the development from the building of the control dam to the construction of the power dam and completed powerhouse. In conclusion, Mr. Montague spoke of the part that Hydro is playing in the development of the country's resources.

EDMONTON BRANCH

W. W. Preston, jr.e.i.c. - - - *Secretary-Treasurer*

Beginning a tour of several western branches with an illustrated lecture entitled **The Joint Use of Poles by Electric Power and Communication Utilities,** D. G. Geiger, western transmission engineer for the Bell Telephone Company of Canada, emphasized to the Edmonton Branch, at a dinner meeting in the Corona Hotel on February 10, that a prime consideration in designing a pole to carry the circuits of two utilities is to protect personnel. This is done by placing the power lines at the top of the pole, and by providing adequate clearances between the wires horizontally and vertically, and by employing de-energizing devices which will act promptly. Mr. Geiger stated that the ideal situation, though uneconomical, would be to put all wiring underground. The practical alternative, he contended, was to reduce the number of poles to a minimum by joint use, and to arrange the wires and attachments on the poles according to recognized safe practices. The need for joint specifications and co-operation of the participating individuals was also pointed out.

Mr. Geiger was introduced by R. E. Phillips to an audience of 61. After a discussion period H. J. Williamson moved a well applauded vote of thanks to the guest speaker. Chairman J. E. Cranswick conducted the meeting.

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On February 11 the Edmonton Branch executive entertained President Grant at dinner in the University of Alberta cafeteria, just before his address to the Engineering Students' Society of the University. Afterwards the members had a round table discussion in the University Senate Chamber, Arts Building.

Lt.-Col. Grant spent the morning with Edmonton military personnel, and toured the University of Alberta in the afternoon, concluding with a visit to the home of Dean R. M. Hardy, Faculty of Applied Science.

HALIFAX BRANCH

W. E. Jefferson, m.e.i.c. - - *Secretary-Treasurer*

M. L. Baker, m.e.i.c. - - *Branch News Editor*

Two hundred and thirty members of the Engineering Institute of Canada and the Association of Professional Engineers of Nova Scotia met at the Lord Nelson Hotel on January 21 for the annual banquet sponsored jointly by these organizations.

Engineers from all parts of the Province look upon this banquet as their major social function of the year. That it is eagerly anticipated, well supported, and thoroughly enjoyed, is evident from the attendance. W. C. Risley, chairman of the Halifax Branch, E.I.C., conducted the first half of the meeting. Following a short period of silence in memory of members who died during the year, Mr. Risley introduced the guests at the head table. They were: Hon. Harold Connolly, Minister of Industry and Publicity; Mr. J. . Ahern, mayor of Halifax; Dr. A. E. Cameron, president, Nova Scotia Technical College; Dr. F. H. Sexton, retired president, Nova Scotia Technical College; Col. F. W. W. Doane, senior member, Association of Professional Engineers of Nova Scotia; Mr. L. D. McKenna, president, Nova Scotia Technical College Engineering Society; Dr. S. A. Beatty, president, Maritime Branch, Canadian Institute of Chemistry; Dr. C. C. Coffin, president, Nova Scotia Institute of Service; Mr. A. E. Priest, president, Nova Scotia Association of Architects; Mr. Frank Crawshaw, actor, entertainer, and radio star.

The chair was then handed over to J. A. Russell, newly elected President of the Association. As chairman, Mr. Russell took pleasure in the presentation of Honorary Life Membership certificates to the following members of the Association: Dr. F. H. Sexton, and Messrs. W. H. Munroe, J. L. Allan, J. R. Morrison.

Mr. Russell next introduced the guest speaker—the Hon. Harold Connolly, who gave a splendid address. He related numerous incidents of his career in public life, and in a more serious vein he presented a comprehensive picture of the part played in Nova Scotia by his Department and of the importance of the engineer in its development. L. Mitchell moved the vote of thanks to the speaker. This was heartily endorsed by the assembly.

Harry Cochrane and assisting artists provided entertainment. Song and dance numbers interspersed with novelty presentations made up the programme which was enthusiastically enjoyed by all members. K. L. Dawson was Master of Ceremonies.

The committee responsible for all arrangements for the banquet was headed by W. M. Gould with V. M. Coy as secretary.

HAMILTON BRANCH

I. M. Macdonald, jr.e.i.c. - - *Secretary-Treasurer*

Tha Hamilton Branch of the Institute held its annual meeting and dinner on January 23, 1948, at the Refectory, McMaster University, with 115 members and guests attending. After the adoption of the minutes of the previous annual meeting and the treasurer's report, Chairman E. G. Wyckoff announced the executive for 1948. It was also announced that W. D. Black, F. W. Paulin, A. G. Riddell, H. A. Lumsden and E. P. Bowman, all of the Hamilton Branch, are now life members of the Institute.

O. H. Somers of the Standard Gauge Company, Poughkeepsie, N.Y., was then introduced by W. A. Dawson. Mr. Somers chose to speak on **Tools for Dimensional Quality Control,** and confined his remarks to the element of dimension as the criterion of quality in machine processed metal products. All such processes possess the characteristics of variability, either in the form of natural or pure chance, or as unnatural or assignable.

Using a Frequensonar, a pin-ball simulation of a machine process, Mr. Somers demonstrated the influence of both types of variability. This demonstration showed that all machine processes, provided only natural causes are operating, produce quantities of parts which always vary in size according to a general curve. Changes in the process, due to unnatural causes do not change the shape of this curve, but only change its location. This leads to the discovery that the average of five successive samples from a process operating under natural variability will almost always fall between upper and lower control limits. The result of an unnatural variability is disclosed promptly because most of them fall outside the control limits. Charts may be plotted for a machine process to guide the operator in controlling his product.

One hundred per cent inspection is a failure. Spot inspection, following the rules of statistical quality control, substantially improves quality, and lowers inspection costs, since only 2 per cent of finished work is inspected.

In conclusion, Mr. Somers enumerated five rules which constitute the "Tools for Dimensional Quality Control"—

1. Determine the nature of the individual machine variability.
2. Utilize variability to control each process.
3. Balance the cost of quality against the value of quality.
4. Choose a rational degree of inspection.
5. Select suitable instrumentation.

The gavel of office was then turned over to W. E. Brown, who, after final announcements, adjourned the meeting.

MONTREAL BRANCH

Branch Dance

The Branch Dance was held on February 13 in the Ball Room of the Mount Royal Hotel. This proved to be a most enjoyable evening for the 600 people in attendance. Continuous music was provided by two orchestras from 9.30 p.m. to 1.30 a.m. A buffet supper was served at 11.30 p.m. A great deal of credit is due to R. Hobner and his Committee, and to Mrs. R. N. Coke and the following ladies who made such excellent arrangements for the evening: Mme. J. A. Beauchemin, Mme. C. E. Gelinas, Mrs. J. M. Crawford, Mrs. Dan Anderson, Mrs. I. R. Tait, Mrs. E. B. Dubien, Mrs. A. T. E. Smith, Mrs. E. Van Koughnet.

Questionaire

Of the 2,559 questionnaires sent out with the Annual Report, 226 have been returned, 163 by Members, 38 by Juniors and 26 by Students. Over 50 per cent of these replies suggested more plant visits. Amongst other suggestions put forward were requests that the Reading Room be kept open until 10.00 p.m. and that a Club Room be provided. Many of those replying stated their willingness to serve on committee.

The Executive wishes to thank those who answered the questionnaire and to assure them that the suggestions put forward are being carefully studied and that action on these suggestions will be taken wherever possible. In the meantime, the Programme Committee has been asked to arrange more plant visits and to add a Chemical Section to the Committee.

Library

Members are again reminded that the Library is open until 6.00 p.m. each evening and until 8.00 p.m. on Thursday nights. Those desiring to make use of the Reading Room in the evening are requested to make advance arrangements with Headquarters.

BRANCH EXECUTIVE

At the Annual meeting elections resulted in the Branch executive committee listed on the Officers Page of this Journal.

STUDENTS' NIGHT

The Annual Students Night was held on February 26 with an attendance of some 150.

Jean Paul Dagenais, S.E.I.C., and Francois L'Anglais, S.E.I.C., of l'Ecole Polytechnique, and R. M. Dunton and D. L. Townsend of McGill University, were the guest speakers. The meeting was under the chairmanship of Gaetan Ducharme, senior student delegate of L'Ecole Polytechnique.

R. M. Dunton gave a most interesting talk on **The Coal Burning Gas Turbine Locomotive,** illustrating his talk with slides. Francois L'Anglais talked on **High Temperature Curing and Drying of Concrete Blocks.** He also used slides for illustration. D. L. Townsend's subject was **Timber Cruising;** and the last speaker, Jean Paul Dagenais, discussed **Electronic Excitation Sources for Spectographic Analysis,** illustrating his talk with slides.

The judges, Messrs L. O'Sullivan, L. Duchastel and J. Sylvester, awarded the 1st prize of $15.00 to Mr. Dagenais, and the 2nd prize of $10.00 to Mr. Dunton. In accordance with past practice each participant was awarded a year's subscription to the *Journal* and a year's membership in the Institute.

Mr. Derome, junior student delegate of L'Ecole Polytechnique thanked the judges and the speakers.

The meeting was adjourned by the chairman at 10 p.m.

NIAGARA PENINSULA BRANCH

J. J. MILLER, M.E.I.C. - - *Secretary-Treasurer*
C. A. O. DELL, M.E.I.C. - - *Branch News Editor*

Members of the Niagara Peninsula branch and their wives and guests enjoyed a very pleasant evening at the Red Casque Inn near Niagara Falls on Tuesday, January 22. The occasion was Annual Ladies' Night and although the programme had been arranged especially to please the ladies it turned out to be intensely interesting to the men as well.

The speakers were S. T. Hadley, control chemist at the Robin Hood Milling Company's Humbertone mill, and Mrs. Ballantyne, lecturer in home economics for the same company.

Chairman M. F. Ker welcomed the ladies and guests to the meeting and called upon vice-chairman C. L. Mason who introduced the speakers.

Mr. Hadley's subject was **The Selection, Harvesting and Milling of Wheat.** In a short historical outline the speaker noted that except for agriculture itself, milling is man's oldest industry and is indeed the godfather of mechanical engineering because millwrights from the earliest days of the industry up to comparatively recent years have been the only men capable of applying and using mechanical power in engines of production. He traced the different type of flour mills from the first crude grinding stones to the modern present day steel rolls which were invented in Austria in the nineteenth century. The first silk bolting cloth for flour milling was made in Switzerland in 1800 and it is from that country that the best bolting cloths still are obtained. Other materials such as fine woven wire and nylon have been tried for this purpose but to date natural silk is the only one to be used successfully.

Uniformity of product is the most difficult problem in flour milling, because wheat, the raw material, is a biological product and as such varies from variety to variety, from farm to farm, from locality to locality, and from season to season. Because of present practices in the selection, testing, blending and milling of wheat it is possible to obtain uniformity of flour for any one year, but man has not gained sufficient control over the vagaries of nature to enable him to maintain uniformity of this biological product from year to year. It is therefore necessary each year to assess the quality of the wheat supply from the new crop and determine the highest basic quality of product which can be maintained from the available raw material for the year and then mill the grain to produce that quality uniformly for the year.

Mr. Hadley discussed the qualities of various wheats, stating that Western Canada hard red spring wheat is recognized throughout the world as the best available for bread. He also described the milling operation and the ash test for milling accuracy.

A question period followed, and then Mrs. Ballantyne was introduced. Her subject was **The Use of Flour In the Home.** She drew a whimsical picture of the discovery of bread which she envisioned as resulting from a few heads of wheat, rain soaked and then parched by lightning. A stone age huntsman comes upon it and being hungry he eats a few of the grains among other unparched kernels which he had often eaten before. Finding the cooked grain to be more palatable than the raw product he takes some home and orders his wife to cook the grain from then on. And so bread was born.

Mrs. Ballantyne put much emphasis on the thought that cooking is a fine art and one which brings immediate reward. She brought out the fact that our Canadian girls who have grown up during the war years have been denied the full opportunity of acquiring this art and have been at a serious disadvantage because any extra pounds of butter and sugar that may have been around the house during food rationing were certainly not made available for experiments in baking by teen-agers. She called upon the older women to allow their daughters "the run of the kitchen" for one day a week now that food rationing is over, and she promised amazingly good results.

At the end of the programme a buffet lunch was served and each lady found herself the richer by one package of Robin Hood "Velvet" cake flour.

OTTAWA BRANCH

C. G. BIESENTHAL, M.E.I.C. - - *Secretary-Treasurer*
R. C. PURSER, M.E.I.C. - - - - *Branch News Editor*

At the first noon luncheon of the 1948 year, held on February 5, Dr. R. C. Wallace, HON.M.E.I.C., principal of Queen's University, spoke on **The Engineer and the Humanities.** The newly-elected chairman, J. L. Shearer, presided. The speaker was introduced by Dr. C. J. Mackenzie and thanked by the chairman. A number of Carleton College engineering students were present.

" Modern specialists have become exceedingly proficient within the confines of their chosen work ", said Dr. Wallace, " but many have become lop-sided in the broader fields of human relationships ". He outlined three different fields wherein man is linked to the world about him.

First, there is the formal knowledge of the world in which we live with its background of laws and the uniform application to the practical problems of living, of the knowledge we get from it. Secondly, there is the living of men together in the community with its social life and other relationships—the field of social science. And thirdly, there is the individual field of hopes, ideals and aspirations with its striving after beauty and its search into the meaning of life.

If we as professional men become specialists in one line only, said the speaker, our influence in life is less than if we make ourselves more competent in each of these three fields enumerated. The engineer's background in physical science tends to make him get back to facts. But he is developing a sense of beauty too, as is evidenced nowadays in the design of his buildings, bridges, industrial plants and other structures. His work also is impinging on the field of human relationships and he is beginning to realize that there is another side to life, fundamental to its enjoyment, that does not ordinarily come within his compass This is the side of the humanities.

How can we do anything in this field for engineers? The universities are attempting to do something about it. With their science courses they are including more English, more economics, more of the so-called " frills ". They find much more can be done in the final year than in the earlier years. They are having a certain measure of success.

Industrialists, too, are talking about " human engineering ". They are beginning to recognize that personality grows with the width of a man's interests. Specialization these days is necessary for the carrying on of vast undertakings but, from the point of view of human relationships, it is apt to err badly by confining the specialist too closely to some little field of knowledge.

PETERBOROUGH BRANCH

J. M. KING, M.E.I.C. - - - - *Secretary-Treasurer*
J. C. ALLAN, M.E.I.C. - - - - *Branch News Editor*

D. S. Simmins of the Imperial Oil Company delivered an address entitled **Western Canada's Oil** to the Peterborough Branch on January 29.

G. Tollington was in the chair and introduced the speaker, in the absence of J. Osborn who has been transferred to San Francisco.

Mr. Simmins first outlined the organization of the Imperial Oil Co. into Production, Manufacturing and Marketing Departments. Production involves the finding of oil and delivering crude oil to the refineries. Imperial Oil has refineries at Halifax, Montreal, Sarnia, Regina, Calgary and Vancouver. The country is divided into marketing areas fed from these refineries as centres. The refinery at Calgary receives its crude oil from Turner Valley, but it is necessary to bring crude oil for the refinery at Regina by tank car from Texas fields.

During the war the demand for gasoline in Western Canada increased to 10 times the pre-war level because of the demands of the Empire Air Training Plan. However the requirements are still near the war time peak and with the present need for conserving U.S. funds there is considerable urgency to finding Canadian sources of crude oil in the Western Area.

There are wells in the far north at Fort Norman and at one stage of the war the temporary military refinery at Whitehorse was supplied from Fort Norman through a 4-in pipe line. Plans for the erection of a plant to produce gasoline from natural gas near Edmonton were completed before the Leduc field was discovered in 1947. The synthesizing plant was immediately shelved but it was found that it would take three years to complete a new refinery. However, 18 months could be saved and U.S. funds conserved by moving the refinery at Whitehorse to the neighbourhood of Edmonton.

The problems associated with the moving of the heavy equipment over the Alaska Highway were described. The severe winters in the area traversed are being turned to advantage at river crossings and other places where ice bridges can carry heavier loads than the highway bridges.

Mr. Simmins gave his impressions of the Yukon and stressed the importance of cheap gasoline in opening up and developing those remote territories. A film entitled " Research Unending " was shown which illustrated the type of seismographic survey by which the Leduc field was discovered.

SAGUENAY BRANCH

J. E. Dyck, M.E.I.C. - - - *Secretary-Treasurer*

Pulpwood Operations — From The Forest To The Mill was the topic of an address given by J. L. Kelly to the Saguenay Branch of the Engineering Institute on January 29, 1948. Mr. Kelly is presently local manager, South Kenogami Division Price Brothers & Co. Ltd., Chicoutimi, Que.

Mr. Kelly explained in great detail the problems involved in supplying the paper mills with the immense quantities of pulpwood they require. The pulp and paper industry however accounts for only 16 per cent of the annual forest consumption while fuelwood is 22.6 per cent, timber pulpwood for export is 34.1 per cent, and fire, insects and disease destroy 26.6 per cent. The pulp and paper industry has done more to establish a programme for forest management and development for use in perpetuity than all the other users combined

There are 82 pulp and paper companies in Canada operating 109 mills in six provinces. Of the 109 mills, 53 are located in the province of Quebec. In 1946, 4 million tons of newsprint were produced in Canada. This country provides 3 out of every 5 newspapers in the world with its paper requirements.

To provide the pulpwood for this tremendous paper production calls for a large, well organized wood cutting operation in the bush.

Price Brothers and Co. Ltd. have a production of 1500 tons of paper per day, using over 500,000 cords, which will require 1,172,000 man-days of work to cut and deliver the wood to the mill.

The cutting of 200,000 cords per year in a 100 square mile area requires the building of 70 miles of car road, 5 miles of wagon road, 70 miles of telephone line, 90 miles of river cleared, mined, etc., 65 driving dams, 15 truck bridges, 60,000 square feet of depot floor space and 150,000 square feet of jobbers, scalers and drivers camps.

In preparing for bush operation, it is first necessary to survey the district and estimate the wood to be cut in each shanty area. Following this, these shanty areas are contracted for by various jobbers.

The question of supplies is taken care of by the pulp and paper company. These supplies are transported to stores in the bush where they are made available to the jobbers at reasonable prices. This entails the transportation of 13,500 tons of food to the various camps at the scene of operation.

The actual felling of trees and cutting into cordwood is done with the bucksaw. Mechanical saws have been tried but have not proved entirely satisfactory so far. Hauling is done for the main part by single horse and sleigh. This is due to the topography of the district and the fact that small streams suitable for driving four foot cordwood are generally near the scene of the cutting operation. Where hauls are over two miles, trucks or tractors are used as well as the Bombardier Snowmobile. Aluminum sleighs and racks are being experimented with and the results to date have been most satisfactory.

The drive down the streams in the spring is in itself a major operation requiring many skilled men. To drive 200,000 cords of wood requires a crew of 950 men, including 39 foremen, 47 assistant foremen, 45 clerks, 37 cooks, 32 cook helpers, 108 dam guardians, 10 boatmen, 815 drivers, 20 motorboat operators and 10 truck drivers.

Past experience in Price Brothers forest areas has shown that, to prevent log jams a maximum of 2500 cords only can be placed at streams per square mile of drainage area. This can be increased below successive dams along the creek however. After the main drive, the sweep is begun from the head of the river and continued until all the wood is driven to the mouth of the main stream or holding grounds. From here it is delivered as required to the mill pond for daily consumption or to be stacked in block piles for the winter.

Following the address, Mr. Kelly presented two excellent films showing all operations carried out in the bush, modern equipment and the building of good roads into the camps. It was shown that great changes have taken place in the life of the modern lumberjack. Where in former times he went into the bush to remain there until the spring breakup, he now can get out easily by bus at frequent intervals.

The speaker was thanked by B. E. Bauman on behalf of the Branch.

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Recent Developments in the Uses of Aluminum was the topic of an address given to the Saguenay Branch of the Institute on February 19, 1948, by G. R. Black, of the Sales Development Division of the Aluminum Company of Canada, Limited, Montreal.

Mr. Black pointed out that before the war the bulk of Canadian fabrication of aluminum consisted of cooking utensils, foil, and electric cable. The war completely changed this and great strides were made in forging, casting and extruding aluminum to provide the many products required. The production of aluminum was exceeded only by iron and steel.

Except for a temporary recession after the war, aluminum continued to be in great demand. At the present time, only 10 per cent of total Canadian consumption goes into cooking utensils as against 50 per cent before the war. The building industry consumes 20 per cent of all aluminum used in Canada while the transportation field has come to realize the economy of this strong light metal in the fabrication of railway rolling stock, motor bus bodies, as well as frames, engine parts, etc.

With the aid of slides Mr. Black described how aluminum is being used in the construction of lake boat deckhouses, lifeboats, locomotive cabs, freight car bodies, bus bodies and frames, building flashings and facings, roofing and window sash. Aluminum is also extensively used for piping, conduit, industrial tanks, drums and other containers.

The properties of aluminum alloys have been developed to such an extent that the uses of this metal have become practically unlimited. Research on surface finishes such as anodizing has opened up additional uses for aluminum where a durable surface and a pleasing appearance is required.

In addition to his talk, Mr. Black presented a film on " Fabricating Processes " illustrating the rolling of aluminum sheet as well as forging, casting and extruding this metal.

J. E. Dyck thanked the speaker on behalf of the branch.

Junior Section

F. H. Duffy, Jr.E.I.C. - - - - *Secretary-Treasurer*

A meeting of the Junior Section, Saguenay Branch of the Institute was held at the Arvida Protestant School at 8.15 p.m., February 4, 1948. F. E. Hogg of the Aluminum Company of Canada Limited, addressed the meeting on the subject of **Fabricating Aluminum at Arvida.**

Mr. Hogg, a graduate of the Colorado School of Mines, has had considerable experience in the several fabricating departments of the Aluminum Company of Canada and is presently supervisor in charge of the metallurgical group of the technical department dealing with the fabricating division.

The speaker pointed out that the definition of fabrication as used in the Aluminum Company of Canada, is a very broad term signifying any further working of the aluminum after it leaves the potroom in its molten state. He briefly outlined the types of fabrication at the various plants of the Company and pointed out the different techniques employed. The speaker then outlined the savings which could be made if the heat of the metal, as it comes from the potroom, could be utilized in direct casting of the metal, in the form to be used in the various plants, thus avoiding re-melting. This process had been previously considered but policy has been to cast in a standard form for re-melting elsewhere. This policy is being changed at the present time with a view to providing the ingot in a form satisfactory for each plant without the necessity of re-melting at the plants themselves.

Some of the difficulties in working the metal as it comes from the potroom, without re-melting, were discussed. A brief reference was also made to the construction of the Rod Mill at Arvida. It was finally pointed out that there were arguments for not having further fabrication of the metal in this country, as other countries, to whom the metal is shipped, prefer to have in their own hands as much of the actual fabrication as possible. The basic advantage of casting the ingots in the final form at Arvida is the elimination of the re-melting and re-casting operations and will provide better quality and lower cost in the finished product.

A lively discussion period followed and the number of questions the speaker was called upon to answer showed the interest of those present in this subject. The speaker was introduced by the Chairman, C. J. Tanner and thanked on behalf of the Section by T. T. Anderson.

SAINT JOHN BRANCH

J. H. C. MacLure, m.e.i.c. - - *Secretary-Treasurer*
A. R. Bonnell, m.e.i.c. - - - *Branch News Editor*

The annual joint dinner meeting of the Saint John Branch of the Institute and the New Brunswick Association of Professional Engineers was held Thursday evening, January 29 in the Admiral Beatty Hotel with Chairman T. C. Macnabb presiding.

A toast to the Engineering Institute was proposed by C. L. Mofford, an engineering student at the University of New Brunswick and responded to by J. M. Redding. A toast to the Association was proposed by G. L. Dickson and responded to by R. M. Richardson, newly elected president of the Association.

The guest speaker for the evening, D. O. Robinson, chief engineer, Sales Department, Canada Cement Co., Ltd. was introduced by Chairman T. C. Macnabb. Mr. Robinson had chosen as his topic, **Concrete and Air Entrainment.**

Mr. Robinson stated that the three qualities required in concrete are strength, economy and durability.

A number of years ago when roads were beginning to be kept open for winter traffic, there was ravelling of the surface on concrete pavements. Experiments were made with Portland cement, natural cement, and cement with an addition of beef tallow. Concrete with natural cement was more durable than concrete with Portland cement, but with the addition of beef tallow he Portland cement concrete had the greater durability.

Since the first experiments, a great deal of research has been carried out by the Ontario Department of Highways, with the air entrainment agent, a natural resin, added to the cement, and to the concrete during mixing.

Mr. Robinson stated that the air in the cement, from 3 to 6 per cent for maximum durability, would tend to lower the strength, but with the greater workability attained with the resin added, less water was required, and hence the strength was not lowered.

Since air entrainment in concrete is relatively recent, said Mr. Robinson, not very much information is available as to increased durability.

Following Mr. Robinson's talk the meeting was opened for questioning.

Mr. Macnabb extended a vote of thanks to Mr. Robinson on behalf of the Institute and the Association, following which the meeting adjourned.

VANCOUVER BRANCH

Alan M. Eyre, jr.e.i.c. - - *Secretary-Treasurer*
Stuart Lefeaux, jr.e.i.c. - - *Branch News Editor*

On Wednesday, January 21st the first branch meeting of the year was held in the auditorium of the Medical Dental Building. Approximately one hundred and fifty members and students were favoured with a most interesting and enlightening address on **Aerial Surveys and Mapping** by Dr. Lyle G. Trorey.

Dr. Trorey, who was introduced by J. Alexander Walker of the Vancouver Town Planning Commission, was the Commanding Officer of the Air Survey Company, R.C.E. during the war; he received the M.B.E. for his splendid work on aerial surveying for the allied armies. At present Dr. Trorey is consultant to Aero Surveys Limited of Vancouver, on loan from the Fairey Aviation Company of London, England.

Dr. Trorey explained the geometry of the Multiplex projector, the major item of equipment used in topographical aerial mapping. The Williamson six inch wide-angle air survey camera and the Trorey Anharmonic Rectifier, a product of the war, are also used by his company for aerial surveys.

The speaker enlightened the members on some popular misconceptions regarding aerial surveys. The most amazing revelation was that one hour in the air photographing takes several years of mapping by one man to produce topographical maps. The cost of ground control surveying necessary is 10 to 20 per cent of the total cost. The cost of the aerial photography is approximately 10 per cent of the total cost; the mapping work necessary accounting for the remaining costs. The contour interval obtainable on topography is approximated by height of aircraft in feet divided by 1,000; the accuracy obtainable is one half a contour interval. The horizontal accuracy obtainable may be described as no plotable error.

The major applications of aerial surveys in British Columbia are for small scale forest tree-type maps and large scale topographic maps for logging operation locations. Many engineering uses are found for highway location, damsites, etc.

Many questions were presented and answered to the satisfaction of the members, and Mr. DeJong thanked the speaker for his most informative address.

The Branch News Editor urges readers to advise him of news items regarding Vancouver members. He feels that more items of particular Vancouver interest might be submitted to the "Personals" section of the *Journal.*

WINNIPEG BRANCH

R. T. Harland, m.e.i.c. - - - *Secretary-Treasurer*
R. H. Tivy, jr.e.i.c. - - - - *Branch News Editor*

On Thursday, January 8, the Annual General Meeting of the branch was held, with 54 in attendance. Reports showed the branch to be in sound financial condition and to have a record membership. T. E. Storey retired as chairman after delivering a very capable summary of the year's activities and made way for H. McLeod who is the incoming chairman. Officers elected are listed on the Officer Page of the *Journal.*

Following the business portion of the meeting a talk was given on the subject of **Wood Preservation** by T. N. Miller, who is supervisor of pole preservation for the Manitoba Power Commission.

Mr. Miller dealt briefly with the various types of wood preservation, such as creosote, osmocreo and others, and with the different methods of applying these preservatives to achieve different results for different purposes and different costs.

He mentioned some of the experiences of the Manitoba Power Commission with the methods used in the last three years in preserving Manitoba jackpine poles which are being used currently for the bulk of Manitoba's 80,000-pole-per-year farm electrification programme. The majority of these home grown poles are being cut in the Sandilands Forest Reserve in south-eastern Manitoba and the preservation is done by Dominion Tar and Chemical at Transcona, Man. A discussion period followed and a number of interesting questions were brought up and discussed. The speaker was introduced by J. W. Tomlinson, m.e.i.c., assistant general manager of the Power Commission, and was thanked by G. Fansett.

Electrical Section

L. A. Bateman, jr.e.i.c. - - - - - - *Secretary*
D. C. Bryden, m.e.i.c. - - - - - - *News Editor*

The Electrical Section held two very interesting meetings in January, the first on January 16 when Paul Ross of the Ohio Brass Company spoke on **The Burning of Wood Structures by Leakage Currents.** The lecture was profusely illustrated with coloured slides. Mr. Ross is an acknowledged authority on this subject and his explanations of the cause and cure for this operating trouble were very clear and concise. The meeting found especially interesting his slides illustrating a duplication of outdoor operating conditions in the laboratory. Mr. Ross was very helpful in answering questions in the discussion period following his talk.

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On January 30, G. A. Muir, special service engineer of the Manitoba Telephone System spoke on **Mobile Telephone Service.** The general public was especially invited to this meeting and turned out in considerable numbers. The Manitoba Telephone System is at present inaugurating two mobile telephone systems, one urban and the other rural, these to be on two separate frequencies. Mr. Muir traced the history of mobile communication and then gave an actual demonstration with communications established between an automobile driving around the city and a regular telephone subscriber. The audience was able to listen in by means of another set of equipment, complete with aerial and loudspeaker, set up in the lecture room. The advantages of this advancement in communication were obvious. His listeners were properly appreciative of the time and effort Mr. Muir had given to provide the demonstration.

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During 1945, a number of electrical members of the Winnipeg Branch of the Institute met informally to discuss the type of paper presented at the monthly meeting of the branch. It was generally admitted that, as the branch provided papers to cover all branches of engineering, the number of electrical papers that could be presented was relatively small. It was also the feeling of the group that it would not be in the best interest of the members of the branch to increase the number of technical electrical papers, as these might prove uninteresting to nonelectrical men. From these general considerations the idea of an Electrical Section grew. This section would provide an organization for the presentation of purely electrical papers, and to which any member of the Winnipeg Branch might belong.

To properly inaugurate the Electrical Section proved to be a considerable task. It was necessary to re-write the by-laws of the Winnipeg Branch, write by-laws for the Electrical Section, obtain official approval of the revisions from the E.I.C. Council and obtain sanction of the changes from the members of the Winnipeg Branch, by ballot.

The first meeting was held January 14, 1946, when Perry Peterson of the Control Corporation addressed the Winnipeg Branch. H. L. Briggs, one of the members of the original committee was made provisional chairman at that time. Since then the Section has functioned continuously during the winter months. At the inaugural dinner meeting in March, 1946, Mr. Briggs was elected chairman. In 1947 D. H. McCuaig acted as chairman, and in 1948 M. D. Young is chairman.

As an indication of the interest shown in the section, there were eight meetings in 1946 with an average attendance of 46. In 1947 there were nine meetings with an average attendance of 86. The total membership in the section is approximately 100.

Topics discussed included: control and relay problems, electric utility problems, large power equipment and electric cable, radio and communication, electronics, atomic energy, and general.

From the results obtained so far it would appear that the Electrical Section is performing the function for which it was originally designed.

Library Notes

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEWS

WHEN THE STEEL WENT THROUGH: Reminiscences of a Railroad Pioneer

P. Turner Bone. Toronto, Macmillan, 1947. 180 pp., illus., 8¼ x 6 in., cloth, $3.00

Reviewed by Norman Mackintosh*

Autobiographical, and reminiscent, going back to the author's boyhood in Scotland, this book deals principally with personalities and incidents associated with his life and work on Canadian Pacific Railway construction in the early "80's" and thereafter. The fact that the Index consists entirely of a list of over 270 names of persons remembered by the author as friends and associates in his career as a civil engineer, is in itself an indication of the very human and reminiscently historical character of the work. Its technical interest is negligible, for only occasionally does the author refer to his engineering problems or methods, and never primarily as a matter of technical information. Nevertheless, for the practical railway builder interested in early engineering experiences, the little references made to the works being supervised or laid out, will have worth, since a few words by a competent engineer can be enough for a reader of similar calibre.

Mr. Turner Bone's engineering work in the mountain regions advanced the construction of bridges and viaducts built largely of timber, offering a contrast to similar work in the later era of iron and steel. Principally, however, the book is a record of personal contacts with many of the men who built the Canadian Pacific Railway, or had to do with its building. Personalities prominent at the time, and persons obscure then, who afterwards became prominent, are pleasantly referred to; and there is many a mention of humble but congenial helpers in the great undertaking, whose names are now no more than a friendly memory in this warmly human story of personal associations in the days "when the steel went through' for the C.P.R. Though much of the author's work was concerned with timber he was paving the way for the steel. At a later stage his supervision of snow-shed construction dealt with timber also, but for the needs of steel which had by that time "gone through". Other engineering work of his on C.P.R. location and construction in the prairie country, and in Eastern Canada and the State of Maine, provides personalities, experiences, and incidents well remembered by this very vital veteran of civil engineering and Canadian Pacific Railway construction.

Mr. Turner Bone's book—his "first literary venture" at "more than four score years" of age—was still being printed when he died. An introduction by D. C. Coleman, then president of the C.P.R., pays tribute to the value of the author's keen observation and retentive memory, and points out that the book contains "much information" which has "never before found its way into print". This places Mr. Bone's work in its rightful relation to the many books, historical, economic, or romantic which have been written on the subject of the Canadian Pacific Railway. A valuable contribution provided by Mr. Bone's work in relation to other books on the C P.R. is his happy way of giving vignettes of the everyday life of men engaged with him in engineering branches of Canadian Pacific Railway building. Of particular worth also, are the many little touches of light thrown on the characters of men prominent, or who became prominent in association with the construction and completion of the railroad, and during its developing effects on the Canadian West. Illustrations reproduced from the author's collection of very early, and probably irreplaceable photographic prints add to the interest of the volume, but Mr. Bone's own terse word pictures are even more vividly expressive.

Not as a technical treatise, but as a warmly personal and human account of engineering effort, with many entertaining episodes incidental to an immense undertaking, "When the Steel Went Through" is no doubt unique in its appeal for all interested in the early days, and impact on Canadian history, of the construction of the Canadian Pacific Railway.

* *Public Relations Officer, Department of Public Relations, Canadian Pacific Railway Company, Montreal, Canada.*

ARCHITECTS MANUAL OF ENGINEERED SOUND SYSTEMS

Radio Corporation of America, Architectural Relations Sound Equipment Section, Camden, N.J., RCA Victor Co., Montreal, 1947. 288 pp., illus., 11 x 8½ in., leather, $6.00 (in Canada).

This manual covers the installation of sound systems in buildings. It is intended for the use of architects and construction engineers and stresses the fact that modern buildings should allow for the inclusion of sound installations, at some time in the future if not at the time of erection.

The book is divided into two parts, the first being a general treatise on the various aspects of sound systems, and the second the application to specific types of buildings. The authors have placed logically at the beginning a glossary of descriptive definitions. Following this are two American Standards Association specifications (Z32.5—1944 and Z32.9—1943) of Graphical Symbols for Telephone, Telegraph and Radio Use, and Graphical Electrical Symbols for Architectural Plans. These two sections provide the reader with the facts he needs to understand the book. Next are detailed descriptions of the functions, characteristics, specifications and uses of microphones, amplifiers, loudspeakers, controls of all types (mixers, zone switches, relays, control panels), studios and control rooms, sound film projectors, and radio antenna systems. Also in this section is a discussion of acoustics from every angle needed by the architect.

The second part of the manual is entitled "Typical Layouts and Specifications". Its purpose is to apply the theory and details, already given to specific building types. In each case, the applications are graded from simpler to more elaborate types of sound systems. The buildings included are schools, hospitals, churches, auditoriums, stores, industrial plants, and hotels. The authors consider that these specific examples are of much more use to architects and engineers than theoretical data, and they have used numerous illustrations, charts, and architectural drawings to clarify the text.

The manual is the result of intensive research and provides for the first time a comprehensive compilation of data on sound systems. It is written in fairly non-technical language and provides the architect and engineer with an over-all study of standard practices in sound installation as well as providing him with a working guide to specific problems. The authors have succeeded in presenting their material in a clear, concise, and thoroughly logical form. The subdivision of each topic, the use of many charts and illustrations, and the physical format provide a manual that is at once readable and easy to use. The printing is large and clear; the subdivisions of text are easily defined; and the illustrations contain only relevant matter. There is a fairly complete subject index to the volume and thumb guides to the second part. The manual has been compiled from all pertinent data on the subject and should be of invaluable aid to architects and building engineers. N.T

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Catalogue of Scientific Motion Pictures, interim edition:
Information and Program Committee of the Canadian Scientific Film Association, Ottawa, 1947. 138 pp., paper.

Census of Canada, Eighth, Volume VI, 1941:
Ottawa, King's Printer, 1947. 1,042 pp., illus., fabrikoid.

Clay Pipe Engineering Manual:
Clay Sewer Pipe Association, Inc., Columbus, Ohio, 1946 159 pp., illus., fabrikoid.

Compressed Air Handbook; Applications, Equipment, Engineering Data and Test Procedure:
Compressed Air and Gas Institute, New York, c1947. 387 pp., illus., fabrikoid.

Engineering Tests—Civil, Mechanical, and Electrical:
Arthur Liebers. New York, Arco Publishing Company, c1947. 49 pp., illus., paper.

Gas Turbine Construction, including Operation and Maintenance:
R. Tom Sawyer. New York, Prentice-Hall, 1947. 411 pp., illus., cloth.

Heating and Ventilating's Engineering Databook:
Industrial Press, New York, 1948. 549 pp., illus., fabrikoid.

Heritage of the English-Speaking Peoples and Their Responsibility; Addresses at the 2nd Conference, September, 1947:
Kenyon College, Gambier, Ohio, c1948. 268 pp., paper.

Light Metals in Structural Engineering:
L. Dudley. London, Temple Press, 1947. 216 pp., illus., cloth.

Literature Search on the Preservation of Foods by Freezing; First Supplement, January 1946-July 1947:
Betty Anderson and B. H. Weil. Atlanta, Georgia School of Technology, 1948. 670 pp., paper.

Patent Notes for Engineers:
Radio Corporation of America, Princeton, N.J., 1947. 165 pp., illus., cloth.

Nomography:
A. S. Levens. New York, Wiley, c1948. 176 pp., illus., cloth.

Philips Resistance Welding Handbook:
Philips Industrial, London, n.d. 210 pp., illus., fabrikoid.

Powder Metallurgy; its Physics and Production:
Paul Schwarzkopf. New York, Macmillan, 1947. 379 pp., illus., cloth.

Standard Specifications for Highway Materials and Methods of Sampling and Testing, 5th edition:
American Association of State Highway Officials, Washington, 1947. 2 parts, illus., cloth.

Techniques in Experimental Electronics:
C. H. Bachman. New York, Wiley, 1948. 252 pp., illus., cloth.

Valve Gear Design; a Handbook for Designers and Engineers to aid in the Design of Cams, Tappets, and Springs for the Valve Gear of Internal Combustion Engines:
Michael C. Turkish. Detroit, Eaton Manufacturing Co., 1946. 130 pp., illus., cloth.

Vade-Mecum, 1948:
P. H. Brans. Antwerp, P. H. Brans, Ltd., c1948. 2 volumes, illus., paper.

When the Steel Went Through; Reminiscences of a Railroad Pioneer:
P. Turner Bone. Toronto, Macmillan, 1947. 180 pp., illus., cloth.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

American Society for Testing Materials:
Year Book, 1947.

American Society of Mechanical Engineers:
Mechanical Catalog and Directory, volume 37, 1948.

British Engineers' Association:
Classified Handbook of Members and their Manufactures, volume 18, 1947-48.

Canada. Dept. of Labour:
Report for the Fiscal Year ending March 31, 1947.

LIBRARY REGULATIONS

HOURS

	Oct. 1-May 30	June1-Sept. 30
Monday to Friday	9 a.m.- 6 p.m.	9 a.m.- 5 p.m.
Thursdays (Oct. 1-Mar. 31)	9 a.m.- 8 p.m.	9 a.m.- 5 p.m.
Saturdays (closed July & August)	9 a.m.-12 noon	9 a.m.-12 noon

BORROWING & PURCHASING

Books, Periodicals, Photostats, Translations, etc., may be borrowed or purchased by any member of The Institute, resident in Canada.

Items may be borrowed for two weeks, exclusive of travel time, and may be renewed for a further two weeks on request.

A Library Deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the borrower, or purchaser. Therefore, except in the case of Library Deposits, payment should not be made in advance.

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

BIBLIOGRAPHIES AND EXTENSIVE LITERARY SEARCHES

Short subject bibliographies will be compiled on request.

Extensive literary searches will be made at a charge of $1.50 per hour to members, $2.50 per hour to non-members.

Please indicate which is required.

Requests must indicate clearly the SPECIFIC SUBJECT and SCOPE desired.

Give all pertinent information possible

Canada Year Book, 1947:
Dominion Bureau of Statistics, Ottawa, 1947.

Canadian Broadcasting Corporation:
Annual Report containing Financial Statements for the Fiscal Year ended March 31, 1947.

Heating and Ventilating's Buyers' Directory, 1948 edition:
Industrial Press, New York, 1948.

Institute of Traffic Engineers:
Yearbook, 1947-48.

Iron and Steel Institute:
Journal, volume 153, 1946.

National Research Council:
Review for 1946.

New Zealand Institution of Engineers:
Proceedings, volume 33, 1946-47.

Year Book of the Heating and Ventilating Industry:
Technitrade Journals Ltd., London, 1947.

TECHNICAL BULLETINS, ETC.

Electrochemical Society—Preprints:
92-35—Theory for the Mechanism of Chromium Plating; Theory for the Physical Charactersitics of Chromium Plate, Cloyd A. Snavely.—92-37—Capacity as a Function of Temperature and Discharge Rate of Certain Military Types of Lead-Acid Batteries, David Linden. 92-39—Polarograph in Organic Chemistry, M. J. Astle.—92-40—Electrolytic Oxidation of Ethyl Alcohol to Acetic Acid, George Zeller.—92-41—Electrolytic Oxidation of a-Pinene, Terpinolene and Dipentene, Samuel Glasstone and Harry E. Stanley.

Institution of Electrical Engineers—Publications:
Design of Contactors with Regard to their Industrial Application, B. Feldbauer.—Lightning Strength of Power Transformers, E. T. Norris.—Reference-Crystal-Controlled V.H.F. Equipment, D. M. Heller and L. C. Stenning.—Standardization of Switchgear, D. E. Lambert and J. Christie.—Survey of Metering Practice on the British Grid System, F. Byrne.

Institution of Mechanical Engineers—Publications:
Address of the Chairman of the Automobile Division, G. T. Smith-Clarke.—Design of Contra-Flow Heat Exchangers, Ernst Schmidt.

International Civil Aviation Organization—Publications:
Final Report of the Meteorological Division Special Session, September 1947 (Doc 4820-Met/509).—ICAO Regional Manual. North Atlantic. Amendment No. 4, January 1st, 1948.—ICAO Regional Manual—North Atlantic. Amendment No. 5, January 15, 1948.—Supplementary Procedures for the South American Region (Doc 4976).—Supplementary Procedures for the South Atlantic Region (Doc 4977).

North-East Coast Institution of Engineers and Shipbuilders—Publications:
Classification Societies and the Efficiency of Hull Structures, J. L. Adam.

Purdue University—Extension Series:
No. 62—Proceedings of the Personnel and Industrial Relations Conference at Purdue University, May 19-20, 1947.

U.S. Geological Survey:
Bulletin: *954-A—Tungsten Investigations in the Republic of Argentina, 1942-43.—957-C—Geophysical Abstracts 130, July-September, 1947.*
...Professional Paper: *208—Geology and Ore Deposits of the Little Hatchet Mountains, Hidalgo and Grant Counties, New Mexico.*
...Water-Supply Paper: *968-A—Flood Runoff in the Williamette Valley, Oregon.—968-C—Topographic Characteristics of Drainage Basins.—997—Floods in Colorado.—1031—Surface Water Supply of the United States, 1945: Part 1—North Atlantic Slope Basins.—1036—Surface Water Supply of the United States, 1945: Part 6—Missouri River Basin.*

STANDARDS, SPECIFICATIONS, ETC.

American Institute of Electrical Engineers—Standards:
No. 48—Standard for Potheads (including Test Code).—No. 49—Standard for Roof, Floor and Wall Bushings (including Test Code).

British Standards Institution—Codes of Practice:
CP(B) 702—Code of Functional Requirements of Buildings, Draft Chapter 1(C)—Ventilation. CP(B) 706—Code of Practice for Hand Power Lifts for Passengers, Goods and Service.

Canadian Standards Association. Canadian Electrical Code Part II; Essential Requirements and Minimum Standards Covering Electrical Equipment:
C22.2 No. 16-1947—Construction and Test of Insulated Conductors for Power-Operated Radio Devices, 3rd edition.—C22.2 No. 35-1947—Construction and Test of Extra-Low-Potential Control Circuit Wires and Cables and Organ Control Cable, 3rd edition.—C22.2 No. 93-1947—Construction and Test of Slow Burning and Slow Burning-Weather Proof Wires.

U.S. Bureau of Standards:
Building Materials and Structures Report: BMS110—Paints for Exterior Masonry Walls.

PAMPHLETS, ETC.

Bibliography on High-Frequency Dielectric Heating:
American Institute of Electrical Engineers, New York, 1947.

Engineering Interpretation of the Economic and Financial Aspects of American Industry: Volume VIII—Synthetic Fibers Industry:
George S. Armstrong & Co. (Canada) Ltd., Montreal, c1948.

Geological and Geophysical Study of the Chelan Nickel Deposit, near Winesap, Washington:
Ernest N. Patty and Sherwin F. Kelly. American Institute of Mining and Metallurgical Engineers, New York, 1945.

Industrial Electrical Instruments:
G. W. Stubbings. Manchester, Emmott, 1947.

Montreal and its Public Works Department:
Dept. of Public Works, Ottawa, 1947.

Review of Railway Operations in 1946:
Association of American Railroads, Bureau of Railway Economics, Washington, 1947.

Road Research:
W. H. Glanville. West Drayton, Middlesex, Road Research Laboratory, 1945.

Selected and Annotated Bibliography of Recent Literature on Personnel Administration and Industrial Relations:
Keith Davis. Austin, Texas, University of Texas, 1947.

Symposium of Measurement of Entrained Air in Concrete:
American Society for Testing Materials, New York, 1947.

Symposium on pH Measurement:
American Society for Testing Materials, New York, 1947.

Synthetic Organic Chemicals, 15th edition:
Sharples Chemicals, Philadelphia, 1947.

Technological Stagnation in Great Britain:
Machinery and Allied Products Institute, Chicago, 1948.

Vertical Boiler Defects and Repairs:
Sydney D. Scorer. London, John D. Troup, 1947.

Wage Incentives:
J. K. Louden. Montreal, Engineering Institute of Canada, 1948.

Warning re Geophysics—Magnetic Methods Improperly Used:
Sherwin F. Kelly. Toronto, Geophysical Explorations Ltd., 1945.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

BRITISH STANDARD FOR MASTIC ASPHALT FLOORING: NATURAL ROCK CONTAINING 6-10 PER CENT BITUMEN. B.S. 1410: 1947.

London, British Standards Institution. 2/6.

This is a further British Standard in the series covering the bituminous flooring materials and covers a type of mastic asphalt flooring composed of natural rock asphalt incorporated with an asphaltic bitumen and refined lake asphalt and the addition of coarse aggregate. The materials covered (specified by composition) are designed for a wide range of uses from light duty floors to heavy duty industrial flooring.

BRITISH STANDARD FOR SAFETY BELTS AND HARNESS. B.S. 1397: 1947.

London, British Standards Institution. 2/6.

In this standard, no attempt has been made to design belts for any particular use, but rather the standard ensures that the materials used and the method of manufacture will produce a belt of ample strength and it also specifies method of test which ensures that the belt is so designed as to run the least possible risk of injury to the wearer in the case of a fall.

BRITISH STANDARDS SPECIFICATION FOR ELECTRIC OVERHEAD TRAVELLING CRANES FOR GENERAL USE IN FACTORIES, WORKSHOPS AND WAREHOUSES. B.S. 466: 1947.

London, British Standards Institution. 4/–.

This specification deals with electric overhead travelling cranes, power driven in all motions, for general use in factories, workshops and warehouses, whether working indoors, under cover or exposed to the weather, but it does not apply to special duty cranes, such as heavy-duty steel works cranes, for which it is intended to prepare a separate standard.

BRITISH STANDARD SPECIFICATION FOR PORTABLE FIRE EXTINGUISHERS OF THE GAS/WATER PRESSURE TYPE (RIVETED CONSTRUCTION). B.S. 1382: 1947.

London, British Standards Institution. 2/–.

This standard contains details of materials and construction of body and pressure container as well as fittings and also gives methods of test and marking. It does not at present include any requirements for welded construction, but it is hoped in the near future to publish a revision which will include various methods of welding.

PRELIMINARY MATHEMATICS FOR ENGINEERS; 3rd ed.

W. S. Ibbetson. London, Spon, 1947. .175 pp, illus., 7½ x 5 in., cloth, 6/6.

This book deals with basic mathematics, and includes arithmetic, algebra, mensuration, the slide rule, and the elements of trigonometry. The author contends that there is no short cut to a true knowledge of mathematics, and that a sound foundation is necessary for every engineer. The purpose of his book is to provide this foundation, and to give the engineer a ground on which to base his future study. The principles are presented in simple form, with many examples and diagrams. Exercises follow each chapter.

TREATISE ON MILLING AND MILLING MACHINES, SECTION TWO, 3rd ed.:

Cincinnati Milling Machine Co., Cincinnati, 1946. 326 pp., illus., paper, $1.00.

This section deals with the milling process, chip formation, surface finish and cutting fluids, power required in milling, and mounting of milling cutters. The purpose is primarily to discuss the fundamental concepts of milling, though it is a practical rather than a theoretical book. It is attractively printed, profusely illustrated, and easily readable.

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.

AMERICAN SOCIETY FOR TESTING MATERIALS, Proceedings, Volume 46, 1946. Committee Reports, Technical Papers:

American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 1947. 1,629 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $12; to A.S.T.M. members, $8.00.

This volume presents the committee reports and the technical papers presented at the 49th annual meeting. All the symposia are not presented in full. Those published elsewhere are summarized. Discussions are included and immediately follow the respective papers. A wide variety of materials and material properties are dealt with.

DATA BOOK FOR CIVIL ENGINEERS, Volume 3; Field Practice:

E. E. Seelye. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 306 pp., illus., diagrs., charts, tables, 8¼ x 5 in., cloth, $4.50.

The third in a series entitled "Data Book for Engineers", this volume is designed to equip the field engineer or inspector for the proper inspection of virtually every type of civil engineering work. It contains outlines of inspection procedure and check lists on concrete, masonry, structural steel, welding, bridges, foundations, pile-driving, timber, soils, grading, bituminous paving, sanitary construction, and pipe laying. Material on the conducting of field tests is presented as well as a detailed discussion of surveying practice.

SECOND INTERNATIONAL CONFERENCE ON SOIL MECHANICS AND FOUNDATION ENGINEERING, ROTTERDAM

June 21-30, 1948

It is anticipated that an enrolment fee of approximately 20 guilders (about $8.00) will be required from those participating in the Conference. The application for participation must reach the Secretary (Oostplantsoen 25, Delft, The Netherlands) before May 1st, 1948.

The *Proceedings* will form an unusually valuable record of developments in the field since the First Conference in 1936. Their cost is expected to be about 75 guilders (about $30.00) per set. In order that a number of sets may be reserved for Canada, those organizations and individuals desiring Proceedings should inform their regional Committee member or the Committee secretary before April 1st of the number they wish. In this way it is hoped to anticipate the needs of everyone with regard to publications of the Conference.

ESSENTIALS OF APPLIED PHYSICS:

R. M. Frye. Prentice-Hall, Inc., New York, 1947. 322 pp., diagrs., tables, 9¼ x 6 in., cloth, $4.35.

An elementary physics textbook requiring a mathematical basis of algebra, geometry and trigonometry. The general procedure of mechanics, heat, sound, electricity and light is followed. Each chapter is summarized on the basis of definitions of the technical terms and laws introduced. The practical electrical units are used, and the electron current is employed exclusively rather than the conventional positive current.

CALLAWAY TEXTILE DICTIONARY:

W. L. Carmichael, G. E. Linton and I. Price. Callaway Mills, La Grange, Georgia, 1947. 392 pp., illus., 8 x 5¼ in., cloth, $4.00.

Designed for use by those in the textile and related industries and professions, this volume comprehensively covers the terminology of textile manufacturing and its products. It includes those products contained within the categories of yarns and woven fabrics, including the dyeing and finishing processes, the major synthetic and natural fibers used, and the steps involved in the production of the completed article.

HIGH VACUA: Principles, Production, and Measurement:

S. Jnanananda. D. Van Nostrand Co., Toronto, New York and London, 1947. 310 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $6.95 in Canada.

The scope of this book ranges from the choice of suitable vacuum-producing and vacuum-measuring apparatus to the most effective means of control and calibration. Many diagrams show constructional details and working methods. The basic principles of all the equipment used are explained, and the kinetic theory of gases is reviewed.

JACOB INTEGRAPH INSTRUCTIONS AND TYPICAL PROBLEMS:

B. C. Jacob, 205 North Mountain St., Bay City, Mich.; photo offset by Polygraphic Company of America, New York, 1947. 126 pp., diagrs., charts, tables, 8¼ x 6 in., paper, apply to author.

The Jacob Integraph is a small transparent triangle having ruled lines and small perforated holes so placed as to make it possible to perform graphically a variety of arithmetical and analytical computations. It may be used with an ordinary tee-square or triangle or as an attachment on a universal drafting machine. The accompanying instruction book gives a detailed explanation first, of the simple fundamental operations; and then, of more complex problems in mechanics and engineering, including a variety of practical applications such as determining bending moments and deflections in beams and shafts, impact or collision values, forces and accelerations, volumes of tanks, etc.

MODERN GAS TURBINE:

R. T. Sawyer. 2 ed. Prentice-Hall, Inc., New York, 1947. 224 pp. illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.00.

Prepared for the use of those interested in the development and applications of the gas turbine, this volume contains fundamental principles of operation, a graphic description of the inventions concerned, and an account of recent uses as supercharger and prime mover. This second edition covers the same material as the first with the addition of material on jet propulsion in the rewritten chapter on the gas turbine as an aircraft prime mover. An appendix of questions on the material in each chapter has been added. There is a bibliography.

SPECIFICATIONS FOR STEEL RAILWAY BRIDGES FOR FIXED SPANS NOT EXCEEDING 400 FEET IN LENGTH:

American Railway Engineering Association, 59 East Van Buren St., Chicago 5, Ill., 1947. 49 pp., diagrs., tables, 9 x 6 in., paper, $0.50.

The specifications are for steel railway bridges with fixed spans not exceeding 400 feet in length. Part I, giving details of design and manufacture, includes proposals, drawings and weighing and shipping information. Parts II and III cover the various types of steel for structural and rivet use, giving chemical and physical properties and certain information concerning alloy steels not appropriate as specification clauses.

SPRING DESIGN AND CALCULATIONS: Compiled by J. A. Roberts.

Technical Research Laboratory, Herbert Terry and Sons, Limited, Redditch, England, 1947. 114 pp., illus., diagrs., charts, tables, 7½ x 4¾ in., cloth, 10s.6d.

This small book gives examples of practical design calculations for a variety of spring types. Belleville washers, retaining rings, and spring driving belts are also covered. Brief chapters are devoted to the power and natural frequency of springs, the surging of valve springs, and combined axial and horizontal loading on compression springs. Helpful hints are given for ordering springs.

SURVIVAL AND RETIREMENT EXPERIENCE WITH WATER WORKS FACILITIES; a Committee Report.

American Water Works Association, 500 Fifth Ave., New York, 1947. 566 pp., charts, tables, 9 x 6 in., cloth, $3.00.

The American Water Works Association, with the co-operation of other associations in this field, has compiled this collection of records relating to the chief items of equipment used in water plants. The comprehensive and detailed tables show the number and length of life of such items of property as have been used and retired, the number and age of those still in service, and the distribution by ages throughout the life span. Twenty-six communities exemplifying rapid, slow and normal growth are cited, representing a geographical range from Canada to Florida and from New York to California.

TABLES OF SPHERICAL BESSEL FUNCTIONS; Volume II: Prepared by the Mathematical Tables Project, National Bureau of Standards:

Columbia University Press, New York, 1947. 328 pp., tables, 10¾ x 7¾ in., cloth, $7.50.

The major part of the present volume is devoted to tables of the spherical Bessel functions $\sqrt{\pi/2x}\ Jv(X)$, for $\pm v$ ranging from 29/2 to 61/2 with from 7 to 10 significant figures. This set of tables complements those previously published for $\pm v$ ranging from 1/2 to 27/2. A discussion of the properties of these functions and the computation methods used also appeared in the previous volume, while both volumes contain interpolation methods and notes on their respective tables.

Although not available in the Institute Library, inquiries concerning the following new books will be welcomed there or may be sent direct to the publishers.

CHEMICAL ENGINEERING CATALOG, the Process Industries' Catalog, 1947-48, 32nd edition.

Reinhold Publishing Corp., New York, 1947. 1,584 pp., illus., diagrs., charts, tables, 11 x 8 in., cloth, $3 in U.S.A. and Canada; $12 foreign (free to chemists).

This annual publication provides a collected group of some 500 condensed manufacturers' catalogs giving data about equipment, machinery, raw materials, heavy and fine chemicals, and laboratory supplies used in chemical process industries. The volume also contains a technical data section, trade name index, and a section on technical and scientific books. A classified index covers equipment, supplies, chemicals and materials.

CONVEYORS AND CRANES

By W. H. Atherton. Pitman Publishing Corp., New York and Chicago, 1947. 357 pp., illus., diagrs., charts, tables, 8½ x 5¼ in., cloth, $6.00.

This descriptive treatise is intended primarily for those responsible for the selection and application of such equipment. Part I deals, in considerable detail, with the mechanical handling of package goods by conveyors, elevators and stackers; Part II considers machines for handling coal and other loose materials in bulk, including both mechanical and pneumatic grain-handling plants; Part III is devoted to a briefer treatment of heavy cranes, skip hoists, and electric telphers. Fully illustrated, the book also contains graphs, tables, capacity and power formulae for design work.

ELECTRONIC ENGINEERING PRINCIPLES:

By J. D. Ryder. Prentice-Hall, Inc., New York, 1947. 397 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.65.

With the object of supplying the physical fundamentals needed for an understanding of electron tubes, this volume covers theories of conduction, simple atomic structure, and generalized circuit analysis with linear and nonlinear circuit elements. A basic knowledge of alternating current network theory and mathematics through simple differential equations is assumed. The physics involved in emission, space charge, and gaseous conduction phenomena is explained. Theory and applications are closely grouped, and applications are chosen mainly from the industrial field. An appendix contains selected vacuum tube characteristic curves and data. References are given at the end of each chapter.

ELEMENTARY TELEGRAPHY:

By E. Missen. George Newnes Limited, London, 1946. 340 pp., diagrs., tables, 7½ x 5 in., cloth, 12s.6d.

Elementary principles and modern apparatus are the subjects of this volume. The earlier chapters deal with the various codes employed, the principles of the start-stop telegraph system, telegraph relays, and elementary line telegraph transmission. Subsequent sections have been devoted to voice frequency telegraphy, telegraph circuits, signal distortion, and power supplies. Other features are chapters dealing with testing and measuring apparatus and telegraph instrument room equipment.

FLAMEPROOFING TEXTILE FABRICS. (American Chemical Society Monograph Series No. 104.):

By R. W. Little. Reinhold Publishing Corp., New York, 1947. 410 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.75.

Written by specialists in the fields covered, this volume presents a comprehensive survey of the subject. It is based on the findings of war-time investigations. The fundamental mechanisms of thermal degradation of cellulose and the chemical and physical phenomena of flameproofing are considered in the first section. The second section is devoted to the methods employed in the processing and evaluation of flameproofed fabrics. Various applications of flame retarding treatments in the field of textile products are discussed in the last section, with particular reference to military clothing and equipment.

FLIGHT TESTING, Conventional and Jet-Propelled Airplanes:

By B. Hamlin. Macmillan Co., New York, 1946. 147 pp., illus., diagrs., charts, tables, 11 x 8 in., cloth, $5.00.

Standardized methods are given for the analysis and reduction of flight test data to standard conditions; in Part I for conventional airplanes, and in Part II for jet-propelled airplanes. The book also covers basic flight testing formulae, data required and methods for acquiring them, necessary instrumental vibrations, and explanations of essential aerodynamic theories including the theory and general characteristics of turbo-jet engines. All necessary terms and symbols are carefully defined or explained.

FUNDAMENTALS OF ALTERNATING-CURRENT MACHINES:

By A. Pen-Tung Sah. McGraw-Hill Book Company, New York and London, 1946. 466 pp., illus., diagrs., charts, tables, 9 x 5¾ in., cloth, $5.00.

Written from the viewpoint of the operating man rather than that of the design engineer, this book lays particular stress on the operating problems of electrical machines. The student is shown not only how to test his equipment, but also what tests to make in order to obtain quickly and accurately the requisite parameters from which he may compute the performance. Thus design formulas are avoided, while the experimental determination of the machine parameters is given full prominence after the theory is explained. Only those theories and experimental methods capable of being generalized are treated, and for directness the theory is developed from the standpoint of circuits.

(Continued on page 201)

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

February 28th, 1948

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

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

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

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

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

The Council will consider the applications herein described at the April meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.
Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.
He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

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

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

FOR ADMISSION

ABBOTT-SMITH—HENRY BANCROFT, of Montreal, Que. Born at Montreal, Jan. 11, 1902. Educ.: B.A.Sc., McGill, 1923; R.P.E., Quebec; 1923-24, test course, C.G.E.; with Shawinigan Water & Co., as follows: 1924-25, power house operator, 1925-27, meterman, 1927-28, field meter tester, 1928-40, asst. to meter engr., 1941-45, asst. meter engr., 1946 to date, supt., records divn., power house sales dept., Montreal, Que.

References: P. S. Gregory, W. R. Way, G. D. Hulme, R. E. Heartz, W. F. Mainguy, J. L. Bieler.

AITKEN—THOMAS, of Kenogami, Que. Born at Chase, B.C., Mar. 17, 1922. Educ.: B.A.Sc., (Chem. Engrg.), B.C., 1946; 1946 to date, asst. chemist, Jonquiere mill, Price Bros. & Co., Ltd., Kenogami, Que.

References: G. F. Layne, A. Cunningham, D. Ross, W. P. C. LeBoutillier, K. A. Booth, L. McDougall.

BETOURNAY—JOSEPH NOE, of Montreal, Que. Born at St. Lambert, Que., Jan. 24, 1898. Educ.: B.A.Sc., (Civil), McGill, 1920; Cornell Univ., 1921-22; 1923-34, mgr., Royal Silver Plate Co.; engr., Baulne & Leonard; 1934-36, City of Montreal; with Dept. of Transport, 1936-48, Quebec Canals Branch, at present, asst. to supt. engr., Montreal, Que.

References: I. Brouillet, E. G. Carmel, R. S. Eadie, H. Gaudefroy, C. E. Gelinas, W. M. Gardner, E. Prevost.

CODE—RICHARD GIBSON, of Sarnia, Ont. Born at Petrolea, Ont., Oct. 23, 1920. Educ.: B.A.Sc., (Chem. Engrg.), Toronto, 1942; R.P.E., Ontario; 1942-46, Lieut., R.C.C.S.; 1946, (9 mos.), chemist, devel'pt. work, Radio Valve Co. of Can., Ltd., Toronto, Ont.; 1946 to date, supt., responsible for tech. operation and admin., ethylene unit, styrene plant, Dow Chemical Co. of Canada, Ltd., Sarnia, Ont.

References: B. B. Hillary, D. H. Welch, R. R. McLaughlin, A C. Blue, R. W. Garrett, G. R. Henderson.

COLES—RAYMOND SCOFIELD, of Toronto, Ont. Born at Yonkers, N.Y., May 29, 1910. Educ.: B.Sc., (Elect.), 1930; B.Sc., (Civil), 1931, Univ. of Bristol, England; A.M., Inst. E. E. Engrs.; R.P.E., Ont.; Central Elect. Board, as follows: asst. engr. 132 kv., constrn., Balfour, Beatty, Eng., 1932-34, asst. change freq. engr., Cornwall area, 1932-36, asst. to dist. engr., planning constrn., opern. & mtce. of C.E.P. Co.'s H.V. system, Cornwall Elect. Power Co.; 1936-39, divn. engr., responsible for eastern divn. H.V., Cornwall Elect.; 1939, asst. to chief engr., Wessex Elect. Co., Newbury; 1939-47, asst. elect. engr., Edmundsons Elect. Corp. (parent co. of Cornwall Elect. & Wessex), devel'pt. trans. systems, sub. stns., generating stns., etc.; 1947 to date, asst. engr., stn. sect., elect. engrg. dept., H.E.P.C., Ontario, Toronto, Ont.

References: L. A. Wright, A. H. Hull, H. E. Brandon, R. C. McMordie, D. D. Whitson, H. V. Armstrong.

DILWORTH—PAUL BERNARD, of Toronto, Ont. Born at Toronto, Jan. 31, 1915. Educ.: B.A.Sc., (Mech.), Toronto, 1939; R.P.E., Ontario; N.R.C., as follows: 1939-42, jr. research engr., I.C. engines, design of test equipt., Ottawa, 1943, (5 mos.), mission to U.K. to investigate jet engine devel'pt., 1943-44, sr. tech. off., design of Winnipeg Cold Test Station for jet engine testing, recruiting and training of personnel, provision of test equipt., i/c test program, 1944-46, officer i/c Cold Test Stn., when taken over by Turbo Research Ltd., (Aug. 1944); 1946 to date, mgr. and chief engr., A. V. Roe Canada Ltd., gas turbine divn., Toronto, Ont.

References: C. J. Mackenzie, K. F. Tupper, W. P. Dobson, R. C. Wiren, G. H. Herriot, W. D. Laird, J. H. Parkin.

FERRABEE—FRANCIS GILBERT, of Montreal, Que. Born at Montreal, Que., Aug. 25, 1902. Educ.: Grad., R.M.C., 1922; B.A.Sc., McGill, 1924; R.P.E., Que.; M., C.I.M.M.; with Canadian Ingersoll-Rand Co., as follows: 1924-25, student engr., Easton, Pa.; 1925-26, sales engr., Pittsburgh; 1926-28, sales repr., Wheeling, W.Va.; 1928-33, asst. to mgr., Pittsburgh; 1933-34, genl. sales dept., New York; Montreal, 1934-39, genl. sales mgr., 1939-41, vice-pres. sales divn., 1941-42, vice-pres. and asst. genl. mgr., 1942 to date, vice-pres. and genl. mgr.

References: C. A. Peachey, H. Massue, G. M. Dick, C. N. Danks, J. B. Stirling, J. J. O'Neill, C. A. Robb.

FORD—KENNETH ROSNY, of Banff, Alta. Born at Toronto, Jan. 15, 1908. Educ.: B.Sc., (Civil), Alberta, 1934; 1927-28, chain. and instru'man., Calgary Power Co., Ltd.; 1930-31, rodman, chain., C.P.R., Dept. Interior, 1934-36, rodman, instru'man., Highway Br.; 1937-39, jr. engr., highway location and constrn.. Golden-Revelstoke Highway, Dept. Mines & Resources, Engrg. & Surveys Br.; 1939, (7 mos.), asst. recon. engr., Alaska Highway Comm., Dept. Public Works, B.C.; 1940-45, Section Officer, etc., R.C.E.; Dept. Mines & Resources, Engrg. & Constrn. Div., as follows: 1945-47, asst. engr. i/c reconnaissance, location, constrn., survey parties, 1947 to date, res. engr., Banff, Windermere Highway constrn.

References: J. M. Wardle, T. S. Mills, A. L. Carruthers, F. K. Beach, C. R. Cornish, W. A. Capelle, R. J. Durley, A. L. Ford.

HICKS—THOMAS SAMUEL, of Hamilton, Ont. Born at Lafleche, Sask., April 10, 1923. Educ.: B.Eng., (Physics), Sask., 1947; June, 1947 to date, engr. apprent., Canadian Westinghouse Co., Hamilton, Ont.

References: L. C. Sentance, E. H. Tovee, J. R. Dunbar, I. M. Fraser, R. A. Spencer, W. E. Lovell.

HUSSMAN—DAVE, of Toronto, Ont. Born at Saskatoon, Oct. 24, 1925. Educ.: B.Sc., (Mech.), Sask., 1947; 1943-44-45-46, (summers), laborer, constrn. co., Stevenson Field, Wpg.; chainman, C.N.R., Dauphin Divn.; laborer, dftsman., Cochenour Willans Gold Mine; dftsman., J. C. Davis Ltd., Winnipeg; 1947 to date, jr. engr. in training, H.E.P.C. Ontario, Toronto, Ont.

References: R. H. Self, J. J. Traill, N. B. Hutcheon, I. M. Fraser, W. E. Lovell, A. F. M. S. Huda.

JAMES—DOUGLAS WILLIAM GEORGE, of Toronto, Ont. Born at Ashgrove, Ont., July 13, 1920. Educ.: corr. diploma, Aero Industries Tech. Inst., California; course engrg., (not completed) I.C.S.; 1937-40, mtce. mech., auto. bagging equipt., Nock Bros. & Ayre Co., Toronto; 1940, (4 mos.), assembly mech., National Steel Car Corp., Malton, Ont.; 1940-41, lead hand, jig and fixture constrn., major fuselage components, responsible for tool proving, Anson Aircraft Tooling; 1941, (3 mos.), Glenn L. Martin plant, Balt more, to gather prod. and tooling information, to be i/c tooling and welded components; 1941-42, Martin B-26 cont. cancelled, co. became known as Victory Aircraft Ltd., returned to shop as lead hand for mtce. of Anson Lysander Assemb. Tools. 1942-45, tool engrg. dept., i/c planning assembly fixture design, etc., on Lancaster Bomber contract, 1945-46, Victory Aircraft dissolved, plant taken over by A. V. Roe Canada Ltd., engaged as sr. designer of dies and machine tools, 1946 to present, mec. designed in plant engrg. dept., plant layout and supervng. mach. and equipt. instalns., responsible for cranes, handling equipt., co-ord. engrg. on special projects.

References: Z. S. Cyma, J. A. Grant.

JARVIS—ARTHUR CHARLES GORDON, of Baie Comeau, Que. Born at Ft. William, Ont., March 16, 1922. Educ.: B.Sc., (Mech.), Queen's 1943; R.P.E., Quebec; 1943-45, Lieut., R.C.E. M.E.; Quebec North Shore Paper Co., Baie Comeau Que., as follows: 1946-47, mech., control engr., i/c instln. and mtce. of pressure temp. and flow control instru'ts. analyzing paper mill problems, etc., 1947 to date. mtce. engr., supervn. of mtce. and constrn. of pumps, piping and all mch. connected with pulp and paper mill, minor design, liaison with engrg. dept.

References: D. S. Ellis, J. M. Pope, C. E. Hand, S. D. Lash, S. J. Simons, J. F. McInnis.

KSIEZOPOLSKI—ZYGMUNT WIKTOR, of Montreal, Que. Born at Istanbul, Turkey, Nov. 13, 1918. Educ.: Naval Engr., Naval Engrg. College, Poland, 1943; 1941-42, designer, deputy mgr. of fuselage section, sec., prod. dept., Turkish Aircraft factory, Ankara; 1943-47, Engr. Officer, Destroyer; Flotilla Engr., Motor Torpedo Boats; at present design engr., Canadian Vickers Ltd., Montreal, Que.

References: F. S. B. Heward, J. S. Korwin-Gosiewski, P. W. Gooch, R. C. Flitton, R. K. Thoman.

KUPA—PETER CONSTANTINE, of Sarnia, Ont. Born at Ft. Williams, Ont., Feb. 25, 1919. Educ.: B.Sc., (Chem. Engrg.), Queen's, 1945; 1943, (5 mos.), layout work in tool and jig dept. at Canadian Car & Foundry Co., Ft. Wm.; Polymer Corp., Sarnia, Ont., as follows: 1945-47, lab. shift supvr., 1947 to date, investigation plant prod. problems.

References: G. R. Henderson, F. F. Walsh, L. A. Petrie, A. Jackson, D. S. Ellis, S. D. Lash.

McLEAN—JONATHAN ALBERT, of Aylmer East, Que. Born at Aylmer East, Que., March 1, 1901. Educ.: Private tuition, Mech. Engrg., 1927-29; Victoria Foundry Co., Ltd., 1929-33, mech. dftsman., 1933-39, estimator and planner; Ottawa Car & Aircraft Ltd., as follows: 1939-40, tool designer and dftsman., 1941-43, planner and estimator, 1943-44, chief supvr., Anson Aircraft Ass'y., 1944-45, supvr. tool design and tool prod., Lancaster Aircraft; 1945-46, chief of job simplifi'n. and time study, 1946, chief of estimating and job planning

References: W. R. Peck, S. H. Wilson, T. Lanctot, W. H. G. Flay, C. M. Pitts.

McLEOD—ROBERT MALCOLM, of Winnipeg, Man. Born at Amherst, N.S., April 3, 1902. Educ.: B.Sc., (Civil), Man., 1929; 1919-24, timekeeper, Carter-Halls-Aldinger; 1927, articled pupil, Dominion Topo. Survey (vacation); 1928, dftsman., C.N.R., bridge dept., Winnipeg; 1929, (6 mos.), asst. engr., Carter-Halls-Aldinger Co.; instru'man. and res. engr., Dept. Highways, N.S.; 1935 to date, inspect. automatic sprinkler system, Western Canada Insurance Underwriters Assn., Winnipeg, Man.

References: J. N. Finlayson, W. L. Bunting, A. W. Fosness, C. P. Wright, C. P. Haltalin.

METCALFE—CHARLES MELBOURNE, of Windsor, Ont. Born at Norwood, Man., May 9, 1912. Educ.: Univ. of Man., 1929-32; 1942-43, dftsman., Defence Industries Ltd., Bouchard plant; with Dominion Rubber Co., Montreal, as follows: 1943-47, process engr., 1947 to date, factory representative.

References: J. A. Alexander, H. J. B. Richards, W. R. Mitchell, W. MacDougall.

MOORE—FREDERICK THOMPSON, of Winnipeg, Man. Born at Hamilton, Ont., April 16, 1922. Educ.: B.A.Sc., (Aero Engrg.), Toronto, 1946; Massey-Harris, Weston, Ont., as follows: 1944, (5 mos.), aircraft tool design, dftsman., 1945, (5 mos.), aircraft engrg., eng. liaison; 1941-42, clerk and timekeeper, The Frid Constrn. Co., Hamilton, Ont.; with Trans-Canada Air Lines, Winnipeg, as follows: 1946, jr. engr. in aircraft engrg. group, genl. liaison engrg. for six mos., 1947, (8 mos.) invest. new equipt. for aircraft systems, 1947, (Sept.), to date, transferred to service engrg. group, overhaul base, genl. aircraft work of aero. nature with sr. engr. rating.

References: T. R. Loudon, J. T. Dyment, C. A. Proudfoot, D. R. Taylor.

MOTTONEN—WILLIAM OLIVER, of Montreal, Que. Born at Creighton Mines, Ont., Aug. 5, 1921. Educ.: B.Eng., Milwaukee School of Engrg., 1942; 1 yr. post-grad. elect. engrg., McGill Univ., 1945-46; 1942-45, Comm. Officer, R.C.C.S.; at present, telephone equipt. engr., manual and toll dept., Northern Electric Co., Ltd., Montreal, Que.

References: R. Wilson, E. G. Gagnon, E. H. Hayes, W. N. McGuinness, J. H. Budden, D. B. Spence.

MUNRO—THOMAS ROBERT DOUGLAS, of Powell River, B.C. Born at Edinburgh, Scot., April 28, 1907. Educ.: Diploma, Heriot-Watt Coll., 1928-30; B.Sc., Univ. of London, 1930; Holder, Higher Nat. Diploma in Mech. Engrg.; A.M., Inst. M.E., London; 5 yrs. apprent., MacTaggart Scott & Co., (hydraulic engrs.), Edinburgh; 1931-35, tech. asst., i/c engrs., blacksmiths, carpenters, plumbers' workshops, etc., Corp. of Edinburg; 1935-40, asst. works mgr., responsibilities under dir. of chief, supvn. prod., mtce. of entire mech. plant, dftng., design, etc., Scotsman Publications Ltd., Edinburgh; 1940-46, Cmdr. (E), R.N.; 1946-47, asst. works mgr., Scotsman Publications Ltd. (duties as above); 1947 to date, sr. design engr., Powell River Co., Ltd.

References: A. C. R. Yuill, A. Pearson, P. R. Sandwell, D. A. Evans, W. Jamieson.

MURPHY—MAURICE PETER, of Shawinigan Falls, Que. Born at Shawinigan Falls, Que., June 24, 1923. Educ.: B.Eng., (Civil), N.S. Tech., 1947; 1944 (summer), instru'man., asst. geologist survey for oil, Lion Oil Co.; 1945 and 46 (summers), Shawinigan Engrg. Ltd., instru'man., road relocation, instru'man., bush survey; 1947 to date, field engr., Shawinigan Engrg., Shawinigan Falls, Que.

References: J. A. Burke, J. W. March, W. P. Fogarty, J. S. Whyte, H. K. Wyman.

PAOLI—AMBROSE ALOYSIUS, of Winnipeg, Man. Born at Charlottetown, P.E.I., July 13, 1892. Educ.: B.Sc., (Civil), Queen's, 1922; R.P.E., Man.; over past 25 years held following positions: sales engr. and subsequently br. mgr., Canadian Ingersoll-Rand Co., Toronto, Sydney, Wpg.; dir. of co., mgr. mining and contracting mach'ny., Kipp Kelly Ltd., Winnipeg; mgr., mining mach'ny. dept., etc., consultation on foundry, genl. sales mgr., Vulcan Iron Works Ltd., Winnipeg; during World War II applicant supervised all gov't. contracts; at present district sales mgr., John Inglis Co., Ltd., Winnipeg, Man.

References: T. H. Kirby, I. S. Patterson, G. E. Cole, N. M. Hall, G. L. MacKenzie, H. W. McLeod.

PATERSON—ALEXANDER ROSS, of Montreal, Que. Born at Winnipeg, Man., Mar. 31. 1922. Educ.: B.Sc., (Elect.), Manitoba, 1944; 1944-46, Tech. Officer, R.C.C.S.; 1946 to date, telephone equipt. engr., Northern Electric Co., Ltd., Montreal, Que.

References: R. Wilson, E. G. Gagnon, E. H. Haynes, J. H. Budden, D. B. Spence, W. N. McGuinness.

PAYNE—LESLIE FRANK, of Ottawa, Ont. Born at Bognor, Sussex, Eng., Sept. 6, 1898. Educ.: Queen's, 1924-26; 1927-31, engrg. clerk and map dftsman., Geodetic Survey of Canada; 1931-32, staff, Beauharnois Construction Co.; 1932-41, designing dftsman., elect. engrg. lab., N.R.C., Ottawa; 1941 to date, inspectr., elect. and gas, grade III, standards divn., Dept. of Trade & Commerce, Ottawa, Ont.

References: J. L. Rannie, N. J. Ogilvie, R. W. Boyle, B. G. Ballard, G. R. Davis, G. E. B. Sinclair.

SPECTOR—HAROLD, of Shawinigan Falls, Que. Born at Saskatoon, Sask., June 21, 1923. Educ.: B.Sc. (Chem. Engrg.), Sask., 1944; 1943-45, Dept. National Defence, Dist. Engr. Officer, M.D. 12, Regina; 1945-46, tech. control dept., Pacific Mills Ltd., Ocean Falls, B.C.; at present, process supvr., Shawinigan Chemicals Ltd., Shawinigan Falls, Que.

References: J. S. Whyte, H. K. Wyman, M. Eaton, R. A. Spencer, E. K. Phillips, I. M. Fraser.

STEDMAN—ROBERT WILLIAM, of Port Arthur, Ont. Born at Ottawa, Ont., Sept. 24, 1921. Educ.: R.M.C., 1939-41; B.A.Sc., (Mech.), Toronto, 1947; R.P.E., Ont.; 1945, (summer), apprent., machine shop, N.R.C.; with C. D. Howe Co., Port Arthur, as follows: 1946, (summer), design dftsman., 1947 to date, design engr.

References: H. M. Olsson, J. M. Fleming, W. C. Byers, P. W. Pinn, D. W. Laird.

STIDWILL—GEORGE BENSON M., of Cornwall, Ont. Born at Cornwall, Ont., Sept. 7, 1910. Educ.: B.Sc., (Civil), Queen's, 1932; 1928-33, constrn. supt., various; with Howard Smith Paper Mills, as follows: 1933-36, indus. engr., 1936-37, design engr., 1937-40, indus. engr., 1940-45, acting chief indus. engr., 1945 to date, chief indus. engr., Cornwall divn.

References: H. A. DeWolfe, D. Ross-Ross, W. P. Nesbitt, H. E. Meade.

WONG—GEORGE GAR, of Montreal, Que. Born at Montreal, Que., Feb. 4, 1921. Educ.: B.Eng., (Mech.), McGill, 1943; 1943-47, Montreal Locomotive Works, Ltd.; 1947 to date, lecturer, McGill Univ.

References: C. A. Robb, R. H. Patten, R. A. Young, H. G. Wong, C. M. McKergow.

FOR TRANSFER FROM THE CLASS OF JUNIOR

ARCHAMBAULT—GEORGES LOUIS, of Levis, Que. Born at Outremont on March 21st, 1915. Educ.: B.Eng. (Mech.), McGill, 1939. R.P.E., Que.; 1939-41, sales and service engr Minneapolis Honeywell Regulators; with Aluminum Company as follows: 1941-42, mtce. engr.; 1942-43, production engr.; 1944-46, sales engr.; 1946 to date, sales mgr. L'Hoir Aluminum and Stainless Steel Products, Levis, Que. (St. 1937. Jr. 1942)

References: deG. Beaubien, L. A. Duchastel, G. A. L'Hir, A. P. Benoit, A. Surveyer, J. E. Benoit, J. A. Ouimet.

BURGESS—BASIL ARTHUR, of Montreal. Born at Montreal on April 23, 1919. Educ.: B.Eng. (Mech.), McGill, 1943; R.P.E., Que.; summer work as follows: 1940-41, apprentice toolmaker, Jenkins Valves; 1942, mech. engrg. dept., United Shipyards; 1943-45, (2 mos.) boiler cleaning, machinery repairs, R.C.N.V.R. Dockyard, Halifax; (2 yrs.) served at sea as Engr. Officer, H.M.C. Ships; 1946 to date, machine design, supervision of fabrication, assembly, installation of custom built machinery, Bowers Machine Co. Ltd. (St. 1943. Jr. 1946)

References: J. A. Webster, J. E. Brett, J. C. Kemp, H. W. Lea.

GEDDES—WALTER ROBERT, of Toronto. Born at Dalhousie Lake, Ont., on Sept. 23, 1923. Educ.: B.Sc. (Mech.), Queen's Univ., 1945. 1942, fitter, International Nickel Company; 1943, designing, building exp. farm machinery, Frost & Wood Company; 1944, machinist, Ataco Ltd. 1945-46, demonstrator in dftg., Queen's Univ.; 1946-47, general geophysical and mining field work, Variometer Surveys; 1947, Jr. engr., British American Oil Co., Clarkson Refinery. (St. 1944. Jr. 1947)

References: A. L. Malcolm, D. S. Ellis, A. Jackson, S. D. Lash, J. D. Lee.

OULTON—ROGER REYNOLDS, of Montreal. Born at Sackville, N.B., on July 19, 1913. Educ.: B.Eng. (Elect.), Nova Scotia Technical College; R.P.E., Que.; 1938-39, group leader on survey party, Engrg. Service Co., Halifax; 1939-41, broadcast operator, C.B.C., Sackville, N.B.; 1941-45, signals officer, R.C.A.F. Ottawa; 1945-47, designer, radio, Canadian Ltd.; 1947 to date, equipt. engr., Can. Pacific Communications. (Jr. 1939)

References: R. W. Dobridge, E. A. Harvey, H. W. McKiel, G. V. Ross, W. A. Orr.

PAYNE—ROBERT LAW, of Vancouver, B.C. Born at Vancouver on Nov. 18, 1920. Educ.: B.Eng. (Mech.), McGill, 1946; summer work with Can. Fish Co. as follows: 1936, asst. lineman; 1937-38, operating marine diesel eng.; 1938, master MV "Dickinson Point"; 1939, operating marine diesel engr.; 1940-41, dftsman. plant and equipt. layout; 1942, dftg. shipyard design, layout; 1943-45, watch keeping, Deck Officer, Can. Merchant Navy; 1946-48, Marine Supt., Can. Fishing Co. Ltd., Vancouver. (St. 1943. Jr. 1948)

References: A. D. Creer, W. N. Kelly, J. N. Finlayson, E. P. Fetherstonhaught, J. N. Hall, C. M. McKergow.

READ—WALLACE FOSTER, of Toronto. Born at Fort William, Ont., on Oct. 4, 1921. Educ.: B.Sc. (Chem. Eng.), Queen's, 1943. Summer work as follows: 1940-41-42, control asst. Great Lakes Paper Co., Fort William; 1943, R.C.E. (Lieut.); 1943-45, instructor, Petawawa Military Camp; 1945-46, Staff Duties, N.D. H.Q., Ottawa; 1945-46, student brewer, Can. Breweries Ltd., Toronto; 1946, O'Keefe Ale Brewery, Toronto; at present asst. brewer, Can. Breweries Ltd. (Jr. 1946)

References: S. T. McCavour, A. Jackson, S. D. Lash, E. Ellis, L. T. Rutledge, R. A. Low.

ROBSON—RICHARD CHRISTOPHER, of Vancouver, B.C. Born at Bromley, England, on July 13, 1904. Educ.: 1922--25, B.C. (Jr.E.I.C. by Exam), 1932; 1926-27, highway location, survey and constrn. rod, chain, W. G. Swan, Consulting Engr.; 1927 mech. and elect. dftsman. on constrn., American Can. Co., Vancouver; 1927-29, dftsman. and asst. to mech. supt. on design, Can. Fishing Co. Ltd.; 1929-32, designing structl. mech. elect. dftsman., Smelting Co. of Canada Ltd.; under chief engr., West Kootenay Power & Light Co. Ltd. design and constrn. of Corra Linn Dam & Power House; 1933-35, mech. and structl. desng. dftsman. asst. to Mech. Supt., Can. Fishing Co. Ltd.; 1935-36, desng. structl. elect. dftsman, B.C. Sugar Refining Co. Ltd.; 1936-38, structl. and mech. designing engr., study and calculation of machine room ventilation and control of humidity, design, layout, Powell River Co.; 1938-39, structl. dftsman. and mech. designer, Western Bridge Co.; 1939-40, structl. and elect. desgn. engr. and estimator, Bloedel Stewart & Welch Ltd.; 1940-42, structl. mech. desgn. engr., C.M. & S. Kootenay; 1942, mech. engr., sawmill constrn. Stewart & Welch Ltd.; 1942-44, structl. desgn. engr., B.C. Electric Railway Co.; 1944 to date, chief dftsman. and structl. mech. designer, Arthur Pearson, Consulting Eng., design of industrial buildings, plywood plants, mech. layout, Vancouver. (Jr. 1932)

References: W. C. Swan, E. M. Stiles, A. C. Ridgers, A. L. Swanson, A. S. Mansbridge, A. D. Creer, A. Pearson.

TAYLOR—THOMAS ALASTAIR I. C., of Montreal. Born at Edmonton, Alta., Sept. 16, 1912. Educ.: B.Sc. (Elect.), Alberta, 1936; 1936, chainman, C.N.R.; 1936-37, apprentice engr.; 1937-38, plant engr. Saguenay Power Co.; with Aluminum Co. of Canada as follows: 1938-41, elect. engr. 1941-42, elect. mtce. eng.; 1942-46, R.C.E. Elect. and Mech. Officer; 1946, elect. engr. A. D. Ross & Co.; 1946 to date, project engr., Aluminum Co. of Canada. (Jr. 1937)

References: F. L. Lawton, A. D. Ross, A. G. Moore, McN. DuBose, A. C. Johnston, J. W. Ward.

Library Notes

(*Continued from page 198*)

STRATEGIC MINERALS:

By J. B. DeMille. McGraw-Hill Book Company, New York and London, 1947. 626 pp., tables, 9¼ x 6 in., cloth, $7.50.

This comprehensive manual furnishes a wealth of detailed information on the essential chemical and physical properties of 76 strategic metals and minerals. Treating the subject from the viewpoint of world supply and production, the author gives the sources of these materials and provides pertinent statistics on the domestic and foreign output and distribution of each. The development of new applications for these minerals in industry is discussed, and reference is made to new methods in metallurgy. A brief review of government regulations affecting procurement and production, and a detailed discussion of stockpile directives are supplied.

TECHNICAL DRAWING PROBLEMS:

By F. E. Giesecke, A. Mitchell and H. C. Spencer. 2 ed. Macmillan Company, New York, 1947. 9 pp., text 105 sheets of diagrs., 11 x 9¼ in., paper, ring binder, $2.75.

Containing problems which are designed to cover the important fundamental principles of technical drawing, this volume is not intended for use as a complete course in itself. The problems are divided into units, and references are given under each unit to the section in "Technical Drawing", second edition, by the same authors. Following a section on the use of instruments is one on the geometry of technical drawing. Succeeding sections discuss the construction of letters and numbers, problems on views, identification, revolutions, isometric and oblique drawing, and dimensioning. Problems on fasteners and springs complete the book.

TRICOT FABRIC DESIGN:

By T. H. Johnson, McGraw-Hill Book Company, New York and London, 1946. 124 pp., illus., diagrs., tables, 8¼ x 5½ in., cloth, $2.50.

In the opening chapters the elements and action of the tricot knitting machine are described with illustrative diagrams. Succeeding chapters discuss in detail the formation of the basic pattern types, with drafting and design detail. Separate chapters deal with graphic design and the important topic of runproof construction.

WATER TREATMENT AND PURIFICATION:

By W. J. Ryan. 2 ed. McGraw-Hill Book Co., New York and London, 1946. 270 pp., illus., diagrs., charts, maps, tables, 8¼ x 5½ in., cloth, $2.75.

The purpose of this book is to make available to students, engineers and plant managers a description, under one cover, of the several purification and other processes that are applied to water. The construction and operation of the different types of filtering, softening and treating apparatus are described and illustrated by diagrams and photographs. The chemical reactions occurring in the treatments are also given. In this new edition have been added recent developments such as: organic ion exchange materials for water softening; new embrittlement prevention processes; etc.

Employment Service

The 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 therefore be particularly appreciated if employers would make the fullest possible use of these facilities to make known their existing or estimated requirements. Notices appearing in the Situations Wanted column will be discontinued after three insertions, and will be inserted upon request after a lapse of one month. Personal interviews by appointment.

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER required by a major Canadian Company located in Toronto as Technical Service Man. 25 to 35 years old. Definite sales personality. Position will include 6 to 12 months' training. It will carry the responsibility for servicing all types of adhesives to industries throughout Canada. Salary open. Apply to File No. 4044-V.

ELECTRICAL

DESIGNING ELECTRICAL DRAUGHTSMAN with experience on station design and layout required in Montreal by a pulp and paper mill. Experience in pulp and paper industry would be an asset, but not essential. Salary open. Apply to File No. 4046-V.

MISCELLANEOUS

GRADUATE ENGINEERS preferably with about five years light structural and mechanical experience required by growing concern in central Ontario to learn business thoroughly and thereby be in a position to accept responsibility in Engineering Department. Salary open, based on experience and aptitude. Apply to File No. 4045-V.

TOWN ENGINEER required by Town of Weston, Ontario. Position includes the supervision of the Works Department and Building and Plumbing Inspections. Applicants to give full particulars in first letter. Salary open. Apply to File No. 4047-V.

ENGINEERING ASSISTANT to teach some classes in first three years of Engineering course at Dalhousie University, Halifax, Nova Scotia. Appointment for one year, commencing September, 1948, with possibility of permanent re-appointment. Salary open. Apply to File No. 4048-V.

MUNICIPAL ENGINEER, required by a Town in Ontario. Must have electric and water-works experience also be prepared to obtain papers as a land surveyor in order to layout lots in town and to layout a new sub-division. Salary to start $300.00. Apply to File No. 4049-V.

TOWN ENGINEER, required for Town of Fort Erie, Ontario. Duties include the supervision of the Works Department and Building and Plumbing Inspections. Reply giving full particulars. Salary open. Apply to File No. 4050-V.

SENIOR INDUSTRIAL ENGINEER required by Management Consultants in Montreal. Experience in installations of Production and Cost Control, Wage Incentives, etc. Free to travel, preferably bilingual. Salary open. Apply to File No. 4052-V.

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

CHEMICAL

CHEMICAL ENGINEER OR CHEMIST, preferably with Ph.D., required by a pulp and paper company with plants in Eastern Canada, for research work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER required by a pulp and paper company with plants in Eastern Canada, for mill control and pilot plant work. Salary open. Apply to File No. 3549-V.

*CHEMICAL ENGINEER OR CHEMIST interested in textile dyeing required by an industrial firm in South Western Quebec. Salary open. Apply to File No. 3798-V.

CHEMICAL ENGINEER with considerable mechanic and hydraulic experience or mechanical engineer with good chemical knowledge and experience in hydraulics, required by a manufacturer in Ontario. Salary open. Apply to File No. 3928-V.

CHEMICAL ENGINEER, recent graduate, required to study and become experienced with industrial products fabricated from carbon or graphite by firm in Toronto area. Position to eventually lead to sales. Salary $180 to $200. Apply to File No. 3958-V.

CHEMICAL ENGINEER, recent graduate, is needed by a chemical manufacturing firm situated in the Province of Quebec. Some experience in oil refinery, pulp and paper, or synthetic resin manufacture would be useful. Salary open. Apply to File No. 3978-V.

CHEMICAL ENGINEER OR CHEMIST wanted by large manufacturers of bleached sulphate pulp for their Technical and Development Department. Several years experience preferably in the pulp and paper industry. Mill located in Northern Ontario. Salary open. Apply to File No. 3991-V.

CHEMICAL ENGINEER, experienced in use of physics and mathematics, under 30 years of age, required by industrial and chemical organization with Headquarters in Montreal. Duties include development work and study explosives and chemistry and hydro-dynamics. Salary open. Apply to File No. 3995-V.

SENIOR CHEMICAL ENGINEER OR CHEMIST, required by leading Paper Manufacturer in Eastern Canada. Applicant should have some experience in Paper Mill Control work. This position offers plenty of scope for advancement. Salary open. Apply to File No. 4013-V.

CIVIL

CIVIL ENGINEER to take charge of work in a drainage district in Quebec. Must be bilingual, may be recent graduate. Salary from $200. Apply to File No. 3479-V.

CIVIL ENGINEERS with experience in detailing and designing structural steel and reinforced concrete for manufacturers are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

CIVIL ENGINEERS, recent graduate up, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

GRADUATE CIVIL ENGINEER, required by a public utility in the Montreal area with three or four years experience in design of reinforced concrete and structural steel. Salary $250-$300. Apply to File No. 3766-V.

CIVIL ENGINEERS with some experience on design and field work required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

CIVIL ENGINEERS required as draughtsman in bridge department of large transport company. Preferably with experience in steel, concrete and timber construction. Location Montreal. Salary $200-$300. Apply to File No. 3884-V.

CIVIL ENGINEER, required in New Brunswick. Must be qualified designer of miscellaneous public utility buildings in frame and masonry construction. Thorough working knowledge of timber, reinforced concrete and steel framing essential, knowledge of the design of various types of heating system and plumbing. Salary open. Apply to File No. 3887-V.

CIVIL ENGINEER required as Town Engineer of a town in the Maritimes. Required to supervise and layout work for Water and Sewerage Department also construction of a general nature for the Electric Light Department. Salary open. Apply to File No. 3930-V.

CIVIL ENGINEER, required by a Steel Company in Montreal for the design of reinforced concrete frame. Salary open. Apply to File No. 3931-V.

*JUNIOR CIVIL ENGINEER, with some structural experience, required for general duties by a textile manufacturing concern near Montreal. Salary around $300. Apply to File No. 3954-V.

CIVIL ENGINEER, recent graduate, required to under study City Engineer of a city in Western Quebec. Salary open. Apply to File No. 3966-V.

JUNIOR ENGINEER, preferably with civil background required for sales and service by a Montreal manufacturer of waterproofing compounds. Salary open. Apply to File No. 3968-V.

CIVIL ENGINEER required in Montreal with general knowledge of reinforced concrete and steel structures. Special knowledge of triangulation surveys, boundry surveys, also laws and procedure to be followed in regard to the purchase, transfer and registration of lands in Province of Quebec. Must be bilingual. Preferably veteran. Salary not less than $3,480. Apply to File No. 3987-V.

CIVIL ENGINEER required in Montreal with considerable experience in design of reinforced concrete and steel structures. Ability to make stability reports of wharves and retaining walls, also draft specifications, prepare estimates and economic studies. Preferably bilingual and veteran with overseas service. Salary not less than $3,480. Apply to File No. 3987-V.

ELECTRICAL

ELECTRICAL ENGINEER, age 30-45, required as sales engineer in Canada for U.S. firm making special equipment for transport and industry. Must have sales training in electrical equipment instruments also experience as sales and service engineer. Salary open. Apply to File No. 3447-V.

ELECTRICAL ENGINEER, recent graduate, required for the engineering staff of a paper mill in the Lake St. John area. Salary open. Apply to File No. 3507-V.

ELECTRICAL ENGINEER with considerable industrial experience required as a safety engineer by a public utility in the Montreal area. Bilingual preferred. Salary open. Apply to File No. 3654-V.

ELECTRICAL ENGINEER, with general knowledge of a.c. and d.c. motors, switchgear, mercury rectifiers, transformers and other electrical apparatus, for sales work in Eastern Canada, age 30 to 35. Salay open. Apply to File No. 3695-V.

ELECTRICAL ENGINEER, recent graduate up, required by a manufacturer in Montreal, for sales engineering. Preferably bilingual and familiar with rotating electrical equipment. Salary $200 up. Apply to File No. 3761-V.

GRADUATE, ELECTRICAL ENGINEERS with 3 to 10 years experience in design operation, layout of substations, switching stations, and electrical machinery, together with engineering studies, including draughting for a large hydro electric power house in Quebec. Salary $225 up according to experience. Apply to File No. 3787-V.

ELECTRICAL ENGINEER required for power sales by an electrical utility in Province of Quebec. Preferably experienced. Bilingual. Salary open. Apply to File No. 3802-V.

ELECTRICAL ENGINEER with experience in layout and design of generating and transformer stations, required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

*SEVERAL EXPERIENCED ELECTRICAL DRAUGHTSMEN, for the design and layout of industrial power and control systems. Required by consulting engineering office in Montreal. Salary open. Good chance for advancement. Apply to File No. 3890-V.

* Filled since appearance in advance notice.

JUNIOR ELECTRICAL ENGINEER, with practical experience in general manufacturing industries, required by an industrial organization in Ontario. Salary open. Apply to File No. 3904-V.

ELECTRICAL ENGINEERS, required for sales engineering work in Western Canada. Graduates with some selling experience preferred. Salary open, plus expenses. Apply to File No. 3915-V.

JUNIOR ELECTRICAL ENGINEER, age about 30, required as assistant to superintendent of light department in Montreal area. Practical experience in Hydro Distribution and Steam Turbines. General office routine of administrative nature Salary open. Apply to File No. 3950-V.

ELECTRICAL DRAUGHTSMAN, required by a firm of Engineer Contractors in Alberta for layout and plotting with a minimum of supervision. Should be accustomed to working with power lines to 2,300 volts and must be able to do lighting circuits, both overhead and underground. Salary $250 to $300. Apply to File No. 3972-V.

PROFESSOR IN ELECTRICAL ENGINEERING required by a Canadian University in the Province of Quebec for fall 1948 semester. Preferably with teaching and practical experience in power, electrical machinery design, lab. etc. Bilingual preferred. Attractive salary available for right man. Apply to File No. 3982-V.

RECENT GRADUATE electrical background, preferably bilingual, required by a Montreal manufacturer of electric motors, generators, ventilating equipment and pumps. Position to eventually lead to sales. Salary open. Apply to File No. 3989-V.

*ELECTRICAL ENGINEER with 2 years experience in industrial electrical maintenance and at least 1 year's supervisory experience, age 20-35, required by chemical organization with headquarters in Montreal. Duties include responsibility of all electrical and instrument maintenance also electrical distribution system and air-conditioning system. Salary open. Apply to File No. 3995-V.

ELECTRICAL ENGINEERS, age 30 to 40, required for the Commercial and Distribution Department of large Hydro Electric Utility. Must have experience in electrical distribution. Salary open. Apply to File No. 4002-V.

*ELECTRICAL ENGINEER to take charge of hydro electric maintenance involving four or five plants. Salary open. Apply to File No. 4015-V.

ELECTRICAL ENGINEER experienced in Power Station, Transmission and Distribution design and installation. Permanence and advancement depending upon performance. Salary open. Apply to File No. 4024-V.

JUNIOR ELECTRICAL ENGINEER, required by a mining company in Northern Ontario. Salary open. Apply to File No. 4028-V.

ELECTRICAL ENGINEER with minimum of 5 years experience in paper industry, between 35-45 years of age, for responsible position with large newsprint manufacturing concern in Northern Ontario. Salary commensurate with qualifications. Living accommodation assured. Apply to File No. 4032-V.

ELECTRICAL ENGINEERS with some experience in research, design, and development, backgrounds in communications, electronics, power or physics are preferred. Required for the staff of a technical college in N.Y. state. Salary and rank will be commensurate with experience and training. Apply to File No. 4038-V.

MECHANICAL

MECHANICAL ENGINEERS, preferably with design experience, are required for armament research and development in the Quebec area in a government establishment. Salary from $190.00. Apply to File No. 3401-V.

MECHANICAL ENGINEERS, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

JUNIOR MECHANICAL ENGINEER with knowledge of precision machine shop practice and aptitude for research in metals and plastics required for an organization in Toronto for the production of artificial limbs. Must be veteran. Salary from $225. Apply to File No. 3675-V.

MECHANICAL ENGINEERS with at least five years experience in the pulp and paper industry required by an Ontario Paper Company. Salary open. Apply to File No. 3733-V.

*MECHANICAL ENGINEER experience in heating, ventilating and air-conditioning required by a consulting engineer in Montreal. Salary open. Apply to File No. 3773-V.

MECHANICAL ENGINEERS required by a Pulp and Paper Mill at Powell River, B.C. Preferably with experience in plant design in the pulp and paper industry. Salary according to qualifications. Salary open. Apply to File No. 3796-V.

MECHANICAL ENGINEERS with experience in plant layout and design or ventilation problems or general mechanical design, required by a firm in Quebec. Salary from $250. Apply to File No. 3818-V.

MECHANICAL ENGINEER, age 35-40, with considerable experience in design and layout of machinery and equipment, required by an organization with Head Office in Montreal. Salary $300-$400. Apply to File No. 3820-V.

MECHANICAL ENGINEER with six to ten years experience in maintenance and engineering work required by alkali manufacturers in Ontario. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER, required by a manufacturer in Ontario for the plant operation staff. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER with knowledge of physical metallurgy heat treatment, ability in stress analysis and design. Required for research work in B.C. Maximum salary $4,000. Apply to File No. 3865-V.

MECHANICAL ENGINEER, age 30-38, required for northern Ontario Paper Mill. Preferably with paper mill experience or experience in general layout and design. Knowledge of pumps capacities, piping, conveyors, estimating and structural design essential. Salary open. Apply to File No. 3891-V.

MECHANICAL ENGINEER, bilingual, with 4 or 5 years experience in sheet metal work required as Plant Manager by a manufacturer in the Province of Quebec. Salary open. Apply to File No. 3894-V.

RECENT GRADUATE mechanical background, required by a manufacturer in Montreal for work in machine design, possibly for production in the future. Salary $225. Apply to File No. 3901-V.

MECHANICAL ENGINEER, age 25 to 35, experienced in industrial plant layout and machine design required by manufacturing firm in Brantford. Salary open. Apply to File No. 3907-V.

MECHANICAL ENGINEER, recent graduate, with some knowledge of heat exchanges, condensers, or any type of unfired pressure vessels required by an industrial organization in Montreal. Salary open. Apply to File No. 3976-V.

MECHANICAL ENGINEER, recent graduate, bilingual, with some experience in general plant work, required in Montreal. Industrial engineering experience would be useful. Duties include time-study in Standards Department. Salary open. Apply to File No. 3980-V.

MECHANICAL ENGINEER age 25 to 30, is required by a company in Shawinigan Falls to eventually act as Assistant Works Manager when qualified. Salary open. Apply to File No. 3985-V.

MECHANICAL ENGINEER, with experience in plant lay-out and knowledge of reinforced concrete, timber and steel design, required in an industrial manufacturing and processing plant situated 75 miles from both Ottawa and Montreal. Salary open. Apply to File No. 3990-V.

GRADUATE MECHANICAL ENGINEER required by engineering concern in Montreal area engaged in manufacture of hydraulic turbines and mining machinery. Preferably with 5 or more years experience. Excellent working conditions, free pension, group and health insurance, five day week, cafeteria service. Salary open. Apply to File No. 3992-V.

MECHANICAL DESIGN DRAUGHTSMAN with experience in reinforced concrete and structural steel required by a mining company in Northern Ontario. Housing available. Salary open. Apply to File No. 3994-V.

MECHANICAL ENGINEER, with 2 or 3 years experience, preferably bilingual, required as Mechanical Development Engineer by industrial and chemical organization with headquarters in Montreal. Duties will be conducting investigations on existing equipment and a certain amount of plant layout work and draughting. Salary open. Apply to File No. 3995-V.

MECHANICAL ENGINEER with 1 to 3 years experience in production, required as Industrial Engineer by industrial and chemical organization with headquarters in Montreal. Duties include responsibility for conducting methods engineering studies using methods of process charts, time and motion study. Salary open. Apply to File No. 3995-V.

MECHANICAL ENGINEER, required by a Montreal manufacturer of machines and equipment for work consisting of general engineering and design in connection with the manufacture of pulp and paper machinery. Salary open. Apply to File No. 4000-V.

*MECHANICAL ENGINEER, required by a textile manufacturing concern near Montreal. Applicant after becoming acquainted with the plant would be expected to act as general follow up man on repair of mechanical and electrical equipment also see that all material necessary is on order or on hand. Salary open. Apply to File No. 4001-V.

*MECHANICAL ENGINEER, required for paper mill converting department of large Paper Manufacturer in Eastern Canada. Preferably with experience in Production and Mechanical Maintenance. Salary open. Apply to File No. 4013-V.

MECHANICAL ENGINEER must be bilingual, required by paper company for general duties in line with capabilities and interest. Position in very small community in Province of Quebec. Salary open. Apply to File No. 4020-V.

MECHANICAL ENGINEER required as assistant in Chief Engineers Department by large paper company. Paper experience essential. Some knowledge of French language would be helpful. Must be able to complete investigations and write reports. Age 28-40. Salary $350-$450. Apply to File No. 4022-V.

MECHANICAL ENGINEERS required in Ontario by a firm specializing in machine tools. Vacancies exist for Junior Salesman with ability and interest in sales engineering also engineer experienced in Production control. Salaries open. Apply to File No. 4026-V.

MECHANICAL ENGINEER required by a road building and earth moving machinery manufacturer in Ontario. Position to eventually lead to General Plant Superintendent. Preferably veteran. Salary open. (Application by letter only.) Apply to File No. 4029-V.

MECHANICAL DRAUGHTSMAN required by a large coal mining firm in the Maritimes for simple designing, layout and detail drawings for colliery plant, screening equipment, hoists, simple steel structures. etc. Salary $240.00 up depending upon ability. Apply to File No. 4030-V.

MECHANICAL ENGINEER preferably with heating and ventilating experience required in Montreal for design and draughting. Salary depending on experience. Apply to File No. 4034-V.

METALLURGICAL

*METALLURGICAL ENGINEER, preferably with lab experience also some industrial experience would be helpful, required by large transportation company in Montreal. Salary open. Apply to File No. 3998-V.

MINING

MINING ENGINEERS, with varied experience required by a firm in Quebec for general mine operation, exploitation and development work. Salary from $250. Apply to File No 3818-V.

* Filled since appearance in advance notice.

MINING ENGINEER with several years experience required by a company engaged in large scale asbestos production in Quebec. Salary open. Apply to File No. 3935-V.

MISCELLANEOUS

MANAGEMENT ENGINEER with business administration and mechanical background, age 30 up, bilingual with at least 5 years practical experience, required by an industrial engineering consultant in Montreal. Salary open. Apply to File No. 3307-V.

STRUCTURAL STEEL DRAUGHTSMAN AND CHECKERS, preferably graduate engineers but any experienced men acceptable, are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

GRADUATE ENGINEERS, required by an industrial and chemical organization with headquarters in Montreal for all phases of research, design, operation development, production and maintenance. Salaries open. Apply to File No. 3588-V.

*DESIGN DRAUGHTSMAN for the design of cranes and hoists of all types, capable of making and checking complete manufacturing detail drawing, required by a manufacturer in Southern Ontario. Apply by letter with full details. Salary open. Apply to File No. 3628-V.

SALES ENGINEER with wide engineering experience, wanted by a company in Toronto for the sale of textile machinery and construction equipment. Salary open. Apply to File No. 3639-V.

CHEMICAL OR METALLURGICAL ENGINEERS, from recent graduates up, required by a Quebec firm engaged in metal production for employment as production and development engineers. Salaries open. Apply to File No. 3693-V.

MINING AND METALLURGICAL ENGINEER, age about 30, with considerable experience, required by a manufacturer in the St. Maurice Valley. Salary open. Apply to File No. 3723-V.

*CIVIL ENGINEERS and ASSISTANT HYDRAULIC ENGINEERS required for government organization on West Coast for highway and construction. Salary open. Apply to File No. 3724-V.

STRUCTURAL STEEL DETAILER AND CHECKER with considerable experience, required for checking shop details by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

DETAILER AND DESIGNER for reinforcing steel with considerable experience, required by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

SALES ENGINEER, preferably bilingual required by a Montreal firm dealing in building materials. Salary from $200. Apply to File No. 3745-V.

GRADUATE ENGINEER, required by an electrical firm in Montreal to organize publicity department and edit trade journal. Salary open. Apply to File No. 3751-V.

STRUCTURAL STEEL DRAUGHTSMAN, qualified to detail and check all classes of structural steel, and to supervise draughtsmen in a large drawing office on the West Coast. Salary open. Apply to File No. 3777-V.

BRIDGE ENGINEER, qualified to be in charge of the design and supervision of the construction of highway bridges. Apply stating qualifications, experience, age and salary wanted. Apply to File No. 3780-V.

GRADUATE CIVIL OR MECHANICAL ENGINEERS with 3 to 10 years experience in design, cost estimates, draughting, and engineering studies for a large hydro-electric power house in Quebec. Salary $225 up according to experience. Apply to File No. 3787-V.

STEAM PLANT ENGINEER, for large concern in Eastern Townships, with at least 5 years practical experience. Must be familiar with thermo-dynamics, combustion control, steam turbines, mechanical refrigeration, hydraulics, etc. Permanent position and attractive salary for the right man. Apply to File No. 3791-V.

RECENT GRADUATES OR JUNIOR ENGINEERS, with mechanical background, required by a Montreal Engineering fabricating and contracting firm for training purposes leading to sales and service. Area Montreal. Salary $175 up. Apply to File No. 3810-V.

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open. Apply to File No. 3811-V.

DRAUGHTSMEN required by a pulp and paper mill in the Eastern Townships for general draughting and detailing. Three or four years experience preferred but not essential. Salary open. Apply to File No. 3823-V.

DRAUGHTSMAN, preferably with mechanical background, required by a manufacturer in Montreal for design work on electrical equipment. Salary open. Apply to File No. 3829-V.

*CITY ENGINEER required by City of Moose Jaw, Saskatchewan. Salary open. Apply to File No. 3856-V.

DRAUGHTSMAN of the following classes: Architectural, piping layout, equipment layout, mechanical design, steam plant heating, and ventilating electrical and plumbing required by an industrial organization in Montreal. Salaries open. Apply to File No. 3860-V.

STRUCTURAL STEEL CHECKER AND ONE DETAILER CHECKER, wanter for large fabricating plant in Vancouver, B.C. Age between 30 and 40 years preferred. Must be experienced. Give full information and references. Salary open. Apply to File No. 3862-V.

MECHANICAL CHEMICAL OR CIVIL, recent graduate up, required for sales and service in Montreal. Salary open. Apply to File No. 3867-V.

GRADUATE ENGINEERS required for all phases of research, design, operation, and development by an industrial organization with Head Office in Montreal. Salaries open. Apply to File No. 3882-V.

CIVIL OR STRUCTURAL ENGINEER, 24-35 years, required for Northern Ontario Paper Mill. At least 2 years construction and 2 years design experience. Opportunity to train junior personnel. Salary not less than $350. Apply to File No. 3891-V.

STRUCTURAL ENGINEER, preferably a graduate civil engineer with experience in the design of mill buildings required by a paper manufacturer in Eastern Ontario. Salary open. Apply to File No. 3896-V.

DETAILERS OR JUNIOR DESIGNERS on mechanical or sheet metal design required by an industrial organization in Ontario. Salary open. Apply to File No. 3904-V.

INDUSTRIAL ENGINEERS, with production experience required by a firm of industrial consultants in Montreal. Preferably with experience in time study, cost control, etc. Salary around $400 depending on qualifications. Apply to File No. 3910-V.

RECENT GRADUATES in Electrical or Mechanical Engineering can still be offered the opportunity of being trained by large Hydro-Electric Utility. Very good opportunities for regular employment in various departments at the completion of training period. Minimum salary 1st year $200; 2nd year $215. Apply to File No. 3912-V.

GRADUATE ENGINEER, Mechanical, Electrical or Civil, about 30 years of age, required by a large Hydro-Electric Utility in Montreal for Field Testing Hydraulic Turbines. Salary open. Apply to File No. 3932-V.

RECENT GRADUATE required by a Montreal contractor for survey and making of plans. Must be bilingual. Salary $175 up according to experience. Apply to File No. 3933-V.

TWO METALLURGICAL ENGINEERS AND ONE CHEMICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No 3942-V.

SALES ENGINEER required by well known manufacturer of mechanical equipment to solicit industrial accounts throughout the Province of Quebec. Applicants must reply giving full details, age, training, etc. Salary open. Apply to File No. 3951-V.

INDUSTRIAL ENGINEER thoroughly experienced in time study, standard data and wage incentive installation and administration required for firm in Quebec. Salary open. Apply to File No. 3952-V.

*JUNIOR ENGINEERS, preferably with mechanical background required for general duties by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 3954-V

CITY ENGINEER, required by a City in Saskatchewan to take full charge of its utilities which include electric light, power, sewer, water, sidewalk, etc. Salary open. Apply to File No 3955-V.

*INDUSTRIAL ENGINEER to act as assistant in the Engineering Department of Meat Packing firm with plants throughout Canada, Headquarters in Calgary. Requires knowledge of building construction, mechanical maintenance and power plant work. Experience in refrigeration desirable. Salary open. Apply to File No. 3960-V.

JUNIOR ENGINEER preferably chemical background required for Alberta refinery. Duties include plant tests, inspection of equipment and assistance on designs and specifications. Opportunity for supervised training in all phases of refinery operations. Salary open. Apply to File No. 3961-V.

JUNIOR SALES ENGINEERS with production experience required by a firm of industrial consultants in Montreal. Salary $300 depending on qualifications. Apply to File No. 3965-V.

STRUCTURAL ENGINEER DRAUGHTSMAN, required by a firm of engineer contractors in Alberta. Duties include structural detailer and requires knowledge of major concrete foundations; to detail stuctural steel buildings, access tower platforms and miscellaneous small steel structures. Salary $300.00. Apply to File No. 3972-V.

DRAUGHTSMAN required by a firm of engineer contractors in Alberta for layout of pipelines and details in refinery construction. Preferably background of refinery experience or alternately power-house piping or heavy industrial draughting. Salary $300.00. Apply to File No. 3972-V.

*ENGINEER with estimating and cost experience, able to read blueprints, take of and price materials, evaluate machine and assembly shop operations and fully capable of organizing and installing a Standard Cost System. Required by a manufacturer in Southern Ontario. Salary according to qualifications and ability. Apply to File No. 3977-V.

GRADUATE ENGINEER, with some experience in a manufacturing industry, required by Hamilton company. Some knowledge of production operations, mill scheduling, job evaluation, time study, job methods, industrial relations would be helpful. Salary open. Apply to File No. 3981-V.

*ELECTRICAL OR MECHANICAL ENGINEER, recent graduate, bilingual preferred, required for Public Utility in Quebec City. Salary open. Apply to File No. 3993-V.

GRADUATE ENGINEER, age 32 up, preferably bilingual and with 10 years experience in industrial design required by chemical organization with headquarters in Montreal. Duties include supervision of Works Design Department, supply draughting and design service for plant, prepare appropriation requests, maintain cost estimating units, etc. Salary open. Apply to File No. 3995-V.

GRADUATE ENGINEER, three to 5 years plant experience, required by chemical organization in Montreal. Duties include assisting in developing and carrying out in various plants training programs in subject and related fields for junior industrial engineers. Develop and apply such office routine as may be necessary. Salary open. Apply to File No. 3995-V.

MECHANICAL ELECTRICAL OR CIVIL ENGINEER, age 23-30, preferably single and bilingual with some experience in maintenance required by an industrial and chemical organization with headquarters in Montreal. Duties include construction project and design studies. Salary open. Apply to File No. 3995-V.

* Filled since appearance in advance notice.

*GRADUATE ENGINEER, with some experience in industrial building design to supervise construction of the railway buildings and allied structures of a large railway terminal project in Montreal. Salary $300 to $350. Apply to File No. 3996-V.

*CIVIL OR MECHANICAL ENGINEERS with up to five years design experience required by an engineering firm in Montreal for hydraulic work. Salary open. Apply to File No. 3999-V.

CIVIL OR MECHANICAL ENGINEER wanted with 5 to 8 years experience for key position in moderate size plant in Manitoba doing fabrication of Plate Work and Light Steel Work, also Grey Iron Foundry and Machine Shop. This will lead to key position in a growing organization. Salary open. Apply to File No. 4003-V.

SALES ENGINEER required by a manufacturer of industrial building products in the Toronto area. Preferably with sales experience and knowledge of building products. Salary open. Apply to File No. 4008-V.

SENIOR SALES ENGINEER required as District Manager by a firm manufacturing industrial products in Ontario. Must have considerable sales experience. Salary open. Apply to File No. 4008-V.

MECHANICAL AND CHEMICAL ENGINEERS, interested in entering the Pulp and Paper industry, required in Newfoundland. Vacancies in Technical Department and studying process work and improved methods of operation. Pulp and paper experience is not necessary. Salary open. Apply to File No. 4009-V.

SAFETY SUPERVISOR required for South America. Age 25-40 years. Single. To supervise safety activities, promote safety first and inspect operations to assure proper installation and use of safety devices. Salary $350 U.S. currency. Apply to File No. 4011-V.

RESERVOIR ENGINEER, required for South America. Age 25-35. Should be experienced in reservoir and production cost analysis. Capable of determining efficient flow rates for reservoirs and wells. Salary approximately $400 U.S. currency. Apply to File No. 4011-V.

MAINTENANCE ENGINEER, required for South America. Age 35-40. Duties include, refinery maintenance, inspection of units, metal inspection work. Responsible for engineering calculations, design of equipment and pipefitting work. Salary $375 U.S. currency. Apply to File No. 4011-V.

POWER PLANT SUPERVISOR required for South America. Age 30-40, single preferred. To supervise steam power plant including operating, boiler cleaning and minor repairs. Salary $375 U.S. currency. Apply to File No. 4011-V.

DESIGNING DRAUGHTSMEN preferably graduates in mechanical or electrical engineering with at least 5 years experience in manufacture of sulphite or newsprint pulp required in Province of Quebec. Good salaries and opportunities for advancement. Permanent employment. Apply to File No. 4014-V.

ASSISTANT CITY ENGINEER with experience in municipal engineering required by Sask. City. Duties include operation of pumping sewage disposal and asphalt plants also building inspection department and concrete construction. Salary $4,000 to $4,500. Apply to File No. 4017-V.

ELECTRICAL OR MECHANICAL ENGINEERS required by large Montreal firm to prepare and analyze specifications for telephone equipment manufacturing and installation. Other types of engineering work also available. Salary open. Please send photo together with particulars of education and experience. Apply to File No. 4018-V.

GRADUATE ENGINEER, required as Assistant to Manager of Sawmill and Woodlands operations. Position located in Ontario. Good commercial sense essential also some sales ability Salary $300-$350. Apply to File No. 4021-V.

MECHANICAL, STRUCTURAL AND ELECTRICAL ENGINEERS, required in Trail, B.C., as Designers, Draughtsmen and Construction Cost Estimators for Mining, Metallurgical, Chemical and Fertilizer Plant Design and layout. Salary open. Apply to File No. 4023-V.

ARCHITECTURAL DRAUGHTSMAN experienced in industrial building construction, with natural aptitude for design work, wanted by large industry in Eastern Townships, good salary, permanent position to the right man. Apply to File No. 4031-V.

GRADUATE ENGINEER, CHEMICAL OR MECHANICAL. Age 26 to 29, to act as Sales Engineer for Bituminous Coal Importing Company in Province of Quebec. Previous industrial combustion experience, helpful but not essential. Must be prepared to travel. Salary $350.00 per month. Application in confidence. Apply to File No. 4033-V.

*PLANT ENGINEER, mechanical background, age 35 to 40 required to modernize plant in Quebec. Duties include setting up and maintenance of paper machinery. Salary $4,500 to $5,000. Apply to File No. 4035-V.

DESIGNING ENGINEERS OR DRAUGHTSMEN, preferably but not necessarily with experience in Pulp and Paper Mill work required for paper mill in Newfoundland. Salaries $300.00 per month or better depending upon experience and ability. Apply to File No. 4036-V.

CHEMICAL OR MECHANICAL ENGINEER GRADUATE, age not over 26, required by Montreal firm for industrial combustion service. Salary $250.00 per month up, depending upon qualification and previous experience. Application in confidence. Apply to File No. 4037-V.

SALES ENGINEER for popular line of Diesel Engines, applicants must be specialists on Power Units and Generator Sets Required for permanent employment with well established organization. Apply to File No. 4055-V.

INDUSTRIAL ENGINEER with considerable manufacturing experience. Between 30 and 40 years of age. Required for plant surveys in Province of Quebec. Must be fluently bilingual. Permanent position. Salary according to qualifications. Apply to File No. 4064-V.

* Filled since appearance in advance notice.

Situations Wanted

MECHANICAL AND CIVIL ENGINEER, M.E.I.C., Queen's, age 48, 5 years hydro-electric power development construction, 1 year industrial building construction, 2 years sales engineer and estimator architectural iron works concern, 14 years oil refinery on initial construction, on operations and maintenance, last 6 years refinery engineer in charge of maintenance, safety, equipment inspection, design and construction of plant changes and extensions, industrial buildings. Resigned to undertake private venture. Desires to re-enter industry. Apply to File No. 166-W.

MECHANICAL ENGINEER. Jr.E.I.C., McGill University. Eight years experience Tool and Production Methods Engineer. Age 38. Married. Presently employed. Desires employment as Production Manager or Materials Engineer for large company. Preferably Montreal area. Apply to File No. 551-W.

PART TIME WORK. Senior Civil Engineer P.E.Q., M.E.I.C., Montreal area, available part time where consultant or engineer staff short handed. Preliminary plans, estimates, reports, industrial or engineering projects. Apply to File No. 1021-W.

MECHANICAL ENGINEER, B.Sc., Queen's, '33, M.E.I.C., M.I. A.S., P. Eng, Que. Married, age 37, over twelve years experience including design, stress analysis, maintenance, inspection, administration and 5½ years as an R.C.A.F. Engineer Officer. Presently employed desires permanent position with good future prospects. Preferably in an English speaking locality. Apply to File No. 1042-W.

CIVIL ENGINEER, C.E., B.Sc., M.E.I.C., age 32, married with experience in road construction; surveying; industrial plant lay-out, including steel tank erection; piping design and installation, equipment installation; building construction such as offices, warehouses, service station; costings; estimates; administrative control. Working knowledge of cost and operational studies, inventory work, material necessary for all types of construction work. Will accept responsible position anywhere. Salary in accordance with responsibility and living conditions. Apply to File No. 1914-W.

MECHANICAL ENGINEER, McGill, Jr.E.I.C., P.Eng., Que. Age 26, single, veteran, bilingual. 6 years of varied experience covering general plant maintenance; power-house operation; gasoline and diesel trucks, tractor and locomotive maintenance; residential and some industrial construction. Well versed in Time Study and job evaluation. Position desired in Montreal. Now employed out of town. Available after reasonable notice to present employers. Apply to File No. 2338-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.E.Q., B.Sc. Age 32, married. Presently engaged in Montreal area would prefer position in Eastern Ontario. Experience includes machine design, jig, tool and die design, methods engineering, design development, plant layout, engineering department organization. 4½ years as chief engineer. Also experience in construction industry on building, mechanical and electrical trades. Salary $415 per month. Available one months notice Apply to File No. 2682-W.

ELECTRICAL ENGINEER, B.Eng. Honors, McGill, 1943, Jr.E.I.C., A.I.R.E., P.Eng. (Que.), 26, married, presently employed, desires change to smaller organization with more general scope, broader future, responsible outlook, in Ontario or B.C. Experience in heavy manufacturing, radio production, standardization, specification, audio design. Apply to File No. 2727-W

ELECTRICAL ENGINEER, M.E.I.C., P.E. (N.B.), age 35, married. 12 years experience in electrical machinery including 2 years District Manager of Sub Station in North West Quebec; 3 years Assistant Electrical Superintendent of Gold Mine in North West Quebec; 3 years R.C.E. Electrical Distribution Systems; 2 years teaching in electrical department of a Canadian University. Present teaching position temporary. Apply to File No. 2827-W.

MECHANICAL ENGINEER, Jr.E.I.C., McGill, '44, age 26, bilingual, single, good health. Due to an unusual situation, have not been employed in work of an engineering nature since graduation. Would prefer to locate with organization building custom-built automatic industrial machinery. Available on short notice for assignment in Canada or U.S.A. Apply to File No. 2882-W.

CHEMICAL ENGINEER, Jr.E.I.C., B.Eng., McGill, '45, age 24, single. 2½ years experience in quality control general office work and for over a year with pulp and paper mill (sulphite) on process control working in conjunction with the foreman. Desires position in production, planning, or sales engineering requiring initiative. Prefer Montreal or vicinity. Available on one month's notice. Apply to File No. 2899-W.

CIVIL ENGINEER, Jr.E.I.C., B.A.Sc. (Toronto), P.Eng. (Ont.) with some experience in reinforced concrete and structural steel design including detailing of reinforced concrete and estimating. Would accept part time work during evenings and weekends. At present employed and residing in the Toronto area. Apply to File No. 2910-W.

ENGINEER, (27), graduate of London (England) University, ambitious and energetic with five years industrial experience, lately Deputy Works Manager in a large chemical works. Familiar with design, production control, costing, job evaluation and factory lay-out procedure. Handled a great variety of equipment, tactful leader of men, but keen and able to get results. Willing to accept responsibility. Living at present in Toronto, Ontario, but willing to go to any part of Canada or abroad. Apply to File No. 2912-W.

SUPERINTENDENT GRADUATE ENGINEER, P.Eng. (Ont.), M.E.I.C., 12 years experience with men and cost control in casting, fabricating and machining brass, aluminum and grey iron. Available immediately. Apply to File No. 2913-W.

YOUNG GRADUATE CIVIL ENGINEER, S.E.I.C. Presently employed seeks part time work of such nature that it may be done at home i.e. Estimates, etc. Apply to File No. 2914-W.

CIVIL ENGINEERING STUDENT, S.E.I.C., 3rd year at McGill University would like part time work with firm in Montreal vicinity, dealing with design or construction of structural steel or reinforced concrete; 25-30 daytime hours per week available, plus evenings if necessary. Experienced in foundation construction. Apply to File No. 2916-W.

GRADUATE ELECTRICAL ENGINEER, McGill, '24, M.E.I.C., Prof. Eng., Que.; over 20 years experience in High Voltage Transmission line, design and construction. Interested in part time or temporary position in general engineering or transmission line work. Location preferably Montreal or in B.C. At present residing in Montreal area, due to certain physical defects the type of work that can be undertaken is limited. Available at once. Apply to File No. 2918-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng (Que.), B.A.Sc., Ecole Polytechnique, '44. Presently employed with R.C.E.M.E. Canadian Army. To be released from engagement in one month or two. Age 24, married, bilingual, 2 years experience in automotive engineering, job evaluation, supervision, management and administrative work. Also experience in designing mechanical testing apparatus. Would consider any kind of work with industrial firm. Willing to learn. Apply to File No. 2919-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng., Que., B.Eng., '40, McGill, age 33, married. Presently employed, desires experience in heating and ventilating. Experience with boilers, piping, construction, machine shop and plant maintenance. Available 1 month. Apply to File No. 2922-W.

GRADUATE MECHANICAL ENGINEER, Ph.D. (London), M.E., A.M.I., Mech. E., age 36, single, 10 years' experience in plant maintenance, plant layout, production control, industrial administration, research and development. At present employed in the Montreal district. Apply to File No. 2929-W.

CIVIL ENGINEER, M.Sc., M.I.T., Jr.E.I.C., interested in part time work in steel and reinforced concrete design. Presently employed as instructor at a Canadian University. Four years practical experience in design. Must be Montreal area. Apply to File No. 2930-W.

GRADUATE MECHANICAL AND ELECTRICAL ENGINEER, M.E.I.C., P.Eng. (Ont.), age 39, married. 16 years of experience here and in Europe includes mechanical, electrical and optical design, applications, sales, administration, inspection of production, statistical quality control. Knowledge of foreign languages. Presently engaged in Montreal area, salary $420 per month, would prefer position in Ontario or B.C. Available one month's notice. Apply to File No. 2931-W.

GRADUATE, Institution of Mechanical Engineers (England), age 25, seeks position of Junior Engineer with a firm engaged in producing consumer goods. Five years engineering apprentice; one year draughting; and three years as junior metallurgist mainly occupied in solving production problems from a metallurgical aspect. Apply to File No. 2933-W.

GRADUATE ENGINEER, M.E.I.C., age 30, veteran, married. Experience includes maintenance, construction, production, etc. Toronto area preferred. One month's notice. Apply to File No. 2934-W.

CHEMICAL ENGINEER, S.E.I.C., age 25, experience, process control in rubber and heavy chemicals; engineering in distillery. Presently employed seeks position with greater scope in engineering work. Available one-month's notice. Will travel anywhere. Apply to File No. 2936-W.

MECHANICAL ENGINEER, Jr.E.I.C., B.Eng., McGill, '44, P. Eng., Que., age 24, veteran, proceeding toward Masters Degree, seeks employment for months May to September inclusive, on research or development projects or with consulting engineer. Varied experienced in production, mechanical design and layout work. Would be able to continue project part time after October if necessary. Apply to File No. 2942-W.

ELECTRICAL ENGINEER, M.E.I.C., P.Eng. (Que.), B.A.Sc., Diploma in Business Administration; age 29, married; seven years industrial engineering and technical sales supervision in electrical industry. Available in May. Industrial marketing, or management engineering. Apply to File No. 2946-W.

CAMBRIDGE GRADUATE ENGINEER, M.E.I.C., P.Eng. (Ont.), age 29, married. With Civil, Aeronautical and Mechanical background. 4½ years R.A.F. Pilot and Instructor and 3½ years practical experience in consulting and municipal engineering on surveys, design estimating and construction work. Requires responsible and progressive position where full use can be made of wide interests. Location Ontario (where presently employed) or Western Canada. Apply to File No. 2943-W.

CIVIL ENGINEER, Jr.E.I.C., P.Eng. (Que.) McGill graduate desires spare time work evenings and week-ends on design and detail of reinforced concrete and steel structures. Also qualified to make stress analysis of rigid frames and most statically indeterminate, structures. Location Montreal. Apply to File No. 2947-W.

ELECTRICAL ENGINEERING GRADUATE

Required with minimum of five years' experience in Paper Industry. Between 35-45 years of age, for responsible position with large newsprint manufacturing concern in Northern Ontario. Salary commensurate with qualifications. Living accommodation assured.

Apply stating experience and background to File No. 4032-V.

GRADUATE ELECTRICAL ENGINEER

With a minimum of two years practical experience to assist in electrical engineering design work. Field work on construction and maintenance of structures, service and installation of equipment. To direct small group of assistants, etc. Salary $226.00-$257.00 per month. Apply City of Winnipeg, Central Employment Registry, 4th Floor, 160 Princess Street, Winnipeg, Manitoba.

EMPLOYMENT FOR STUDENTS

The Minister of Labour has announced from Ottawa that the Bureau of Technical Personnel and the Department are continuing the excellent employment service established some years ago by the Bureau to find employment for engineering undergraduates and graduates.

The Minister has written to a great number of employers asking them to examine their requirements for next summer and to report back to the Department. The *Journal* is happy to co-operate with the Department in this worthy effort and urges all the employers who read this page in *The Engineering Journal* to comply at the earliest possible moment with the Minister's request.

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Business & Industrial Briefs

A Digest of Information received by The Editor

C.I.L. Appointment

Robert M. Watson has been appointed district sales manager of the explosives division of Canadian Industries Limited, in Edmonton, Alberta. Since joining the Vancouver office of C.I.L. in 1921, Mr. Watson has served in every province with the exception of Saskatchewan. Between 1936 and 1947 he was the local sales manager in Kirkland Lake, Sudbury and Edmonton.

Canadian International Trade Fair

The Canadian International Trade Fair, which was authorized by order-in-council in August, 1946, will be held in Toronto between May 31st and June 12th, 1948.

It is estimated that there will be between 1200 and 1500 individual exhibits from twenty six different countries. Buyers from outside North America are expected to exceed ten thousand and will represent fifty two countries. Toronto hotels are cooperating closely with the Trade Fair officials and all hotel and guest home accommodation for that period will be funnelled through the public relations department of the Canadian International Trade Fair.

Early in February approximately 30,000 invitations to attend the Fair were sent to buyers in Canada and America.

New Foster Wheeler Bulletin

Foster Wheeler Limited of St. Catharines, Ontario, have recently published a new bulletin—CB 47-10—entitled "S-A Steam Generators."

The bulletin is very attractive and most informative in content.

Readers are invited to apply to the Company for copies.

Auto-Filtration Company Appointed Sales Agent

The Hardinge Company, Inc., York, Pa., have announced the appointment of the Auto-Filtration Company of Montreal as sales agent for the Province of Quebec, the Maritime provinces and Newfoundland. These newly appointed agents will sell Hardinge automatic backwash rapid sand filters, clarifiers, flocculators, and digesters. This information should be of particular interest to readers who are employed in the pulp and paper industry, or by municipalities.

C. W. Baker Receives New Appointment

Crawford Gordon Jr., President of English Electric Company of Canada Limited has announced the appointment of C. W. Baker as Engineering Consultant to the vice-president. Mr. Baker is a graduate of Queen's University and he has been actively engaged in electrical engineering for over forty years. For the past fourteen years he has been chief engineer of the Company.

An Industrial Cleaning Cloth

Metal Textile Corporation of Canada Limited, Hamilton, Ontario, have announced the production of a new industrial cleaning cloth which will be marketed under the trade name of "Nickeltex".

It is made of "Z"-nickel, an alloy containing approximately 94% nickel. Special corrosion elements have been added to make it heat treatable for greater wear resistance and strength.

The manufacturers claim that it is superior to other industrial cleaning cloths and that it will be very valuable for use in many types of industry.

Link-Belt Catalogue

"Link-Belt Machinery for Handling and Preparing Sand, Gravel, Stone" is the title of a new 64-page Book No. 2126 published by Link-Belt Limited. For copies please apply to Link-Belt Limited, Eastern Avenue at Leslie and Keating Streets, Toronto, 8. To expedite reply mention the catalogue by number.

Brown, Boveri Handbook

Brown, Boveri (Canada) Limited, of 1111 Beaver Hall Hill, Montreal, 1, Que., have informed the editor of the *Journal* that they have available a supply of a booklet, "A Review of Our Work and Products".

The booklet was produced in Switzerland. It is most informative and profusely illustrated.

It deals with the history of the Brown, Boveri Company at Baden, Switzerland; the research laboratories; range of manufacture; the test plants and lists the products of the company.

For copies please communicate with the Canadian Company.

A Calculator Chart

Howard M. Edmunds Consulting Engineer of 6, East 39th Street, New York 16, N.Y., has announced the development of a new calculator chart known as the "Rapidadd Chart".

It has no moving parts and can be used without removing from the table. It may be used for the addition and subtraction of fractions down to 64ths. It is claimed that a series of fractions may be added successively without writing them down.

The price is moderate.

For details communicate with Mr. Edmunds.

C.G.E. Announcements

A. M. Doyle has been appointed manager of the Apparatus Division of the Company. Mr. Doyle has had extensive experience in the field of power station engineering. He has been with C.G.E. since his graduation from the University of Manitoba in 1928. Previous to his present appointment he was manager of the transformer section of the Company's Apparatus Department.

A twelve-page bulletin on Trolley-Type Mine Haulage Locomotives is now available from the Canadian General Electric Company Limited. The bulletin covers locomotives from 10 to 30 tons and 250 or 500 volts. It should be particularly valuable to mine operators.

Requests for the bulletin may be sent to any C.G.E. office. Refer specifically to Bulletin GEA-4676.

A 28-page booklet on "Formex Magnet Wire" is available. It should be of special interest to Engineers in rewind shops and refrigerator and electric-motor plants. The publication is most comprehensive in content. Refer to any C.G.E. office for a copy quoting bulletin CGEA-3911A.

A 24-page booklet on "Distribution Transformers"—which will be particularly valuable to electrical engineers in utilities, industry, mining and railways—is available. It deals with oil immersed transformers in ratings up to 200 Kva, 15,000 volts, single and three-phase. Apply to your nearest C.G.E. office and request bulletin CGEA-2600A.,

Electrical contractors, consulting engineers, architects and electrical superintendents will be particularly interested in an illustrative pamphlet "Twin-Turret Industrial Fluorescent Luminaire". Apply to the nearest C.G.E. office and refer to the bulletin by number—4399.

New Amalgamated Electric Catalogue

"Lighting Equipment" is the title of a new ten-section catalogue issued by Amalgamated Electric Corporation, Limited, 384 Pape Avenue, Toronto, Ont.

This catalogue is concise, attractive and easy-to-read. It contains complete information on the Company's extensive range of commercial and industrial lighting fixtures and equipment. The over-all dimensions make the publication the right size for shelf or portfolio.

Contact your nearest Amalgamated Electric district office, or the head office in Toronto, for your copy.

A Slide Rule

Pickett & Eckel Inc., 111 South Freemont Avenue, Alhambra, California, have announced the production of a climate-proof all metal Slide Rule.

It is known as the "Ortho-Phase Log Slide Rule".

The manufacturer claims that this instrument has many advantages over those of older type and design. For details write to the Company.

The Northern Electric Five Year Plan

The Northern Electric Company Ltd., have announced a five year plan of expansion which will involve the expenditure of 13 million dollars.

This plan has been developed to extend the Company's production and distribution facilities. Of the amount to be spent approximately $5,000,000 will provide more than 400,000 sq. ft. of additional manufacturing floor space; $5,650,000 will be spent on tools, machinery and material handling equipment and $2,600,000 will establish a number of new distributing premises, as well as enlarge and modernize existing buildings.

Largest unit in the Company's expansion programme is the new wire and cable plant now nearing completion at Lachine, Que.

C. R. Chataway in New Position

John Inglis Company Limited has announced the appointment of C. R. Chataway as district sales manager of the Vancouver office. He is a graduate of the University of Manitoba in Mining. For the past three years Mr. Chataway has been engaged in sales work at the head office of the company in Toronto.

American Can Company Appointment

C. A. Bartells has been appointed assistant manager of manufacture for the American Can Company in Canada. Mr. Bartells has had long service with the Company and until his present appointment he served as superintendent of manufacture for the Pacific division. He will make his headquarters at Hamilton.

Netherlands Shipping Recovery

The Dutch merchant fleet is again in a position to contribute to the credit side of Holland's balance of payments. According to the Netherlands Government Information Bureau, net returns in foreign exchange of Dutch ocean shipping during the period from October 1, 1946 to October 1, 1947 are estimated at between 300 to 350 million guilders.

In the Government release from which our information was obtained it is stated that five hundred and fifty million tons of shipping is being constructed for the Dutch merchant marine.

Link-Belt Appointment

H. J. Harris has been appointed manager of the Vancouver office of Link-Belt Limited. He has succeeded Frank B. Wetherill who has retired.

Mr. Harris has been with the Company since 1924.

X-Ray Examinations for Employees

Using its own modern X-ray equipment the Chrysler Corporation of Canada Limited is giving its more than 4,500 employees in Windsor Ontario a chest examination as a safeguard against tuberculosis. This announcement was made by Dr. John A. MacLennan, the Company's chief medical advisor.

It is claimed that this is one of the largest mass X-ray examinations ever attempted by a Canadian industry and that Chrysler was the first company in Windsor to instal full size hospital-type X-ray equipment.

New Line of Suspension and Strain Hardware

The Canadian Ohio Brass Company Limited, Niagara Falls, Ontario, is producing a new line of suspension and strain hardware, utilizing the non-magnetic quality of aluminum alloy in high voltage clamp design. The new line of clamps will be known as "Cooline". The chief advantages claimed are—direct power saving, reduction in pitting and burning, minimization of low temperature annealing, increase in transmission line amperages.

For complete details please communicate with the Company at the address given above.

John Inglis Co. Controls English Electric Co.

Combining total assets of over $10,500,000 in two well known Canadian engineering firms, John Inglis Co. Limited has acquired full control of English Electric Company of Canada Limited, through an exchange of shares. English Electric will continue to operate in St. Catharines, Ont., as a wholly-owned subsidiary of John Inglis Co. which also controls Production Castings Ltd., at New Toronto. The three companies employ over 2,200 people.

As a result of this merger it is believed that economies can be effected in operations and sales can be further expanded.

New Composite Strip Available

The development of rolled nickel and Monel clad strip was announced by the Superior Steel Corporation, Carnegie, Pennsylvania.

This composite strip is available in widths between one-quarter of an inch and ten and one quarter inches, in coils ranging up to several hundred feet depending upon gauge. In the cold rolled condition it is produced in thicknesses between 10 and 125 one-thousandths of an inch. In the hot rolled condition it is available in thicknesses between 95 thousandths and 1/4 of an inch.

According to a communiqué received by the editor of the "*Journal*" it is impossible to separate the nickel or Monel cladding from the steel base by any other means than the chemical dissolving out of the steel. Separation, it is claimed, cannot be effected by mechanical means or by heating. Because of this fact, the clad strip can be stamped, drawn, spun, bent, spot-welded, or otherwise fabricated in the same manner and with no more difficulty than ordinary low carbon, deep-drawing steel.

For complete details communicate with the International Nickel Company of Canada Ltd., 25 King Street, West Toronto 1, Ont.

Gardner-Denver Co. Announces New Pump

A new Sump Pump known as the VP-4 has just been announced by the Gardner-Denver Co. It has been designed to overcome one of the most common causes of pump failure — breaking of the pump shaft seal because of water pressure.

The design of the pump embodies a new principle. For complete details communicate with your nearest Gardner-Denver agent or directly with the company.

Bell Telephone Developing Metal Lens

The Bell Telephone Company of Canada have stated that an entirely new type of metal lens, for focussing radio waves in radio relay systems, is under development at the Bell Telephone Laboratories.

According to the Company announcement, present plans call for the use of the lens—theoretically capable of handling from 50 to 100 television channels or tens of thousands of simultaneous telephone messages—in the proposed radio relay link which the Bell System is planning between New York and Chicago.

"The Dominion Engineer"

Copies of the Dominion Engineering Company Ltd., publication, "The Dominion Engineer" are available to members of the Institute. Readers who would like to receive the publication regularly are invited to communicate with the Dominion Engineering Co. Ltd., Post Office Box 220, Montreal, Que.

Canadian Car Appointment

Victor M. Drury, president of Canadian Car & Foundry Company, Limited, has announced the appointment of Arthur Hodgkinson, comptroller and treasurer, as a vice-president of the Company, effective February 23, 1948, with the title of vice-president, comptroller and treasurer.

Thirty-One Million C.P.R. Expenditure

According to information received from the Company, the Canadian Pacific Railway has authorized more than $31,000,000 in new equipment orders for 1948. Purchases will include 44 diesel locomotives, 2,100 freight and work cars and 115 passenger cars.

Combined with a carry-over of orders, in excess of $42,000,000, from previous years, for items on which the Road is awaiting delivery, this brings to more than $63,0000,00 the value of motive power and rolling stock contracts outstanding.

W. M. Neal, chairman and president of the Company stated, "thirteen of the diesels will go to the Esquimalt and Nanaimo Railway on Vancouver Island which is being completely dieselized".

Among the companies with which contracts have been placed are, National Steel Car Corp., Hamilton, Ont.; Canadian Car and Foundry Co. Ltd., Montreal; Montreal Locomotive Works and the Angus Shops, Montreal; Eastern Car and Foundry Company, Trenton, N.S.; the Canadian Locomotive Company, Kingston, Ont.

New Haydon Catalogue

Haydon Manufacturing Co. Inc. of 245 East Elm Street, Torrington, Conn., have produced a new catalogue No. 320. The catalogue contains complete information on the Company's timing motors and devices, clock movements and Haydon's time engineering service. Copies of this interesting publication may be obtained on application to the Company at the address given above.

"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

WOOD PRESERVATION

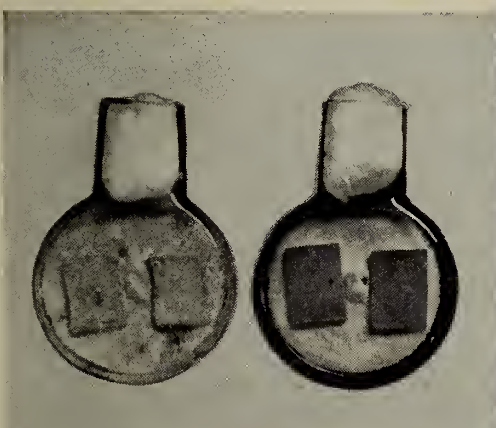
SANTOPHEN 20

higher killing power... at lower concentrations

COMPARATIVE TOXICITY DATA*
Killing Concentration of Various Materials to the Fungus "Madison No. 517" (Formerly called Fomes annosus)

Preservative	Killing Concentration (% by weight)	Reported by
PENTACHLOROPHENOL	0.002	Bateman and Baechler
Mercuric chloride	0.005 to 0.006	Bateman and Baechler
2-Chlororthophenylphenol	0.009 to 0.01	Hatfield
Betanaphthol	0.015	Bateman and Baechler
Sodium dichromate	0.03	Bateman and Baechler
Sodium chromate	0.034	Bateman and Baechler
Coal-tar creosote, sample 8387 (sp. gr. 1.040)	0.05 to 0.1	Schmitz
Zinc-meta-arsenite	0.10	Curtin and Thordarson
Borax (sodium tetraborote)	0.13	Bateman and Baechler
50:50 creosote-coal-tar solution	0.2 to 0.6 (according to creosote used)	Schmitz
Boric Acid	0.25	Bateman and Baechler
Sodium fluoride	0.25	Richards
Wood-tar creosote	0.25 to 0.05	Hatfield
Zinc chloride	0.35	Richords
50:50 creosote-petroleum solution	0.5 to 3.0 (depending on oils used)	Schmitz
Coal tor, somple 8400 (sp. gr. 1.166)	0.9 to 1.0	Schmitz
Woter-gos-tar creosote (Sample 2233)	6.5 to 0.65	Fleming and Humphrey
Petroleum	Above 10.0	Schmitz

*Reproduced (in part) by permission from WOOD PRESERVATION by Hunt and Garrett, Copyrighted, 1938, by the McGraw-Hill Book Company, Inc.



KOLLE FLASK TESTS
Fungus uncontrolled — Fungus controlled with Santophen 20

Outstanding killing effectiveness at low concentrations is one of the many reasons for using Santophen 20 (Monsanto's pentachlorophenol) for the preservation of poles, crossarms, ties and structural timbers of all types. The comparative toxicity data shown here indicate the high potency of Santophen 20 in destroying wood-rotting fungi. Lasting protection against termites and other wood-boring insects is provided.

Complete application and formulating data are available in Monsanto's 16-page book, "Wood Preservation with Santophen 20 in Oil Solutions by Pressure Processes." For your copy, write to MONSANTO (CANADA) LIMITED, Montreal-Toronto-Vancouver, or simply return the convenient coupon.

Santophen: Reg. U. S. Pat. Off.

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378 St. Paul W., Montreal — EJ-2

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Company ______
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Behind every Gutta Percha transmission belt is 64 years of rubber belt experience. This accumulated specialized knowledge is yours for the asking to help you with your belting problems. Write to—
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Head Office and Factory, Toronto
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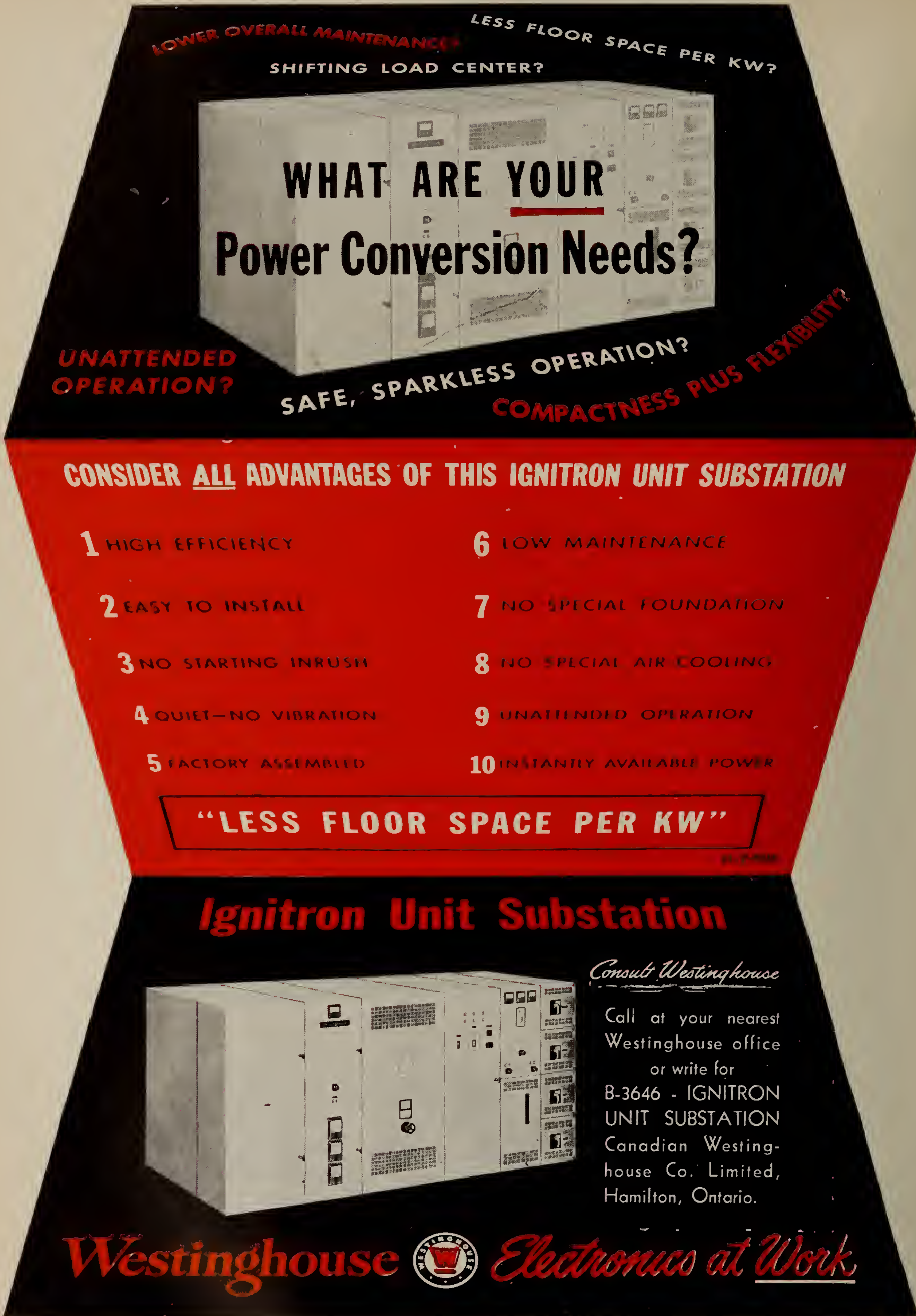
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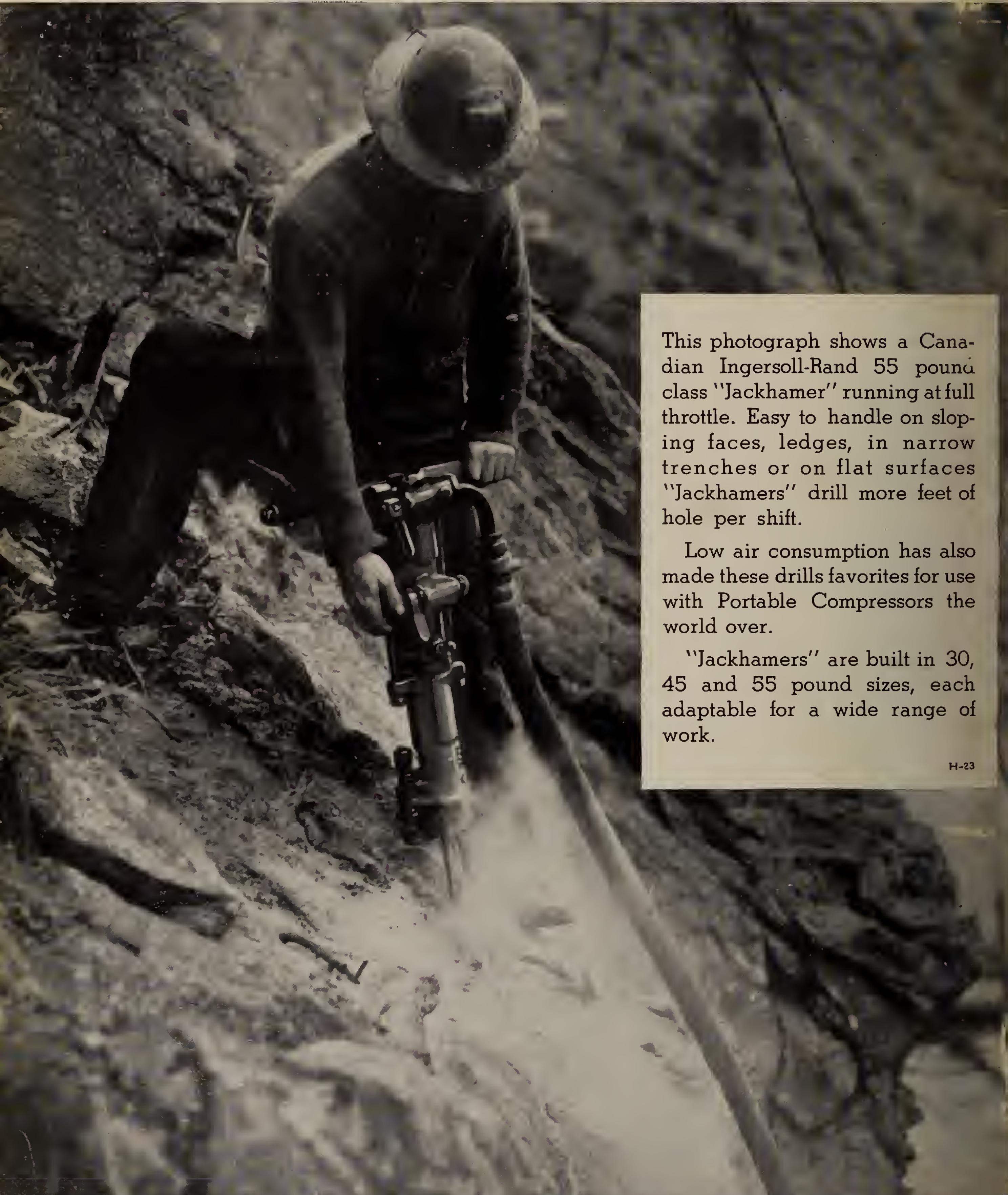
Westinghouse
Electronics at Work

Index to Advertisers

The revenue derived from the sale of advertising space enables the *Institute* to publish the *Journal* on a regular monthly basis. Listed below are the names of the Companies and Individuals whose advertisements appear in this issue.

EASY HANDLING HARD HITTING "JACKHAMERS"



This photograph shows a Canadian Ingersoll-Rand 55 pound class "Jackhamer" running at full throttle. Easy to handle on sloping faces, ledges, in narrow trenches or on flat surfaces "Jackhamers" drill more feet of hole per shift.

Low air consumption has also made these drills favorites for use with Portable Compressors the world over.

"Jackhamers" are built in 30, 45 and 55 pound sizes, each adaptable for a wide range of work.

H-23

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head office - MONTREAL QUE. —— *works* - SHERBROOKE QUE.

THE ENGINEERING JOURNAL

VOLUME 31 NUMBER 4
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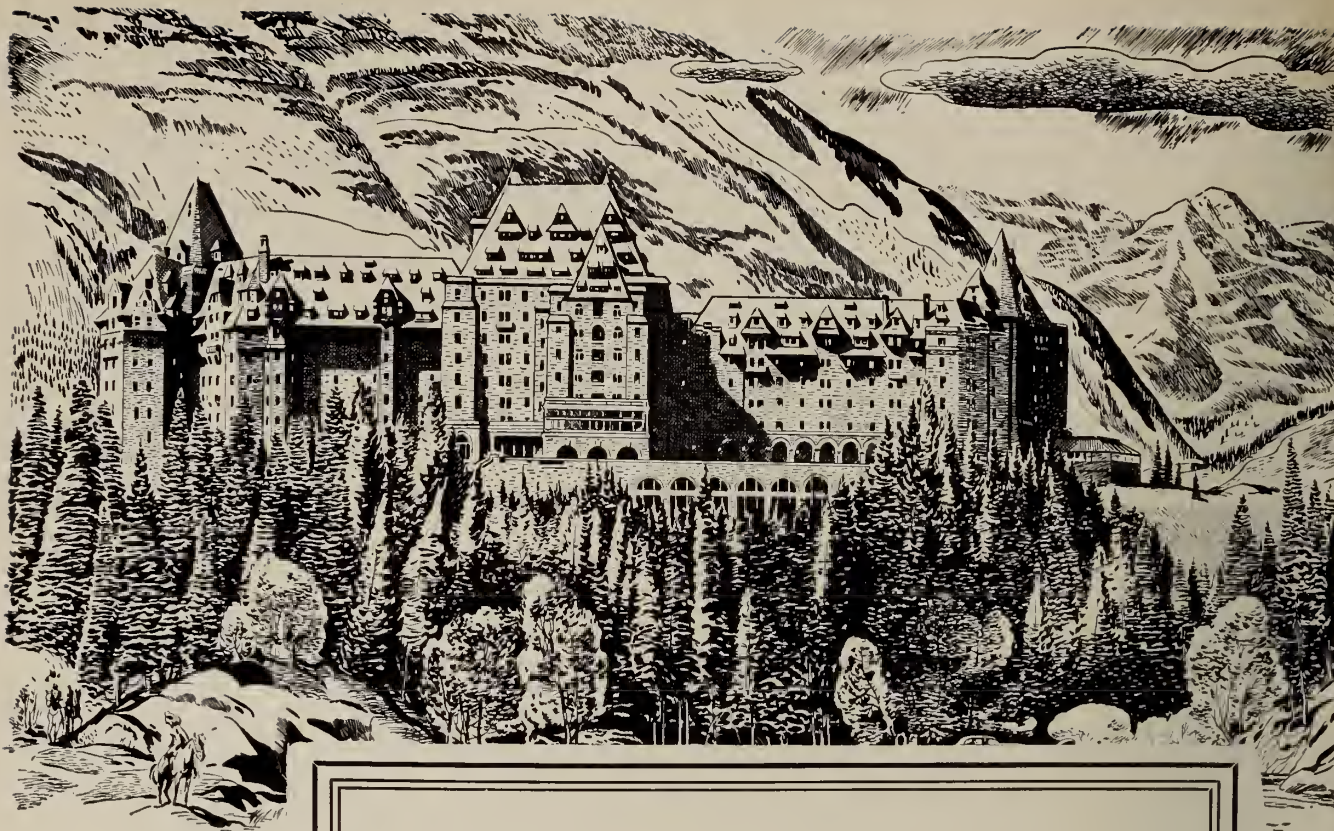
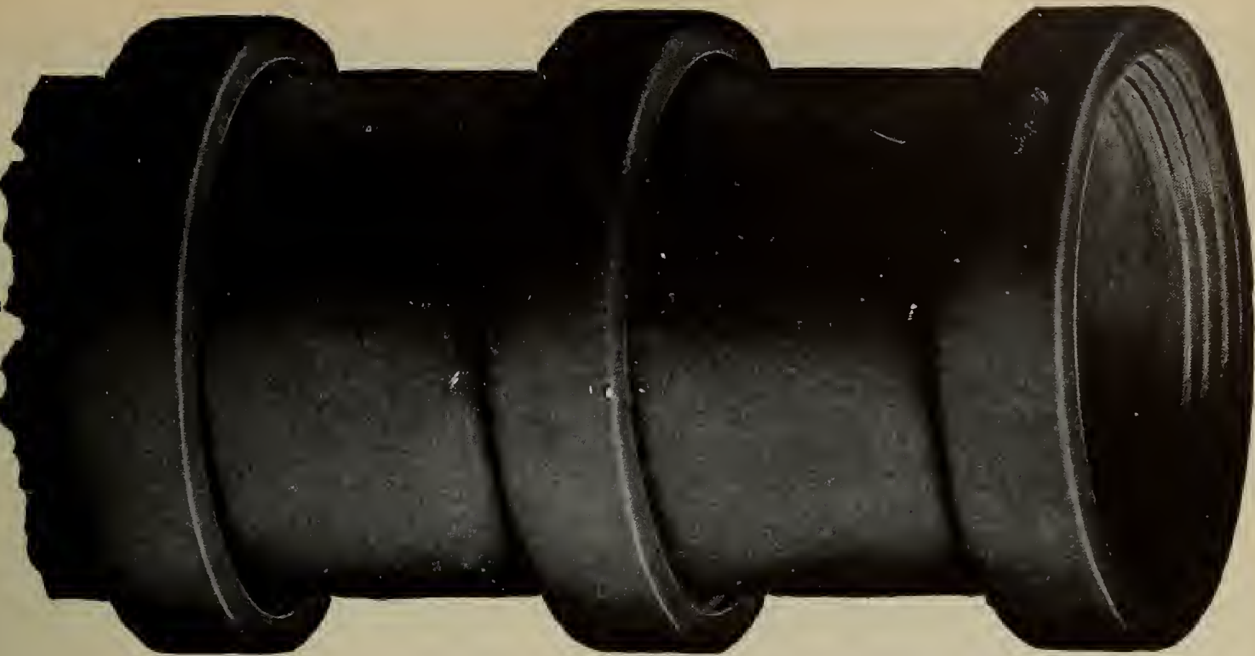
PUBLISHED MONTHLY BY
THE ENGINEERING INSTITUTE of CANADA



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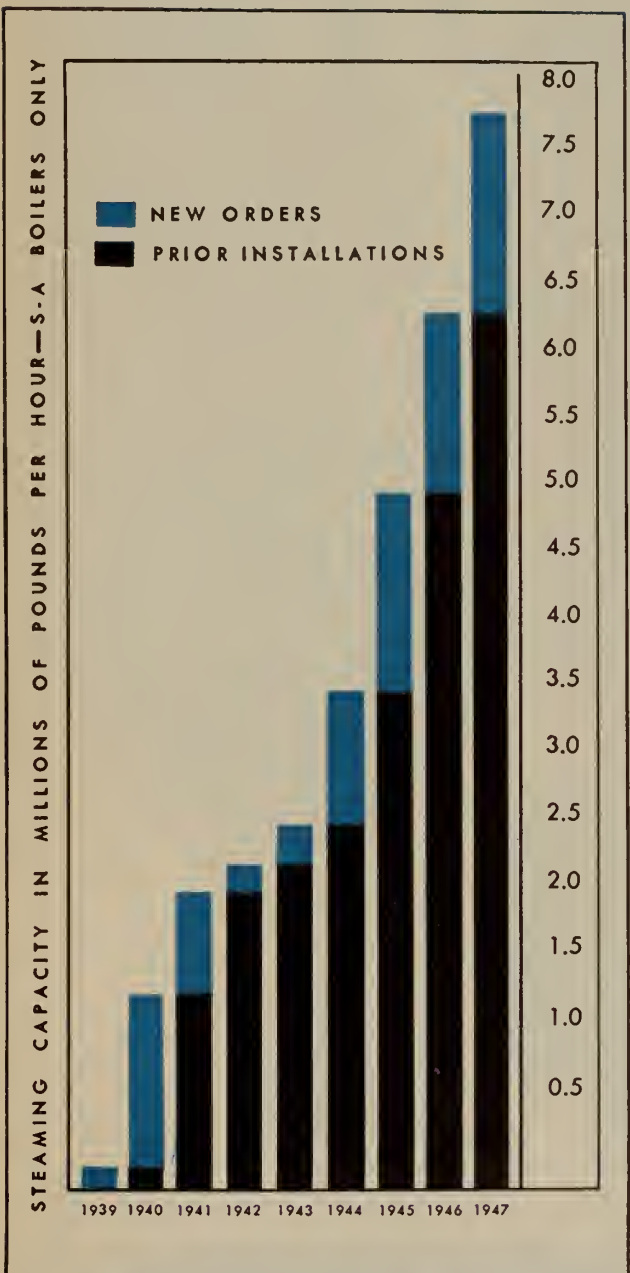
AN INNOVATION

1938 - *The "SA" Boiler was conceived*
1948 - *Nearly 8 million lbs. per hr.*



The Growing Trend Toward SA Boilers in Canada

It was less than 10 years ago that FW Engineers conceived the principle of the "SA" Boiler.

They were looking for an improved boiler that could be standardized and yet adapted to units of all sizes—a design that would eliminate the conventional external waterwall header systems which placed certain limitations on flame travel and furnace volume—a design which would also do away with the complicated inefficient method of convection bank baffling which resulted in high draft losses.

In 1938, after a great deal of study, FW Engineers found the answer to these problems in the "SA" ("S"-ingle Pass, "A" Type) Design as illustrated and described on the opposite page.

In 1948 the "SA" Steam Generator, with its many unique advantages, has been accepted by Canadian steam engineers as illustrated by the accompanying chart showing the rapid yearly increase in installed capacity. Since the first "SA" Boiler was installed in 1939, only the wartime marine boiler program has retarded the sharply rising curve of installed capacity. Repeat orders from satisfied customers have accounted for twenty-seven percent of the nearly eight million pounds of installed steaming capacity.

MADE IN CANADA

"SA" boilers are completely engineered and fabricated in Foster Wheeler's modern plant at St. Catharines, Ontario — erected and serviced by experienced FW field engineers.

FW FOSTER

Less Deadweight—More Payload

THROUGH "STELCOLOY"

LOW-ALLOY HIGH-TENSILE STEEL

Hopper car built of "Stelcoloy" by Canadian Pacific Railway.

"STELCOLOY", the new nickel-copper steel plate, permits the design of rolling stock for increased payloads without sacrificing strength.

"Stelcoloy" possesses sound weldability, good formability, excellent resistance to corrosion, shock and abrasion.

Among the outstanding uses of "Stelcoloy" are the construction of: Railway Box Cars and Coaches, Mine Cars, Motor Buses, Automotive Parts, such as Bumpers, Truck Bodies, Trailers, Cargo Holds for Lake Vessels.

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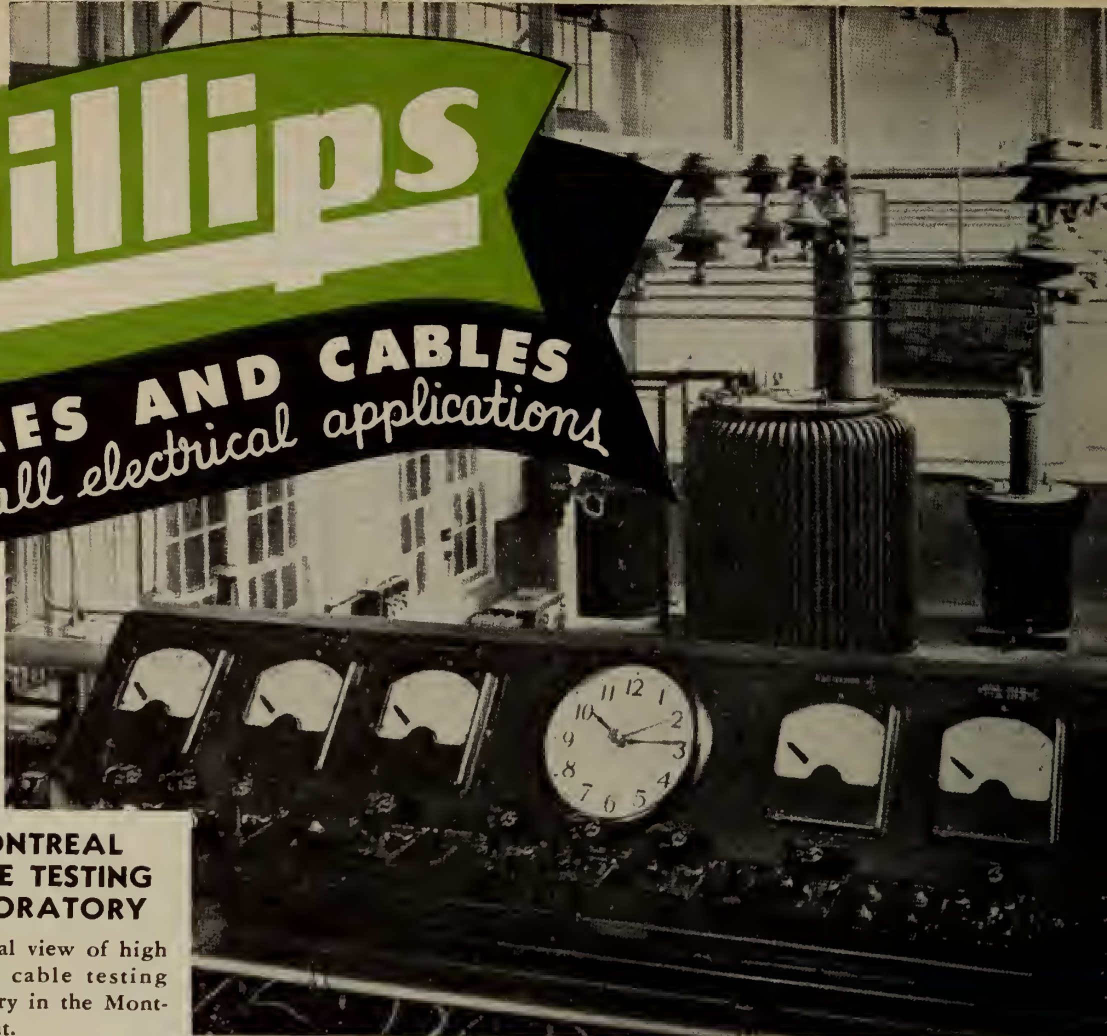

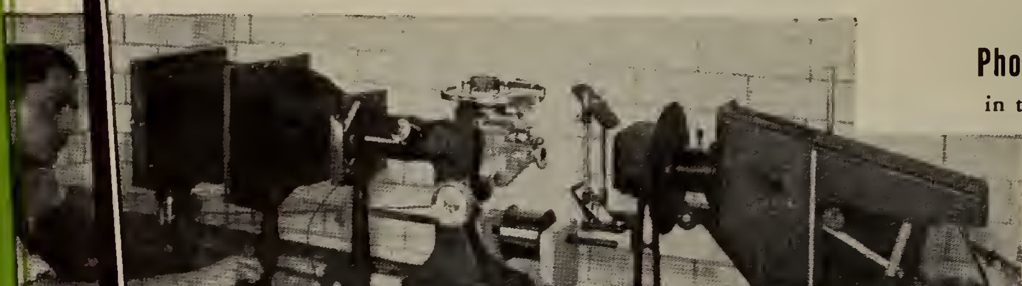


PLATEWORK
FOR EVERY INDUSTRY
TABLE OF CONTENTS
Aerial Views Of Principal Plants
Introduction
Platework For following Industries:
Refineries
Pulp & Paper Mills
Steel Mills
Nickel Manufacture
Aluminum Manufacture
Rubber Processing
Mining
Chemical Manufacture
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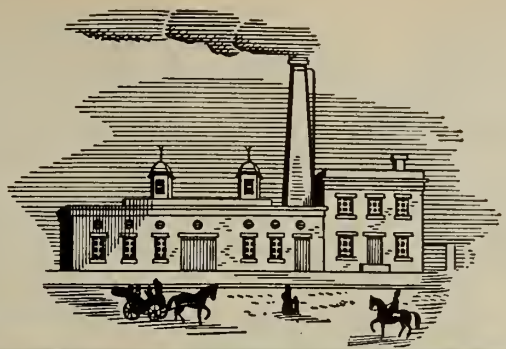

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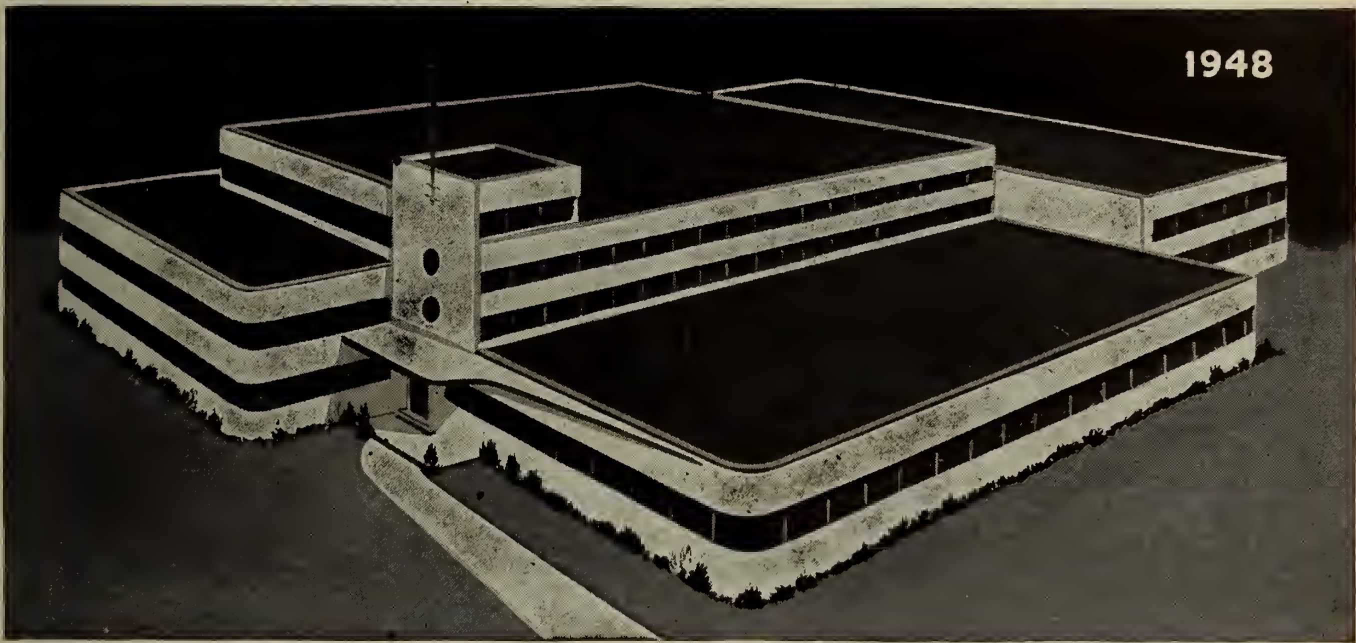

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Experience counts . . . especially in roofing. Convincing proof is the record-making Barrett Bonded Job No. 1 . . . the first of many Barrett "SPECIFICATION" roofs in Canada to outlive its bond without maintenance or repair.

Job No. 1 was no accident. It was the result of many long years of aggressive pioneering in the built-up roofing field. Barrett was the first to promote built-up felt, pitch and gravel roofs. First to use standard specifications. First to establish approved roofers. First to bond built-up roofs. And first to develop almost every major refinement in built-up roofing practice. Refinements that today are accepted as standard in the business. Today, the built-up felt, pitch and gravel roof is considered the finest type of industrial roofing, and the Barrett "SPECIFICATION" roof is regarded as leader in the fiield.

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3. Gravel or slag armoured top embedded in hot pitch protects roof against elements, mechanical damage, wear and tear. It interposes a surface of fireproof rock between building and flying embers.
4. Only these materials, applied by a Barrett Approved Roofer in accordance with time-tested Barrett specifications, and examined by a Barrett Inspector make the Barrett "SPECIFICATION" roof.

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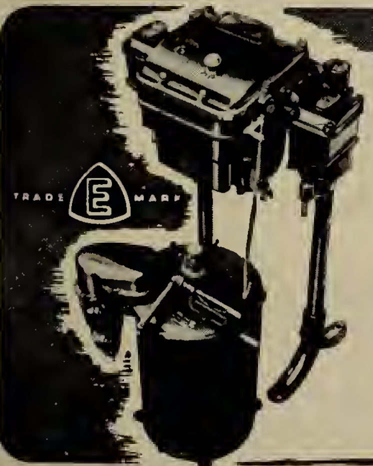

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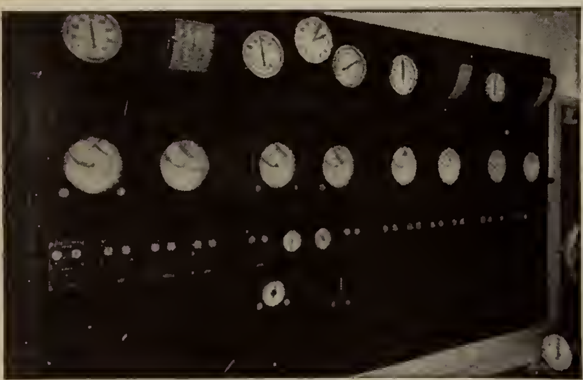

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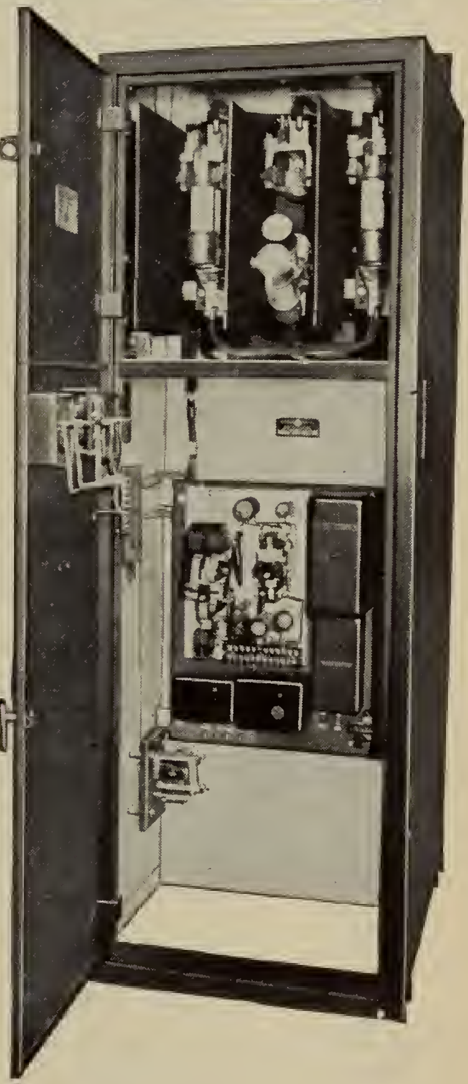

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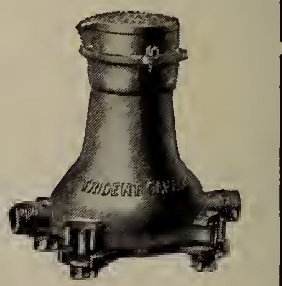

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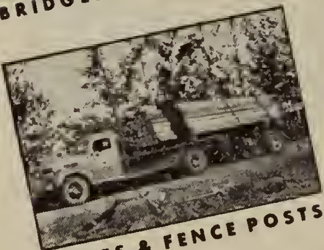

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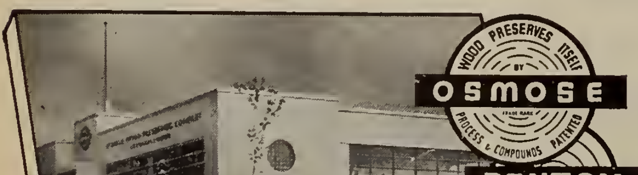

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

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CONTENTS

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COVER PICTURE

Beautiful Banff Springs Hotel—where the Sixty-second Annual General Meeting of the Institute will be held—as seen from the Sulphur Mountain trail.

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The Institute is indebted to the Canadian Pacific Railway Co. for the illustration.

Novel Concrete Headframe for Asbestos Mine

by

Per Hall, M.E.I.C.

Designing Engineer, Foundation Company of Canada, Montreal

A paper specially prepared for publication in The Engineering Journal

The author describes a recent innovation in the design and building of mine headframes, using reinforced concrete built with sliding forms. The job conditions calling for such a type of construction are given, and details of both design and construction are discussed.

An interesting and unusual mine headframe has recently been completed for the asbestos mine of the Canadian Johns-Manville Company at Asbestos, Quebec, the world's largest asbestos property. It takes the form of a reinforced concrete cylinder 30 feet in height, with 12-in. walls supported on the mine shaft collar.

Though a number of reinforced-concrete headframes have been erected in the past, it is believed that this headframe, both in conception and with regard to design and the use of sliding forms for its construction, constitutes an innovation in the field of mine structures. Moreover, it offers a number of advantages over the conventional types, viz., elimination of special foundation; elimination of scarce structural steel; use of sliding forms; reduced fire hazard; low maintenance cost; and good basic appearance, which can be accentuated by suitable architectural treatment.

The first three of these features facilitate prompt and speedy construction.

In this particular case, the cost was practically the same as it would have been had structural steel been used. However, this is hardly a fair test, because all the basic conditions had been established to suit a conventional steel headframe, and for this reason it was not possible to exploit all the advantages offered by a reinforced-concrete design. In fact, a rational development of these types of headframes should result in very substantial savings to mine operators.

Sinking the Shaft

In the spring of 1946, the general contractors, The Foundation Company of Canada, had sunk a shaft for the owners to approximately 1000 ft. below the surface, as a part of the Company programme to mine extensive underground ore bodies. This shaft accommodates compartments for two 10-ton skip buckets, one 15-ton cage, a man-way and pipe-way, and a well for the cage counterweight, all within an opening of 13 ft. 6 in. x 18 ft. (Fig. 1). The sinking of the shaft was complicated by the presence of 75 ft. of over-burden, consisting of approximately 3 ft. of mine tailings, 18 ft. of hard dry clay, and 24 ft. of gravel and sand, underlaid by 34 ft. of sticky blue clay immediately above bed rock at Elev. +671. (Fig 2).

An open pit was first excavated to a depth of 30 ft. below the surface. Below this level, water flow made it necessary to complete the balance of the excavation within a cofferdam. 80 pieces of steel sheet piles were driven in a ring of 32 ft. diameter. After considerable difficulties due to the flow of water through the gravel the shaft was successfully bottomed and sealed. From Elev. +671 down to the bottom level at Elev. —249, the shaft was sunk square through serpentine rocks, and provided with a concrete lining of 12 in. minimum thickness flush with the inside of the steel sets, as protection against sloughing or breakage of the rock walls.

Above bed rock Elev. +671, the cofferdam was

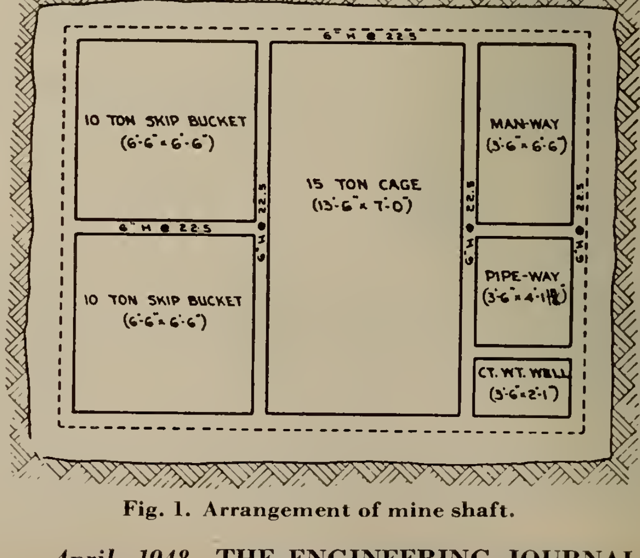

Fig. 1. Arrangement of mine shaft.

filled with concrete to Elev. +720, leaving a 20 ft. x 15 ft. opening concentric with the mine shaft below. A concrete cylinder 26½ ft. I.D. and 30½ ft. O.D. was poured from Elev. +720 to Elev. +747 and topped off with a 4 ft. slab to Elev. +751, with an opening corresponding to the mine shaft.

Basis for Design

In the spring of 1946, when the hoist-house was under construction, plans were prepared for a conventional structural-steel headframe with overhead bins for ore and waste rock, supported on piles driven through the overburden to bedrock. Plans for other mining buildings, including change and collar houses, were also well advanced and the general layout was pretty well established. All surface structures, with the exception of the headframe itself, are founded on spread footings designed for a general bearing value of 2000 lbs. per sq. ft.

However, by May 1946, it became clear that difficulties in obtaining deliveries on steel for this headframe would delay the completion of the project a year or more beyond the scheduled date. Furthermore the prevailing high prices on structural steel would increase the cost substantially.

In view of this, the owners requested the contractors to develop an alternative design for the headframe in reinforced concrete, which could be erected without delay and put in operation by early 1947. All mechanical equipment had been ordered for the steel design and, to avoid delays, it was necessary to design the concrete headframe to match this equipment,

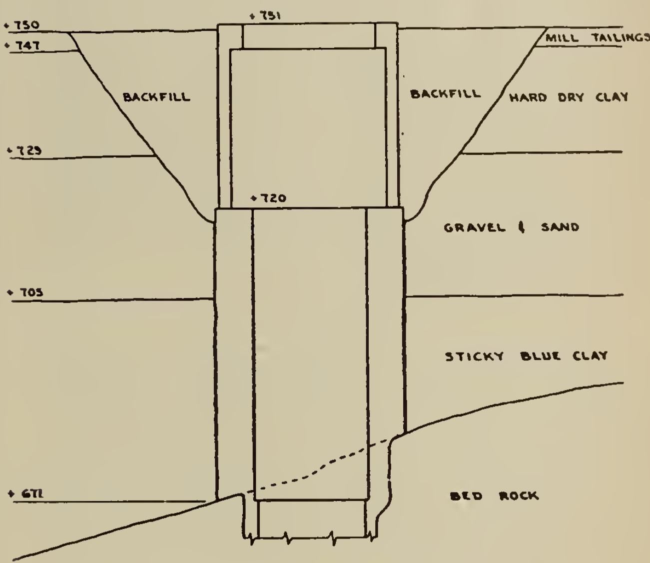

Fig. 2. Ground conditions.

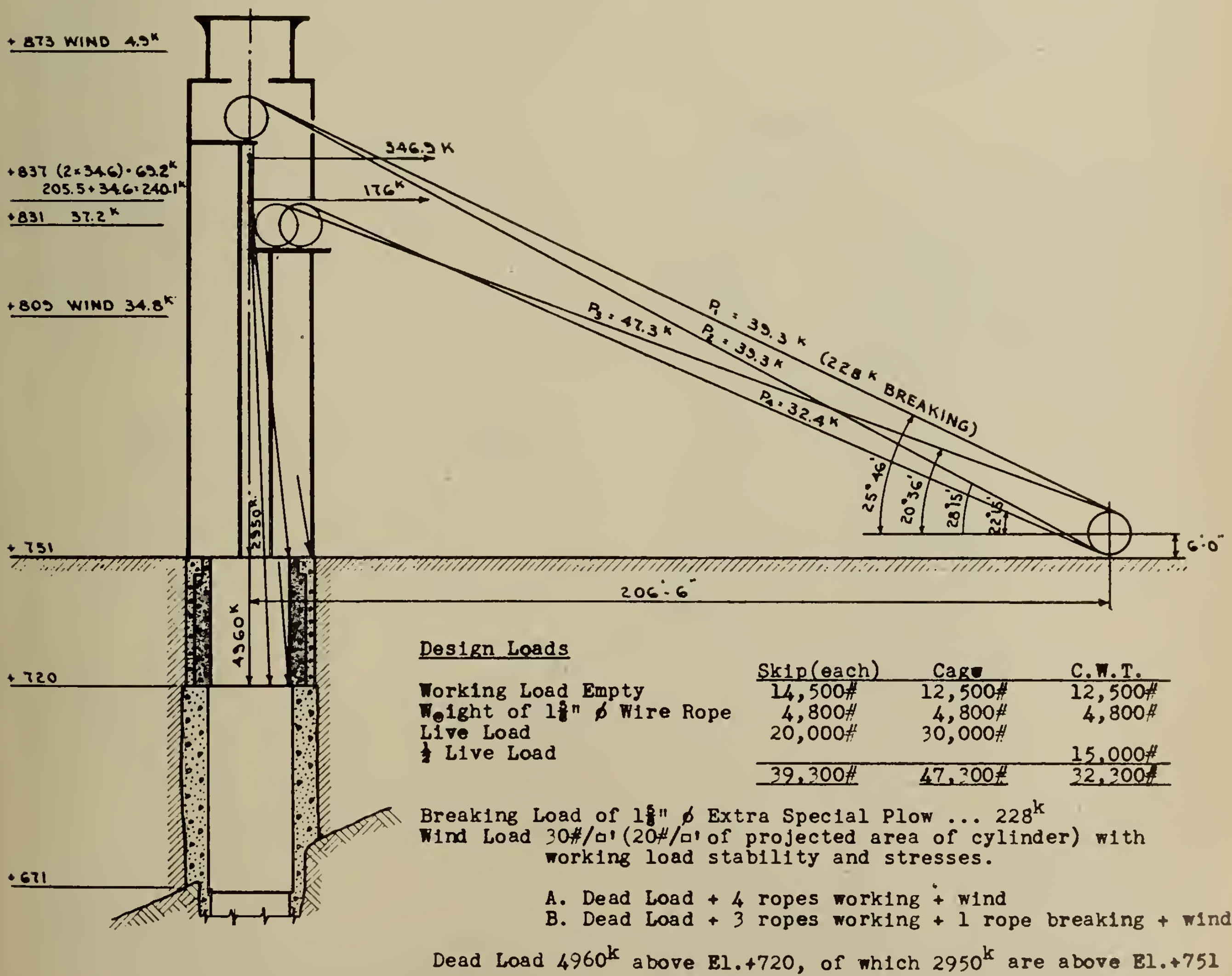

Fig. 3. Stability requirements.

namely two 10-ton skip buckets, and a 15-ton cage with corresponding counterweight, carried by 1⅝ in. extra improved plow-steel hoisting rope. Thus the design was tied down to a rigid set of conditions which had to be met, though in some instances it meant that full advantage could not be taken of the special characteristics of a reinforced-concrete structure.

From the outset, it was realized that a headframe is nothing but an extension of the mine shaft above the surface level to provide necessary height to dump ore into bins. Therefore, it would be logical to choose the same geometrical shape for the superstructure as for the top 79 feet of the shaft. This arrangement would permit the headframe to be supported directly on the shaft collar, eliminating the need for piling or other special foundation.

Design

These considerations led to a design which basically consists of a vertical concrete cylinder 30 feet O.D. with 12 in. walls 115 feet high (Fig. 3). Two partitions, one on each side of the shaft compartments, are incorporated to carry the sheave floors, and provide added stiffness and mass to the structure. The front of the structure facing west is extended into a rectangular pocket between the two partitions, to give room for the dump action of the skip buckets. Moreover, the superstructure is extended down to Elev. +720 inside the concrete cylinder by cutting away part of the collar slab. It is securely keyed to this structural element, just leaving a 13 ft. x 18 ft. opening for the mine shaft. This arrangement adds considerable weight to the base of the superstructure and, though the design does not depend on the fixity derived from having the structure itself surrounded by 30 feet of earth fill, this feature adds to the overall stability and it makes the top of the shaft lining at Elev. +720 serve as a natural foundation for the headframe.

Normal stability requirements, i.e. compensation for the overturning moment caused by working loads and 30 lbs. wind pressure (reduced to 20 lbs. due to circular shape of main structure), are fulfilled by incorporating sufficient weight in the superstructure to keep the component of the forces within the kern area of the base (Fig. 3). Compensating loads have been arranged partly by bringing the superstructure down inside the circular collar to Elev. +720 as described above, and partly by adding extra concrete to the front part of the structure in the form of two triangular buttresses, which at the same time serve to frame a large opening in the front of the headframe.

In addition to the above load case, the design allows for the breaking load of one of the skip

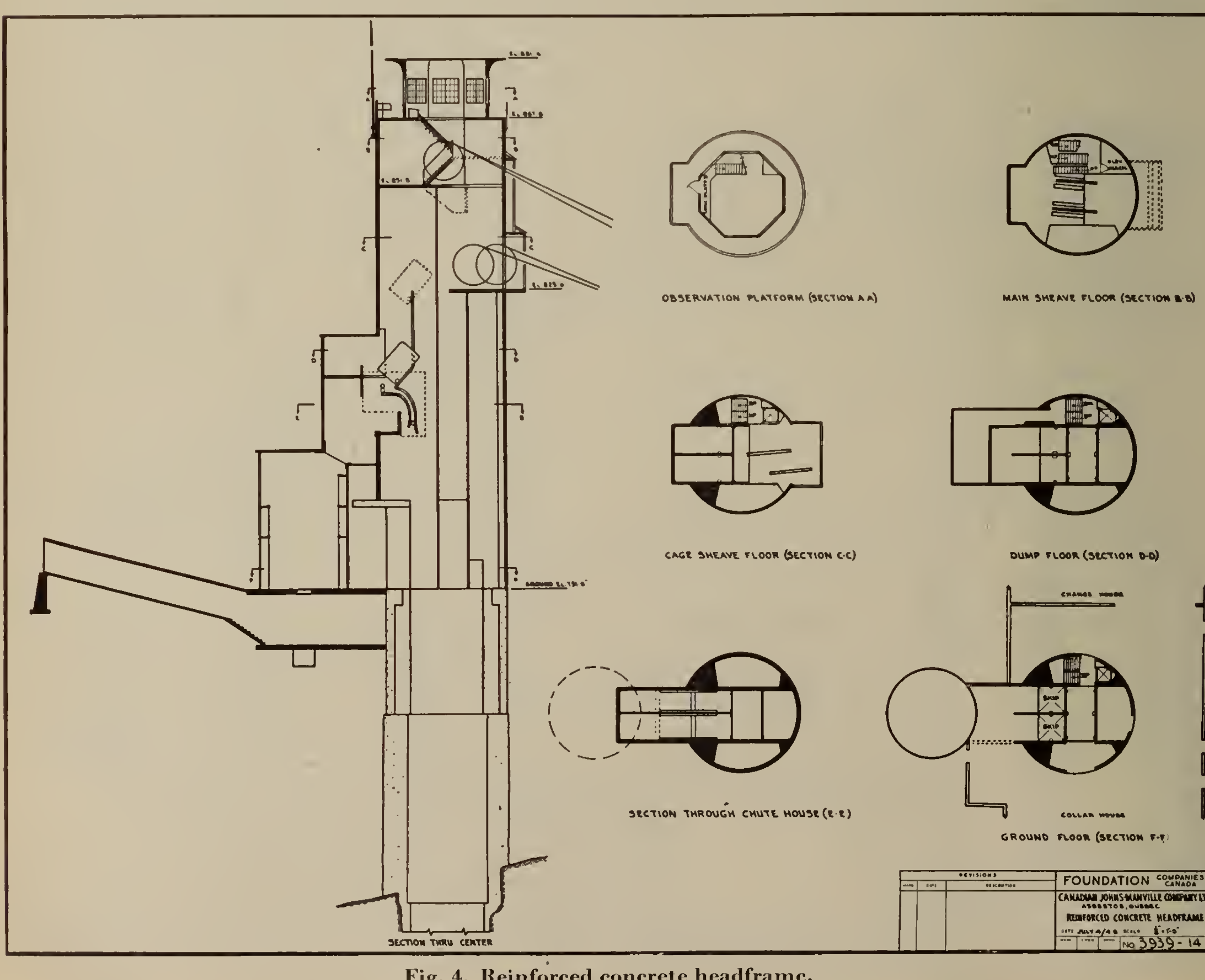

Fig. 4. Reinforced concrete headframe.

Fig. 5. Completed headframe.

The arrangement of partitions leaves two compartments of the shape of circular segments for auxiliary use. The one on the north side of the shaft compartments adjoining the change house serves as combined stair and elevator well and the other, which adjoins the collar house, provides a hoist-way between the sheave floors and the ground floor. An overhead monorail is installed in the ceiling of the monitor, making it a simple matter to take equipment from the sheave floors down for repair or overhaul in the collar house. The elevator in the north compartment provides convenient access to the dump floor, the sheave floors and the observation platform.

Ten openings of different sizes, varying from 25 ft. x 13 ft. 6 in. to some few feet square, had to be provided in the walls. The smaller openings were formed easily by anchoring a box of the required shape in the concrete while the sliding form went by. In the case of the larger openings, it was found convenient to use a double form, consisting of a fixed vertical form anchored in the concrete wall in its proper position and backed up by bulkheads temporarily attached to the sliding form. In several instances, jack rods passed through large openings, in which cases the rods were braced to prevent buckling.

A large number of inserts were required to hold the brackets for the guide timbers for skip buckets, cage and counterweight, and also to hold the dump plates in place. A special design was developed which permitted the successful placing of 186 inserts without hampering the progress of pouring operations. While

ropes, which is equivalent to a force of 228 cos. 25° 46 = 205.5 kips, acting horizontally (857-720) = 137 feet over the base. In this case, maximum stresses of +443 p.s.i. and − 113 p.s.i. develop at Elev. +751, and +267 p.s.i. and − 75 p.s.i at Elev. +720. The tensile stresses are taken care of by reinforcing steel and by dowels at Elev. +720. Actually, this is an unnecessary precaution, because only a sudden shock caused by the abrupt stoppage of a skip bucket could overstress the rope. The impact from this shock would however be of such short duration that it could not overcome the inertia of the headframe.

Construction Methods and Details

From an early stage, it was realized that the silo-like shape of the proposed design would lend itself to the application of sliding forms. All details related to partitions, floors, openings and inserts were developed to avoid any horizontal features which would interfere with the vertical movement of the forms. The result is shown in Fig. 4.

Concrete partitions separate the cage compartment from the rest of the structure, and the two skip compartments from each other. The thickness of these partitions is limited to 6 in. by the steel sets installed throughout the mine shaft. All partitions in the rear half of the headframe are brought up to Elev. +823 to support the cage sheave floor and, in the front half, to Elev. +849 to support the main sheave floor. The sliding forms were stopped at Elev. +866.5 and the work platform served as form for the deck slab which was poured in this elevation. This arrangement permitted the completion of all vertical walls and partitions in one operation. The entire structure is crowned with a 15 ft. high octagonal monitor, through which daylight and fresh air are admitted to the headframe.

Fig. 6. Sliding forms approach the top of the tower as concreting operations reach the final stage.

the primary function of the jack rods is to assure adequate, even lifting of the sliding form, their spacing was, in this case, somewhat influenced by a desire to make use of them as supports for the inserts. However, experience proved that inserts might as well be held in place by special rods held plumb by means of dummy yokes on the sliding form, which would have reduced the number of lifting yokes and thereby brought about better working conditions on a rather crowded working platform.

Model

To gain some preliminary information with respect to the special difficulties that might arise as a result of the rather intricate system of partitions and the great number of relatively large openings in the walls, a model was constructed to scale 1 in. to 2 ft. Though it was not possible to simulate actual job conditions, it was shown that the concrete in the interior 6 in. walls would tend to lift with the forms, and also that special precautions would have to be taken to protect the concrete in free corners. Both conditions developed on the actual job and the difficulties were successfully overcome. Pouring of the superstructure was completed in little over two weeks, the average lift being 7.7 feet per 24 hours.

Building Details

A circular surge bin of 300-ton capacity free flowing ore is erected on the west side of the headframe (Ref. Fig. 4). This bin, which is 20 feet in diameter, is provided with circular shelves spaced so rock dust cones will form to protect the structure against impact and abrasion. The basement under the bin, which contains a Jeffrey feeder and the tail end of a conveyor installation, was developed into a floating raft foundation. A chute house is fitted between the headframe and the top of the surge bin. It is designed as a simple supported bridge span, permitting the surge bin to settle freely as the fill underneath consolidates.

Considerable attention was paid to the aesthetic aspects of the structure. The stovepipe-like appearance of the cylindrical surfaces is broken by suitable fluting and, without departing from the severe functionalism of this installation, some interest has been added to the massive appearance of the main structure by treating the chute house, the observation platform, and the monitor on top of the building, as separate units.

Fig. 7. Interior of headframe.

The sinking of the shaft and erection of surface structures were carried out by the Foundation Company of Canada, Ltd., under the direction of W. U. Smick, vice-president and general superintendent. F. Astels, M.E.I.C., acted as job engineer and the detailing was done by J. N. Galli, JR.E.I.C.

Hydrogen-Peroxide as a Source of Power

A Report on War-time Developments in Germany

by

Dr. René Simard

Imperial Oil Limited, Montreal

The author describes the uses of hydrogen-peroxide for power production as developed by the Germans for secret weapons. Describing the Walter plant set up for its production, he traces the derivatives from commercial peroxide, and their properties, uses, and methods of handling, including Ingolin, the most important of these.

Listing the weapons already in operation or under test which employ Ingolin as a fuel, and describing such in brief, he also lists projected uses for war, and summarizes "Report L-13" by Dr. Schmidt, dated January 1942, which enumerates various peace-time uses for Ingolin as a propellant, to which he adds his own conclusions.

This paper gives a general picture of the uses of hydrogen peroxide for the production of power as developed almost exclusively by the Germans in their various secret weapons, including uses which have peace-time, commercial possibilties. The information was obtained from documents found by the author at the Walter plant in Kiel, Germany in June 1945. As invasion began to threaten Kiel, Walter had all his drawings and reports photographed on micro-film, the originals destroyed and the films buried outside of town, no doubt for intended later use. Only after Admiral Doenitz, as Hitler's successor, had relieved the personnel of their oath of secrecy did they reveal the hiding place of the films and start a policy of full co-operation with the allied investigators.

General Information

Hydrogen peroxide was first put to use by Prof. H. Walter who, with Government help, founded the firm bearing his name in 1935. Thus, four years before the war actually started, the Hitler regime was already willing to subsidize research on secret weapons to be used in the war which they were engineering.

After Walter had sold his new idea to the authorities, he was supplied with approximately $7 millions of government money for capital expenditures and set up a plant at Kiel which with the impetus of war branched out to a total of five separate establishments. The Government further subsidized the firm by paying running costs of another $7 millions a year, regardless of results obtained. The capital had to be reimbursed, using royalties and government payments on a cost-plus basis, and Walter had almost succeeded in doing this when his activities were brought to a sudden end.

The firm employed about 5000 men and was solely concerned in research, development and production of prototypes. There was a total of 10 first-class chemists, physicists, and engineers working on research, and 20 more employed on development work. These top men were backed with a further 30 scientists and technicians on the research side and 250 (including the design staff) on the development side. The rest of the 5000 consisted of industrial workers, clerical staff and auxiliary grades; all in all a pretty formidable organization.

Walter was given a free hand in the development of his ideas, which the Government felt sure would greatly increase the chances of winning the projected, and later, the actual war. The general opinion of investigators after looking into the work of the Walter plant alone, was that, had they been given about six more months, the results would have made the issue of the war a very debatable point. One project alone would have reduced the supplies to England and the continent to a mere trickle. This project, based on the use of hydrogen peroxide, was the manufacture of a submarine capable of a 25-knot speed when submerged, and it was stopped only after operational tests had already been made.

Properties and Manufacture of Hydrogen Peroxide

Hydrogen peroxide H_2O_2, has been widely known as an antiseptic and bleaching agent in the form of a 3 per cent solution in water. This is the solution commonly obtained in drugstores. The commercial peroxide is standardized as a 30 per cent solution, with 50 per cent being available under special orders. Higher concentrations were not produced in America until the war was over, when it became necessary to develop a supply for army experiments with captured German weapons. The pure 100 per cent peroxide is somewhat of a laboratory curiosity, due to the difficulty and danger of its preparation. It is a colourless, slightly viscous liquid with a density almost one and one half times that of water. It freezes at 29.5 deg. F, and boils at an estimated temperature of 305 deg. F. This temperature is estimated because the peroxide explodes 1 or 2 degrees before that. The peroxide used by the Germans was an 80-85 per cent solution, and that form was known at various times under the trade or code names of Oxylene, Aurol, T-Stoff and finally Ingolin (after Walter's daughter Ingol).

Ingolin is a relatively stable product, but it is liable to decompose violently unless it is kept free of impurities and foreign substances, especially organic matter. This property makes its production rather difficult due to the salts which are accumulated in the residue during concentration. Ingolin must be kept free of dust, rust, metallic particles or filings, since any one of these promotes decomposition.

The chemical Warfare Service of the U.S. Army has made a thorough investigation[1] of concentrated peroxide solutions, and has found that the rate of decomposition can be greatly retarded by the use of stabilizing agents in very small quantities. They found that sodium phosphates were the best stabilizers when used at the rate of 100 p.p.m. Larger amounts tend to overcome the stabilizing action due to the increased impurities. The Germans themselves used phosphoric acid and 8-oxyquinoline as stabilizers.

All surfaces which come in contact with Ingolin must be acid treated for the removal of grease, and then soaked in peroxide after such treatment. The materials best suited for handling concentrated peroxide in order of passivity are as follows: Pyrex glass, aluminium (99.6 per cent +), aluminium-magnesium alloys, pure tin, pure tantalum, pure cadmium and stainless steel. Again, according to results of the U.S. Army, Koroseal and polyethylene are suitable for gaskets, while the new silicone greases can be used for lubricants.

Despite all the difficulties inherent to this substance and the rather specialized materials required for its handling, Ingolin has one rather important redeeming feature:—it cannot be detonated by shock, unless organic materials are present.

Ingolin was manufactured in Germany by the electrolytic (anodic) oxidation of potassium or ammonium sulphate, K_2SO_4 or $(NH_4)_2SO_4$. Persulphates are formed in the process, and these are converted to hydrogen peroxide by treatment with steam at high temperatures. The weak solution is then concentrated by vacuum distillation. Great care must be taken towards the end of the distillation, due to the increasing concentration of salts in the residue which can promote a rapid or even explosive decomposition. If a purer product is required, the concentrated peroxide can be further distilled from its impurities.

Ingolin is not in itself a poisonous substance, but its ability to release oxygen quickly makes it a dangerous liquid to handle. Contact with the skin causes severe burns, and necessary precautions include rubber gloves and a thorough washing down with water of any apparatus in which it has been used for test or experiment. Its effects on clothing are varied but uniformly destructive.

Methods of Use

Hydrogen peroxide can be used as a source of power due to its ease of decomposition, its relatively high heat of decomposition (996 B.t.u. per lb.) and the nature of the products formed. These products are water and oxygen, according to the equation: $2H_2O_2 = 2H_2O + O_2$. However, due to the heat developed during decomposition, the theoretical temperature reaches about 900 deg. F, and the water produced is in the form of highly superheated steam. The relative proportions are 62 per cent steam and 38 per cent oxygen. This high concentration of oxygen (almost double that of air) is most advantageous for the production of energy by combustion. Thus two distinct methods of using Ingolin suggest themselves: the so-called "cold" process where the steam-oxygen mixture is used solely to drive a turbine and the "hot" process where the oxygen of the mixture is used after expansion in the turbine to burn an additional fuel. These two basic methods lend themselves to a number of variations. However, whatever the process used, a catalyst is required to ensure steady and complete decomposition of the Ingolin. This catalyst may take various forms, but is invariably a metal salt.

As a rule, four different processes are used, three of which are variants of the "hot" process.

(a) In the "cold" process, Ingolin is decomposed directly over a catalyst and the steam-oxygen mixture used directly to drive a turbine. The theoretical temperature is 900 deg. F, and the pressure can be varied at will before decomposition in the catalyst chamber. In this case the catalyst used can be either calcium or sodium permanganate in solution, or as a solid coating over porous cement or porcelain stones. The calcium solution has the disadvantage of leaving an insoluble residue. The solutions are sometimes compounded with manganese dioxide powder.

(b) Ingolin is mixed with a compound which reacts readily with it, giving a mixture of gases as the products of the reaction. In this case, the catalyst itself is a complex cuprous cyanide of formula $K_3(Cu(CN_4))$, a small quantity of which is dissolved in Helman or C-Stoff (about 0.6 grams per liter). Helman (from Walter's son Helmuth) and C-Stoff are similar mixtures, the active ingredient of which is hydrazine hydrate, $N_2H_4.H_2O$, a compound which is as strongly reducing as hydrogen peroxide is oxidizing. The composition of Helman is 80 per cent hydrazine hydrate and 20 per cent ethyl alcohol, spec. grav. 0.980, heat of combustion 6220 B.t.u. per lb. The other mixture, C-Stoff, is made up of 30 per cent hydrazine hydrate, 57 per cent methyl alcohol and 13 per cent water, spec. grav. 0.915, heat of combustion 7050 B.t.u. per lb.

[1] *Ind. Eng. Chem.* 38, 160-170, 310-320, 627-630 (1946).

Both mixtures contain, in addition, a small quantity of the copper cyanide catalyst. The products of the combustion with the peroxide's liberated oxygen are steam, carbon dioxide and nitrogen, all gases which are expanded through a turbine or through a venturi when used as rocket propellant.

(c) The third method of use decomposes the Ingolin over solid permanganate catalyst stones, and the steam—oxygen mixture is led to a combustion chamber into which is sprayed a normal fuel of the hydrocarbon family. Temperatures of the order of 4000 deg. F can thus be obtained, depending on the fuel used. Although any fuel can be burned in the combustion chambers, the firm of Walter was using decalin, a fully hydrogenated napthalene of formula $C_{10}H_{18}$, in their application for under-water power plants.

(d) The fourth process is a combination of the second and third. The Ingolin is decomposed with Helman and after a definite time which is controlled by the pressure in the combustion chamber, the Helman is shut off and replaced immediately by decalin.

These four processes vary in safety. The safest of all is the first when the solid permanganate catalyst is used. Practically as safe is the third process where the fuel is burnt after the complete decomposition of the Ingolin. Not quite so safe are the first with liquid catalyst and the second where in each case a stoppage in the catalyst flow would cause an accumulation of undecomposed Ingolin, which would explode if the catalyst stoppage became cleared suddenly. The most dangerous process is the fourth where the timing of the Helman cut-off and the start of the fuel injection is very critical. If the fuel is let in at the same time as the Helman, an explosion comparable to H.E. is to be expected. This process was mainly used in torpedoes, and tests had to be made by remote control and the personnel protected by blast walls.

Germany's Practical Uses of Peroxide

As might be expected, a new idea like the use of hydrogen peroxide as a source of power was entirely directed to perfect secret weapons of more or less revolutionary character. In this respect, Germany was ahead of the Allied Powers, being the only one to develop practical uses for hydrogen peroxide, and of course the only one to produce large quantities of highly concentrated peroxide.

Tested Weapons Using Ingolin

Following is a list of weapons built, in operational use, or under test, in which Ingolin has played a part.

(1) *Hs 293 Glider Bomb:*—Simplified system of propulsion, using Ingolin and liquid calcium permanganate as catalyst. The decomposition products are expanded in a venturi nozzle, which is the sole means of propulsion. This weapon had a fair amount of success against our shipping when it first came out but was abandoned or at least seldom used after a while, possibly due to lack of long-range aircraft suitable for its launching and radio control.

(2) *Assisted Take-off (A.T.O.) Unit:*—Uses the same system of rocket propulsion as the Hs 293 Glider Bomb. These units were placed under the fuselage or wings of an aircraft and produced enough thrust to facilitate take-offs of heavily loaded aircraft. The same idea, but not the same rocket fuel was used by the allies, especially for take-offs from aircraft carriers. These units were first used by the Germans in 1941 and invariably operated on the " cold " process. They developed a thrust which varied between 2200 lb. for 45 seconds or 3300 lb. for 30 seconds.

(3) *V-1 Launching device:*—The secret weapon known as V-1 (V for Vergeltungswaffe or Revenge Weapon) was also known only too well as the " Buzz-bomb ". Its propulsion motor used gasoline as fuel, but could only get started when the bomb travelled at speeds above 200 m.p.h. which was also its stalling speed. The 600 hp. motor depended on ram compression to admit air through spring vanes, after which combustion took place and the pressure developed produced a forward thrust against the closed vanes. The combustion gases were exhausted through the tail pipe, and with a decreased pressure in the combustion chamber a new supply of air was allowed in through the vanes. This cycle was repeated about 75 times per second, producting a loud intermittent roar or " buzz " which gave the bomb its popular name.

Since the V-1 was not self-propelled until a speed of 200 m.p.h. forced the vanes to open, a mechanism was devised which would impart to it sufficient speed to allow it to proceed on its own. This launching mechanism used Ingolin and permanganate solution to create gases under pressure, which were the driving force of the apparatus. A brief description of the launching mechanism might be of interest at this point.

The reaction unit was mounted on a wheeled frame which could be fairly easily attached to the launching ramp. The unit consisted of blow-cases for Ingolin and permanganate solution, high-pressure air reservoirs and the mixing or reaction chamber. The solutions were blown into the reaction chamber by the compressed air at 2200 p.s.i. The gases produced by the reaction developed a pressure of 800 p.s.i. behind a piston, which travelled in a cylinder 11½ inches in diameter and 160 ft. long, built into the launching ramp. The evolution of gases was such (15000 c.f.m. at 850 p.s.i.) that the piston travelled the 160 ft. in ¾ of a second, leaving the cylinder at a speed of 250 m.p.h. The instantaneous work done at that time is calculated to be 55000 hp. The acceleration of almost 500 ft. per sec. per sec. is equivalent to about 15 times gravity.

The bomb was placed on a light iron sled with wooden runners which travelled along a track on the ramp. The piston was fitted with a fin protruding through a ½ inch slot along the top of the cylinder, and this fin engaged into a keyway in the belly of the bomb. To reduce the escape of gases through the slot in the cylinder, a 1-inch rod was used to plug the slot behind the piston. This rod was suspended by light wires and the piston was grooved to accommodate it. During its passage along the cylinder, the piston pushed this rod up against the slot and the internal pressure in the cylinder ensured a sufficient seal until the piston shot out of the cylinder and the V-1 was on its deadly mission.

(4) *V2 Rocket:*—This rather awesome missile made use of Ingolin only in a secondary capacity, the main rocket fuels being ethyl alcohol and liquid oxygen. These two liquids were delivered to the burners by individual centrifugal pumps, one on each side of a turbine and all three on the same shaft. The turbine was operated by the decomposition gases of the Ingolin which was blown into a reaction chamber, together with sodium permanganate solution, by the

pressure of compressed nitrogen in metal containers. The power behind this pumping mechanism is shown by the fact that about 1000 gallons of both alcohol and liquid oxygen were pumped and burned during 53 seconds, after which the rocket travelled under its own momentum.

(5) *Me 163 Rocket Fighter Aircraft:*—In this case, the peroxide serves a dual purpose. Part of it is decomposed over solid permanganate catalyst, the products of combustion are expanded into a turbine which drives two pumps. The pumps feed the greater part of the Ingolin and Helman into the burners and the jet nozzle which produces the thrust. This aircraft was capable of almost vertical climb and flew circles around our fastest Mosquitoes. It was used solely for quick interception and had an endurance of about 10 minutes only, at full throttle. The rocket motor was first used on the DFS 194 designed by Lippisch before the war and first flown in 1940. The motor then developed a thrust of 660 lb., using the "cold" process. When Lippisch joined Messerschmidt in 1940 he designed the Me 163A, which used a "cold" motor giving 1650 lb. of thrust and was first flown in 1941. This aircraft, 30 of which were built, was subsequently used for training when the Me 163B was brought out using a "hot" process engine developing 3300 lb. and later 3750 lb. of thrust. The prototype flew in 1943 and it was first used operationally in August 1944. A still later version, the Me 163C had a smaller combustion chamber mounted below the normal one, which was used for cruising to give better efficiency and fuel consumption at cruising speeds, thus increasing the endurance appreciably. The end of the war stopped the development of the Me 263, which was to use two of the twin combustion chamber motors, giving a maximum thrust of 5300 lb. with 880 lb. for cruising on the small combustion chamber.

(6) *U-Boats:*—Five types of U-boats were in the process of development and testing by the Walter firm. Their systems of propulsion varied from the "cold" process of simple decomposition of Ingolin and direct expansion in a turbine, to the various modifications of the "hot" process which includes the combustion of a fuel, usually decalin, in the oxygen-rich decomposition products of Ingolin over solid permanganate catalyst. In the submarine department of the Walter plant, the stern end of a full-size U-boat had been erected, in which was installed an Ingolin-decalin system of propulsion. It was used for tests and training in the operation of the new type of motor.

(7) *Torpedoes:*—Walter's had twelve types of naval torpedoes and three types of aircraft torpedoes in process of development. Most of them worked on process "d" where the dangerous conditions were not likely to endanger the lives of the personnel. All types used turbine and propeller drive except one each of the naval and aircraft types which were actually jet propelled.

(8) *Rocket Propulsive Duct:*—Propulsive ducts are also known as "athodyds" (from aero-Thermodynamic Duct). They are a simplified system of jet propulsion in which the air compressor and its driving turbine are eliminated, leaving only the cylindrical duct into which fuel is injected and burned, exhausting through the tail-pipe and producing the reaction which propels it forward. The compressor in this case is replaced by the ram effect of the duct's travel through the air. Needless to say, the ram compression is obtained only at rather high speeds and, as in the case of the V-1, the propulsive duct must be launched by outside means or, if carried aboard an aircraft, can be switched on after the proper speed is reached.

Thus, this system of propulsion can be useful to extend the range of anti-aircraft guided missiles or as an auxiliary source of power aboard rocket planes to increase the endurance and range. The overall efficiency of a propulsive duct is comparable to that of a rocket or V-1 flying bomb, but only about 1/3 that of a regular gas-turbine jet at the same speed. This system of propulsion was first thought of by Lorin of France in 1913. The firm of Walter had been doing some intensive research and development on propulsive ducts, and the investigation of this work was the reason why, during a stage with Power Jets at Farnborough, England, the author was asked to visit the Kiel plant.

One development of their work brought in the use of Ingolin to increase the ram compression and to facilitate fuel combustion. The apparatus, which was built and ready for test, combined a "cold" process rocket with a normal propulsive duct. The discharge of the rocket was immediately ahead of the duct entry and concentric with it. The high velocity gases (steam and oxygen) entered the duct and sucked in with them through an annular space, a large amount of air. This system increased the ram compression and the mass flow through the duct, both of which have direct influence on the thrust produced, and the high oxygen concentration of the gases allowed more efficient combustion of the fuel which was usually gasoline.

The output of the rocket is important as there is a maximum amount of energy which gives maximum thrust. In other words, the velocity and mass of rocket gases must be such that the suitable amount of air is drawn in. Various rocket venturis were tried, and the 10-mm. throat size was finally adopted, because it gave the lowest specific fuel consumption at a ratio of 1 part of Ingolin to 6-7 parts of entrained air. The Ingolin pressure was 30 atmospheres, which produced a stream of oxygen and steam with a velocity of 3300 f.p.s. (2250 m.p.h.). Under these conditions, the air velocity was about 160 f.p.s. (109 m.p.h.) at the duct entry. This air velocity of course gave the whole apparatus a lead of 109 m.p.h. on the air speed of the aircraft, and allowed it to be used with full efficiency almost on take-off.

The simple propulsive duct designed by Walter developed a gross thrust of about 220 lb. at 625 m.p.h. Compared to that, the net thrust (gross thrust-drag) of the rocket-duct combination obtained in wind-tunnel tests ran from 220 to 265 lb. at speeds from 0 to 540 m.p.h. Thus its net thrust was consistently higher than the gross thrust of the propulsive duct alone.

The maximum thrust of the rocket-duct system was obtained at a ratio of Ingolin to intake air of 1 to 4. However, the minimum specific fuel consumption occurred at a ratio of Ingolin to air of 1 to 6-7, at which point the net thrust drops from 265 lb. to 176 lb.

Walter also tried out another combination by placing the Ingolin rocket in the tail pipe of the propulsive duct instead of in the entry. This did not prove as successful. The rocket sucks air through the inlet as before, but the rocket body is in the stream of hot gases and required special cooling devices to protect it. The structural difficulties were also quite great.

Some results were obtained nevertheless. They showed that the total thrust produced was the sum of the thrust of each component and that these individual thrusts varied with fuel consumption independently of each other. The only advantage of this type of motor besides the increased thrust from two components instead of one, was the slight reduction in skin friction and turbulence at the outlet due to the suction action of the discharge gases.

Walter had found another use for his Ingolin, this time as a possible improvement to the regular gas-turbine system of jet propulsion. His idea was to use a straight Ingolin turbine to drive the usual compressor. This method gives a better compression ratio and thus greater efficiency while the combustion gases (to which is added the steam and oxygen discharge of the turbine) are allowed to give up all their energy in the form of thrust, without having to drive a turbine to run the compressor. Its main disadvantage is that two separate fuels are required for its operation. It generally approximates so closely the normal gas turbine that its development was abandoned in favor of the Jumo 004 engine, which was the first jet propulsion motor to be used in operations.

(9) *Anti-aircraft Shells:*—Four or five types of shells were being developed, the propulsion systems of which were all based on rocket principles utilizing Ingolin. All of these were of the guided missile type.

(10) *Catapults:* — A great deal of research and development work was being done at a separate establishment of the Walter firm, located at Plön in Schleswig. Trials were made by catapulting heavy bodies into a lake, using Ingolin as a source of power instead of compressed air. This is essentially the same idea as the launching mechanism for the V-1, but with added variations.

(11) *Panzerfaust:*—This is the German equivalent of the American "bazooka" and the rocket propulsion used employed Ingolin.

(12) *Acoustic Mine Sweeping Device:*—This is a simple little device which depends on the explosive reaction of Ingolin with B-stoff (pure hydrazine hydrate) to produce sound waves under water. The two fuels are fed from their respective tanks into a flat, cylindrical explosion chamber, which is hollowed out in the shape of a doughnut with a hole on one face only. The inside diameter is only about 6 inches. A spring-loaded lever actuated by a cam causes two plungers to inject the two fuels rapidly into the explosion chamber. They enter the chamber tangentially so that, due to centifugal force, they form a liquid layer on the inside surface. The explosion delay is just long enough to allow complete feed of both fuels, after which their respective non-return valves automatically close. The sharp explosion, which is produced at the rate of one every second (r.p.m. of the cam) is claimed to be effective in exploding acoustic mines at a range of about 1 mile. The explosion gases are allowed to escape through the opening in the face of the explosion chamber. Their escape is facilitated by the scavenging action of compressed air, which is obtained from an air piston actuated by the upward motion of the spring lever, as the spring is compressed by the cam in readiness for the next cycle. The source of power for the cam is a small electric motor. The entire driving mechanism is located on board the mine-sweeping vessel, and the explosion chamber is fixed on the bow of the ship, below the water-line.

Projected Uses for War:

The following is a list of Walter projects which make use of Ingolin as a source of power. Being only undeveloped projects, there is no data available except possibly a short explanation of what was in Walter's mind.

(1) *Ingolin rocket for spinning experiments:*—The idea here was to install a rocket aboard the aircraft probably in various off-center positions in order to study the effect of various moments on the spinning and spin recovery of an aircraft.

(2) *Ingolin propulsion for explosive carriers:*—This idea applies to the " Goliath " or " Beetle " miniature tank which the Germans loaded with explosive and sent over into Allied lines, its progress being controlled by radio. Walter wanted to propel this little tank by his Ingolin driven turbine engine.

(3) *Ingolin propulsion for amphibious tanks:*—This idea is similar to (2) but applies to regular sized tanks which would be able to travel under water.

(4) *Boundary layer control:*—Walter's intentions were to use an Ingolin driven turbine to drive an air pump, through which the boundary layer or wings and fuselage of an aircraft would be sucked in, thus reducing drag and increasing the lift of the wings.

(5) *Rocket propulsion for bombs:*—As if ordinary aircraft bombs were not deadly enough, even when allowed to drop freely, Walter was toying with the idea of installing an Ingolin rocket near the tail end of the bomb in order to give it extra speed and minimize the lack of accuracy which is due to air-currents encountered during its descent.

(6) *Rocket propulsion for artillery shells:*—This is an idea similar to (5), except that it would have to be adapted to long range artillery shells instead of aircraft bombs. This device was meant to increase the range of the shell beyond its normal range as fired by the gun.

(7) *Rocket brake:*—As far as could be ascertained, the idea here was to use an Ingolin rocket in reverse, in order to slow down the rate of descent for airborne torpedoes and mines.

(8) *Depth-charge launching:*—Both the " hot " and " cold " processes were intended to be used to provide enough gas pressure to launch depth-charges from ships.

(9) *Mélot thrust augmentor:*—The Mélot thrust augmentor is a device consisting of short concentric venturis, fitted into each other in series and placed at the outlet of a rocket. Just how Walter intended to use this device is not very clear, but it is known that it was planned to use it both in air and in water.

(10) *Hydroplane vessel propulsion:*—A man named Tietjens had designed a hydroplane boat for the Government which, as far as we know was never used. Walter was thinking of using Ingolin for the propulsion system, either as a straight " cold " process turbine drive or as the fuel burning, " hot " process drive.

(11) *Assault boat propulsion:*—What was said in (10) also applies to a special type of assault boat.

(12) *Depth-keeping mines:*—These mines can be sown in deep water where anchoring would provide difficulties. They are controlled by a water pressure mechanism and Walter intended to use Ingolin rockets to provide upward or downward thrust as required to keep the mine at its predetermined depth.

(13) *Ingolin propelled hurdlers:*—Walter had made a theoretical study of the use of Ingolin to propel or catapult heavy bodies such as beach hurdlers. Two separate devices were planned, one with a thrust of 20 tons, the other with as much as 60 tons of thrust.

(14) *Soundless and flashless long range gun:*—Again here, Walter had thought of the exceptional properties of Ingolin, this time to propel an explosive shell without the noise and flame of the usual gun charge. This of course would have made the location of such a gun almost impossible to trace. The principle was simply to admit Ingolin decomposition gases under very high pressure into the gun cylinder and to accelerate the shell by successive admission of the gases at various points of the cylinder. Each admission of gas was to be timed to coincide with the passage of the shell along the gun's cylinder.

A variation of the above was meant to increase the range of the shell, but without eliminating the standard explosive charge. This system was to have an auxiliary chamber along the gun barrel which, after being filled with Ingolin decomposition gases under very high pressure, would bleed the gases in the gun cylinder behind the shell. Again the gases were to be let in from various stations along the barrel, timed with the shell's passage at each station.

(15) *Torpedo launching:*—It is well known that torpedoes are launched from a submarine by means of compressed air. This requires a fair size air-compressor and air storage. Walter had figured that space could be gained if Ingolin decomposition gases were used instead of air.

(16) *Oxygen for aircraft ventilation:*—What form this idea was to take is unknown. No doubt the principle was based on the fact that the decomposition of Ingolin produces a mixture of 62 per cent steam and 38 per cent oxygen. The oxygen can be concentrated very easily by the simple process of condensing the steam. This oxygen would be very useful in sealed cabins of high flying aircraft.

(17) *Wind-tunnel drive:*—Just the Ingolin decomposition gases can be made to drive a turbine for the production of power to drive pumps in the V-2 and the Me 163, so can it be used to drive the fan of a wind tunnel. As far as is known, no German wind tunnel was ever built or designed to use this type of power supply.

Projected Uses with Peace-time Applications

The following is a list of Walter projects powered by Ingolin, with peace-time uses:

(1) *Increased output of aero-engines:*—This subject is of special peace-time interest, and can be discussed more extensively than the above, since it was the subject of a full report found at Kiel and printed from the micro-film at the author's request. This report bore the Walter number L-13, by a Dr. Schmidt and is dated January 1942. It was left in the hands of Power Jets at Farnborough, England. The following is a summary of this report, which was a theoretical and mathematical analysis of the problem, with no reference to any practical tests or experiments.

The Walter firm had used Ingolin for self-acting mechanisms with outstanding properties of high performance, light weight and a thrust independent of height and speed, but with the noticeable disadvantage of high fuel consumption. The minimum for pure rockets seems to be 5.5 lb. fuel per 1000 lb. thrust. For operations at high speed and altitude, the fuel consumption can be decreased when atmospheric oxygen is used for combustion. Thus, by combining the use of hydrogen peroxide with a normal internal combustion engine, the advantages of peak performance become available without reducing appreciably the range and endurance.

Three methods were investigated theoretically and compared. They differ in the method of use of the peroxide; (a) utilization of the decomposition energy in a turbine whose output is delivered to the engine shaft; burning of fuel with the oxygen of decomposition and expansion in a suitable jet; (b) utilization of the decomposition energy in a turbine which operates an additional supercharger and use of the oxygen in the engine itself or, as in (a); and (c), utilization of the total energy of the peroxide in the engine.

Method (a) is specially useful for flights at low altitudes and for take-off when the engine is under its maximum thermal load while the propeller can absorb more power. Methods (b) and (c) on the other hand, prove to be more favourable for the prevention of power decrease at high altitudes.

Case (a):—The set-up in case (a) is as follows: the motor drives a pump for the peroxide and another for the additional jet fuel. The peroxide is delivered into a decomposition chamber under pressure and the oxygen-steam mixture produced is expanded in a turbine which transmits its output to the engine shaft by suitable gearing. The turbine outlet gases then go to a combustion chamber, where the jet fuel is burned and expanded through a normal venturi.

Calculations show that there is a flat minimum in specific fuel consumption for a turbine back-pressure of 2 atmospheres for speeds of 450 and 670 m.p.h. This back-pressure is therefore used for further calculations. The specific fuel consumption decreases with height and speed, due to the increased thrust of the jet at high speeds and altitudes.

The modern propellers are only a compromise. They cannot be designed only for altitude performance, otherwise their efficiency at sea-level is very poor. If the sea-level output is increased, the conditions improve. For example, if a propeller designed for flight at 50,000 feet could operate with an output 2 or 3 times as great, its efficiency at sea-level would only be decreased slightly.

In the motor-turbine-jet combination, the propeller thrust is much greater than the jet thrust under static conditions, but the two become about equal at speeds above 450 m.p.h. The overall fuel consumption remains under 1 lb. per 1000 lb. of thrust until speeds of 90 m.p.h., which is about 1/5 the fuel consumption of an A.T.O. (assisted take-off) unit.

The report then gives results of calculations made for such a combination motor. Assume an engine with supercharger which gives 1800 hp. at sea level. Its output at 36,000 ft. can be taken as 900 hp. The aircraft speed is 450 m.p.h. at sea-level, and, if the aircraft is ideal, the speed at 36,000 ft. will then be 1000 m.p.h. If a turbine of 1000 shaft hp. and equivalent jet power of 500 hp. is added to the normal engine the turbine will still deliver 1000 hp. at 36,000 ft. but the jet output will have increased to 1600 hp. The take-off power of 3,300 hp. (1800 + 1000 + 500) will thus correspond to 3500 hp. (900 + 1000 + 1600) at altitude, and the performance is then approximately constant throughout. Of special advantage for the propeller is its unloading to the jet as the height increases. Thus, at sea level, the propeller delivers 2800 hp. (1800 + 1000) but only 1900 hp. (900 + 1000) at 36,000 ft., allowing it to be smaller than if it was designed for high altitude efficiency.

Case (b):—This case uses decomposition energy of peroxide to boost the supercharging of the normal engine. Two types are possible. The first type has a motor with a mechanically driven supercharger ahead of which is interposed an auxiliary supercharger driven by a peroxide turbine. The decomposition gases at 20-30 atmospheres and 900 deg. F. are expanded in the turbine to the supercharger pressure. The turbine drives the 2nd stage which feeds the 1st stage. The turbine exhaust, which is rich in oxygen, is mixed with the supercharger air and cooled with it in the air cooler. The end temperature remains above the dew-point of the mixture so that no steam condensation takes place. At high altitude, the over-rich mixture of a Diesel engine will use up the oxygen. With the Otto-cycle engine, special control of the fuel feed must be provided.

The second type of peroxide supercharging is that of an engine with an exhaust turbo-supercharger. The supercharger in this case must be designed for the additional amount of exhaust gases from the peroxide decomposition. With 2-stroke engines especially, it becomes more economical to use the additional volume of exhaust gases in a 2nd stage coupled with the peroxide turbine to drive the additional supercharger stage. This arrangement is very economical because the peroxide is used twice to provide supercharging.

It is also possible to expand the excess energy of the exhaust in a jet. As in case (a) the energy of decomposition of the peroxide can be used to drive the supercharger and the oxygen used to burn extra fuel in a jet.

The fuel consumptions obtainable with auxiliary supercharging were calculated for a Diesel engine with a take-off power of 1100 hp. The climbing power falls from 830 hp. at sea level to 350 hp. at 39,000 ft. In the problem, the output is to be increased by 300 hp. through the use of peroxide. The duration of the peroxide use is to be 45 to 60 minutes, the additional weight, including the fuel is not to exceed 880 lb.

In order to obtain an additional 300 hp., 0.154 lb. per sec. of peroxide will be needed besides 0.044 lb. per sec. of fuel, hence a specific fuel consumption of 2.38 lb. per hp. per hr. This relatively satisfactory value assumes the installation of two turbines, a supercharger stage and a large air cooler. Estimating a weight of 220 lb. for these parts, plus a peroxide pump and decomposition chamber, the weight limit of 880 lb. allows enough peroxide for an endurance of 55 minutes.

Case (c):—This case uses direct injection of peroxide, either mixed with the supercharged air by direct cylinder injection or by atomization. The direct injection would be advantageous for two-stroke engines as it would reduce the loss of peroxide in the scavenging air. Disadvantages would be the additional trouble of control mechanisms and the difficulty of manufacturing a precise metering gear to work at high peroxide pressure. Added to that is the danger of explosion in contact with oil and the very poor lubricating properties of peroxide.

When the peroxide is atomized in the manifold, care must be taken that each cylinder receives the same quantity of peroxide, otherwise dangerous excessive pressures will be produced in individual cylinders. The most promising arrangement seems to be the atomization directly ahead of the inlet valve.

Based on the same requirements as in case (b), an additional 300 hp. can be obtained with 0.22 lb. per sec. of peroxide which, with the fuel consumption of 0.044 lb. per sec. gives an overall specific fuel consumption of 3.15 lb. per hp. per hr. and the endurance is 51 minutes for a total weight of 880 lb., of which only 66 lb. is for the extra gear required. The conclusions drawn from this report are as follows:

1—To compensate for the loss of power with increasing height, the injection of hydrogen peroxide in the inlet manifold shows to best advantage due to its simplicity. Its suitablity must be developed by the motor industry.

2—The use of a peroxide turbine to drive an auxiliary stage of supercharging gives the most economical fuel consumption but requires, among other things, sufficient air cooling.

3—The auxiliary turbine coupled to the engine shaft gives the highest specific fuel consumption but allows a wider range of power increases without overloading the engine thermally. Thus, this combination is well suited to take-off and low altitude flying, but can also be used advantageously at high altitudes as long as the propeller can absorb increased outputs.

4—The specially favourable take-off performance of the above combination would make possible its use instead of A.T.O. units which have much higher rates of fuel consumption and must be jettisoned after use. The motor-turbine combination has the added advantage of making available temporary increases in power during flight.

This necessarily sketchy description of what the Germans were able to do and were seriously planning to do with such a simple chemical as hydrogen peroxide should, even so, be an example of what can be achieved when scientific knowledge and enterprise are allowed facilities and funds for research and development. Let us hope that future German brainwaves will be directed into more peaceful channels than those described in this paper.

APPENDIX

Ingredients Used in German Peroxide Systems

Name	Composition	Sp. Gr.	Heat of Combustion
Oxylene Aurol T-Stoff Ingolin	80% H_2O_2 20% H_2O	1.340	996 Btu/Lb.
Helman	80% N_2H_4/H_2O 20% C_2H_5OH 0.6 gr/li $K_3(Cu(CN)_4)$	0.980	6220 Btu/Lb.
C-Stoff	57% CH_3OH 30% $N_2H_4.H_2O$ 13% H_2O 0.6 gr/li $K_3(Cu(CN)_4)$	0.915	7050 Btu/Lb.
B-Stoff	100% $N_2H_4.H_2O$	1.032	5090 Btu/Lb.
M-Stoff	100% CH_3OH	0.796	9690 Btu/Lb.
Z-Stoff N	Na Mn O_4	Catalyst, solid or in 40% solution	
Z-Stoff C	$Ca(MnO_4)_2$		
Dekalin	$C_{10}H_{18}$	0.896	19650 Btu/Lb.

The EAST PINE BRIDGE

A paper specially prepared for The Engineering Journal

by

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After outlining the location of the new John Hart Highway from Prince George to Dawson Creek and progress thereon, the authors describe the site and the design of the East Pine Bridge near the Dawson Creek terminus. Construction of foundations and piers is discussed and methods of erecting the superstructure are given. The latter are of interest due to the remote location and the equipment used for erection.

For a number of years the people of British Columbia have sought access to the vast area of rich farm lands known as the Peace River Block, which, in addition to its farm land, has natural resources such as timber, coal and oil. A chance to realize this ambition has come about through the Province's postwar public construction programme, under which the new Prince George to Dawson Creek highway is being undertaken, now known as the John Hart Highway. It is on this road that the East Pine bridge is located.

The principal town in the Peace River Block of B.C. is Dawson Creek, which is the starting point of the 1,600 miles of Alaska Highway built by the United States Government through Canadian territory during the war. Heretofore connection between British Columbia and the Alaska Highway has been made via Edmonton and Grand Prairie in Alberta. At the southern end of the projected Hart Highway is the thriving northern British Columbia town of Prince George, a Canadian National Railway divisional point, situated at the junction of the Fraser and Nechako Rivers.

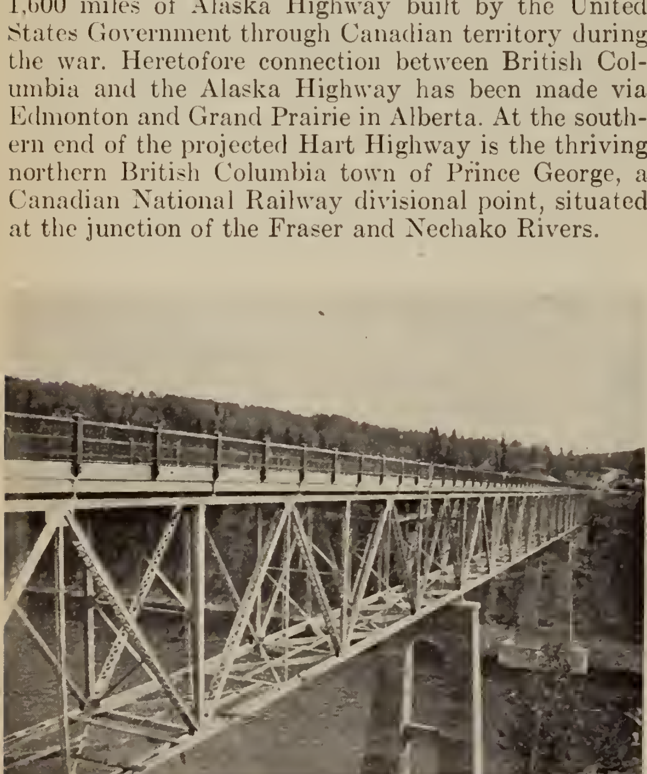
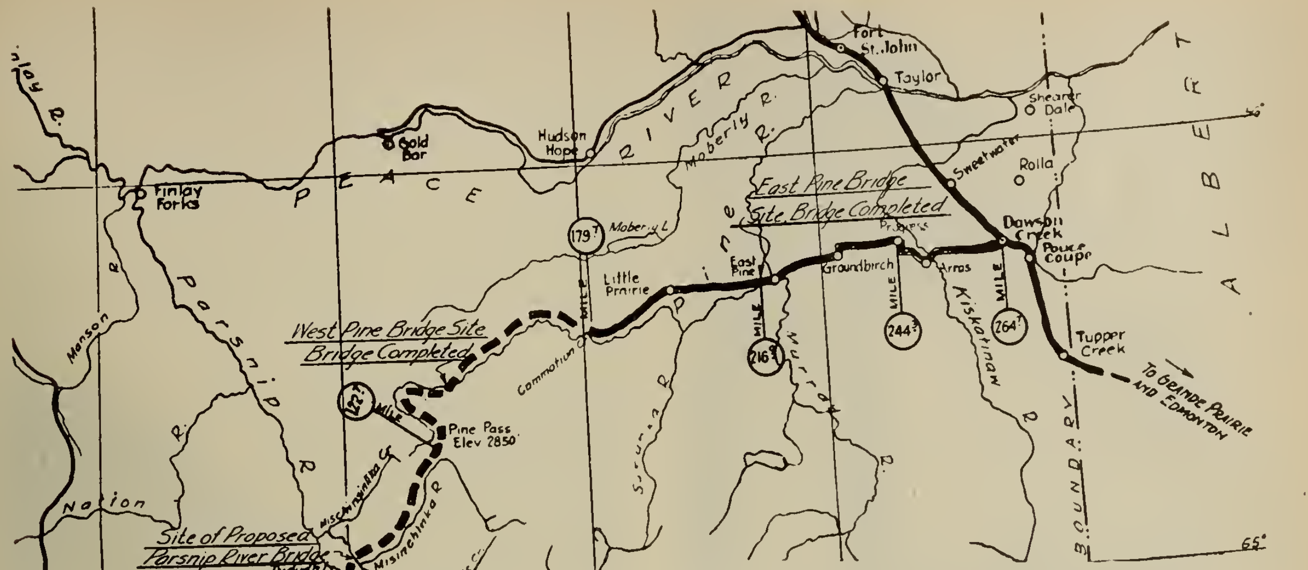
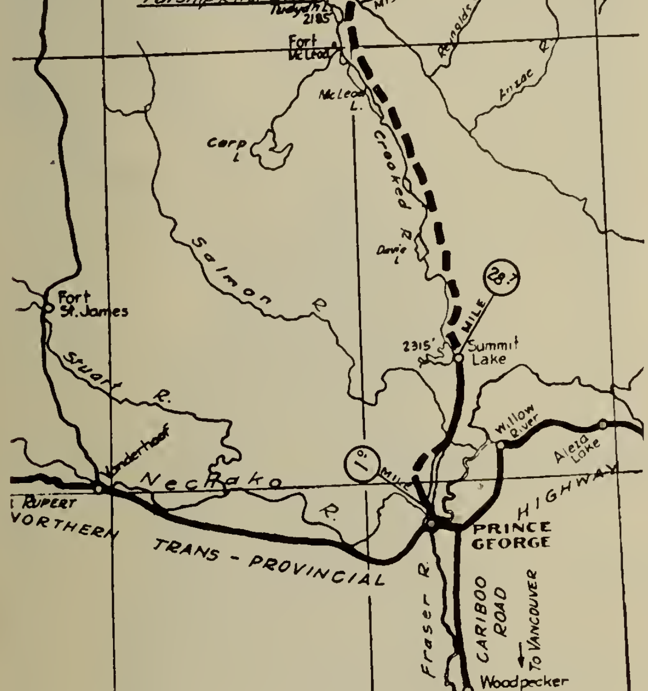


Fig. 1. View of completed bridge looking south, showing trusses, deck and railings.

Prince George is also the northern terminus of the famous Cariboo Trail now known as " Highway 16 ", leading from Yale up the Fraser Canyon annd on through early pioneer settlements such as Lytton, Spences Bridge, Clinton and Quesnel, towns founded in the early gold placer and mining days of the 1860's. From Prince George one may now travel westward to Hazelton and on down the Skeena River to Prince Rupert; or one may travel eastward on the Northern Trans-Provincial Highway known as Highway 2, toward Jasper, a portion of which remains to be completed.

The John Hart Highway

The route of the Hart Highway, covering over 280 miles to Dawson Creek, travels north from Prince George, past Summit Lake and along the east bank of the Crooked River to a crossing of the Parsnip immediately below the junction of the Missinchinka, a tributary of the Parsnip. This crossing entails a large steel bridge, yet to be built. From the Parsnip Crossing the route swings north-east along the north bank of the Missinchinka to Pine Pass, the elevation of which is 2,850 feet. From here it follows the south bank of the Pine River to cross on a 120 ft. steel span now constructed at West Pine.

The road from here eastward has now been completed to modern standards, a distance of 50 miles to Commotion Creek, the scene of oil drilling operations some years ago. From Commotion Creek to East Pine the route has to be reconstructed.

At East Pine is a location which contains all the elements of an ideal bridge site. The new highway beyond East Pine is now finished to modern standards.

East Pine Bridge

The Pine River at East Pine is about 450 ft. wide with a shale rock bed, overlaid with a shallow depth of gravel and boulders. The banks are steep at this point and are of rock formation with alternate horizontal layers of shale and sandstone through which the river has croded to an average depth of about 120 feet below the adjacent benches at the bridge abutments.

To suit this crossing a three span continuous deck type Warren Truss with parallel upper and lower chords was chosen as being the most economical type to construct and maintain. The centre span, 280 feet in length, is flanked on either side by a 160 foot span, followed by a simple truss span of 50 feet, triangular in shape, making a symmetrical layout with a total length from north to south abutments of just over 700 feet.

The grade is level across the bridge, and is 102 feet above extreme flood level. The deck is of reinforced concrete construction, 18 feet wide from curb to curb, with crown at the centre of the roadway 1 in. above the gutters. The deck is supported on seven lines of 12 in. steel stringers, riveted to 18 in. floor beams at the panel points, which are 20 ft. apart. The bridge is designed for 15-ton trucks or a live load of U-80 according to C.E.S.A. specifications.

The extreme high water level is 13 feet above the average low water level. River velocities vary between 4 m.p.h. at low water and 10 m.p.h. at high water, with a depth of about 9 ft. at the deepest part of the channel near Pier 2 during the low water period. The river usually attains its maximum flow during May and June, receding gradually until about mid-October when ice conditions may be expected, with the river completely frozen over from November until about the end of March. The hydraulic gradient of the river at the crossing is a little over 1 in 1000 ft. Heretofore this crossing had been made with a reaction ferry, which was difficult to maintain by the Department throughout all seasons of the year.

The steel spans are supported on four reinforced concrete piers and two concrete abutments. The two end piers, each about fourteen feet in height, are founded well back in the solid rock banks of the river. The two main piers are of massive reinforced concrete construction, having shafts set on suitable cutwaters designed to withstand the severe ice shove.

Substructure Footings

Excavations for each main pier measured 60 feet long by 22 feet wide, and varied in depth from 10 to 12 feet. To prepare the foundations for the main piers. it was necessary to first divert the current somewhat toward the centre of the river with a loose rock and earth fill placed upstream, so that large timber cofferdams might be set in their proper position. After setting and filling the cofferdams, the next step was to make them watertight with wakefield pile sheathing

Fig. 2. Looking north from bed of river in August 1947, showing spans almost touching.

sealed at the bottom with cement placed by tremie. The cofferdams were then dewatered and kept dry with two 6 in. pumps and a 3 in. pump, while excavation of the rock bottom was carried out. A derrick and skips were used for handling the excavation.

About 500 yds. of shale was removed from each main pier footing. In this rock were found some fine specimens of fossilized leaves, with here and there traces of a narrow coal seam. Several test holes in each footing were then put down a further 20 ft., disclosing horizontal layers of solid shale rock throughout with no layers of clay or unstable material.

Forms for the footing slab were erected, surrounded by side ditches hewn in the rock to drain all water into each of the four sumps. Pouring of concrete was then commenced in horizontal layers using the cone bucket method, supplied by two half-yard mixers. The design mix for each footing was 3,000 p.s.i. concrete and all concrete was poured " in the dry ". Each of the large footings was of a lozenge shape with overall dimensions of 59 ft. by 20 ft. and approximately 10 ft. thick.

Piers

On top of each footing slab, a large number of hooked tie rod anchors were embedded in the concrete to a definite pattern, in order to fasten the large number of ½ in. steel tie rods used for the internal bracing of the cutwater forms, which were erected and poured in two lifts of 10 ft. in each case. The design mix for the cutwaters was a 4000 p.s.i. concrete to withstand severe ice conditions, also poured by the cone bucket method as chutes were found impracticable.

From the top of the cutwater to the top of each main pier, a height of seventy feet, the setting of forms and placing of concrete was accomplished by means of a derrick hoist and bucket, poured in about 10 ft. lifts and internally braced with tie rods. The pier shafts were reinforced with 28 1-inch vertical rods in each shaft and a suitable number of hoops and transverse horizontal rods at the arches. The shafts were of 3000

Fig. 3. View showing north approach span landing on Pier 3—July 1947. Photo by J. W. Copeman, resident engineer.

p.s.i. concrete while the top coping slab was finished off with a 4000 p.s.i. mix.

The substructure was built by the Northern Construction Company and J. W. Stewart Ltd. of Vancouver on a unit price basis. Quantities involved some 5,000 cu. yds. of rock for the bank piers and abutments; 3800 cu. yds. of concrete in the piers, abutments and deck. Some 25,000 bags of cement or 31 freight car loads were used, as well as 60 tons of reinforcing steel rods and bars.

Superstructure

The superstructure was fabricated and erected by the Dominion Bridge Co. of Vancouver on a unit price basis. The fabrication and erection of the steel, included delivery to the site which involved a 1,500 mile train haul from the Vancouver shops via Edmonton and the Northern Alberta Railway to railhead at Dawson Creek, and thence a road haul by truck of about 50 miles to the final destination at East Pine. Over 460 tons of structural steel were required for the superstructure.

Cantilever erection methods were followed throughout. Erection commenced on June 19, 1947, using a nominal 20-ton capacity truck crane with a 60 ft. boom for handling and erecting the steel. The 50 ft. end span was first erected and decked over with transverse timber planking and a longitudinal plank runway. The crane was then advanced to the first pier. Using the 50 ft. span securely fastened down at the abutment as an anchor arm, 80 ft. of the 160 ft. span was erected as a cantilever, the crane advancing on the timber deck as required. A temporary steel bent 80 ft. high consisting of chords, diagonals and bracing from the center span was then erected on concrete pedestals located half way between the bank pier and main pier. The cantilever arm was landed on it by slackening off on the tie-downs at the abutment. Erection then proceeded to the main pier and when the span was landed there the temporary bent was dismantled.

Erection of the 280 ft. span then continued until the cantilever arm extended 160 ft. from the pier, the 160 ft. side span acting as an anchor arm. Equipment was then transferred across the river by ferry and an identical procedure followed on the other side of the river. To close the main span, the shoreward ends of the 160 ft. spans were lowered to temporary shoes, for a distance sufficient to raise the centre span up to its dead load camber position, and to cause openings between the closing chords of $\frac{5}{8}$ in. on the bottom chord and $1\frac{3}{8}$ in. on the top chord. Closure was made by pulling one half of the bridge forward on its roller bearings to close the bottom chord, and jacking the shore ends of the 160 ft. spans to close the top chord. The shore ends were then jacked up further to set the permanent shoes and induce the requisite stresses in the trusses.

Painting

It was decided to use aluminum paint not only as a preservative and for appearances sake, but also for the purpose of minimizing the effect of expansion and contraction which in this northern area is considerable due to the wide variation in seasonal temperatures. Accordingly all the steelwork received two spray coats of aluminum paint in addition to the usual shop coat of red lead. The steel fences, however, were painted a jade green colour.

Closing operations were completed on August 14, 1947. The spans, which had only been pinned and bolted during erection, were then riveted. Pouring of the concrete deck started before riveting was finished, and was completed by September 20. The bridge was opened for traffic on October 4, 1947. The total cost of the project was in the neighbourhood of $400,000.

From Month To Month

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

Importation of Engineering Plans

The evidence in favour of restoring the protective tariff on engineers' drawings coming into Canada is growing into a substantial volume. The personal experience of several Canadian consulting engineers shows clearly that the removal of the tariff has encouraged many American industrial firms with plants in Canada to turn over to American engineers the designing of the plant extensions in this country.

This has resulted in loss of business to Canadian engineers and to Canadian industry and also a loss of American dollars in very substantial amounts. Canadian industry stands to lose hundreds of thousands of dollars of business in a number of instances because American engineers naturally enough specify American equipment with which they are familiar.

A specific case was brought to this writer's attention wherein a Canadian engineer examined plans and specifications for a large plant in which over a hundred thousand dollars worth of mechanical equipment of American manufacture was specified by the American engineers. The owners were of the opinion that Canadian manufacturers could not build it, but a study of the project revealed that 98 per cent of the total value could be made readily in Canada. Had these plans been made in Canada such a mistake would not have occurred.

The Institute's officers, in close association with the Corporation of Professional Engineers of Quebec, have been active in following this matter at Ottawa. It is apparent that support for the regulation in its present form is not lacking, but there is some encouragement to believe that relief may be obtained shortly.

One cannot but observe that the industries in Canada which requested and obtained the removal of the tariff, are the same ones that demand a high tariff to protect their own products.

Cry "Culture"

It has become a popular pastime on the part of many people to decry technical education because it was said to lack adequate instruction in the so-called cultural subjects or the humanities. It was said that the engineer was not an educated person. In the beginning these comments seemed to come from persons who were trained in the non-technical fields, but later even engineers joined in the cry.

Fortunately there has developed at last a resistance to these charges. Strong leaders in the profession and in educational fields have taken the "culturists'" arguments to pieces and exposed them in all their emptiness. It has not been difficult to do. However, it may be that the exposé has not caught up to the charges, as is so frequently the case, under which circumstances the *Journal* feels it has a duty to perform.

Leaders in the cry against technical education have overlooked, or failed to appreciate, three things:

(1) Cultural values are not restricted to literature, history and economics. There are great values of equal cultural significance in mathematics and science.

(2) Engineering courses are now so crowded that to add the many "cultural" subjects recommended, it would become necessary to drop some of the present subjects. Nobody has offered a wholly satisfactory proposal for doing this in a four year course, although many attempts have been made.

(3) Culture is not something you can inject into a man's life at any time, like adding salt to porridge. It is something with which he must grow up. If he does not get it at home, and in his early schooling, he will not absorb it in adulthood. One is not likely to suddenly acquire a taste for literature, just because he is exposed to a few hours of instruction during his college years.

Many of the utterances on what constitutes culture are not reasonable. Usually they are wide sweeping statements, which upon analysis prove to be impossible of accomplishment by anyone. This weakness is treated excellently by A. M. Buchan, a teacher of literature at Washington University, in an article appearing in the January issue of the *Journal of Engineering Education* under the title "What is this 'Culture'"? Prof. Buchan quotes from a frequently referred to article written by an executive of a large electrical company—

> No matter how fine a man's technical qualifications may be, in order to take an important

place in industry today he must know people as he never knew them before. He must be able to differentiate between the good and the bad, the true and the false, the worthwhile and the unimportant. He must study and know the reactions of people just as he studies and knows the reactions of material things.

Prof. Buchan then goes on to point out how important are these proposals. He says—

> In another sense, however, these sentences from the article are quite frightening. For they imply that it is possible to know the reactions of people as one knows the reactions of material things. They suggest that a man behind a desk in an office can tell whether another man, sitting before him being interviewed, is good or bad, true or false, worth something or worthless. They imply that a competent executive is able to size up a human situation and not only understand it fully but feel confident enough to say, " I'm sorry, I can't hire you. You're no good!"

Referring generally to statements of how the engineer should be " culturized ", Prof. Buchan says—

> With all respect for these excellent reports and for the many favourable comments on them, I'd like to suggest that the aims are set far too high. What they demand is not a kind of education for engineering students or a form of culture for engineers themselves, but a form of salvation. If these exalted aims are to be retained, the question before us must be stated in different words. It should not be " What is this culture that engineers should cultivate?" but rather " What must the engineer do to be saved?" These aims can scarcely be presented as realizable in terms of fallible human beings, crowded curricula and quite imperfect teachers of the humanities which, presumably, will be the scriptures of this gospel; they seem to consider the process of education as Bunyan considered the progress of Christian—a pilgrimage from a city of destruction to a celestial city. And no education, certainly not the literary kind with which I am reasonably familiar, is able to bear such a responsibility.
>
> Let us look at one or two of these stated objectives and see how even the best forms of training fall short.
>
> One excellent goal proposed is " development of the ability to read, write and speak the English language effectively." This has been, as you know, a goal of English departments from the old days of training in rhetoric to our up-to-date practices—not noticeably an improvement—of theme-writing and training in speech, and yet with all of our experimentation we lag far behind the goal set. Businessmen still complain bitterly about the illiteracy of our students, and neither our talk nor our platform speaking does much credit to teachers of speech and composition. It may be that this ideal of an " effective " use of the language, in speech and writing, has been fostered in the tradition of the great writers and the great orators, and that, trying to do too much, trying to make artists of language out of people who will never need more than a craftsmanlike handling of their tongue, we miss the near goal of literacy in seeking the far one of mastery.

Referring to the value of literature in an engineering curriculum Prof. Buchan has this to say—

> The study of literature, too, is unlike many other studies. One does not acquire a knowledge of literature as one absorbs by persistent effort the facts of history, let us say, or the formulæ of chemistry. One grows up with books, as one grows into friendship; and so to grow into a subject generally takes more time than administrative officials are willing to dole out. . .
>
> Another point must also be made. Although as a lover of literature I hate to make the confession, the influence of great literature is not, as has been commonly assumed, either certain or universal.
>
> For anybody, therefore, who likes to live with certainties and who wants his culture with the union label attached, literature offers little. It offers fear and humility rather than arrogance and display.

Such utterances from a teacher of English will bring comfort to the engineer, and we hope, misgivings to those who without adequate knowledge and study have joined the procession of critics, some of whom have gone so far as to say that the engineer is—

> " a greasy illiterate individual who sure can use a monkey wrench and a slide rule but who is naught but an embarrassment and a liability in polite society ".

A Milestone in Engineering Education

On April 15-18th at the Windsor Hotel in Montreal, there took place an event of particular significance to the profession of engineering in Canada. The oldest school of engineering celebrated its seventy-fifth birthday.

The Ecole Polytechnique, which is the Faculty of Engineering and Applied Science of the University of Montreal, was established in 1873. From a small component of the Plateau Academy in Montreal, it has grown to a large modern unit of 75,000 sq. ft. in the heart of French speaking Montreal. At the present time, the staff numbers about sixty professors instructing a student body of four hundred and fifty of whom seventy are in this year's graduating class. Dr. Augustin Frigon, M.E.I.C., General Manager of the Canadian Broadcasting Corporation is President of the " Corporation de l'Ecole Polytechnique " and Ignace Brouillet, M.E.I.C., is the Dean of Studies.

Throughout the year, the occasion will be celebrated by a variety of activities for the public and the profession. The main events took place at the Windsor Hotel in April where the graduates, the engineering profession, government officials and industry representatives discussed the role and future of Polytechnique and the profession. Among the prominent engineers who participated were J. N. Langelier, M.E.I.C., president of the Graduates Society, Dr. Arthur Surveyer, M.E.I.C. and Dr. deGaspe Beaubien, M.E.I.C., of Montreal, Dr. C. R.

Young, M.E.I.C., Dean of Engineering, University of Toronto, Lieut. Col. L. F. Grant, M.E.I.C., president of The Engineering Institute of Canada, Hector Cimon, M.E.I.C., secretary, Price Bros. & Co. Ltd., Quebec City, C. C. Lindsay, M.E.I.C., consulting engineer and land surveyor, M. D. Barclay Inc., Montreal, and many others.

The warmest congratulations were forthcoming and President Grant conveyed the Institute's felicitations with the presentation of the following congratulatory message:

To Ecole Polytechnique on the occasion of its Seventy-fifth Anniversary, The Engineering Institute of Canada is happy to join with a multitude of others in the celebration of this notable occasion.

On behalf of our council and members we offer congratulations on attaining this distinguished anniversary, and on the outstanding work accomplished in those years. A pioneer in engineering education in this country, Ecole Polytechnique has made great contributions to the profession and to Canada. May its record of success continue and may The Engineering Institute of Canada be privileged to continue its association with it in its broad endeavours.

Collective Bargaining Legislation

The much debated subject of permanent legislation for collective bargaining is showing signs of life again, " back-stage " at Ottawa. It may be that it will be before the House by the time these notes appear.

A Bill similar to No. 338, which was presented last year by the Minister of Labour, is being groomed for presentation at this Sessions. This Bill will apply only to federal activities but it is hoped it will be adopted by the provinces for local application.

At the March meeting of the Council of the Institute the Committee on Employment Conditions recommended that further representation be made to the Minister on behalf of the members of the Institute. A resolution was unanimously approved and transmitted to Mr. Mitchell with the following letter:

February 21, 1948

Hon. Humphrey Mitchell,
Minister of Labour,
Ottawa, Canada

Re: Labour Relations Bill

Dear Mr. Mitchell:

The Council of The Engineering Institute of Canada at council meeting held in Montreal on Saturday, February 21st considered at some length the proposal of a revised or new Bill to provide " for the investigation, conciliation and settlement of industrial disputes ". The Institute's interest in the proposal comes from the evident intention to include professional engineers in the field covered by the legislation. The Institute's membership of over 9,000 is the largest group in Canada to be affected by such a proposal.

In 1944 the Institute conducted a survey of its membership to determine their wishes with regard to collective bargaining. The result showed clearly that the majority did not want to be included in such legislation unless the profession were permitted to control their own bargaining by means of a separate Bill.

Order-in-Council 1003 provided no such privilege, nor does the Bill No. 338 presented last year to replace 1003, make any such provision. Therefore we urge that professional engineers be included in the list of exemptions in the definition of " employee " contained in clause (i), (ii).

In the following resolution passed unanimously on February 21st, the Council of the Institute reaffirms its stand on collective bargaining for engineers—

> THAT in view of the inability of the engineering profession to obtain a specific act for engineers, the Minister of Labour be urged to exclude professional engineers from the group of workers embraced by collective bargaining legislation to be enacted by the Federal Government.

Yours sincerely,

(Signed) L. Austin Wright,
General Secretary

The officers of the Institute have been given encouragement to believe that the exemption will be granted.

Back to Fundamentals in Engineering Education

" The trend today in engineering education is away from undergraduate specialization. This is in spite of the wide current phase of highly detailed diversification, which has expressed itself in a score or more of different engineering curricula accredited by the Engineers' Council for Professional Development. Three quarters of the supply of future engineering graduates will engage in non-technical positions in industry and commerce. As modern engineering practice comes to make more and more use of mathematics, so must the engineering schools lay more and more stress on fundamentals, training our young men for adaptability rather than for informed skilfulness ".

This was the important message given by an eminent leader in education, Dr. Harvey Nathaniel Davis, President of the Stevens Institute of Technology at Hoboken, N.J., in a recent outstanding address before the Faculty of Applied Science of the University of Toronto. The occasion was the presentation of the " First Wallberg Lecture ", inaugurating a series of continuing lectures for the advancement of engineering educational work, as provided in bequests of the late Emil Andrew Wallberg, prominent Canadian engineer of Swedish birth, and bearing his name.

Dr. Davis, who is a shrewd observer, is a graduate of Brown and Harvard. He served the latter for twenty-four years, nine of them as professor of mechanical engineering. Since 1928 he has been president of Stevens. Serving with distinction during the recent war as director of the Office of Production Research of the War Production Board at Washington, he is an honorary member of the Institution of the Mechanical Engineers of Great Britain and honorary member and past president of the American Society of Mechanical Engineers.

More and more, he thinks, must we stress these fundamentals in the more elementary parts of our engineering education, even if, to make room for them, we have to crowd out much of that description of current procedures and practices, of currently used machines or processes, that is so easy to give and so entertaining to listen to. Men so trained have the advantage of knowing, when they graduate, that they don't know much of anything of a practical sort, and are thereby inspired to strive with particular assiduity to learn all they can while they work in whatever field their lot proves to lie.

The engineer's most important task is to keep modern civilization running. He is responsible for the operation and maintenance of the whole material basis of modern living. Equally obvious is his role in *improving* the material basis of civilized living. To the engineer we also owe much of the invention, and practically all of the development, of the machines and other gadgets that make modern living what it is.

Pointing out that the popularity of engineering education today in the United States is providing an abundance of engineering graduates, Dr. Davis expresses the opinion that four graduates per hundred thousand of population will adequately supply the needs of the strictly technical phases of the engineering profession. This applies to Britain and Canada as well. The rest of them he believes, are becoming employed in industry. This is where they are needed, as production men, in personnel service, in time study, in management-employee relations, or as sales or service engineers. The indicated ratio of needs is one technical person to four or five engineers in industry.

The target in engineering education he thinks, should be to graduate yearly twenty or perhaps even thirty cadet engineers per hundred thousand of population, even after the post war bulge has subsided. Perhaps four will be engineers of the traditional type, most of them will be industrial men. If this be so, then, he believes, many subjects such as economics, sociology and the humanities deserve far more attention than are currently given in curricula.

All this is possible only if we are willing to give up the idea of offering much technical specialization in a four-year undergraduate engineering curriculum. This is why many educators believe that specialization should be left for post-graduate work, or for self-education on the job, and that in our undergraduate schools we should stress only the fundamentals, and strive mightily to inculcate self-reliance and adaptability rather than mere technical competence. In other words, they believe that an engineering school can provide the best possible sort of liberal education for life in this twentieth century for an increasingly numerous group of young men who are fitted by temperament, inclination, and early training to take it.

This lecture expresses a thought-provoking point of view, of interest alike to educators, members of the profession and engineering graduates. The foregoing only touches the highlights. The lecture itself is, to use the words of Dean Young of Toronto University, " the best thing that has been said on engineering education for many a day ". Single copies of the full text may be obtained, without charge, on application to the Secretary of the Faculty of Applied Science and Engineering, University of Toronto. Multiple copies will be furnished at cost.

The First Fifty Years

In a country as young as Canada, the completion of 50 years of continuous service is a genuine accomplishment. In April, The Canadian Institute of Mining and Metallurgy joined the small group

R. W. Diamond, president of C.I.M.M.

of those societies that have already attained this enviable record—and, by their presence, will add distinction to the company.

At the February meeting of Council it was the unanimous opinion that the C.I.M.M. should be congratulated. The following message was therefore presented by Vice-President S. G. Coultis to the Jubilee meeting of the C.I.M.M. in Vancouver:

> On the occasion of the semi-centennial celebration of the Canadian Institute of Mining and Metallurgy, the engineering profession throughout Canada will extend greetings and offer congratulations. The Engineering Institute of Canada joins in this tribute to an organization which is foremost in furthering the progress of the profession of mining engineering and the mining industry itself. It is hoped that the past 50 years of accomplishment are but a prologue to greater things and that, in the future these two societies may continue their work together in the interests of engineering and of Canada.

The Jubilee celebrations were marked by a programme of technical and social events at the Hotels Vancouver and Georgia which exceeded the most enthusiastic expectations of its planners and concluded with a trip through the Gulf of Georgia and to British Columbia's principal mining camps. Several of the papers presented at the meeting were published in the March issue of *The Canadian Mining and Metallurgical Bulletin* which was the Jubilee Meeting Number of that publication. In this issue also, commencing on page 119, is a history, admirably written by M. W. Goodwin. of the Mining Institute's fifty years of growth and accomplishment.

Bureau of Technical Personnel

Supply and Demand for New Graduates

The Bureau's 4th Quarterly Report of 1947 disclosed that the year 1947 was one in which graduating classes in engineering were small, at the same time it was a year of greatest demand to date by employers. Early reports from a Department of Labour survey of possible demand for university students for 1948 are encouraging; the survey shows that students employed during vacation last year are being widely re-engaged and in many cases with promise of permanent employment. Further studies on the supply side now indicate about 12,000 graduates for the 5 year period 1947-51 as against a previous estimate of some 12,900.

Architects Employ Students

In Architecture, a sampling survey indicates that a majority of professional architects will employ under - graduates in the coming vacation period, with consideration being given for permanent employment, while at least 200 out of the 500 graduates expected for the 5 year period can be absorbed by employers other than practicing architects. In 1946 it was found that 40 per cent of architects then registered with the Bureau were 56 years of age or over. By 1950 when the first large new class will graduate, this 40 per cent will be 60 years of age or over.

Veteran Enrolment Low

Veterans' enrolment in Commerce courses has been about 40 per cent of enrolments in engineering courses, instead of showing the largest course enrolment as expected. This proportion applies also on current enrolment of non-veteran students. The major outlet for students from this course is accountancy. The second most important outlet is in financial institutions, viz. banks, insurance and trust companies, and investment dealers. The third largest outlet is in large scale manufacturing and merchandising. A small number will also enter the teaching field. Employers are looking for graduates with a general type of education, who can adapt themselves to the particular business processes of their employers. This suggests that a substantial proportion of commerce graduates will be absorbed on the general grounds of useful training, rather than into any type of work specifically related to their courses. The demand for commerce students is substantial and there is a definite trend to a wider use of persons with university training.

Academic Training Important

Undoubtedly many opportunities to become established in a professional career depend definitely on the specific type of academic training that the student has undergone. Nevertheless, many graduates will become employed in places where their academic training is assessed on quite general lines. One consideration however applies to all graduates. A recent U.S. Study of Employer Practice regarding Engineering Graduates, (*Engineering Journal*, April 1947) listed 9 items considered when selecting an engineering employee. The order in which employers placed 8 of these, including scholastic record varied somewhat, but there was agreement throughout that "personality" should head the list.

Salaries of Technical Personnel

Available information on salaries of technical persons is constantly increasing, and it now seems opportune to review the whole question, setting out not only certain established trends in salaries, but also certain principles which govern the economic advancement of engineers and scientists.

Since 1941, the trend in starting salaries on graduation has been steadily upward. When the demands of war industries were just beginning to be felt, the average starting salary for new graduates was around \$125 and \$130 per month. From April 1942 to March 1945 inclusive, the average starting salary was \$160 per month. The graduating class of 1946 went to work at an average of just over \$175 per month and in 1947 at just a shade under \$200. From estimates now being received from employers covering needs for 1948, it seems the upward trend is still in effect.

Obviously the starting salaries for new graduates will always vary widely. Each specific opening has its own set of qualifying conditions. Yet a distribution curve indicating the spread of starting salaries maintains the same general characteristic form. Another significant trend is observed when new graduates' salaries are split up into engineering and non-engineering groups. The latter group embraces chemistry, physics, geology and agriculture. In the period 1942 to 1945, these non-engineering groups averaged \$150 per month against \$167 for the engineering groups. In 1946 figures were \$172 and \$178 respectively. In 1947 there was little if any difference.

At the top there is also evidence of a trend toward higher figures. In all types of financial matters, people are becoming accustomed to thinking in terms of amounts of money which only a few years ago were usually classified as "astronomical". This makes for less hesitancy when dealing with salaries.

Administrative Duties

Another change has been the increased extent to which engineers and scientists have been called upon to assume administrative duties. Rightly or wrongly, an engineer whose duties are predominately administrative will normally earn above the average for his age.

The number of technical persons in senior administrative positions in Canada whose salary is \$10,000 or more has now passed the 1,000 mark, the proportion being about one in thirty in some groups. It has been held that those whose duties are purely administrative should no longer be referred to as engineers or scientists, as they have ceased to perform professional work. In most such cases, however, it is hard to tell when engineering duties are completely abandoned.

Salaries of technical persons in 1941 were lower, on the average, than they were in 1931. The 1947 age-salary curve, like that for 1941, does not give a complete picture. Yet there has been no change in the overall salary pattern. Departures from average, both above and below, become more extensive as age increases.

Meeting of Council

Minutes of a meeting of the Council of the Institute held at Headquarters on Saturday, February 21, 1948, convening at nine thirty a.m.

Present

President L. F. Grant (Kingston) in the chair; Past-President deGaspe Beaubien (Montreal); Vice-Presidents R. S. Eadie (Montreal), G. F. Layne (Quebec), and W. R. Manock (Fort Erie); Councillors P. E. Buss (Thorold), J. R. Dunbar (Hamilton), J. H. Irvine (Ottawa), V. Jepson (Grand'-Mere), C. F. Morrison (Toronto), J. A. Beauchemin, K. G. Cameron, R. C. Flitton, C. E. Gelinas, C. A. Peachey, J. B. Stirling, of Montreal; Treasurer L. C. Jacobs (Montreal), G. A. Gaherty (Montreal), chairman of the Committee on Prairie Water Problems, G. N. Martin (Montreal), chairman of the Committee on Employment Conditions; General Secretary L. Austin Wright, and Assistant General Secretary W. D. Laird.

The president reported that since the January meeting in Toronto he had had the privilege of making a ten day trip to the west and had visited the four western universities. He had received a most enthusiastic reception. At the University of British Columbia there were over seven hundred students at the meeting and at the other universities the halls had been filled. He had found a keen interest in Institute affairs and the arrangements made by the local branches in conjunction with the universities had been excellent.

The minutes of the meeting held on January 24th, 1948, were taken as read and approved.

1948 Annual Meeting Programme

The general secretary outlined the details of the programme which have been determined up to the present time. He explained that the president's dinner would be on the evening of Monday, May 31st, and that the Council meeting would be held on the morning and afternoon of Tuesday, June 1st, followed by the annual meeting of the Institute in the evening of the same day. Professional sessions would be held all day Wednesday with entertainment in the evening. Professional sessions would be held all day Wednesday with entertainment in the evening. Professional sessions would also occupy the morning of Thursday, but the afternoon and evening were held free for relaxation. Professional sessions would take up the entire day, morning and afternoon, of Friday and would be followed by the annual banquet and dance in the evening.

Mr. Wright explained that provision was also being made for a meeting of the officers of branches similar to that which was held for the first time last year at Toronto and for a student conference. " Muriel's Room " would again be a feature.

The papers will include several phases of the prairie water problems involving irrigation, agriculture and power, as arranged by Mr. G. A. Gaherty, chairman of the Institute's committee (who was present at the Council meeting to supply details); a half day session on oil and gas, also rural electrification, community planning, management, and some one of the many interests of Consolidated Mining and Smelting Company Limited.

Arrangements were being made whereby special cars would be available from such centres as Toronto, Montreal and Vancouver, so that members could travel together. If enough cars were occupied it is possible that they might be made up into a special train. All this detailed information will be supplied to members from Headquarters just as soon as sufficient fixed detail is available.

Civil Service Commission Requirements

The general secretary reported that he had had a very satisfactory interview with Mr. George Jackson of the Civil Service Commission relative to the Commission using qualification for membership in the Institute as one of the conditions for engineering appointments in the Service. The Commission had not yet agreed to reinsert the Institute's qualifications in their list of conditions but it was still possible that some such basis may be agreed upon.

With regard to the specific instance of a member of the Institute wherein a hardship had been experienced, Mr. Jackson agreed that if the man's name and address were given to him he would endeavour to get the matter straightened out to everyone's satisfaction.

Budget Item 180e

The general secretary reported that he and Mr. Marc. Boyer, the registrar of the Corporation of Professional Engineers of Quebec, had gone to Ottawa to again urge upon the officials of the Department of Finance that the tariff on engineers' plans, which was removed in June 1946 by Item 180e, be restored.

New Awards to Undergraduates

A letter from Dr. Langley, chairman of the Committee on the Training and Welfare of the Young Engineer, was presented in which he outlined the basis for appraising, on a non-academic basis, the top ten per cent of the students in the third year to which he proposed the awards would be applicable. There was a very broad discussion and some concern was felt that even the revised method would produce a problem for the committee inasmuch as there are now approximately 3800 third year students enrolled in Canada.

Several variations of Dr. Langley's proposal were suggested and discussed but the majority seemed to agree with Professor Morrison's suggestion that nothing but the academic qualifications should be considered in making the awards. Professor Morrison felt that to go beyond this point would be to undertake an almost insurmountable task. Eventually, after further discussion between Messrs. Flitton, Dunbar, Beaubien, Eadie, Peachey and Cameron, the following resolution was made and approved unanimously: " It is resolved that the method of award be left to the committee but Council considers it essential that uniformity across Canada should be obtained and for this reason suggests that the chairman should consult with the deans of the various universities."

Mr. Eadie reported that following the instructions of Council, the Finance Committee had considered in some detail the matter of further awards to undergraduates. Following some discussion, on the motion of Mr. Eadie, seconded by Mr.

Dunbar, it was unanimously resolved that the general secretary be authorized to canvass all branches to secure complete information as to the prizes and awards now being offered by them to Students, Juniors and others, including information as to the source of the money used for such purposes.

Committee on Community Planning

The general secretary reminded Council that the report of the Committee on Community Planning had been presented at the January meeting in Toronto and further consideration had been postponed to this meeting so that all councillors would have an opportunity to familiarize themselves with it. The general secretary then read the two recommendations made by the committee and referred to two communications which had been received on the subject, one from Past-President Shearwood and one from Councillor V. A. McKillop.

The general secretary went on to explain that under instructions from the president he had called on two people in Ottawa who, it was thought, were in the best position to appraise the possibilities of the Institute being able to accomplish the two things recommended by the committee. Resolution number one deals with by-laws and taxation and recommends that the Institute endeavour to provide some leadership in these fields. Mr. Wright's informant stated that a committee to deal with a revised National Building Code was in the process of being formed and that the Institute would be asked to name a representative on it. Beyond this point Mr. Wright's consultant did not see that the Institute would be able to accomplish very much in the field which was described in the resolution.

Resolution number two deals with housing and recommends that the Institute set up a research committee to study the problem in various parts of Canada, dealing particularly with engineering methods whereby houses could be mass produced at low cost. Mr. Wright's consultant in this field stated that the National Research Council has already done a great deal of work on it. Several types of houses have been built and tested and the engineering features of mass production have been worked out in great detail in many different parts of the world.

Under these circumstances the consultant was of the opinion that the Institute would have little chance of accomplishing its objective due primarily to the lack of properly qualified personnel to do the work on a full time basis. He stated that if the Institute had any knowledge of such experienced personnel the National Research Council would be delighted to have the names forwarded to them as they were very short of such technical assistants.

The president referred back to the informal meeting which had followed the Community Planning Conference and expressed the opinion that the terms of reference developed at that meeting for the committee dealt simply with making up recommendations for Council as to ways and means by which the Institute could inform its members more widely on the subject of community planning and develop in them a greater interest in the subject. He was of the opinion that the report of the committee was outside their terms of reference but he did not think it should be turned down solely on that score. He thought consideration should be given to the two recommendations solely on their merits.

A very long and exhaustive discussion on the subject followed, and eventually a resolution was prepared and presented by Mr. Dunbar, seconded by Mr. Stirling, as follows: THAT in the opinion of Council the recommendations of the Committee on Community Planning can best be accomplished under the direction of the National Research Council and other already established agencies which have at their disposal the necessary facilities, and that the Institute co-operate fully with them in their activities in this matter, and that the committee be thanked for its report and at its own request be discharged. This was approved unanimously.

Committee on Employment Conditions

The general secretary reported that when in Ottawa he had discovered that the Labour Relations Bill was being readied for presentation shortly to Parliament. He communicated with certain Ministers in order to secure adequate information and in turn had been advised as to the policy to be followed by the Institute.

Mr. Martin, chairman of the Institute's Committee on Employment Conditions, reported that when Mr. Wright had returned from Ottawa his committee had met to discuss the situation in detail and had decided eventually to recommend to Council that a communication be sent to the Minister of Labour outlining the policy which the Institute had followed from the beginning with regard to collective bargaining and stating that it desired to follow this policy through to the end. Mr. Martin pointed out that on the Institute's questionnaire, the great majority had voted in favour of collective bargaining providing it could be controlled by the engineers through a separate bill, but that, failing this, the majority asked for total exclusion from the legislation.

Mr. Martin pointed out that as Order in Council 1003 and Bill No. 338, which was presented last year, contained no provision for the profession controlling its own collective bargaining, it was apparent that the profession was not to be given the authority for which it had asked and therefore the committee recommended that Council ask the Minister for exclusion from the new bill.

The matter was discussed at considerable length, and eventually it was agreed to approve of the following resolution: THAT in view of the inability of the engineering profession to obtain a specific act for engineers, the Minister of Labour be urged to exclude professional engineers from the group of workers embraced by collective bargaining legislation to be enacted by the Federal Government.

Annual Meeting 1949

The general secretary read a letter from the Quebec Branch inviting the Council to hold the 1949 annual meeting in Quebec City. This had been presented to the last meeting and a decision had been postponed until some consideration could be given to the matter. Following some discussion, particularly as to the date of the meeting on which no definite decision was reached, on the motion of Mr. Flitton, seconded by Mr. Beaubien, it was unanimously resolved that the invitation of the Quebec Branch to hold the 1949 annual meeting in Quebec City be accepted.

ASME Applied Mechanics Reviews

On the motion of Mr. Manock, seconded by Mr. Buss, it was unanimously resolved that Dr. J. J. Green, M.E.I.C., of Ottawa, be appointed as the Institute's representative on the Advisory Board of the ASME Applied Mechanics Reviews. Dr. Green has expressed his willingness to accept this appointment.

RCE Proposed Book of Remembrance

The general secretary explained that this subject had been introduced first at the January Council meeting in Toronto and after some consideration had been put forward for further consideration at this meeting. He explained further that Major-General Guy Turner had written to Mr. Stirling to inquire if the Institute would be interested in sharing in the cost of a Book of Remembrance which it was proposed that the Royal Canadian Engineers would prepare in memory of the members of that service who had lost their lives in the late war. Mr. Stirling had discussed the matter in detail with Mr. Wright and eventually decided that it should be brought before Council for consideration and decision.

The president thought Council should reach a decision which Mr. Stirling could forward to General Turner. He personally would favour the Institute supporting such a project but he thought Council's first duty was to prepare a memorial to our own members. He inquired as to whether or not Council would like a committee set up to give consideration to the Institute memorial and to a policy which might be adopted towards the proposed Book of Remembrance.

The discussion which followed brought out the point that the first duty of the Institute was to provide a memorial for its own members and it was left with Mr. Stirling to inform General Turner of the situation in which the Institute found itself and of its inability to participate in the fund for the Book of Remembrance.

In conclusion, the president suggested that if councillors thought some definite action should be taken now on an Institute memorial they should communicate with the general secretary asking him to put the subject on the agenda for a later meeting.

International Electrotechnical Commission

On the motion of Mr. Beaubien, seconded by Mr. Dunbar, it was unanimously resolved, that, subject to his acceptance, Professor C. V. Christie, of McGill University, be appointed as the Institute's representative on the Canadian National Committee of the Electrotechnical Commission. (Professor Christie has since indicated his willingness to accept this appointment.)

Financial Statement

It was noted that the financial statement to the end of January had been examined and approved.

Students and Juniors Prizes

The recommendations presented by the chairmen of the examiners for the Phelps Johnson Prize and the Ernest Marceau Prize for the year 1947, were unanimously approved as follows:

Phelps Johnson Prize (Province of Quebec—English) to—R. B. Todd, S.E.I.C., for his paper " The Manufacture of .22 Calibre Long Rifle Cartridge ".

Ernest Marceau Prize (Province of Quebec—French) to—R. Riopelle, S.E.I.C., for his paper " Etude, Plans et Devis d'un Generateur de Haute Frequence pour le prechauffage dielectrique d'une poudre a mouler thermostable ".

Engineering Journal

The president explained that he had asked Mr. E. J. Blandford, publication manager of the *Journal*, to report on the advertising situation of that publication. Mr. Blandford gave a general outline of his experiences with the various advertisers and advertising agents and stated that he had found the *Journal* to be very highly regarded by them all. The Institute's decision to handle the advertising through one person alone rather than through a general agency handling several other publications, had been generally approved.

He stated that no unsurmountable difficulties had been met because of the recent increase in advertising rates. Advertisers were impressed with the fact that even at the higher rate the *Journal* still represented the lowest cost per page per reader of any comparable publication in Canada. Mr Blandford was very hopeful that before the end of the year the volume would be increased sufficiently that a substantial net revenue would accrue to the Institute.

International Meeting of Engineering Societies

The general secretary presented a letter signed by the president of the three British Institutions of Civil, Mechanical and Electrical Engineers in which an outline was given for the proposal to hold an international meeting in London in October 1948.

The letter suggested that invitations be sent to societies in Belgium, Denmark, France, Holland, Norway, Sweden, Switzerland, and the United States. It was recommended that the three institutions in England carry the representation for the Commonwealth, otherwise there would be a preponderance of British societies which would overbalance the meeting.

The purpose of the meeting was described as the promotion of international collaboration between engineering societies. The letter asked the Institute if we were agreeable to the proposal and to the Commonwealth representation being limited to the three British Institutions.

After a short discussion it was agreed to approve the proposal, stipulating, however, that the Institute would not be bound by any decisions unless it had an opportunity to discuss them beforehand.

Montreal Branch Facilities

The general secretary reported that the chairman and other officers of the Montreal Branch had called on him on February 19th in order to secure certain information of special interest to the Montreal Branch.

The delegation asked, primarily, the following two questions: (1) Are there any early prospects of branch facilities at Headquarters being improved? (2) As the branch now finds the Headquarters auditorium too small for some of its meetings, is Council prepared to reimburse them for the expense of securing auditorium space elsewhere for approximately three meetings a year?

Mr. Flitton, as chairman of the House Committee, stated he had hoped to meet with the officers of the branch to discuss Headquarters facilities. He commented on the questionnaire which the branch had circulated to the members inquiring as to their wishes with regard to additional accommodation. He spoke of the estimated cost of a new building which had been prepared by his committee, stating that the figure had been prepared for submission to the Finance Committee.

Mr. Eadie stated that the Finance Committee had taken no further action because of the amount of $450,000 was entirely outside the capacity of the Institute to handle. Eventually, after some further discussion, it was agreed that Council should appoint a committee to meet with the officers of the branch. Accordingly, it was moved, seconded and approved unanimously that the Montreal councillors who were past chairmen of the Montreal Branch, together with Mr. Flitton, as chairman of the House Committee, should constitute Council's committee, under the chairmanship of Vice-President Eadie.

Council Agenda

The president reported that while in the west he had received inquiries as to whether or not it would be possible to send out an agenda to councillors in advance of the Council meetings. The general secretary explained that while it would be possible to issue a list of the principal items, it would be difficult to circulate a complete agenda in advance as many important items come up during the last few days before a meeting. It was agreed to include something along that line with the notices of Council meetings.

It was decided that the next meeting of Council would be held in Montreal on Saturday, March 13th, 1948, this early date being necessary because the annual meeting of the Corporation of Professional Engineers of Quebec is being held on March 20th, and Easter Saturday falls on March 27th.

The Council rose at four o'clock p.m.

L. Austin Wright,
General Secretary.

Elections and Transfers

At the meeting of Council held on March 13, 1948, the following elections and transfers were effected:

Admitted as Students

Davies, Llewelyn Bennett, B.A.Sc., (Elect.), B.C., asst. engr., Bell Telephone Co. of Canada, Montreal, Que.

McConnell, Paul Goodwin, B.Sc., (Elect.), Alberta, test course, Canadian General Electric, Peterborough, Ont.

Sadler, Gerald Wesley, B.Sc., (Mech.), Sask., Univ. of Alberta, Edmonton, Alta.

Strickland, Lloyd Boyce, B.Eng., (Elect.), N.S.T.C., test course, Canadian General Electric, Peterborough, Ont.

Students at University of Manitoba

E. K. Christian	M. G. Kunec
E. M. Clark	D. Liberson
D. G. Curiston	L. W. Locke
L. L. Dixon	R. F. MacMillan
K. R. Ebbern	H. G. Mitchell
L. J. Eibner	F. H. Pascoe
Z. M. Ferley	R. J. Pope
A. Ficks	R. F. D. Rice
L. J. Foord	W. L. Saunders
E. H. Hawley	A. T. Sherrett
H. R. Hayman	J. E. Staples
W. C. Heaney	J. M. Sterling
R. W. Hutchinson	W. N. Tivy
C. K. Johnson	C. Tooth
S. T. Johnson	

Students at University of Saskatchewan

K. W. Allcock	M. F. Pardoe
D. J. Anderson	E. Rapp
J. Belzile	W. E. Rubashewsky
G. A. Bernard	O. A. Timm
O. D. Bobyn	W. R. Tinkess
M. E. Erfle	J. D. Turner
E. Lee	

Students at University of Alberta

G. A. Davis	J. R. McEwen
J. S. Harris	T. G. Tustin
A. Garfin	R. A. Underhill
D. I. Hougan	A. R. Walker
A. J. Mair	

Students at University of British Columbia

M. J. J. Dayton	D. H. Jamieson
A. T. Holmes	N. A. Macdougall
J. Lee	J. W. McPhail
R. Linden	

Students at University of Toronto

G. H. Bagshaw	J. S. Mutchmor
G. K. Hopper	C. J. Radford
G. I. Legate	G. S. Warner

Students at Queens University

H. L. Armstrong	B. Miner
C. R. Baker	R. W. Steward
R. P. Blake	A. E. Toole
G. K. Escott	J. A. Walsworth
W. F. Houghton	R. F. Wheelan
J. D. McIlveen	

Students at McGill University

F. B. Agnew	R. M. Johnson
W. C. Belschner	J. J. A. Laporte
G. M. Butler	H. R. Lumsden
S. P. Byers	N. F. Ogilvie
J. R. Candlish	J. Palevsky
E. H. R. Clayson	J. A. Z. Paquet
R. E. G. Cox	A. C. Rae
T. L. Craig	A. Saunders
W. W. Davis	J. J. Stefaniszyn
R. M. Dunton	R. C. T. Stewart
J. A. Edger	J. L. G. Turgeon
S. Frankowski	J. L. Vachon
G. D. Harvey	W. D. Watt
C. A. Hennigar	J. M. Zaback

Students at Laval University

P. Beauchesne	J. L. Labbe
J. Beland	W. A. Laurie
M. Bergeron	M. Michaud
J. J. A. Bernier	C. Morisset
J. L. A. Blais	E. Normand
R. Blais	P. E. Normand
B. Bonneau	J. A. R. Normand
C. Carpentier	J. L. S. O'Connor
V. Corriveau	J. L. G. Premont
A. B. Deshaye	P. H. Roy
G. Jobin	A. St. Arnaud
V. Gregoire	J. C. Soucy
M. Grondin	M. Vermette

Students at University of New Brunswick

H. M. Barnett	F. J. LeBlanc
K. E. Barter	L. V. Lockhart
W. S. Bears	J. D. Long
G. A. Bird	F. C. MacLoon
J. A. Brown	E. K. MacNair
T. A. Downing	D. A. Matheson
K. I. Fletcher	W. E. Matthews
G. R. C. Fownes	C. A. Northrup
J. W. F. Graham	R. G. Scott
B. B. Hanson	L. A. Wade
E. C. Inch	A. D. Washburn

Students at Nova Scotia Technical College

R. A. Bradley	A. Macdonald
A. J. Callaghan	O. T. McCarthy
W. P. Kerr	W. J. Myatt

Student at Dalhousie University

H. M. Anderson

Student at Carleton College

B. H. Newington

Student at Ottawa University

J. C. Besserer

By virtue of the cooperative agreements between the Institute and the associations of professional engineers, the following elections and transfers have become effective.

Alberta

Member

Young, Roy Effinger, equipt. engr., Alberta Government Telephones, Edmonton, Alta.

Junior to Member

McManus, Leslie Harold, B.Sc., (Civil), Alberta, testing engr., Dept. of Public Works, Alberta, Edmonton, Alta.

Treleaven, Leonard James, B. Eng., (Agri.), Sask., asst. engr., constrn. dept., Alberta Wheat Pool, Calgary, Alta.

Saskatchewan

Junior

Sharpe, William Lloyd, B.Eng., (Civil), Sask., instru'man., Dept. of Highways, Regina, Sask.

Students at University of Saskatchewan

W. H. Abel	C. E. Nickel
K. M. Bayne	W. E. O'Brien
G. H. Bradley	P. J. Olynyk
G. R. Campbell	R. H. Persson
R. F. Comstock	N. Peters
R. P. Dohan	A. B. Platt
J. W. A. Donald	L. T. Raham
L. S. R. Eley	R. J. Riecken
A. Friesen	B. F. Riemer
C. Goodrich	A. S. Ringheim
C. D. Gould	L. H. Ritenburg
I. W. Hamm	S. A. Rokosh
R. J. Hood	J. E. D. Salloum
N. J. Howes	M. D. Smith
G. T. Keith	R. C. Strayer
A. J. Macgillivray	A. H. Sunley
M. D. Mackenzie	I. W. Tweddell
S. D. MacKinnon	G. G. Wellington
B. I. Maduke	G. L. Williamson
G. H. Nagel	D. E. Woodbury

Junior to Member

McLeod, George Carrol, B.Sc., (Civil), Sask., field engr., C. D. Howe Co., Ltd. (home: Saskatoon, Sask.)

Wiles, Alfred Payne, B.Sc., (Engrg. Physics), Sask., lab. instructor, Physics Dept., Univ. of Sask., Saskatoon, Sask.

(Continued foot of page 239)

Personals

Notes of the Personal Activities of Members of the Institute

Dr. C. J. Mackenzie, M.E.I.C., president of the National Research Council, has been appointed chairman of the Canadian Atomic Energy Control Board, succeeding Gen. A. G. L. McNaughton, M.E.I.C. Dr. Mackenzie will continue as head of the Research Council.

J. B. Stirling, M.E.I.C., has been elected president of the Corporation of Professional Engineers of Quebec for the year 1948. He is vice-president of E. G. M. Cape & Co., Montreal, engineering contractors.

Mr. Stirling is a graduate of Queen's University, class of 1911, who worked first on municipal construction projects. After service overseas with the R.C.E. in World War I, Mr. Stirling joined E. G. M. Cape in 1915. He was a field engineer, and later a supervising engineer on construction projects throughout Canada. He became a partner in the firm in 1928 and its vice-president in 1940.

A councillor of the Institute, Mr. Stirling has been chairman of the Committee on Professional Interests since 1944.

J. A. Lalonde, M.E.I.C., Montreal consulting engineer, is vice-president of the Corporation. Mr. Lalonde is a past-councillor and past-treasurer of the Institute, and a past-chairman of the Montreal Branch.

Secretary-treasurer of the Corporation is **L. W. Bladon.** Councillors are **J. A. H. Henderson,** M.E.I.C., and **F. S. Howes,** Montreal; **Leo Dufresne** and **Adrien Pouliot,** M.E.I.C., and **Gerard Letendre,** of Quebec.

J. A. Russell, M.E.I.C., who has been elected president of the Association of Professional Engineers of Nova Scotia for 1947, was councillor of the Institute for the Cape Breton Branch in 1944. He is chief mechanical engineer of Dominion Coal Company Limited, Sydney, N.S.

He came from Birmingham, England, to Canada in 1929 after a number of years employment as a designer on mining machinery and an apprenticeship with a firm of mining machinery manufacturers. He joined Dominion Coal Company as a draughtsman, and the following year was appointed to his present position.

Ernest Mason, M.E.I.C., chief designing engineer of Consolidated Mining and Smelting Company, Trail, B.C., is chairman of the Kootenay Branch of the Institute for the year 1948.

He was born at Bolton, Lancashire, England, and studied at Bolton Technical School and at Manchester College of Technology. He worked first in Canada in 1913-15 as a machinist with B. Greening Wire Company, Hamilton, Ont., and was with Homer and Wilson, Hamilton, in 1916. The next year he returned to England and was a tool designer for Rolls Royce Company for a time before joining Dobson and Barlow, at Bolton, as machine designer. He held positions with Hans Renold Limited at Manchester, with Thomas Ryder and with Chatwood Safe Company of Bolton from 1919 to 1922, returning then to Canada and joining Consolidated Mining and Smelting Company. There he was successively designer, chief draughtsman and assistant to the chief engineer before receiving the appointment to his present position in 1945.

Stewart Young, M.E.I.C., has been elected chairman of the Saskatchewan Branch of the Institute and president of the Association of Professional Engineers of Saskatchewan. He is director of community planning for the government of the Province of Saskatchewan.

Born at Owen Sound, Ont., he received the degree of B.A.Sc. from the University of Toronto in 1912. He joined the Department of Public Works of Saskatchewan that year as assistant surveyor, subsequently becoming district surveyor and resident engineer. In 1924 he was appointed director of town planning in the department of municipal affairs of the Province of Saskatchewan, and he was later director of technical services. He became director of the provincial division of municipal planning, and in 1945 was appointed to his present position.

Mr. Young served on the Institute council representing the Association of Professional Engineers of Saskatchewan in 1946-47. He was registrar for the Association for several years, as well as secretary-treasurer of the Saskatchewan Branch of the Institute.

W. A. Mather, M.E.I.C., seventh president of the Canadian Pacific Railway Company, is the first civil engineer to be elected to that office.

William Allan Mather, whose first railway job was as axeman with a survey gang at the age of 18, was vice-president at Winnipeg from May, 1942, until his election to the presidency March 8 this year.

Upon graduation from McGill University, Montreal, in 1908, he immediately entered C.P.R. He was an axeman, and instrumentman at Kenora, Ont., and

W. A. Mather, M.E.I.C.

a transitman at Laggan, Alta., in his first years with the railway. In 1912 he became 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, as assistant general superintendent at Vancouver, and as general superintendent at Calgary and Moose Jaw.

He assumed the duties of general manager of eastern lines early in 1934 and returned west as general manager of western lines, with headquarters at Winnipeg, late in 1934. While vice-president at Winnipeg his territory was first defined as western lines and then as the prairie region.

Mr. Mather is a director of the Great West Life Assurance Company and of the Calgary and Edmonton Corporation, was a member of the Winnipeg advisory committee of the Royal Trust Company and of the operating committee of the Northern Alberta Railways. He is chairman of Canadian Pacific Air Lines and of Canadian Pacific Steamships.

Wilks, George Haden, B.Sc., (Civil), Sask., civil engr., Ducks Unlimited, Swift Current, Sask.

Student to Junior

Buhr, Donald Alan, B.Sc., (Civil), jr. hydraulic engr., P.F.R.A., Regina, Sask.

New Brunswick

Members

Bateman, Frederick John, consultg engr., Fair Vale, N.B.

Baxter, Arthur George, heating engr., Enterprise Foundry Co., Ltd., Sackville, N.B.

Evans, Herbert George, layout and design Canadian Ingersoll-Rand Co., Saint John, N.B.

Junior to Member

Baird, Robert Gordon, B.Sc., (Elect.), N.B., engr., N.B. Electric Power Co., Saint John, N.B.

Brenan, William Murdoch, B.Sc., (Civil), N.B., designer & dftsman., D. O. Turnbull, consultg. engr., Saint John, N.B.

Shearer, John Alexander, B.Sc., (Civil), N.B., roadmaster, C.P.R., Aroostook. N.B.

R. J. Griesbach, M.E.I.C.

R. J. Griesbach, M.E.I.C., has been appointed general superintendent of the engineering construction department of the Foundation Company of Canada Limited. Mr. Griesbach joined Foundation shortly after graduating from the University of Toronto in civil engineering with the degree of B.A.Sc. in 1924. During his 24 years with the company he has been identified in a supervisory capacity with many major undertakings in the hydro-electric power field, pulp and paper industry, mining construction developments, marine terminal projects, bridges, dams and wharves in Central and Eastern Canada.

T. E. Bate, M.E.I.C., has resigned as assistant engineer, for Canadian National Railways at Fort William, Ont., and has become assistant engineer to Charles E. Garnett, M.E.I.C., president and general manager of Gorman's Limited, Edmonton. Mr. Bate will be in charge of the Elevator Service Company, division of Gorman's Limited, and will take care of the sale and installation of Turnbull passenger and freight elevators throughout Northern Alberta and will also act as sales engineer handling the company's various engineering lines.

George W. Beecroft, M.E.I.C., recently formed in Toronto a new company in the sales engineering field. He represents in Ontario the Fisher Governor Company of Marshalltown, Iowa, manufacturers of automatic control specialties, and Manning, Maxwell and Moore Inc., of Bridgeport, Conn., manufacturers of gauges, valves and industrial instruments. Prior to World War II, he was with Imperial Oil Limited and had extensive experience in their oil fields in South America and in their operations in Canada. Colonel Beecroft served with R.C.E.M.E. in Canada and overseas, and for two years was Services Advisor to the Wartime Bureau of Technical Personnel.

Lucien Allaire, M.E.I.C., was reported inaccurately in the February *Journal* as being assistant manager for the west division of the Waterworks and Sewerage Department, City of Montreal. Mr. Allaire is an engineer in the Sewer Collectors Division of the City of Montreal, and the occasion for our "Personal" was his completion of a course in municipal public works administration.

New Company Formed

A new Montreal company of engineers and contractors was incorporated in January last and came into operation on March 1st. It is the Pentagon Construction Company Limited whose principal officers are as follows:

C. H. Gordon, M.E.I.C., president of the new company, is a graduate of Royal Military College and of McGill University, receiving the degree of B.Sc. from the latter in 1924. After one year's association with Armstrong-Whitworth, he joined Atlas Construction Company Limited and between 1925 and 1940 he served that organization as engineer, secretary-treasurer and vice-president and director. From 1940 to 1945 he was assistant chief engineer and director of shell filling for the Allied War Supplies Corporation of the Department of Munitions and Supply. He then returned to Atlas Construction and was vice-president and managing director until the end of 1947.

C. H. Gordon, M.E.I.C.

H. R. Montgomery, M.E.I.C., vice-president of the Pentagon company, is the former vice-president of Atlas Construction Company Limited. He had been connected with the latter from 1929, and in 1932 had been elected director of the company and of the Belmont Construction Company Limited. He was made vice-president in 1942. Mr. Montgomery was graduated in civil engineering, with honors, from McGill University, Montreal, in 1929. He had also attended Bishops College, Lennoxville, Que.

Frank B. Rolph, M.E.I.C., a director of the Pentagon company is another graduate of Royal Military College and McGill University, receiving the degree of B.Sc. from the latter in 1928. He was for a year a director of Atlas Construction Company Limited, which firm he joined in 1946 as an engineer, after terminating five years service overseas with the Royal Canadian Artillery and being discharged with the rank of major and with D.S.O., E.D., and M.I.D. Before the war he was in London, England, director and plant engineer for Hygrade Corrugated Cases Ltd. He had gone overseas in 1937 as English representative of John S. Metcalfe Company of Chicago, Ill., with whose Montreal office he was associated from 1928 to 1937 as engineer on designing and supervision, and general superintendent. In London, in 1938 and 1939 he was general manager of Ontario Estates Limited.

Alphonse Trudeau, M.E.I.C., director of the Pentagon Construction Co. Ltd., is a graduate of McGill University, class of 1917. After a short time in the service of G. B. Mitchell Company, Mr. Trudeau joined Atlas Construction Company and Belmont Construction Company Limited and up to 1939 held the positions of engineer, superintendent, and director. He was then elected director and vice-president of the two companies, remaining until the organization of the new Pentagon Company.

Leo Galler, M.E.I.C., chief engineer and director of Pentagon Construction Company. Formerly chief engineer and director of the Atlas Construction Company Limited, from 1925 to 1948. Mr. Galler was graduated from the University of Vienna in 1917. He spent the years until 1925 as engineer on various engineering projects in Central Europe, and as owner of a construction company there.

Sigmund Wang, M.E.I.C., is president and manager of Industrial Cellulose Research Limited, Hawkesbury, Ont. That organization now operates the Research and Technical Service Laboratories formerly operated by Canadian International Paper Company, under Mr. Wang's direction.

C. A. Miller, M.E.I.C., has left the employ of Canadian Industries Limited and has joined the Varcum Chemical Corporation (Canada) Limited, Lindsay, Ont., as assistant to the plant manager. He was in Montreal, a project engineer working on design of the Atomic Development Plant at Chalk River, Ont.

A. J. E. Smith, M.E.I.C., is with Central Mortgage and Housing Corporation, and has been assistant supervisor, Ontario Region since February. He resigned from his former position with the Town of Hampstead, Quebec, in May, 1947, and immediately joined the Corporation at head office in Ottawa. He was transferred to Toronto on land assembly and special projects, and was later appointed regional engineer for Ontario in charge of engineering and construction.

E. H. Henderson, M.E.I.C., is now located in Sackville, N.B. He is the maritime distributor for Plibrico Jointless Firebrico Company of New Toronto, Ont., and maritime representative for E. F. Drew and Co. Ltd. He intends to specialize in boiler plant equipment and will form a company to handle the various agencies in the near future. He was previously plant engineer with Halifax Shipyards Limited at Halifax.

Canada Cement Appointments

CANADA CEMENT COMPANY appointments, effected at a February meeting of the board of directors in Montreal included the following Institute members:

F. B. Kilbourn, M.E.I.C., is president. Formerly executive vice-president and general manager, he had been with Canada Cement since 1906. Until 1919 he was in charge of construction and operation of the company's No. 1 plant in Montreal, and was then appointed general superintendent of the company. In 1941, when vice-president and assistant general manager, he was made steel controller by the Minister of Munitions and Supply of Canada.

J. D. Johnson, Affil. E.I.C., president of Canada Cement since 1931, was elected chairman of the board. Mr. Johnson joined the company in 1909 as sales manager of the Toronto office. Ten years later he was appointed general sales manager at Montreal.

J. M. Breen, M.E.I.C., who was assistant general manager since 1947 succeeds Mr. Kilbourn as executive vice-president and general manager. He was also elected a director of the company. He joined Canada Cement in Toronto in 1922, a year after his graduation from the University of Toronto. He was a technical engineer there until his transfer in 1934 as chief of the technical staff at Montreal. His appointment as assistant general manager occurred early in 1947.

E. K. Lewis, M.E.I.C., has been transferred to Montreal by Imperial Oil Limited. and is superintendent of the refinery. Mr. Lewis was in the engineering and development section of the company at Sarnia, Ont.

MacKenzie McMurray, M.E.I.C., and **Rene Dansereau,** JR.E.I.C., have been appointed sales engineers in the boiler division of Dominion Bridge Company.

Mr. McMurray, who will be attached to the company's Ontario Division, with headquarters in Toronto, has the degree of B.A.Sc. in metallurgical engineering from the University of Toronto. He spent some time as a demonstrator in mining engineering at that University before joining Dominion Bridge in 1940. At that time he entered the Sorauren Avenue Munitions Division as metallurgist and chief inspector, retaining this position until the close of plant operations in 1945. He was then engaged in design work, at Toronto, and at the Boiler Division of the company's head office at Lachine.

MacKenzie McMurray, M.E.I.C.

Rene Dansereau, Jr.E.I.C.

Mr. Dansereau has been associated with Dominion Bridge since 1942, with the exception of a period of service overseas as a navigator in the R.C.A.F. He has a B.A.Sc. degree in civil engineering from Ecole Polytechnique, Montreal. He was the recipient of the Ernest Marceau Prize of the Institute in 1943.

R. W. Wright, JR.E.I.C., is manager of Eastern District sales for Canadian Allis-Chalmers Limited, with headquarters in Montreal. He is a graduate of Dalhousie (B.Sc.) and of McGill University (B.Eng.). Following his graduation in 1941 he took the "Test" training of Canadian General Electric Company and during the war served in design and plant engineering with C.G.E. Since that time he has had extensive experience in the engineering, service and sales of Canadian Allis-Chalmers products.

At the February meeting of the Kingston Branch of the Institute, President L. F. Grant received from Professor A. Jackson membership pin representing Life Membership in the Institute.

Obituaries

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

Martin Wolff, M.E.I.C., of Montreal, who died on March 6, 1948, while vacationing at Hastings, Barbados, B.W.I., was associated with M. D. Barclay, Inc., of Montreal.

Born in 1881, he studied at Clifton College, Bristol, England, and at Central Technical College, London. He served with the Royal Engineers in the South African War, winning the Queen's Medal with five bars, and returned to England in 1902. Resuming his studies in civil and mechanical engineering, he graduated in 1904, and came to Canada in 1906. He served with Canadian railways for eight years. In 1914 he attended the Officer's Training Course in Quebec, Que., qualifying as a lieutenant, and becoming attached to the Department of Militia and Defence, and later to the Imperial Ministry of Munitions at Quebec.

In 1917-22 he was with the Department of Railways and Canals. He was then made assistant engineer in the Bureau of Economics of Canadian National Railways at Montreal. In 1925 he became senior draughtsman at the Cornwall office of the St. Lawrence Waterway Commission, but in 1927 he joined the Gatineau Power Company, Ottawa, as assistant engineer in the Development Branch. From 1928 to 1930 he was with the Laurentide Construction Co. Ltd., Montreal, as office engineer.

He entered the employ of the city of Westmount then, and was engaged on construction of sewerage developments. He joined M. D. Barclay Inc. in 1941. He was later recalled by the City of Westmount to fit out and organize

Martin Wolff, M.E.I.C.

the central control room of their A.R.P service, and upon its completion he returned to the service of M. D. Barclay Inc., acting as assistant civil engineer until he went on leave to the West Indies just prior to his death.

Mr. Wolff was the author of "History of the Canadian National Railways", and of the "History of the Jews in Canada". He had been associated with the Congregation Shearith Israel of Montreal, serving as treasurer for fifteen years, and as chairman of the building committee of the new synagogue. He was chairman of the Archives Committee for the Dominion Council of the Canadian Jewish Congress since its inception in 1934.

Mr. Wolff joined the Institute in 1908 as a Student, transferring to Associate Member in 1911, and to Member in 1940. He had attained Life Membership in 1941.

E. B. Martin, M.E.I.C., city engineer of Moncton, N.B., since 1930, and a member of the engineer staff since 1912, died

E. B. Martin, M.E.I.C.

on February 3, 1948, at his home, after a brief illness.

In his long association with the city of Moncton, where he was born in 1887, Mr. Martin, in his post with the Board of Works Department, had contributed materially to the growth of Moncton and had given freely of his time and energy to bring about many improvements necessary to keep pace with the rapid growth of the city.

On graduating from the University of New Brunswick, Moncton, with the degree of B.Sc. in 1912, he joined the city staff as assistant city engineer, and three years later was granted leave of absence for military service. He served with the R.C.E. in France for four years, with the rank of lieutenant. In 1919, returning from overseas and to civilian life, Mr. Martin returned to city hall, taking the post of street commissioner. In 1930 he became city engineer, in addition to his duties as street commissioner, and held both posts.

He joined the Institute as an Associate Member in 1920, becoming a Member in 1940. He was active in the Moncton Branch, representing it on the Council of the Institute in 1944.

John Stadler, M.E.I.C., widely-known as a consulting engineer, particularly in the pulp and paper industry, died at his home on February 28, 1948. He was a partner in the Montreal firm of Stadler and Hurter.

Born in Bavaria in 1874, he was a graduate in engineering of the Polytechnical Institute at Munich. After a few years with Helios Company, of Cologne, as field engineer on construction of

John Stadler, M.E.I.C.

hydro-electric and industrial plants, he came to the United States of America in 1902. In 1905 he joined the staff of the Shawinigan Water and Power Company; he was superintendent of the Shawinigan Falls power house until 1906 when he joined the Belgo-Canadian Pulp and Paper Company, as plant engineer in full charge of design and construction. In 1913 he became assistant manager of the company, and left in 1923 having remodelled and managed the plant and built extensions to produce 380 tons of newsprint. During this time he also made investigations on pulp, paper and power properties. He went to the Newfoundland Power and Paper Company at Cornerbrook as general manager in 1924. Three years later he was appointed general manager of the Lake St. John Power and Paper Company, Dolbeau, Que.

Since 1929 Mr. Stadler carried on a successful consulting practice in Montreal, specializing in pulp, paper and power. Among corporations to whom Mr. Stadler rendered consulting services on such developments, were the Australian Newsprint Mills Proprietary at Hobart, Tasmania; Bowaters Paper Mills, and Daily Express, London, England; Kymmene Aktiebolag, Kuusankoski, and Papersbruk, Woikka, Finland; Papeteries de la Chapelle, Rouen, France; Papeteries de Belgique, Brussels, Belgium; Powell River Co. Ltd., at Powell River, B.C.; Scott Paper Company, Chester, Pa.

Mr. Stadler was a member of the American Society of Mechanical Engineers, the Corporation of Professional Engineers of Quebec, Technical Association of American Pulp and Paper Industry, and an honorary life member of the Canadian Pulp and Paper Association. He joined the Institute in 1921 as a Member. He was its treasurer in 1941.

News of the Branches

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented at their meetings

Calgary

J. F. Langston, m.e.i.c.
Secretary-Treasurer

T. M. Parry, m.e.i.c.
Branch News Editor

The Calgary branch held a luncheon meeting on Thursday, February 19, in the Palliser Hotel and 50 members were present to hear D. G. Geiger, m.e.i.c., transmission engineer of the Bell Telephone Company of Canada. Mr. Geiger is chairman of the Toronto branch of the Institute. Following luncheon, he was introduced to the gathering by R. MacKay, superintendent of the Calgary Electric Light and Power Department. Mr. Geiger's paper, of particular interest to the many power and communications men present, was entitled, **The Joint Use of Poles by Electric Power and Communication Utilities.**

He pointed out that both of these utilities usually supply the same customers. Where the plant is above the ground, safer and better conditions result if the same poles support circuits of both services. Frequently, economy to both companies is a big factor.

Joint use of poles by power and communication utilities has become increasingly popular on this continent, with several millions of poles in such use. Certain principles and practices for joint use have been established for the partners and the general construction practices and specifications employed in this country are based on the National Electrical Safety Code (5th edition).

The most practical method of establishing the definite procedures necessary to secure the full benefits of joint use is by the use of formal agreements. Such agreements cover introductory statements as to corporate standing, purpose of the agreement, poles to be included or excluded, ownership of the poles involved and basis of rentals, specifications to be followed, advance notice of intended changes by either party and other necessary details. Full cooperation between the parties concerned is the keynote of successful joint use, concluded Mr. Geiger.

The paper was illustrated with slides showing examples of proper specifications and good and bad examples of joint use.

The interest of the gathering in Mr. Geiger's paper was indicated by the long question period which followed. A hearty vote of thanks was moved by R. S. Trowsdale, local manager for Canadian General Electric Company.

Saturday, February 21, saw the "Annual Ladies Night" of the Calgary branch at the Renfrew Club. Some 65 couples, plus a few "stags" enjoyed an evening of conversation, dancing, bridge, entertainment, buffet supper and refreshments. The dance floor took precedent in popularity for the evening as couples enjoyed the music and vocals of a small, but excellent orchestra.

Those attending were welcomed by Branch Chairman M. W. Jennings and Mrs. Jennings. Among the many prominent members noticed among the gay throng were S. G. Coultis, Western Zone vice-president; Councillors J. G. McGregor, and P. M. Sauder.

Cornwall

G. G. M. Eastwood, m.e.i.c.
Secretary-Treasurer

T. B. Webster, jr.e.i.c.
Branch News Editor

On March 16, the Cornwall branch was honoured by the visit of Lt.-Col. L. F. Grant, when a banquet was held in the Cornwallis Hotel. Three vice-presidents and three councillors were also present for the presidential visit, the first since the inauguration of the branch a little more than a year ago.

The branch chairman, R. H. Wallace, introduced Col. Grant who spoke of his previous visits to all the other eastern and central branches. Col. Grant said that the Institute is very favourably regarded by similar organizations in the United States, this position having been attained by the exacting admission requirements, the wide coverage of Canadian engineers' interests, and its attention to the welfare of the young engineer. The President spoke of the continual improvement of the status of the profession in the past 40 years and the realization by industry of the useful service that can be performed by engineers.

Councillor Drummond Giles thanked Col. Grant.

Visiting vice-presidents were W. R. Manock of Fort Erie, R. S. Eadie of Montreal and G. F. Layne of Quebec, and visiting councillors were R. C. Flitton and J. B. Stirling, both of Montreal.

Dr. L. Austin Wright, general secretary, spoke of the work of the Institute, its growth, and the advantages of membership.

Edmonton

W. W. Preston, jr.e.i.c.
Secretary-Treasurer

What has happened and what may happen to Alberta's trees and water resources were described by Robson Black, at a meeting of the Edmonton Branch at the King Edward Hotel, on March 3, 1948. Mr. Black, who is president of the Dominion Forestry Association, spoke on **Why Manage the Resources?**

The paper was prefaced by a description of plans in Great Britain to utilize waste. England, who lost eighty per cent of her trees in the last war is busy replanting. Scotland, whose people are leaving the Highlands in alarming numbers, has undertaken a million-horsepower hydro-electric development in order to provide industries that will attract her population.

The speaker claimed Alberta had a heritage of 90,000 square miles of forest, but has lost three quarters of it in 40 years of exploitation. However, there is hope that the land still retains its recuperative power and that engineering management will bring forth a crop which will be better than the original.

Alberta was compared to Libya and Sweden, each with widely different forest experiences. Libya was a prosperous grain grower until she lost her forests. Without watershed protection, the land was flooded, and lost its fertility. Now Libya is a land with goat herds and a nomadic population. Other countries too have cleared their upper lands and drained their swamps, and shared Libya's experience.

To prevent similar conditions from coming to the Prairies, a body known as the East Slope Conservation Board has been established. This board is neither a government nor commercial organization. It is headed by Major General Kennedy, a first rate forestry engineer, and has been granted several thousand dollars to replace trees on the east slope of the Rockies, and thus control essential water resources. Trees, according to Mr. Black, do the job better than is done by any engineering works.

Sweden is comparable with Alberta in area, soil, moisture and sunlight. Sweden's good management of her forests allows profits from continual forest crops to eliminate taxes.

In conclusion, Mr. Black paid tribute to Alberta's Lands Minister, Hon. N. E. Tanner, for a policy whereby appropriate areas are chosen for settlers and none opened which might prove disastrous to them and to a programme of conservation of essential forest and water resources.

During the general discussion, Mr. Black referred enthusiastically to the prospect of Alberta's poplar trees being used for the production of paper pulp.

Mr. Black was introduced to the meeting, attended by forty-one members and guests, by T. Main, a director in the Dominion Forestry Association. F. R. Burfield Provincial water resources engineer, proposed a vote of thanks to Mr. Black. J. F. Cranswick was chairman of the meeting.

Halifax

W. E. Jefferson, M.E.I.C.
Secretary-Treasurer

M. L. Baker, M.E.I.C.
Branch News Editor

Geological and Mineral Possibilities of the Coast of Labrador was the subject of a most interesting and instructive address given at the February meeting of the Halifax Branch. This meeting was held in the Lord Nelson Hotel on February 24. Sixty members were present. Guests at the dinner were Past-president J. B. Hayes, and Dennis Stairs, vice-president of the Dominion Engineering Co. Ltd. Chairman W. C. Risley presided.

The speaker was Prof. G. Vibert Douglas, head of the Department of Geology at Dalhousie University. At the request of the Government of Newfoundland Prof. Douglas made, during the summers of 1946 and 1947, geological surveys of the coast of Labrador from Point St. Charles to Cape Chidley. The personnel of the parties was made up of Dalhousie University geology and engineering undergraduates.

Slides made from photographs taken on the expedition illustrated the various phases of the subject, including the topography of the coast. No less than five ranges of mountains are distributed along the coast line. They are, beginning at the north: the Torngats, the Kaumajets, the Kiglapaits, the Benedicts, and the Mealys. The highest peak —Mount Cirque—first climbed by the late Prof. A. P. Coleman of Toronto University, has an elevation of 5,500 feet. It is in the Torngats. The area north of the Kaumajets is devoid of trees.

In honor of Dalhousie University, a mountain in the Torngats was named Mount Dalhousie. This name is officially recognized by the Newfoundland government.

The fundamental geological column in the area has been determined. This column, with the younger strata at the top and the older at the bottom, is as follows:

Pleistocene and Recent	Glacial and recent deposits
Cambrian	Sediments — akoses, shales, etc.
Great Unconformity	
Huronian?	Mugford series—volcanics Unconformity Ramah series—sediments and igneous
Unconformity	
	Igneous rocks—granite and gabbro
Laurentian?	Mountain building Sedimentary rocks Basement unknown

Probably the most useful contribution of the expedition to the geology of the area was the discovery of a section on the north side of Tessisoak, west of Nain, which showed the gabbro (anorthosite) cutting the sediments and the relation of the granite to these two rocks. The granite sends sharply marked dykes into the gabbro but has soaked its way into the sediments transforming them into gneisses of the particular kind known as migmatites.

Mineralization on the coast is not widespread. A body of iron pyrites is known to exist at Rowsell Harbor and, in the course of the work, was carefully surveyed and sampled. Prof. Douglas mentioned, however, great iron deposits which lie astride the Labrador-Quebec boundary near the headwaters of the Hamilton River.

In the discussion, which was led by Prof. A. E. Flynn and Dr. A. E. Cameron, questions were asked about the possibilities of further surveys extending inland. The chief difficulty would be in getting supplies and equipment to any base established away from the coastal area. The rivers do not provide transportation, being too shallow or too swift. Prof. Douglas said the ideal way to conduct further surveys would be to use a flying boat to establish a base on the shore of a lake and then use a helicopter for extending out from the base.

E. C. Thomas moved a vote of thanks to the speaker. This was seconded by J. P. Messervey and enthusiastically endorsed by the audience.

Kingston

D. L. Rigsby, M.E.I.C.
Secretary-Treasurer

First-hand account of the Bikini atom bomb experiments was a highlight of a joint meeting of the Engineering Institute Kingston Branch, and the Engineering Society of Queen's University, in February, in Convocation Hall.

Air Vice Marshal E. W. Stedman, who was senior Canadian observer at the Bikini operations, and now adviser to the Defence Research Board, Ottawa, presented a personal and graphic picture of the two controlled atomic bomb explosions at Bikini.

He used a film-strip and a coloured motion picture to illustrate his remarks.

"The possession of the atomic bomb will not, of itself, prevent war, because fear engenders hatred and hatred leads to war," Air Marshal Stedman said in summing up the implications of the pictures he had shown.

"War can be prevented only by spiritual work. We must cultivate the better qualities of man if we are to make war impossible."

His address was sponsored by the Engineering Society. He was introduced by J. C. Davidson and thanked by M. G. Saunders. Norman Simmons, president of the Society, chaired this part of the meeting.

Main section of the Engineering Institute portion of the programme was the presentation of four papers by university students for the annual prizes awarded by the institute.

Winner of first prize was W. H. Finch, who gave a paper on sound recording methods.

Second prize was given to H. L. Armstrong, who presented a paper dealing with some original work on the complex nomograph; third to C. R. Baker, who spoke on controls on the sub-division of land in Ontario; the fourth student speaker was W. S. Bradley, who delivered a paper on the Venturi meter.

Another highlight of the meeting was the presentation of life membership buttons to six veteran members of the Institute. These awards were made by Prof. Arthur Jackson.

Those receiving the tokens were Institute President Lt.-Col. L. F. Grant, O. T. Macklem, T. A. McGinnis, J. M. Campbell and Col. Alex. MacPhail. The latter two were unable to attend the meeting.

C. E. Craig, chairman of the institute, announced that Kingston branch membership had leaped 39 per cent. during the past year and now stood at 169 members.

Kootenay

E. B. Broadhurst, M.E.I.C.
Secretary-Treasurer

The annual meeting of the Kootenay Branch of the Institute was held in the Conference Room on February 27th, 1948 with 24 members present.

Several items of interest were discussed, with chief interest centering around the forthcoming Presidential visit in May. Preparations for this visit are to get under way at once.

The members were extremely interested in low cost housing as outlined in a section of the Council Minutes. It was suggested that a committee be formed to investigate our local housing situation.

Following the business meeting and election of officers a film entitled "The Life of Colonel Crompton" was shown by A. W. Busby.

London

N. J. W. Smith, M.E.I.C.
Secretary-Treasurer

G. N. Scroggie, M.E.I.C.
Branch News Editor

The London Branch of the Institute held its regular monthly meeting on February 24 at the Wolseley Barracks Reserve Force Officers Mess.

Chairman E. R. Jarmain opened the meeting by welcoming members of the Professional Engineers of Ontario and the Military Engineers Association, who were guests.

The meeting took the form of a discussion on **The Engineers' Council for Professional Development.**

J. A. Vance, the first speaker, after giving a definition of E.C.P.D., went on to give a resumé of its history, explaining its general organization, and stressed the point that the E.I.C. is the only Canadian Society that is a member of the E.C.P.D. and that the Canadian representatives are members of various Committees of the Council.

E. V. Buchanan spoke next, giving his impressions of the meeting he had attended, and pointed out that big business men, as well as leaders in the field of education, were taking a real interest in the E.C.P.D. who had raised the standards of many universities and colleges.

The two above named speakers spoke alternately throughout the balance of the meeting, giving the functions of the various committees and their accomplishments in dealing with Professional Recognition, Engineering Schools, Professional Training, etc.

After G. Keegan thanked the speakers for their very informative discussion, refreshments and entertainment were provided to round out a very enjoyable evening.

Montreal

The following appointments to chairmanship of committees have been made by the Branch executive and accepted by the appointees.

Programme Committee, D. G. Elliot; Membership, H. M. Finlayson; Admissions, H. Gaudefroy; Entertainment, R. Hobner; Publicity, A. C. Abbott; Student Guidance, G. B. Moxon; Policy, E. B. Jubien; House, I. R. Tait. Mrs. R. N. Coke has agreed to be convenor of the Ladies' Committee.

Representatives of the Executive Committee meeting with representatives of Council are studying present and future accommodation of the Branch at Institute Headquarters.

R. N. Coke and I. R. Tait have been appointed by the executive as delegates to the Branch Conference which is to be held during the Annual Meeting at Banff in June of this year.

One result of the recent questionnaire is the inclusion of a Chemical Section by the Programme Committee. The Programme Committee is also studying other points put forward by members in regards to future programmes. Members are reminded of Section 11 of the Branch By-Laws which permits special sections to be established under certain stipulated conditions. Members can obtain a copy of the By-Laws on application to Institute Headquarters.

Junior Section

At a regular meeting of the Junior Section held on February 23, Mr. Jacques Perreault, a recognized authority on Union Legislation, spoke on **The Rights of the Workers,** reviewing the progress of organized labour and outlining some of the objectives which labour had obtained.

An innovation this year which proved to be a great success was the Ladies Film Night held on March 7. Three films were shown and the event proved so successful that it has been decided to make arrangements for the holding of a similar event next year.

At a business meeting held on March 15, next year's programme was tentatively discussed. Committees have been set up for the operation of study groups. A Public Speaking class will be organized and a professional instructor engaged. This will be the first study group to operate next year and those wishing further information are requested to get in touch with Jos. Galley, at FI. 4671.

Congratulations are due to R. B. Todd and R. Riopelle, winners of the Phelps Johnson prize and Ernest Marceau prize, respectively.

Niagara Peninsula

J. J. Miller, M.E.I.C.
Secretary-Treasurer

C. A. O. Dell, M.E.I.C.
Branch News Editor

The February meeting was held at The Welland House in St. Catharines on Thursday the 19th.

Chairman M. F. Ker spoke briefly at the outset and introduced one of the new members, C. K. Overall. Several guests from the English Electric Company, were also introduced by P. J. Farmer.

Vice-chairman R. A. Coombes introduced the speaker, D. P. Douglas, electrical inspector of mines for the Province of Ontario. Mr. Douglas spoke interestingly on many special problems which are met with in the use of electricity and electrical equipment in the mining industry in this province. His discussion covered special cable insulations to reduce fire hazard, electrical safety devices on hoisting equipment, transformers and sub-stations. He also spoke highly of the new type of standardized training which is being given to crews from widely separated mines to work together in emergencies. Mr. Douglas stated that safety regulations for mining in the province of Ontario are probably the most rigid in the world, but the mining industry is co-operating in every way, and in many cases owners are going beyond the minimum safety requirements in order to safeguard their workmen.

Following the address a technicolour movie on prospecting was shown.

Announcement was made that the annual joint meeting with the Association of Professional Engineers will be held on March 18 at the Red Casque Inn in Stamford.

At a short business meeting, favourable action was taken on several new membership applications and plans were made for future meetings.

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A joint meeting of this branch with the members of the Association of Professional Engineers of this district was held on Friday, March 19th. Chairman M. F. Ker presided, and Col. T. M. Medland, representative of the association, was introduced to the gathering by councillor P. E. Buss.

Col. Medland gave a timely resumé of recent developments affecting the official status of the engineer in this province. He pointed out that the membership of the Association has increased from 2,800 in 1944 to 6,377 in 1948. The Association supports The Dominion Council of Professional Engineers who are advocating a uniform system of fees for the various Professional Engineers Associations throughout the country. The Canadian Council of Professional Engineers and Scientists who are working on collective bargaining, and also The Technical Service Council which is at present the only active employment service for engineers in the province.

At a meeting of the branch executive C. L. Mason was appointed to carry out the duties of vice-chairman R. A. Coombes who will be absent for several weeks on a business trip to Vancouver.

Ottawa

C. G. Biesenthal, M.E.I.C.
Secretary-Treasurer

R. C. Purser, M.E.I.C.
Branch News Editor

The Ottawa Branch, at its noon luncheon February 19, heard something about the present oil situation in Canada from John Ness, Toronto, Imperial Oil Limited. The speaker's address was accompanied by the showing of a film "Search Unending" dealing with oil discovery. J. L. Shearer, branch chairman, presided. The speaker was introduced by A. A. Swinnerton, and thanked by Col. J. W. Bishop.

With the exception of our cousins to the south, Canadians use more oil per capita than any other people in the world. We need about 77,000,000 barrels of oil annually. But we only produce one-third of one per cent of the world's production, and of the crude processed at our refineries, only one barrel in every ten comes from a Canadian well. The rest is imported: sixty per cent from United States, and the remainder mostly from Peru, Colombia and Venezuela.

In the early days southwestern Ontario was a heavy producer. In 1894 approximately one million barrels came from Oil Springs, Petrolia, and Bothwell. Today, their output is about 160,000 barrels.

It is estimated that the oil industry has spent $75,000,000 in the search for new fields, not including expenditures on development of proven areas. Prospective oil-bearing formations cover some 560,000 square miles, 90 per cent of which is in the western provinces and the territories.

Turner Valley, discovered in 1914, with further important discoveries in 1924 and 1936 has in some years accounted for as much as 97 per cent of the Dominion's entire output. During the war years it was the mainstay of the Commonwealth Air Training Plan, reaching a peak of production in 1942 with around 10,000,000 barrels. Since then, production has steadily declined to a total of 6,000,000 in 1946. But altogether the Valley has supplied Canada with 100,000,000 barrels of oil and distillate, and has still many years of usefulness on a descending scale.

Norman Wells on the Mackenzie was a war-baby, for although discovered in 1920 it was only as an important cog in the Canol project that it came into its full growth. In 1944, Norman crude to the amount of 1,150,000 barrels went through the Canol pipe line to Whitehorse. Although Norman Wells has a proven reserve of 28,000,000 barrels, it would require perhaps ten times that amount of oil in sight before it would be considered economical to construct pipe lines to bring it out to seaboard. Meantime, however, it helps out with diesel and aeroplane fuel at Yellowknife and other nearby localities.

A third field, at Leduc, shows promise. Imperial Leduc No. 1 was completed as a producer on February 13, 1947. On its first birthday forty producing wells could be counted, with five failures indicating the limits of the field in certain directions. Drilling footage aggregated 53 miles. In the first year of operation, the field provided around 450,000 barrels. An 8-inch pipe line has been laid to the railway at Nisku, eight miles distant, and storage facilities, loading racks and offices constructed. Roadways have been built for year-round traffic; and a new town is taking shape.

Geologists consider the field is proved over a minimum area of 8,100 acres with reserves of at least 100,000,000 barrels. This estimate may, of course, be amended after further drilling. The Imperial Oil is erecting a refinery at Edmonton.

Materials will come from the Whitehorse refinery purchased from the United States Government. This refinery, part of the Canol project, will be dismantled, transported and re-erected at Edmonton. It will form the nucleus of an up-to-date refinery handling from 4,000 to 6,000 barrels daily. Once storage tanks are erected the pipe line will be extended from Nisku, making transhipment by rail unnecessary.

Canada's refineries require over 200,000 barrels of crude daily. Turner Valley, Norman Wells, Leduc and other smaller fields in the West, in Ontario and the Maritimes, with all the good will in the world, cannot hope to meet this demand. "That is why," the speaker concluded, "the drills are constantly probing; that is why there is a 'search unending'."

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Recently developed materials and their application to the improvement of electrical apparatus were explained by F. R. Benedict, manager of the Industry Engineering Department, Westinghouse Electric Corporation, at an evening meeting, February 24, at the National Research Auditorium, Sussex Street. The meeting was held jointly with the Ottawa sub-section of the American Institute of Electrical Engineers.

The speaker explained the use of various new types of materials and their insulating properties, also difficulties encountered in trying out some of them. For instance, carbons when tried out on submarine switchboards have been known to generate carbon monoxide in sufficient quantity to affect the personnel. This feature has led to the introduction of other materials that do not have the same effect.

Regarding the use of plastics for building motor cars, Mr. Benedict was rather doubtful. Most plastics do not have enough resiliency. Shocks would be terrific and would militate against safety.

The speaker listed a number of new materials and indicated trends in research towards others. Usually it is a case of working toward a definite desired end, though something else may result on the way. Efficient operation of apparatus and machines is, of course, a guiding principle in such research. Reduction in size is also an important consideration and is achieved whenever possible.

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Canada's ore reserves have been heavily eaten into by the war. A greater need than ever now exists to devise ways and means of making better use of those that remain.

C. S. Parsons, Chief of the Bureau of Mines, Ottawa, speaking before the Ottawa branch at a noon luncheon on March 4, in elaborating this thought said, "Most of the easy finds have been made. Now we must scratch for it."

He cited, as examples of new products developed from Canadian minerals, the rock wool industry and the brucite magnesium industry.

The rock wool industry was established in Canada as a direct result of work in the Bureau's laboratories, he said. In 1947 ten plants devoted to this industry had a production valued at more than $15 millions and employed more than 500 people.

A new plant for the production of brucite limestone in the Wakefield area in Quebec province about 25 miles north of Ottawa owes its origin to a Bureau official, Mr. Parsons said. This official made the discovery of the brucite limestone in the area. Subsequent investigations in the Bureau's laboratories of a process to recover magnesium and hydrated lime made development of the deposit possible.

The Bureau was closely following developments in the production of synthetic liquid fuels from coals and natural gas, Mr. Parsons said. A small-scale pilot plant was now under design at the Bureau's laboratories.

The speaker also disclosed that a large staff of the Bureau is presently assigned to work on the concentrating and treating of radioactive ores for the National Research Council.

Mr. Parsons was introduced by D. E. Kennedy, Chairman of the Junior Section, and was thanked by G. C. MacRostie. The branch chairman, J. L. Shearer, presided.

Peterborough

J. M. King, jr.e.i.c.
Secretary-Treasurer

J. C. Allan, m.e.i.c.
Branch News Editor

Mr. H. A. Blachford, customer relations representative of the Bell Telephone Company of Canada addressed a meeting of the Peterborough Branch on February 19 on the subject of **Micro-waves,** and demonstrated a number of new types of telephone equipment. The basis of the new radio-telephone system is the microwave, which made our wartime radar systems possible. These waves travel at a speed of 186,000 miles per second. Their wavelength is only 1¼ inch, while the waves of commercial radio are about 1,000 feet long. These minute radio waves behave like light waves or rays, and can be reflected from mirrors or metal objects.

In telephony, the microwaves are used to relay telephone conversations from point to point. A great many telephone conversations can be transmitted simultaneously over the beam, the speaker said. In just the same way, a number of conversations are transmitted simultaneously at different frequencies over a pair of telephone wires, making long distance service much more economical than it would be if a pair of wires would carry only a single conversation.

The exploration of the higher radio frequencies has opened up great new possibilities in communications. Previously there were simply not enough frequencies to embark on radio-telephony projects. The higher frequencies have made it possible to provide mobile telephone service whereby motorists can communicate from their cars with any telephone in the main system or with other mobile equipped cars. This service is now in operation in Toronto and Montreal. Radio telephones are also used in ship-to-shore trans-oceanic telephony and in certain areas, such as between Pelee Island and the Ontario mainland.

To what extent radio beam transmission will replace wire transmission in the future is not known. Telephone engineers have pioneered in this new realm of micro-waves to assure that in the future as in the past telephone service will be the best possible at the lowest cost.

Following the lecture demonstration the members were invited to examine the apparatus set-up for demonstration. They were able to repeat the demonstrations and perform other experiments in guiding micro-waves through flexible metal tubes and using sheet metal lenses to concentrate the beam.

Saguenay

J. E. Dyck, m.e.i.c.
Secretary-Treasurer

Junior Section

F. H. Duffy, jr.e.i.c.
Secretary-Treasurer

A meeting of the Section was held at the Arvida Protestant School at 8.15 p.m., Thursday, March 18, 1948.

K. M. MacQuarrie of the Aluminum Company of Canada Limited addressed the meeting on the subject of **Development and Processing of Aluminum Alloys.** He pointed out that, although to any observer operations in any of the fabricating plants look simple, they are actually quite complicated. A system of numbering and lettering is used to designate the various aluminum alloys. Mr. MacQuarrie outlined the types and proportions of alloying metals used with commercially pure aluminum to provide various characteristics in the alloys, and also various methods of fabrication which can be employed with the different alloys. Using a simple typical alloy as an example, the speaker traced the results of various heat treating methods and, by means of diagrams and photomicrographs of the alloys produced, showed the results on the grain structure of proper and improper heat treatment.

A discussion period followed during which the speaker provided answers to the questions presented by those attending the meeting. The speaker was introduced by Chairman C. J. Tanner and thanked on behalf of the Section by S. M. Paterson.

Sarnia

B. B. Hillary, m.e.i.c.
Secretary-Treasurer

Declaring himself in favour of a policy of "orderly decontrol" Kenneth A. Henderson, former Bank of Canada official and a vice-president of Imperial Oil Limited, told a joint meeting of the Engineering Institute of Canada and the Canadian Institute of Chemistry that it is an "imperative necessity" for Canada to contribute "in every possible way" to the reconstruction and recovery of the war-torn and ravaged areas of Western Europe and the United Kingdom. He advocated "liberal trade and financial arrangements to this end."

The meeting, which was held on March 2nd, 1948, in the English Lutheran Church of Our Redeemer, was presided over by branch Chairman Gordon R. Henderson. Prior to the addresses F. Fred Walsh introduced a group of Columbian Squires under the direction of Clair Dillon. They rendered a number of vocal and instrumental Irish numbers. The guest speaker was introduced by Mr. Simmons and the thanks of the gathering was tendered by Andrew Russell.

The speaker gave a broad outline of the principles of governing Canadian finance and affecting the national economy in pre-war days. Then he discussed what changes had taken place during the war, finally relating the two to conditions today.

Saskatchewan

D. W. Houston, M.E.I.C.
Secretary-Treasurer

R. Bingo-Wo, M.E.I.C.
Branch News Editor

The Eighteenth Annual meeting of the Saskatchewan Branch was held on February 27, in the Hotel Saskatchewan, Regina. The business meeting and reports of the various committees were presented during the afternoon session.

The dinner meeting was held at 6.30 p.m. Those seated at the head table were Ross Welsh, representing the Engineering Society of the University of Saskatchewan; H. S. Carpenter, former Deputy Minister of Highways; F. B. Bagshaw, solicitor and legal adviser to the Association of Professional Engineers; Stewart Young, newly elected chairman of the Branch; A. C. Garner; L. A. Thornton; J. B. Mantle, secretary of the Saskatoon Section; Chris Fisher, executive member of the Manitoba Association, from Winnipeg.

The speaker of the evening was F. B. Bagshaw, who discussed **Kipling and the India of Yesterday.** Mr. Bagshaw held the audience enthralled for two hours as he told the story of Rudyard Kipling, his adventures, and the part he played in the history of India. Mr. Bagshaw reviewed most of Kipling's best known works and quoted copiously from his prose and poetry. The address was well interspersed with anecdotes and humorous incidents from the life of Kipling.

A motion of thanks was moved by H. S. Carpenter, and heartily endorsed by the audience.

Vancouver

Alan M. Eyre, Jr.E.I.C.
Secretary-Treasurer

Stuart Lefeaux, Jr.E.I.C.
Branch News Editor

The annual Student Night of the Vancouver branch was held on February 18 in the Medical Dental Auditorium. The chairman turned the meeting over to Allan Fletcher, president of the Student Chapter who gave an account of the eliminations held at U.B.C. to decide on the speakers for the evening.

Don Jamieson, a first year applied science student and Navy veteran, gave a paper on **The Erection of the Pine River Bridge.** This work took place on the John Hart Highway, fifty miles east of Dawson Creek, in the summer of 1947. The bridge is of the Warren continuous truss type with parallel chords of three spans; the center span is two hundred and eighty feet.

The second speaker was Robin Fjarlie a third year agricultural engineering student and R.C.A.F. veteran who gave a talk on **The Oceanography of the Alberni Canal of Vancouver Island.** The need for a thorough investigation of the canal was occasioned by the construction of a sulphite pulp mill at the head of the Canal. The Fisheries Research Board of Canada developed a model of the canal at the Pacific Biological Station in Nanaimo. It was shown that the tonic effluent from the sulphite mill would effect salmon spawning up the Somass River at the head of the canal. Consequently the plant was changed to a kraft-type pulp mill using sulphate and producing a non-tonic effluent.

The final speaker was John McPhail, a third year civil engineering student and R.C.A.F. veteran. His subject was **Three Methods of Road Surfacing.** The speaker confined his remarks to methods used by the Provincial Works Department on Vancouver Island. The *Prime Coat, Seal Coat,* and *Mulch Treatment* were reviewed in detail.

The outstanding ability displayed by the students was commented on by all members present. The judges of the evening were Messrs. Muir, McPherson, and Kelly. They had a most difficult task to choose a winner but decided in favor of Mr. McPhail. Ten dollars in prizes were awarded the student speakers of the evening.

T. W. Berry announced that the H. N. Ruttan Prize for Students and Juniors papers in the Western Provinces had been won by Roy Pillman for his paper on **The Accuracy of a One Minute Transit;** the presentation will be made at the annual meeting at Banff.

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On Wednesday, March 17, the Vancouver Branch was favoured with a paper on **Town Planning in Vancouver,** a most timely topic. The Chairman introduced the speaker of the evening, J. Alexander Walker, M.E.I.C., who is the executive engineer of the Vancouver Town Planning Commission.

Mr. Walker introduced his subject with a brief history of town planning from its known beginnings in early Egypt. He stressed the fact that town planning affects everyone and that as the general public pays the costs, everyone should be interested.

In December, 1925, the British Columbia Town Planning Act was passed and in March, 1926, the Vancouver Town Planning Commission was formed. The firm of Harland Bartholomew and Associates, town planning consultants of St. Louis, Missouri, was retained to make a comprehensive study of Vancouver's planning needs. The elements of the report presented in 1930 were: economic background, population study, street systems, transit routes, parks, recreation and schools, transport, zoning, regional planning administration.

In 1944 the City Council again retained the consulting firm to revise the 1930 plan in light of the city's rapid expansion. The elements of the plan, at present being circulated, are the same as the 1930 report. The revised plan is hoped to take care of Vancouver's growth over the next twenty-five years.

Mr. Walker stressed the importance of the zoning element in town planning and the ability of sensible town planning to overcome the disasters of decentralization. He outlined some of the beneficial results of the 1930 plan in Vancouver's development.

The last hour of the programme was devoted to questions. Archie Peebles, M.E.I.C., thanked the speaker for his most able address and complimented him on his answering of the questions raised, many of which were on controversial subjects, such as downtown parking and locations for a civic centre.

The chairman introduced Mr. Holmes of Toronto, a visitor in Vancouver, and details of the next meeting was announced by George Allen.

Victoria

S. H. Frame, M.E.I.C.
Secretary-Treasurer

Jas. H. Blake, M.E.I.C.
Branch News Editor

D. G. Geiger, M.E.I.C., transmission engineer of the western area, Bell Telephone Company of Canada, addressed a well attended meeting of the Victoria Branch of the Institute on Friday, February 13, taking as his subject **The Joint use of Poles by Electric Power and Communication Utilities.**

The lecture was illustrated and covered such phases as: construction practices, protective devices, agreements for joint use, co-operation between users; it brought up many of the problems encountered in civic and urban usage.

This able address left the conclusion with the large audience that the joint use of poles has many advantages, both from the standpoint of the utilities and the general public, to the ends that safety, good service and economy may be promoted.

Technical personnel from the majority of the power and communication utilities in the province attended the meeting by invitation, joining the many members and friends of the branch.

Winnipeg

R. T. Harland, M.E.I.C.
Secretary-Treasurer

R. H. Tivy, Jr.E.I.C.
Branch News Editor

Theatre F at the University of Manitoba was crowded by some 107 members and friends of the Winnipeg Branch of the Institute and the Association of Professional Engineers of Manitoba on February 19 when R. E. Heartz, vice-president and chief engineer, Shawinigan Engineering Company, Montreal, Que., spoke on **Important Considerations in the Design and Construction of a Hydro-Electric Development.**

Mr. Heartz dealt with the optimum location for a power development, the economical arrangement of structures, the selection of equipment, and the control of costs during construction. He illustrated all of these points with particular reference to the La Tuque development in Quebec, on which he had a series of lantern slides and a movie entitled "From Rapids to Electricity."

The speaker laid particular emphasis on the necessity for careful scheduling of the work on large long term undertakings such as La Tuque. Among other things he showed how the various phases of the construction had to be done at the correct time because of seasonal water levels.

An interesting question period followed Mr. Heartz' presentation of his paper. The speaker was thanked on behalf of those present by E. V. Caton, chief engineer and manager of power production for the Winnipeg Electric Company. He was introduced by H. L. Briggs.

LIBRARY NOTES

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEW

CHEMICAL PROCESS PRINCIPLES
Part II—THERMODYNAMICS*

O. A. Hougen and G. M. Watson. N.Y., Wiley; London, Chapman & Hall, 1947. pp. 437-804, illus., 8¾ x 5½ in., cloth, $5.00.

Reviewed by W. H. GAUVIN†

To write a book which will be equally useful to the beginner and to the advanced student is admittedly a difficult undertaking. It is a tribute to the author's clarity and lucidity of presentation that they achieved this dual purpose so successfully. The same logical organization which characterized Hougen and Watson's earlier "Industrial Chemical Calculations" is again evidenced in the present work.

Although the authors obviously attempted to adapt their treatment to both the chemical engineering and the straight chemistry courses, there is little doubt that their emphasis on the industrial applications, the practical nature of their illustrative examples and the engineering viewpoint reflected in their discussions will particularly appeal to the technologist and the chemical engineer. Although given less emphasis, the theoretical aspects of chemical thermodynamics are nevertheless presented, helping the reader to grasp the underlying philosophy of the subject.

This book fills a definite gap between H. C. Weber's "Thermodynamics for Chemical Engineers", intended primarily for the undergraduate student, and B. F. Dodge's "Chemical Engineering Thermodynamics", which is definitely at graduate level. As such, it should make an excellent text-book for third and fourth year courses in Chemical Engineering Thermodynamics. The graduate student will find particular interest in Chapter XIV, "Thermodynamics of Solutions" and Chapter XVII, "Thermodynamics Properties from Molecular Structure", but may have to consult other texts to supplement the remaining chapters.

One of the unique features of this book—and one which greatly enhances its value—results from the authors' conviction that Thermodynamics should be regarded as a tool for the solution of practical problems. They never lose sight of this practical aim and, to that end, they have included a considerable wealth of data, tables, correlations and new generalizations. New methods of approximating thermodynamic properties are also given, which, up to now, could only be obtained through a time-consuming survey of the literature. This feature, combined with the clarity of the numerous illustrative examples, should make this text popular with practising engineers.

Owing to the presentation of this book as part of a series of three volumes, some topics pertaining to the First Law and to Thermochemistry—and which are generally included under the heading of Thermodynamics—will be found in Part I of the series. This, at first sight, might appear to involve the purchase of two books to cover one subject, but the objection is not very serious, considering the logical approach gained from this presentation. Other criticisms: lack of answers to the problems offered at the end of each chapter; no reference to the Thermodynamics of Fluid Flow; inclusion of a Mollier Chart for water would have been helpful.

The book is well bound, well presented, and remarkably free from typographical errors. The table headings are clear and the figures and diagrams both good. The quality of the paper is, however, mediocre.

*Part III—KINETICS AND CATALYSIS *will be reviewed in the May issue of* THE JOURNAL.—*Ed.*

†*Associate Professor, Chemical Engineering, McGill University, Montreal.*

LIBRARY REGULATIONS

Hours

	Oct-May	June-Sept
Mon-Fri	9–6	9–5
Thurs (Oct-Mar)	9–8	9–5
Sat (closed Jy-Aug)	9–12	9–12

Bibliographies and Extensive Literary Searches

Short subject bibliographies will be compiled on request.

Extensive searches will be made at a charge per hour of $1.50 to members, and $2.50 to non-members.

Indicate which required
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Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

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

ABSTRACTS

FUEL ECONOMY CONFERENCE OF THE WORLD POWER CONFERENCE.

THE HAGUE, SEPTEMBER 1947

The following are official summaries of papers presented at the Fuel Economy Conference. The complete texts of these papers, together with reports of the discussions on the Section in which they were included, will be published in the "Transactions of the Fuel Economy Conference". Enquiries may be presented to Mr. Norman Marr, Canadian Committee, World Power Conference, Laurentian Building, 54 Albert Street, Ottawa, Ontario.

ELECTRIC WARMING OF BUILDINGS IN NORWAY.

Alf O. Hals. The Hague, Fuel Economy Conference of the World Power Conference, 1947. (Fuel Economy Conference. Section C5 Paper No. 2).

An account is given of the development of space heating by electricity in Norway. This originated from the desire to replace imported fuel by water power, but an important consideration is that appropriate electric heating installations lead to an improvement in housing conditions. The various forms of heating apparatus and regulating devices in use are described. Panel and tubular heaters are most commonly used at present. Experience with dwellings has shown that about 3.0 kWh is needed to replace 1 kg. coke in the boilers of a hot water heating plant. In buildings occupied only for a part of the day, this energy consumption may be substantially reduced by automatic operation. Surplus power is to a considerable extent utilized for space heating by means of various kinds of apparatus, especially electrode boilers having fuel-fired boilers as a supplement. When the energy is used in this manner, approximately 5 kWh is needed for replacing 1 kg. coal or coke.

DISTRICT HEATING AND COMBINED POWER-HEAT GENERATION IN DENMARK.

A. K. Bak and N. Chr. Geertsen. The Hague, Fuel Economy Conference of the World Power Conference, 1947. (Fuel Economy Conference Section C5, Paper No. 4).

. . . The city of Copenhagen has had district heating for some twenty years, using both steam and hot water as means of distribution. In the paper are given some details of an investigation, which indicate that considerable savings may be obtained by district heating on a large scale, and as a result of this investigation it has been decided to erect a new combined power-heat plant and further to rebuild an existing plant for power-heat generation. It is estimated that when all areas in Copenhagen suitable for district heating have been covered to the extent of 60 per cent of the total maximum requirements, a total of about 400 million kWh per year may be generated on back pressure operation resulting saving in fuel imports of about 160,000 tons annually.

Where district heating is used for house heating purposes only, hot water distribution with an outgoing water temperature of 70° to 115°C. (158° to 239°F.) is preferred. Steam distribution is used where a higher temperature than can be obtained by hot water is necessary. High pressure hot water with 130° to

180°C. (266° to 356°F.) temperature has not so far been used in Denmark and does not seem to give any advantages compared with the two other systems.

In order to obtain a correct picture of the advantages of district heating, power and heat should each carry their proper share of the costs; a method of dividing these costs is suggested in the paper.

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Architect's Manual of Engineered Sound Systems, Including Sound Symbols, Definitions and Specifications with Suggested Applications of Sound Systems and Typical Layouts:

Radio Corporation of America, Architectural Relations Sound Equipment Section, Camden, N.J., R.C.A. Victor, Montreal 1947. 288 p., illus., leather.

Bentley's Machine Shop Companion, 11th ed.:

Wallace Bentley. London, Bentley, 1947. 181 p., illus., cloth.

Broadcast Operators Handbook:

Harold E. Ennes. N.Y., Rider, 1947. 265 p., illus., cloth.

College Physics; Electricity, Magnetism, Optics:

Francis Weston Sears and Mark W. Zemansky. Cambridge, Mass., Addison-Wesley, 1948. 848 p., illus., cloth.

Corrosion Handbook:

Herbert H. Uhlig. N.Y., Wiley, 1948. 1188 p., illus., cloth.

FM Transmission and Reception:

John F. Rider and Seymour D. Uslan. N.Y., Rider, 1948. 409 p., illus., paper.

Gas Turbines and Jet Propulsion for Aircraft, 4th ed.:

G. Geoffrey Smith. N.Y., Aircraft Books, 1946. 256 p., illus., cloth.

History of the Institution of Mechanical Engineers, 1847-1947:

R. H. Parsons. London, Institution of Mechanical Engineers, 1947. 299 p., illus., cloth.

ICAO Regional Manual—North Atlantic (Doc 4500) Amendments No. 6 and 7:

International Civil Aviation Organization, Montreal, 1948.

Power System Stability—Volume I, Elements of Stability Calculations:

Edward Wilson Kimbark. N.Y., Wiley, 1948. 355 p., illus., cloth.

Practical Evaluation of Railroad Motive Power:

P. W. Kiefer. N.Y., Steam Locomotive Research Institute, 1947. 65 p., illus., cloth.

Radio Amateur's Handbook, 25th ed.:

American Radio Relay League, West Hartford, Conn., 1948. 608 p., illus., paper.

Records and Research in Engineering and Industrial Science; a Guide to the Sources, Processing and Storekeeping of Technical Knowledge with a Chapter on Translating, 2nd ed.:

J. Edwin Holmstrom. London, Chapman and Hall, 1947. 366 p., illus., cloth.

Rubber in Textile Factories:

Colin Macbeth. London, British Rubber Development Board, n.d. 135 p., illus., paper.

Stress Analysis and Design of Elementary Structures, 2nd ed.:

James H. Cissel. N.Y., Wiley, 1948. 419 p., illus., cloth.

Vacuum-Tube Circuits:

Lawrence Baker Arguimbau. N.Y. Wiley, 1948. 668 p., illus., cloth.

Who's Who in Engineering; a Biographical Dictionary of the Engineering Profession, 6th ed.:

Winfield Scott Downs. N.Y., Lewis Historical Publishing Company, 1948. 2357 p., cloth.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

Association of Canadian Fire Marshals:

Proceedings, Volume 26, 1947.

Canada. Dept. of Labour:

Wage Rates and Hours of Labour in Canada, 1946.

Dominion Fire Prevention Association:

Proceedings, Volume 29, 1947.

Engineering Foundation:

Annual Report, Oct. 1, 1946-Sept. 30, 1947.

Quebec (Prov.):

Statistical Year Book, 1947.

TECHNICAL BULLETINS, ETC.

Bell Telephone System Technical Publications:

Monographs: *B-1456—Telegraphy in the Bell System, R. D. Parker, J. A. Duncan, R. E. Pierce.—B-1461—New Microwave Television System, J. F. Wentz and K. D. Smith.—B-1464—Shunt Tube Control of Thyratron Rectifiers, J. A. Potter.—B-1465—Cross-linkage of Linear Polyesters by Free Radicals, W. O. Baker.—B-1466—Fourteen Space Lattices, W. L. Bond.—B-1467—Generation of Centimeter Waves, H. D. Hagstrum.—B-1468—Surface States and Rectification at a Metal Semi-conductor Contact, John Bardeen.—B-1469—Pulse Echo Measurements on Wire Facilities, L. G. Abraham, A. W. Lebert, J. B. Maggio, J. T. Schott.—B-1470—Carrier Telephone System for Rural Service, J. M. Barstow.—B-1471—Joint Use of Pole Lines for Rural Services, J. W. Campbell, L. W. Hill, L. M. Moore, H. J. Scholz.—B-1474—Measurement of High Q Cavities at 10,000 Megacycles, R. W. Lange.—B-1475—Physics of Electronic Semiconductors, G. L. Pearson.—B-1476—Rural Radiotelephone Experiment in Colorado, J. H. Moore, P. K. Seyler, S. B. Wright.—B-1477—Electrochemical Factors in Corrosion of Lead Sheath, V. J. Albano.*

Canada. Geological Survey:

Bulletins: *No. 1—Day in the Arctic, J. D. Bateman.—No. 2—Magnetometer as an Aid in Geological Mapping, J. W. Ambrose.—No. 3—Problems of Sudbury Geology, Ontario, H. C. Cooke.—No. 4—Echinodermata of the Ottawa Formation of the Ottawa-St. Lawrence Lowland, Alice E. Wilson.—No. 5—Geology and Mineral Deposits of Northern British Columbia West of the Rocky Mountains, J. E. Armstrong.—No. 6—Gravimetric Surveys of 1944 in New Brunswick, A. H. Miller.—No. 7—Glacial Lake Agassiz, with Special Reference to the Mode of Deformation of the Beaches, W. A. Johnston.—No. 8—Brachiopoda of the Ottawa Formation of the Ottawa-St. Lawrence Lowland, Alice E. Wilson.*

...Economic Geology Series: *No. 15—Canadian Lode Gold Areas (Summary Account), H. C. Cooke.*

...Memoirs: *No. 232—Geology of East-central Alberta, G. S. Hume and C. O. Hage.—No. 236—Moose Mountain and Morley Map-Areas, Alberta, H. H. Beach.—No. 237—Palaeozoic Geology of the London Area, Ontario, J. F. Caley.—No. 238—Carboniferous Rocks and Fossil Floras of Northern Nova Scotia, W. A. Bell.—No. 239—Mesozoic Stratigraphy of the Eastern Plains, Manitoba and Saskatchewan, R. T. D. Wickenden.—No. 240—Palaeozoic Geology of the Windsor-Sarnia Area, Ontario, J. F. Caley.—No. 241—Geology of the Ottawa-St. Lawrence Lowland, Ontario and Quebec, Alice E. Wilson.*

Harvard University. Graduate School of Engineering:

Publications: *No. 435—On the Asymptotic Distribution of Differentiable Statistical Functions, R. V. Mises.—No. 436—Numerical Determination by Use of Special Computational Devices of an Integral Operator in the Theory of Compressible Fluids; I—Determination of the Coefficients of the Integral Operator by the Use of Punch Card Machines, Stefan Bergman and Leonard Greenstone; II—Determination of the Coefficients of the Integral Operator by Interpolatory Means, Rufus Isaacs.—No. 437—Continuously Calibrated Cathode-Ray Oscilloscope, E. C. Easton.*

Institution of Electrical Engineers:

Publications: *Absolute Measurement of High Voltages by Oscillating Electrode Systems, Eric Bradshaw and N. Kesavamurthy.—Application of Electricity to Horticulture, C. A. Cameron Brown.—Application of Frequency Modulation to V.H.F. Multi-channel Radiotelephony, J. H. H. Merriman and R. W. White.—Centralized Ripple Control on High-Voltage Networks, T. W. Ross, R. M. A. Smith.—Electrification of the Warsaw Railway Junction, J. Podoski.—Survey of the Telephone Transmission-Rating Problem, L. C. Pocock.—Testing of Communication-Type Radio Receivers, W. J. Bray.*

Institution of Mechanical Engineers:

Publications: *Automobile Suspension Springs, B. Mackenzie.—Corrosion of Heating Surfaces in Boiler Plates: Further Studies in Deposit Formation, J. R. Rylands, J. R. Jenkinson.—Gas Turbine as Applied to Marine Propulsion, T. A. Crowe.—Large-scale Torsional Fatigue Testing of Marine Shafting, S. F. Dorey.—Mechanical Engineering Aspects of Naval Mining, E. C. Wadlow.—Notes on Test Methods and Some Instruments, E. B. Stead.—Some Aspects of Petrol Injection Equipment Development, K. Brook and W. E. W. Nicolls.—Some Mechanical Features in Anti-submarine Weapons, J. M. Kirby.—Some Recent Developments in the Technique of Radio Valve Manufacture, J. W. Davies, H. W. B. Gardiner, and W. H. Gomm.—Theory and Practical Application of Vertical Log Framesaws, H. C. Topham-Bruckmann.*

Manitoba. Dept. of Mines and Natural Resources. Mines Branch:

Preliminary Reports: *No. 47-3—Geology of the Hughes Lake Area, Granville Lake Division, Manitoba, J. D. Allan.—No. 47-4—Geology of the Gods Lake Area, Gods Lake Division, Manitoba, W. F. Dix.*

North-East Coast Institution of Engineers and Shipbuilders:

Publications: *Alternating-Current for Ship's Auxiliaries, A. N. Savage.—Analysis and Interpretation of Vibration Records and Similar Traces in Engineering, R. G. Manley.—Ship Vibration, F. H. Todd and W. J. Marwood.*

U.S. Highway Research Board:

Research Reports: *No. 4B—Airport Runway Evaluation in Canada, Norman W. McLeod.*

University of Missouri:

Engineering Series: *No. 35—Influence Lines for Horizontally Curved Fixed-end Beams of Circular-arc Plan, Robert B. B. Moorman and Manford B. Tate.—No. 36—Stresses in a Uniformly Loaded Circular-arc I-Beam, Robert B. B. Moorman.*

STANDARDS, SPECIFICATIONS, ETC.

American Standards Association. Specifications:

C8.18-1948—Weather-resistant (Weatherproof) Wire and Cable (URC Type).

British Standards Institution. Code of Practice:

CP(B)717—Electricity Supply Intake Arrangements for Flats and other Multi-occupier Buildings.—CP(B)718—Installation and Maintenance of Electrical Machines, Transformers, Rectifiers, Capacitors and Associated Equipment.

British Standards Institution. Specifications:

1421:1947—Picks, Beater Picks, and Mattocks.

Canadian Standards Association. Specifications:

C88-1947—Power Transformers.

PAMPHLETS, ETC.

East-West Expressway:

City Planning Dept., Montreal, 1948.

Encouragement to Industrial Expansion in Canada; Operation of Special Depreciation Provisions, November 10, 1944-March 31, 1949:

Dept. of Reconstruction and Supply, Ottawa, 1948.

Engineering:

S. Rajanayagam. Colombo, Ceylon, Ceylon Association of Science, 1947.

Engineering Laminates; Fundamentals Underlying the Problems of their Inhomogeneity:

Walter C. Voss. Philadelphia, American Society for Testing Materials, 1947.

Fretting Corrosion:

Texas Company, N.Y., 1948. (Lubrication, Volume 34, number 3, March 1948.

Here are the Facts:

Association of Canadian Better Business Bureaux, Montreal, 1948.

Improvement of Rural and Urban Highways in the States:

Ben F. Ostergren. Toronto, Ontario Good Roads Association, 1948.

Power Supply in Sweden:

Swedish Water Power Association, Stockholm, 1947.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

BRITISH STANDARD FOR COPPER AND BRASS TUBES FOR GAS INSTALLATION WORK AND GAS LIGHTING FITTINGS. BS 1401-3:1947.

London, British Standards Institution. 2/-.

These new standards have been adapted and amended from BS 659, 885, and 886 to suit the special requirements of the Gas Industry. BS 1401 is for copper tubes, plain or screwed as may be required, for installation work and also for gas lighting fittings. BS 1402 is for annealled brass tubes for installation work normally screwed. BS 1403 is for brass tubes for gas lighting fittings normally screwed; these tubes are intended for the manufacture of pendants, brackets and other lighting fittings and are somewhat stiffer than for installation work. Each standard includes tolerances as to size, and prescribes tests.

BRITISH STANDARD FOR ROTARY SHAFT OIL SEAL UNITS (RELATED DIMENSIONS). BS 1399:1947.

London, British Standards Institution. 2/-.

This new British Standard deals with the dimensions associated with the fitting of Rotary Shaft Oil Seal Units. The standard classifies oil seal units and gives a list of units for shaft diameters from 0.25 to 7.0 inches in conjunction with housing diameters from.75 to 8.0 inches. Limits and maximum corner radii in housings, shaft sizes, lead-on chamfers and relative positions of sealing lips are given.

CANADA YEAR BOOK, 1947:

Dominion Bureau of Statistics, Ottawa, 1947. 1239 p., illus., 9 x 6½ in., cloth, $2.00.

The Canada Year Book is the "official statistical annual of the resources, history, institutions, and social and economic conditions of the Dominion". It is a reference book of data on all aspects of Canada. The introduction is written for the purpose of giving a co-ordinated economic picture of the country's conditions. Many charts and statistical tables are included in the text of the book, as well as maps and illustrations. There is some historical material, although the contents are mainly devoted to recent developments in Canadian commerce, finance, government, trade and industry, culture and national defence.

CANADIAN STANDARD SPECIFICATION FOR POWER TRANSFORMERS. CSA C88-1947:

Ottawa, Canadian Standards Association, 1947. $1.00.

In this specification, the term "Power Transformer" applies to 25 and 60 cycle, oil- or liquid-filled transformers, with capacity above 200 kva, in all voltage classes and also in all kva ratings above 15,000 volts. When used for power purposes, the term includes auto-transformers, net-work transformers, and regulating transformers, insofar as it applies.

INTERNATIONAL CIVIL AVIATION ORGANIZATION CONSOLIDATED TABLES OF AGREEMENTS AND CONTRACTS REGISTERED BY THE ORGANIZATION (January 1, 1946-December 31, 1947):

International Civil Aviation Organization, Montreal, 1948. 90 p., 14 x 8½ in., paper, 25c. (ICAO·DOC 5094—LGB/1).

This document is the fourth edition of the consolidated lists of agreements and contracts filed with the Organization up to the end of the year 1947, either during the Interim period or since the establishment of the permanent Organization. In the future, these consolidated lists will be published only at intervals; but supplements to the present document and in the same form will be issued every six months.

SOIL FREEZING AND FROST HEAVING WITH SPECIAL APPLICATION TO ROADS AND RAILROADS:

Fil dr. Gunnar Beskow. Evanston, Ill., Northwestern University, 1947. 145 p., illus., 11 x 8½ in., paper, $3.00. (Swedish Geological Society 26th Year Book No. 3, Series C, No. 375).

This book represents the culmination of exhaustive research sponsored by the Swedish Government over a period of more than ten years. The text covers the fundamental principles of frost action with application to highways and railroads. Translation has been as literal as possible to avoid any misinterpretation of the author's meaning, and the author has written a special supplement for the English translation summarizing progress in frost action in the Scandinavian countries in the last ten years. The book is well illustrated and has many charts and diagrams.

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.

CLAY PIPE ENGINEERING MANUAL.

Clay Sewer Pipe Association, Inc., 1105 Huntington Bank Bldg., Columbus 15, Ohio, 1946. 159 p., illus., diagrs., tables, maps, 9¼ x 6 in., cloth, $3.00.

Containing engineering reference data applicable to the design of sewers, drains, and other construction projects in which clay pipe is used, this volume provides a practical reference source for the engineer, constructor or user. Sanitary sewer systems and storm water drainage systems are discussed. Subsoil, roadway, airport and railroad drainage systems are considered. A section is included on commonly used constants and tables.

COMPRESSED AIR HANDBOOK. Applications, Equipment, Engineering Data and Test Procedure.

Compressed Air and Gas Institute, 90 West Street, New York, 1947. 387 p., illus., diagrs., charts, tables, 9 x 6 in., cloth, $3.00.

This volume is an authoritative guide for the proper installation, use and maintenance of air compressors and air-actuated equipment. Divided into five parts, the first presents a graphic account of the many common uses of compressed air. The types of machinery used for compressing air are illustrated and described in part two, while part three is devoted to a discussion and illustrations of air-operated devices and mechanisms. Suggestions and data on the selection, installation, operation and care of the compressed air plant are given in part four. The final section contains engineering data and standards established by the Compressed Air and Gas Institute.

ENGINEERING TESTS: CIVIL, MECHANICAL and ELECTRICAL. (Arco Civil Service Series.)

A. Liebers. Arco Publishing Company, 480 Lexington Ave., New York 17, N.Y., 1947. 49 p.; Civil Engineering Test Questions, Sample Examinations, 24 p., diagrs., tables, 10½ x 8 in., paper, $2.50.

This volume presents a careful selection of Civil Service engineering tests with answers, for the use of those who wish to enter public service. The various types of examination questions are demonstrated, acceptable work methods are indicated, and sample examinations with the time limits are included for self-checking.

IMPROVING SUPERVISION.

F. Cushman and R. W. Cushman. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 232 p., tables, 7½ x 5 in., cloth, $2.50.

Of interest to foremen and supervisors, this book contains a composite analysis of their responsibilities in a wide variety of industrial and business organizations. It has been designed for "follow-up" reading in connection with supervisory training programs. The basic philosophy of the whole problem of improving supervision is discussed, and the supervisory job is analyzed. Special emphasis is placed on human relations problems.

LIGHT METALS IN STRUCTURAL ENGINEERING.

L. Dudley. Published for Temple Press Ltd., Bowling Green Lane, London, E.C.1, by The English Universities Press Ltd., St. Paul's House, Warwick Square, London, E.C.4, 1947. 216 p., diagrs., charts, tables, 8¾ x 5½ in., cloth, 30s.

The important principles of the subject of "strength of materials" are covered, with emphasis on the application of these principles to problems involving the use of aluminum, aluminum alloys and magnesium alloys. The book covers much of the information required for the examinations in strength of materials set by the various British professional engineering institutions. Calculus has been used in the explanation of theory, but an understanding of this branch of mathematics is not essential for the majority of the problems and worked examples.

NOMOGRAPHY.

A. S. Levens. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1948. 176 p., diagrs., charts, tables, 9¼ x 5¾ in., cloth, $3.00.

Of interest to the scientist and practising engineer, this book presents fundamental principles of the design and theory of an important graphical method. Emphasis is placed on the geometric method of development, and after the theory is explained, short-cuts are described. A knowledge of algebra, plane geometry, and logarithms is assumed. One chapter is devoted to the use of determinants in alignment chart work. Practical examples of charts and a selected bibliography are included.

PATENT NOTES FOR ENGINEERS.

Published by RCA REVIEW, Radio Corporation of America, RCA Laboratories Division, Princeton, New Jersey, 1947. 165 p., diagrs., tables, 9¼ x 5¾ in., cloth, $2.50, plus $0.20 postage if outside of United States.

First in a new series of books on subjects of general engineering interest, this volume represents an effort to bridge the gap between engineers, research workers, and inventors generally, and their patent attorneys. Statutory inventions are treated at length. Practical suggestions are offered for protecting inventions prior to the filing of patent applications and thereafter, including the prosecution of patent applications, interference actions, and ownership questions.

PHILIPS RESISTANCE WELDING HANDBOOK.

Philips Industrial (Philips Lamps Ltd.), Century House, Shaftesbury Ave., London, W.C.2, England, 1947. 210 p., illus., diagrs., charts, tables, 9 x 5½ in., cloth, 10s. 6d.

Dealing with the integration of resistance welding into the general process of production, this manual is of interest to those who wish to know practical applications. It is not intended to be a technical manual for the design of resistance welding machines. Welding equipment and principles, metallurgy of resistance welding, auxiliary equipment, and planning for resistance welding are the main topics covered. The reader should be familiar with the principles of electricity, magnetism, and general engineering.

POWDER METALLURGY, ITS PHYSICS AND PRODUCTION.

P. Schwarzkopf. Macmillan Company, New York, Toronto, 1947. 379 p., illus., diagrs., charts, tables, 9½ x 6 in., cloth, $8.00.

Covering the entire field of powder metallurgy, this volume contains information on the industrial processing of metal powders and the products obtainable. The theories on which powder metallurgy is based are also discussed, as well as the latest developments and future possibilities. The available literature is reviewed, and bibliographies on processing, products, principles and possibilities for the future are included. It is not intended as a text, but rather represents the workbook of an experienced powder metallurgist.

PROBLEMS OF ACCELERATING AIRCRAFT PRODUCTION DURING WORLD WAR II.

A report by T. Lilley and others. Harvard University, Graduate School of Business Administration, Division of Research, Boston, Mass., 1947. 112 p., charts, tables, 11 x 8½ in., paper, $1.50.

This report analyzes the types of time-consuming problems which had to be solved before wartime production goals could be reached. Problems discussed include airframe and engine production, company management, facilities, materials and manpower. The intention is to provide not only a historical survey, but also a helpful guide to the solution of normal administrative problems.

SCIENCE AND ENGINEERING OF NUCLEAR POWER.

C. D. Coryell and others, edited by C. Goodman. Addison-Wesley Press, Inc., Cambridge 42, Mass., 1947. 503 p., diagrs., charts, tables, 11 x 8 in., cloth, $7.50.

A basic treatment of nuclear pile design and its practical application, containing as well the background material necessary for their understanding. Allied subject such as control, monitoring, the chemistry of heavy elements, and fission products are also treated. The appended Segré Isotope chart contains a summary of some of the more important properties of nuclei. Written for the non-specialist, it is of particular interest to engineers dealing with industrial applications of nuclear energy.

SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS, PROCEEDINGS, VOL. 5, NO. 1.

Edited by C. Lipson and W. M. Murray. Society for Experimental Stress Analysis, Central Square Station, P.O. Box 168, Cambridge 39, Mass.; published and distributed by Addison-Wesley Press, Inc., Kendall Square, Cambridge 42 Mass., 1947. 136 p., illus., diagrs., charts, tables, 11¼ x 8½ in., cloth, $6.00.

The fifteen papers contained in this volume deal with various aspects of the following subjects: strain gauges; impact testing; telemetering; X-ray analysis; fatigue and other stresses. Also included are a list of members, and contents pages for volumes II, III and IV.

SPECTROCHEMICAL ABSTRACTS, VOL. III, 1940-1945.

E. H. S. van Someren. July, 1947. Adam Hilger Limited, 98 St. Pancras Way, London, N.W.1, England. 112 p., 9½ x 6 in., paper, 12s. 6d. (obtainable in U.S.A. from The Jarrell-Ash Company, 165 Newbury St., Boston, Mass., $3.50).

The abstracts are listed by subject and author. Indexes to elements in non-metallic and metallic compounds are presented. The subject index includes such topics as biological materials, ceramics, gases and liquids, minerals and ores, metals and non-metallic solids. Apparatus, methods and theory are considered, and reviews, summaries and books are listed with annotations.

STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. 5th ed.
Part I. Specifications, 272 p.
Part II. Methods of Sampling and Testing, 361 p.

Adopted by American Association of State Highway Officials, 1220 National Press Bldg., Washington, D.C., 1947. Illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.00 per set.

Volume I of this compilation presents specifications for highway materials classified under the following headings: hydraulic cement; bituminous materials; aggregates; brick; expansion joint fillers and asphalt plank; culvert and sewer pipe; bridge paints; reinforcing steel and wire rope; metallic materials for bridges; and miscellaneous. A total of 104 specifications are given, including two new and thirteen revised ones. Volume II covers standard methods of sampling and testing highway materials, again classified under the same headings with the important addition of soil testing. As a result of revision and simplification, all of the test procedures are now in almost complete agreement with the corresponding ones issued by the American Society for Testing Materials. Three new standards bring the total in the present volume up to 106. Lists of specifications and standards in numerical sequence are included.

UNDERSTANDING VECTORS AND PHASE.

J. F. Rider and S. D. Uslan. John F. Rider Publishing, Inc., 404 Fourth Ave., New York 16, N.Y., 1947. 153 p., diagrs., tables, 7¼ x 5¼ in., paper, $0.99.

Intended for those without an engineering background, this book deals with vectors and phase as applied in the field of radio communication. Such knowledge is necessary to the understanding of many of the technical articles in radio magazines which have been written from the theoretical viewpoint. A short bibliography of basic texts in mathematics and communications is presented.

VALVE GEAR DESIGN.

M. C. Turkish, Eaton Manufacturing Co., Wilcox-Rich Division, Detroit, Michigan, 1946. 130 p., illus., diagrs., charts, tables, 10¼ x 7 in., cloth, $6.00.

While the general subject of valve gear mechanisms is covered, emphasis is placed on the mathematical aspects of cam design and performance which occupy some three-fourths of the book. Detailed examples and extensive tables add to its practical value in solving problems encountered in valve gear design. The material presented is based on the author's considerable experience in both the production and research aspects of valve gear for all types of internal-combustion engines.

YEARBOOK OF THE HEATING AND VENTILATING INDUSTRY.

Published by Technitrade Journals Ltd., 8 Southampton Row, London, W.C.1, 1947. 139 p., diagrs., charts, tables, 8¾ x 5½ in., cloth, 5s.

Providing technical, contractual and other trade information, this volume is of interest to architects, engineers and others who have contact with heating and ventilating contractors. Technical articles in this edition are on thermal insulation, district heating, technical education, and standardization. Wage rates and apprenticeships are discussed from the British viewpoint. A list of corporation members, a buyer's guide, and a trade name index are included. Additional technical information is to appear in subsequent issues.

Although not available in the Institute Library, inquiries concerning the following new books will be welcomed there or may be sent direct to the publishers.

ANALYTICAL EXPERIMENTAL PHYSICS.

H. B. Lemon and M. Ference, Jr. University of Chicago Press, Chicago, Ill. rev. ed., 1946. 588 p., illus., diagrs., charts, tables, 12 x 9 in., cloth, $8.00.

The whole range of basic physics is effectively covered in this new textbook. The fundamentals of the major divisions —mechanics; heat; electricity and magnetism; wave motion, sound and light—are covered in detail, with clear, brief treatments of more advanced topics, for example: the production of very low temperatures; nuclear fission; the electron microscope; the scientific aspects of music; etc. The use of successive frames of motion-picture film in demonstrating experiments is a special feature. The text, queries, problems, and illustrations have all been designed to provide a clear, readable presentation of a customarily difficult course in order to stimulate the student's interest. The book is, of necessity, large but provision is made for individual selection of the material to be used.

DIRECTORY OF STEEL FOUNDRIES IN THE UNITED STATES AND CANADA.

Steel Founders' Society of America, 920 Midland Bldg., Cleveland, Ohio, July 1946. 177 p., 9 x 6 in., paper, $10.00.

The steel foundries of the United States and Canada are listed alphabetically in Sections I and II respectively. The information given includes personnel, type and size of castings produced, available melting and annealing equipment, number of employees, and capacity figures. An index of United States foundries by States is included as Section III.

GALVANIZING HANDBOOK:

J. R. Daesen. Reinhold Publishing Corp., New York, 1946. 166 p., illus., diagrs., charts, tables, 10¼ x 7 in., cloth, $5.25.

The basic principles involved in the hot dip galvanizing of iron and steel are presented graphically, with photographic examples (mainly microphotographs) to demonstrate the nature and cause of both satisfactory and defective work. Particular attention is paid to the preparation of the surface to be covered and to the proper control of the galvanizing procedure. The final chapter deals with hot dip coatings with other metals than zinc. In addition to the chapter references a brief bibliography on hot tinning is appended.

MAGNESIUM FABRICATION.

L. B. Harkins. Pitman Publishing Corporation, New York and Chicago, 1947. 149 p., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $2.75.

This practical handbook presents authoritative data for all phases of the fabrication of magnesium-alloy sheet, extrusions and tubing into the finished product. Important topics covered include machining, forming, heat treating, welding joining, surface finishing and protection. The techniques peculiar to magnesium are emphasized, together with notes on fire control and protection against corrosion. The major producers and fabricators in the industry are listed.

(The) MODERN DIESEL:

O. F. Allen, Prentice-Hall, Inc., New York, 1947. 268 p., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.00.

Presenting the history and background of the diesel engine, this volume relates its evolution from the first heavy, awkward-looking machine to the light-weight, beautifully designed modern diesel. Essentially descriptive, the text presents no design information, but utilizes some 185 illustrations to show the accomplishments of the early days, the modern diesels, and their applications on land, in the air and on the sea.

PETROLEUM PRODUCTION ENGINEERING, Oil Field Development.

L. C. Uren, 3 ed. McGraw-Hill Book Co., New York and London, 1946. 764 p., illus., diagrs., charts, tables, 9 x 5¾ in., cloth, $7.00.

This standard text covers every phase of petroleum production engineering up to the point at which the wells are ready to produce. It sketches briefly the problems of petroleum exploration, discusses the principles and practices of oil-field development, and describes the methods and equipment used in modern well drilling. Special chapters are devoted to oil-field hydrology, fishing tools and methods, well completion, well records and surveys. A selected bibliography accompanies each chapter, and a list of illustrative motion films is given. Oil field exploitation is dealt with in a companion volume.

PLASTICS FOR ELECTRICAL AND RADIO ENGINEERS.

W. J. Tucker and R. S. Roberts. 2 ed Technical Press, Gloucester Road, Kingston Hill, Surrey, England, 1947. 167 p., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, 15s.

This volume covers the chemistry of plastics and their application in the electrical industry. The plastic materials discussed are tabulated and analyzed. The terms and definitions used are explained, and guidance is given in designing and manufacturing plastic materials. Applications in the construction of transformers, coils and many other radio and electrical components are presented, as well as applications in the design and manufacture of sleeving, covered wire and cables.

PLASTICS MOLD DESIGN.

C. C. Sachs and E. H. Snyder. Murray Hill Books, New York and Toronto, 1947. 77 p., plus 14 charts, illus., diagrs., tables, 12¼ x 9 in., fabrikoid, spiral binding, $4.50.

Part I briefly covers drafting-room practice and materials for mold construction. Part II takes up the actual design procedures for compression molding, injection molding, and extrusion dies, including the causes and remedies of faults. A pocket at the back of the book contains a group of full-sized, completely dimensioned working drawings of plastics molds for the use of the student, engineer, or designer.

PRACTICAL EMULSIONS.

H. Bennett. Chemical Publishing Co., Brooklyn, N.Y., 1947. 568 p., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $8.50.

Dealing with emulsions for the practical worker, this book touches only lightly on the theoretical aspects, and concentrates on the art of making and applying emulsions. The material on emulsifying agents, their formulation, equipment used, and dispersing and wetting agents remains much as in the first edition. New material on partial fatty acid esters of polyhydric alcohols, as well as a special section presenting a symposium on industrial emulsions, has been added. These emulsions are used in the leather industry, synthetic latex, polishes, cosmetics, paints, dyeing and coloring. More emulsion formulas have also been included.

PRACTICAL GUIDE TO PREFABRICATED HOUSES.

A. L. Carr. Harper & Brothers Publishers, New York and London, 1947. 111 p., illus., diagrs., 10¼ x 6½ in., cloth, $2.75.

Giving examples of the work of twenty

(Continued on page 254)

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

March 31st, 1948

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

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

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

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

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

The Council will consider the applications herein described at the May meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

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

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

FOR ADMISSION

BEAUBIEN—CLAUDE PANET, of Quebec City, Que. Born at Montreal, March 2nd, 1908. Educ.: S.B., (Business & Engrg. Adm.), M.I.T., 1934; with Aluminum Co. of Canada as follows: 1935-36, apprent.; 1936-39, wire mill, rolling mill, reduction plant; 1940-42, mgr., personnel, Shaw. works; 1943-45, mgr., personnel, Arvida; 1945 to date mgr., Quebec sales office, Quebec City.

References: DeG. Beaubien, McN. DuBose, P. E. Radley, R. Brosseau, B. E. Bauman, R. J. Wayland.

CARRUTHERS—V. HALLAM, of Calgary, Alta. Born at Harcourt, N.B., June 27, 1893. Educ.: B.A.Sc., Toronto, 1923; R.P.E., Alberta; 1912-14, rodman, topo., I.C.R., Moncton; 1919-25, (summers), transitman, C.P.R., 1924, (4 mos.), transitman, Illinois Central, Chicago; with C.P.R., as follows: 1925-38, roadmaster, western lines, 1938-46, divn. engr., Revelstoke and Edmonton; 1946 to date, dist. engr., Board of Transport Comm., Calgary, Alta.

References: H. R. Younger, C. H. Fox, R. A. Emerson, J. F. McDougall, D. G. Kilburn.

DUSKES—OSCAR, of Montreal, Que. Born at Montreal, May 10, 1914. Educ.: B.Eng., (Mining), McGill, 1937; Member, C.I.M.M.; 1934-35-36, (summers), Dome Mines, Wright Hargreaves Mines & Geo. Survey; 1937-38, engr. i/c operations in field, Central Chibougamau Mines; 1938-42, surveyor and mining engr., Noranda Mines; 1942-46, Capt., R.C.E.; at present res engr., constrn., C.N.R., Point St. Charles, Montreal, Que.

References: B. Wheelwright, R. O. Stewart, H. F. Finnemore, J. D. Sylvester, W. A. Gilmour.

EDWARDS—BRUCE RUSSEL, of Arvida, Que. Born at Toronto, Ont., Aug. 2, 1917. Educ.: B.A.Sc., (Metall.), Toronto, 1941; with Defence Industries, as follows: 1941-43, asst. supvr., metal and chemical lab., Verdun plant, 1943-45, supvr., 1945-47, sr. supvr., operating dept., Chalk River project; 1947, (6 mos.), sr. supvr., operating dept., National Research Council, Chalk River project; and at present devel'pt. engr., Aluminum Co. of Canada, Arvida, Que.

References: F. D. Nasmith, R. W. Lewis, G. M. Mason, C. J. Tanner.

ENGBLOOM—GUSTAVE ADOLPHE, of Calgary, Alta. Born at Wetaskiwin, Alta., Sept. 19, 1920. Educ.: B.Sc., (Elect.), Alta., 1943; R.P.E., Alta.; 1942, (3 mos.), jr. instructor, Univ. of Alta.; 1943-46, Tech. Officer, D.E.S., Dept. Naval Service, Ottawa; Elect. Officer, H.M.C.S. Micmac; 1946 to date, jr. engr., Calgary Power Ltd.

References: H. Randle, T. D. Stanley, D. A. Hansen, H. B. LeBourveau, F. Tempest.

FAIRFULL—PETER FREDERICK, Constructor Cmdr., R.C.N. (R), of Victoria, B.C. Born at Renfrew, Scot., Jan. 8, 1903. Educ.: Tech. Coll., Paisley, naval arch. course, 1924; 1918-26, apprent. and ship dftsman., Wm. Simons & Co., engrs. and shipbuilders, Scotland; 1926-35, dftsman. and supvrn. of constrn., Chapman & Oxley, architects and engrs., Toronto; 1935-40, res. arch. and bldg. supvr., Toronto Star; 1940-42, chief engr. and chief dftsman., Toronto Shipbldg. Co.; 1942 to date, Res. Naval Overseer on new constrn. and conversion of ships, Dept. National Defence; and at present Mgr., Constructive Dept., H.M.C., Dockyard, Esquimalt, B.C.

References: A. C. M. Davy, E. W. Izard, J. N. Anderson, E. A. Cross, R. A. Crysler, J. M. Oxley.

FOURNIER—JOSEPH AMEDEE, of Quebec, Que. Born at St. Philemon, Que., March 5, 1883. Educ.: American Tech. Institute, civil engrg. corr. course; 1925-30, genl. mgr., builder of sewers, waterworks, electric plants, telephone lines, etc., Cie. Enterprises Publiques; 1939 to date, inspector, survey works, design, specifications, projects, etc., Bridge & Structures Divn., Roads Dept., Province of Quebec. (Asks for Affiliate.)

References: E. Gohier, J. O. Martineau, R. Savary, J. E. Roy, R. Rioux, R. Quintal, G. Piette, A. Lariviere.

GORDON—HARRY, of Port Arthur, Ont. Born at Odessa, Russia, Mar. 26, 1923. Educ.: B.A.S., (Mech.), B.C., 1946; 1946, (3 mos.) dftsman., Letson & Burpee, Vancouver; 1946-47, design dftsman., Trans Canada Airlines; at present, mech. engr., C. D. Howe Co., Port Arthur, Ont.

References: J. N. McNeil, H. M. Ollson, D. W. Laird, H. Os, J. M. Fleming.

HOGG—THOMAS JOHN, of York Mills, Ont. Born at Toronto, March 18, 1923. Educ.: B.A.Sc., (Mech.), Toronto, 1947; 1942, (summer), H.E.P.C. of Ontario, rodman (Barrett Chute); 1943-45, Lieut., R.C.C.S.; 1946, (summer), mtce. helper, Calgary Power Co.; 1947 to date, jr. engr. in training, H.E.P.C. of Ontario, Toronto, Ont.

References: R. H. Self, G. Mitchell, W. M. Hogg, J. B. Bryce, T. H. Hogg.

HUBLEY—ALLAN MURRAY, of Three Rivers, Que. Born at Halifax, N.S., Feb. 2, 1918. Educ.: B.Eng., (Mech.), N.S.T.C., 1946; 1940, (3 mos.), installing degaussing cables on ships, N.S. Light & Power Co., (marine divn.); 1940-45, Sub. Lieut. (E) later as Lieut. (E), R.C.N.V.R., 16 mos. on H.M.C.S. Georgian as Chief Engr.; 5 mos. on H.M.C.S. St. John, as Chief Engr., etc.; 1945, (5 mos.), temp. scientific asst. in engrg., Atlantic Fisheries Exp. Stn., Halifax; 1945-46, i/c mech. engrg., instrument room, N.S.T.C.; Consolidated Paper Corp., as follows: 1946-47, design engr., 1947 to date, asst. divn. engr., Wayagamack Divn., Three Rivers, Que.

References: F. H. Sexton, H. A. Ripley, C. H. Neil, H. G. Timmins, E. Butler, E. R. McMullen, H. O. Keay.

HUTTON—CHARLES GORDON, of New Westminster, B.C. Born at Burnaby, B.C., Dec. 24, 1910. Educ.: T. J. Trapp Tech. School, New West. and private study; R.P.E., B.C.; with Heaps Engrg. Co., Ltd., as follows: 1928-32, apprent., 1932-34, genl. machinist, 1934-35, dftsman. and estimator, 1935-40, chief dftsman., 1940-41, designer and chief engr., 1941-42, prod. and sales engr., 1942-46, executive asst. to president in complete charge plant, operation, engrg. design, etc., 1946-47, sales mgr. and chief engr., 1947 to date, chief engr. and tech. advisor on sales, i/c design, genl. engrg., etc.

References: W. N. Kelly, G. W. Allan, W. O. Scott, A. Pearson, J. G. D'Aoust, A. D. Creer, A. S. Gentles.

MELLISH—JOHN FREDERICK, of Winnipeg, Man. Born at Galt, Ont., June 24, 1892. Educ.: B.Sc., (Civil), Univ. of Washington (accredited E.C.P.D.), 1918; 1912-13, (10 mos.), chainman, Ducane Dutcher Co., Vancouver; 1913-15, student asst., Federal Dept. Mines, Anyox, B.C.; 1919-20, leveller and topo., Dept. Public Works; Banff; 1920-25, res. and asst. engr., parks branch, Dept. of Interior, Banff; 1925-26, field engr., Sydney Junkins Constrn. Co., Vancouver; with Dept. of Public Works, Canada, as follows: 1928-36, jr. engr., Ottawa, 1936-44, asst. engr., Ottawa, 1944-46, sr. asst. engr., Winnipeg, 1947, (9 mos.), acting dist. engr., Winnipeg, 1947 to date, asst. dist. engr., Winnipeg District.

References: L. F. Grant, J. M. Wardle, J. L. Bisson, R. Blais, K. M. Cameron, P. E. Doncaster.

MURRAY—WALTER, of Toronto, Ont. Born at Edinburgh, Scot., April 7, 1905. Educ.: B.Sc., Edinburgh Univ., 1926; R.P.E., Ontario; 1926-28, pupil engr., Hunter, Duff & Middleton, Edinburgh; 1928-30, contract supt., Cementation Co., Ltd., Doncaster, Eng., 1930-32, contract supt., Cement Gun Co., Ltd., London, Eng.; 1932, (7 mos.), res. engr., Pick Everard, Keay & Gimson, Leicester, Eng.; 1939-42, res. engr., Ministry of Aircraft Production, London; 1943-45, res. engr., Ministry of Works, Dir. Opencast Coal Prod., Sheffield, Eng.; 1946-47, (6 mos.), mng. dir., Gilman & Murray Ltd., Lincs., Eng. (contractors); at present, asst. engr., Gore & Storrie, Toronto, Ont.

References: W. Storrie, J. F. MacLaren, N. G. MacDonald, J. Argo, J. G. Powell.

PATCH—PETER RAMSAY, of Montreal, Que. Born at Montreal, March 8, 1919. Educ.: B. Eng., (Mech.), McGill, 1942; R.P.E., Quebec; 1939 and 1940, (summers), genl. shopwork, Canadian Car & Foundry; 1942-46, Capt., R.C.E.M.E.; at present, heating and vent. layout work, McDougall & Friedman, consultg. engrs., Montreal, Que.

References: G. K. McDougall, F. J. Friedman, D. W. Heywood, R. R. Duquette, J. S. Lochead, E. Tait.

RALPH—HOMER THOMAS, of Espanola, Ont. Born at Stittsville, Ont., Aug. 19, 1912. Educ.: B.Sc., (Civil), Queen's, 1934; R.P.E., Ontario; during summer months, transitman, Farley & Grant, contractors; 1934, (3 mos.), field engr., Dorval-Siscoe Gold Mines; 1934-44, engrg. staff, International Nickel Co., Copper Cliff, Ont.; Kalamazoo Vegetable Parchment Co., Ltd., Espanola, Ont., as follows: 1944-46, constrn. engr., and at present paper machine engr.

References: C. G. Biesenthal, P. G. Benjafield, F. J. DeStafano, C. O. Maddock, F. A. Orange.

REVILL—ARTHUR HAROLD, of St. Laurent, Que. Born at St. Wulfruns, Eng., March 20, 1916. Educ.: Lincoln Tech. Coll., 1933-39; Higher National Cert. in Mech. Engrg., 1942; 1933-37, engrg. apprent.; 1937-38, Rover Car Co.; 1938-39, Zenith Carburetors Ltd.; 1939-46, R.A.F., as P/O and finally F/Lt.; 1946-47, tech. advisor and estimating engr., George Angus & Co., Ltd., (Angus small gap double helical gears, etc.); at present, mech. engr. i/c plant instln. and mtce., Turner & Newall (Canada) Ltd., Montreal, Que.

References: J. H. Holden, W. G. Hole, R. R. Willis, G. R. McLeod, S. M. Lyman, S. A. Charters.

STIDWILL—LEONARD PUTNAM, of Cornwall, Ont. Born at Cornwall, Ont., June 24, 1918. Educ.: B.Sc., (Civil), Queen's, 1943; R.P.E., Ontario; O.L.S.; 1939-43, (pre-univ.), land surveying, drainage, constrn., road bldg., etc.; 1943-45, Lieut., Army; 1945 to date, civil engr. and Ont. land surveyor, private practice, drainage work, municip. engrg., etc.

References: N. B. MacRostie, J. B. Wilkinson, R. A. Low, H. E. Meadd, J. M. Hawkes.

TAYLOR—JOHN CHARLES DEANS, of Winnipeg, Man. Born at London, Eng., Nov. 12, 1892. Educ.: Univ. of Penn., 1910-12; R.P.E., Manitoba; 1912-14, dftsman. on loc., res. engr. on constrn., Canadian Northern Rly.; 1914-16, office engr. on loc. and constrn. aqueduct, Greater Wpg. water dist.; 1916-19, 1st World War; 1920-21, asst. to engr., Manitoba Drainage Co.; 1921-24, municip. engr., West Kildonan; 1924-32, engr. and water supt., Sullivan, Kipp & Chace, Ltd., consultg. engrs.; 1938-40, design and operation, Greater Wpg. sanitary dist.; 1940-45, R.A.F., Command Works Officer, sewer and water supply; 1945 to date, engr., sewer design, City of Winnipeg, Man.

References: W. P. Brereton, A. J. S. Taunton, D. L. McLean, W. D. Hurst, J. B. Striowski.

THOMPSTONE—ROBERT EDWARD, Lt. Col., R. E., of Fort Belvoir, Va. Born at Guelph, Ont., March 14, 1916. Educ.: Graduate, R.M.C., Kingston, 1938; Cambridge Univ., 1938-39 (interrupted by war); School of Military Engrg., Chatham; with Royal Engineers as follows: 1939-40, Plat. Cmdr., 1940-42, 2nd in Command, 1942-43, Commandant and Chief Instructor, Armoured Engr. School, 1943-44, S/Cmdr., France, 1944-45, 2nd in Com., Armoured Engr. Reg't., 1945-46, Staff Coll., Haifa, 1946-47, Staff Officer, Middle East, 1947 to date, British Liaison Officer, Corps of Engrs., Army of the U.S., Engineer Research & Development Labs., Fort Belvoir, Va.

References: L. F. Grant, H. H. Lawson, G. H. Spencer, C. H. Drury, W. C. Sutherland, G. Walsh.

WELCH—ARNOLD PHILIP, of Columbus, Ohio. Born at Regina, Sask., Feb. 24, 1920. Educ.: B.Eng., (Ceramic) Sask., 1941; M.Sc., (Ceremic Engrg.), Ohio State Univ., (acc. E.C.P.D.), 1947; 1941-43, service engr., C.I.L., (Aluminate Chemicals Ltd.); 1943-45, Lieut., R.C.N.V.R.; 1946 to date, research assoc., Ohio State Univ., studying for degree of D.Ph. Ceramic Engrg., Columbus, Ohio.

References: E. W. R. Butler, R. A. Spencer, I. M. Fraser, W. G. Worcester, E. K. Phillips.

FOR TRANSFER FROM JUNIOR

HUNT—FREDERICK ALVIN, of Lakeview, Ont. Born at Wentworth Co. Ontario on March 14, 1918; Educ.: B.Sc. (Civil) Queen's 1940; R.P.E. Ontario; 1940-42, Mtce. inspector, Canadian National Railways, Toronto; 1942-46, Lieut. Royal Canadian Engineers Railway Operating Gp.; 1946 to date, asst. engr., Toronto Terminals Division, Canadian National Railways. (St. 1939, Jr. 1946)

References: M. W. Huggins, D. S. Ellis, E. G. Hewson, E. R. Logie, B. Wheelwright.

LIBRARY NOTES

(Continued from page 252)

one American pre-fabrication experts, the volume presents an overall picture of this field. A history of prefabrication is given and its advantages and problems are discussed. More than 100 photographs show the accomplishments possible using prefabrication technique. Facts about the companies and the type of house they build are noted. A directory of companies specializing in prefabricated houses, and a checklist of things to look for in buying a home are included.

PROTECTIVE AND DECORATIVE COATINGS. Vol. 5, Analysis and Testing Methods.

Edited by J. J. Mattiello. John Wiley & Sons, New York; Chapman & Hall, London, 1946. 662 p., illus., diagrs., charts, tables, 9¼ x 5¾ in., cloth, $7.00.

The fifth in a series, this book considers the industry's problems in analysis and testing. The five sections are by various authorities in the respective fields: 1. "The analysis of resins" describes current procedures and methods, such as radiography, x-ray diffraction, ultraviolet, etc., and shows how the physiochemical properties of resins are employed for analytical purposes; 2. "The chemical analysis of drying oils" is presented as a routine analysis as well as a means of identification; 3. "Laboratory testing of metal finishes" is thoroughly covered; 4. The determination of the "spectral characteristics of pigments in the visual and infra-red bands" by spectrophotometric and photographic methods is described; 5. "Resinography", the graphic study of resins and plastics, is developed as analogous to metallography in the study of metals.

SEQUENTIAL ANALYSIS.

A. Wald. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 212 p., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.00.

A full discussion is offered of the new statistical technique known as the Sequential Probability Ratio Test. The author explains the fundamental theory, the applications and potentialities of this method of analysis. Among the advantages stated, as against other procedures for testing a statistical hypothesis, is that it "controls the possible errors committed by a wrong decision as effectively as the best current procedure based on a predetermined number of observations, yet it substantially reduces the number of observations necessary." Comparison with other procedures is made, and through a discussion of possible approaches to problems a groundwork is provided for further research.

STEAM AND GAS ENGINEERING.

T. E. Butterfield, B. H. Jennings and A. W. Luce. 4th ed. D. Van Nostrand Co., Toronto and New York, 1947. 588 p., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.00.

This new edition follows the policy of the previous ones in giving the latest facts and best procedures in elementary steam and gas engineering. The considerable revision includes a shifting of the order of presentation of material for a more logical approach; the work on steam turbines is expanded, while the treatment of reciprocating engines is further condensed; and the chapters on thermodynamics, gas properties, and gas cycles have been enlarged. A new chapter on the gas turbine has been introduced. The text provides a full treatment of heat power engineering for students taking only one heat-power course, or an introductory course for those specializing in the field. *(Continued on page 262)*

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 St., Montreal—Telephone BElair 3019—may be arranged *by appointment.*

Situations Vacant

CHEMICAL

CHIEF CHEMIST required to co-ordinate and supervise quality control, research and development work in laboratories of large industrial organization engaged in manufacture and processing of soaps, cosmetics, dentifrices, edible fats and oils, etc. Salary open. Apply to File No. 4068-V.

GRADUATE CHEMICAL ENGINEERS OR CHEMISTS required by an industrial chemical plant in Montreal area. Preferably with experience in production and the operation of chemical equipment such as filters, presses, etc. Must be able to organize work and direct workmen. Salary $200 up. Apply to File No. 4071-V.

ELECTRICAL

ELECTRICAL ENGINEER, recent graduate, with some practical experience required as technical assistant. Must have working knowledge of electrical terms and be capable of writing concise authentic reports of industrial conferences. Salary open. Apply to File No. 4056-V.

ELECTRICAL ENGINEER required by an industrial firm in the Montreal area. Duties include follow up of electrical installations and planning also layout and design. Salary open. Apply to File No. 4061-V.

GRADUATE ELECTRICAL ENGINEER with a minimum of 2 years practical experience to assist in electrical engineering design work. Field work on construction and maintenance of structures, service and installation of equipment. Required by Manitoba City. Salary $226.00 to $257.00. Apply to File No. 4069-V.

ELECTRICAL ENGINEER, required to act as Project Engineer by an industrial organization with Head Office in Montreal. Duties include the design of industrial electrical layouts and the preparation of material requisitions for industrial installations. Salary open. Apply to File No. 4085-V.

MECHANICAL

MECHANICAL ENGINEERS with experience in the design of hydraulic turbines, valves, penstocks, surge tanks and associated equipment required by large manufacturer in Montreal to participate in expanding program of hydro electric development. Salary open. Apply to File No. 4074-V.

MECHANICAL ENGINEER with minimum of eight years experience in the design of heavy mechanical equipment required by well established firm in Montreal for general supervision and checking. Must be alert and aggressive. Salary open. Apply to File No. 4074-V.

MECHANICAL ENGINEERS with experience in estimating or design required by well known general engineering firm in Montreal. Good future for those with right qualifications. Salary commensurate with ability. Apply to File No. 4074-V.

MISCELLANEOUS

JUNIOR GRADUATE ENGINEER with civil or mechanical qualifications. Moderate salary with excellent prospects for advancement. Required for Canadian University in Montreal for its department of buildings and grounds. Apply to File No. 4057-V.

GRADUATE ENGINEER, preferably mechanical or electrical background, required for drop forging plant operation and production in Province of Ontario, by large steel company with head office in Ontario. Good commercial sense essential. Salary open. Apply to File No. 4062-V.

CHIEF ENGINEER, mechanical background required by a specialized industrial plant in the Montreal area. Work covers mechanical design, preparation of work drawings, bills of materials, specifications and the ordering of all materials for contracts also design of necessary tooling. Minimum salary $450.00. Apply to File No. 4066-V.

POWER STATION OPERATOR with about five years' experience principally in operation and maintenance of turbines and mechanical equipment of hydro-electric plants required by public utility in Brazil. Preferably not over 30 and single but will consider married man without minor dependents. Replies held in strictest confidence. Salary open. Apply to File No. 4073-V.

MECHANICAL OR CIVIL ENGINEER with at least four years experience in stress analysis and vibration required by one of Canada's leading manufacturers of heavy mechanical equipment. Considerable scope for man of proper qualifications. Salary open. Apply to File No. 4074-V.

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

CHEMICAL

CHEMICAL ENGINEER OR CHEMIST, preferably with Ph.D., required by a pulp and paper company with plants in Eastern Canada, for research work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER required by a pulp and paper company with plants in Eastern Canada, for mill control and pilot plant work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER with considerable mechanic and hydraulic experience or mechanical engineer with good chemical knowledge and experience in hydraulics, required by a manufacturer in Ontario. Salary open. Apply to File No. 3928-V.

CHEMICAL ENGINEER, recent graduate, required to study and become experienced with industrial products fabricated from carbon or graphite by firm in Toronto area. Position to eventually lead to sales. Salary $180 to $200. Apply to File No. 3958-V.

CHEMICAL ENGINEER, recent graduate, is needed by a chemical manufacturing firm situated in the Province of Quebec. Some experience in oil refinery, pulp and paper, or synthetic resin manufacture would be useful. Salary open. Apply to File No. 3978-V.

CHEMICAL ENGINEER OR CHEMIST wanted by large manufacturers of bleached sulphate pulp for their Technical and Development Department. Several years experience preferably in the pulp and paper industry. Mill located in Northern Ontario. Salary open. Apply to File No. 3991-V.

CHEMICAL ENGINEER, experienced in use of physics and mathematics, under 30 years of age, required by industrial and chemical organization with Headquarters in Montreal. Duties include development work and study explosives and chemistry and hydro-dynamics. Salary open. Apply to File No. 3995-V.

SENIOR CHEMICAL ENGINEER OR CHEMIST, required by leading Paper Manufacturer in Eastern Canada. Applicant should have some experience in Paper Mill Control work. This position offers plenty of scope for advancement. Salary open. Apply to File No. 4013-V.

CHEMICAL ENGINEER required by a major Canadian Company located in Toronto as Technical Service Man. 25 to 35 years old. Definite sales personality. Position will include 6 to 12 months' training. It will carry the responsibility for servicing all types of adhesives to industries throughout Canada. Salary open. Apply to File No. 4044-V.

CIVIL

CIVIL ENGINEER to take charge of work in a drainage district in Quebec. Must be bilingual, may be recent graduate. Salary from $200. Apply to File No. 3479-V.

CIVIL ENGINEERS with experience in detailing and designing structural steel and reinforced concrete for manufacturers are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

CIVIL ENGINEERS, recent graduate up, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

GRADUATE CIVIL ENGINEER, required by a public utility in the Montreal area with three or four years experience in design of reinforced concrete and structural steel. Salary $250-$300. Apply to File No. 3766-V.

CIVIL ENGINEERS with some experience on design and field work required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

CIVIL ENGINEERS required as draughtsmen in bridge department of large transport company. Preferably with experience in steel, concrete and timber construction. Location Montreal. Salary $200-$300. Apply to File No. 3884-V.

CIVIL ENGINEER, required in New Brunswick. Must be qualified designer of miscellaneous public utility buildings in frame and masonry construction. Thorough working knowledge of timber, reinforced concrete and steel framing essential, knowledge of the design of various types of heating system and plumbing. Salary open. Apply to File No. 3887-V.

CIVIL ENGINEER required as Town Engineer of a town in the Maritimes. Required to supervise and layout work for Water and Sewerage Department also construction of a general nature for the Electric Light Department. Salary open. Apply to File No. 3930-V.

CIVIL ENGINEER, required by a Steel Company in Montreal for the design of reinforced concrete frame. Salary open. Apply to File No. 3931-V.

CIVIL ENGINEER, recent graduate, required to understudy City Engineer of a city in Western Quebec. Salary open. Apply to File No. 3966-V.

JUNIOR ENGINEER, preferably with civil background required for sales and service by a Montreal manufacturer of waterproofing compounds. Salary open. Apply to File No. 3968-V.

CIVIL ENGINEER required in Montreal with general knowledge of reinforced concrete and steel structures. Special knowledge of triangulation surveys, boundary surveys, also laws and procedure to be followed in regard to the purchase, transfer and registration of lands in Province of Quebec. Must be bilingual. Preferably veteran. Salary not less than $3,480. Apply to File No. 3987-V.

ELECTRICAL

ELECTRICAL ENGINEER, age 30-45, required as sales engineer in Canada for U.S. firm making special equipment for transport and industry. Must have sales training in electrical equipment instruments also experience as sales and service engineer. Salary open. Apply to File No. 3447-V.

ELECTRICAL ENGINEER, recent graduate, required for the engineering staff of a paper mill in the Lake St. John area. Salary open. Apply to File No. 3507-V.

ELECTRICAL ENGINEER with considerable industrial experience required as a safety engineer by a public utility in the Montreal area. Bilingual preferred. Salary open. Apply to File No. 3654-V.

ELECTRICAL ENGINEER, recent graduate up, required by a manufacturer in Montreal, for sales engineering. Preferably bilingual and familiar with rotating electrical equipment. Salary $200 up. Apply to File No. 3761-V.

GRADUATE ELECTRICAL ENGINEERS with 3 to 10 years experience in design operation, layout of substations, switching stations, and electrical machinery, together with engineering studies, including draughting for a large hydro electric power house in Quebec. Salary $225 up according to experience. Apply to File No. 3787-V.

ELECTRICAL ENGINEER required for power sales by an electrical utility in Province of Quebec. Preferably experienced. Bilingual. Salary open. Apply to File No. 3802-V.

ELECTRICAL ENGINEER with experience in layout and design of generating and transformer stations, required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

SEVERAL EXPERIENCED ELECTRICAL DRAUGHTSMEN, for the design and layout of industrial power and control systems. Required by consulting engineering office in Montreal. Salary open. Good chance for advancement. Apply to File No. 3890-V.

JUNIOR ELECTRICAL ENGINEER, with practical experience in general manufacturing industries, required by an industrial organization in Ontario. Salary open. Apply to File No. 3904-V.

ELECTRICAL ENGINEERS, required for sales engineering work in Western Canada. Graduates with some selling experience preferred. Salary open, plus expenses. Apply to File No. 3915-V.

ELECTRICAL DRAUGHTSMAN, required by a firm of Engineer Contractors in Alberta for layout and plotting with a minimum of supervision. Should be accustomed to working with power lines to 2,300 volts and must be able to do lighting circuits, both overhead and underground. Salary $250 to $300. Apply to File No. 3972-V.

PROFESSOR IN ELECTRICAL ENGINEERING required by a Canadian University in the Province of Qubeec for fall 1948 semester. Preferably with teaching and practical experience in power, electrical machinery design, lab. etc. Bilingual preferred. Attractive salary available for right man. Apply to File No. 3982-V.

ELECTRICAL ENGINEERS, age 30 to 40, required for the Commercial and Distribution Department of large Hydro Electric Utility. Must have experience in electrical distribution. Salary open. Apply to File No. 4002-V.

ELECTRICAL ENGINEER experienced in Power Station, Transmission and Distribution design and installation. Permanence and advancement depending upon performance. Salary open. Apply to File No. 4024-V.

JUNIOR ELECTRICAL ENGINEER, required by a mining company in Northern Ontario. Salary open. Apply to File No. 4028-V.

ELECTRICAL ENGINEER with minimum of 5 years experience in paper industry, between 35-45 years of age, for responsible position with large newsprint manufacturing concern in Northern Ontario. Salary commensurate with qualifications. Living accommodation assured. Apply to File No. 4032-V.

ELECTRICAL ENGINEERS with some experience in research, design, and development, backgrounds in communications, electronics, power or physics are preferred. Required for the staff of a technical college in N.Y. state. Salary and rank will be commensurate with experience and training. Apply to File No. 4038-V.

DESIGNING ELECTRICAL DRAUGHTSMAN with experience on station design and layout required in Montreal by a pulp and paper mill. Experience in pulp and paper industry would be an asset, but not essential. Salary open. Apply to File No. 4046-V.

MECHANICAL

MECHANICAL ENGINEERS, preferably with design experience, are required for armament research and development in the Quebec area in a government establishment. Salary from $190.00. Apply to File No. 3401-V.

MECHANICAL ENGINEERS, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

JUNIOR MECHANICAL ENGINEER with knowledge of precision machine shop practice and aptitude for research work in metals and plastics required for an organization in Toronto for the production of artificial limbs. Must be veteran. Salary from $225. Apply to File No. 3675-V.

MECHANICAL ENGINEERS with at least five years experience in the pulp and paper industry required by an Ontario Paper Company. Salary open. Apply to File No. 3733-V.

MECHANICAL ENGINEERS required by a Pulp and Paper Mill at Powell River, B.C. Preferably with experience in plant design in the pulp and paper industry. Salary according to qualifications. Apply to File No. 3796-V.

MECHANICAL ENGINEERS with experience in plant layout and design or ventilation problems or general mechanical design, required by a firm in Quebec. Salary from $250. Apply to File No. 3818-V.

MECHANICAL ENGINEER, age 35-40 with considerable experience in design and layout of machinery and equipment, required by an organization with Headquarters in Montreal. Salary $300-$400. Apply to File No. 3820-V.

MECHANICAL ENGINEER with six to ten years experience in maintenance and engineering work required by alkali manufacturers in Ontario. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER, required by a manufacturer in Ontario for the plant operation staff. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER with knowledge of psysical metallurgy heat treatment, ability in stress analysis and design. Required for research work in B.C. Maximum salary $4,000. Apply to File No. 3865-V.

MECHANICAL ENGINEER, age 30-38, required for northern Ontario Paper Mill. Preferably with paper mill experience or experience in general layout and design. Knowledge of pumps capacities, piping, conveyors, estimating and structural design essential. Salary open. Apply to File No. 3891-V.

MECHANICAL ENGINEER, bilingual, with 4 or 5 years experience in sheet metal work required as Plant Manager by a manufacturer in the Province of Quebec. Salary open. Apply to File No. 3894-V.

MECHANICAL ENGINEER, age 25 to 35, experienced in industrial plant layout and machine design required by manufacturing firm in Brantford. Salary open. Apply to File No. 3907-V.

MECHANICAL ENGINEER, recent graduate, with some knowledge of heat exchanges, condensers, or any type of unfired pressure vessels required by an industrial organization in Montreal. Salary open. Apply to File No. 3976-V.

MECHANICAL ENGINEER, recent graduate, bilingual, with some experience in general plant work, required in Montreal. Industrial engineering experience would be useful. Duties include time-study in Standards Department. Salary open. Apply to File No. 3980-V.

MECHANICAL ENGINEER age 25 to 30 is required by a company in Shawinigan Falls to eventually act as Assistant Works Manager when qualified. Salary open. Apply to File No. 3985-V.

MECHANICAL ENGINEER, with experience in plant lay-out and knowledge of reinforced concrete, timber and steel design, required in an industrial manufacturing and processing plant situated 75 miles from both Ottawa and Montreal. Salary open. Apply to File No 3990-V.

MECHANICAL DESIGN DRAUGHTSMAN with experience in reinforced concrete and structural steel required by a mining company in Northern Ontario. Housing, available. Salary open. Apply to File No. 3994-V.

MECHANICAL ENGINEER, with 2 or 3 years experience, preferably bilingual, required as Mechanical Development Engineer by industrial and chemical organization with headquarters in Montreal. Duties will be conducting investigations on existing equipment and a certain amount of plant layout work and draughting. Salary open. Apply to File No. 3995-V.

MECHANICAL ENGINEER with 1 to 3 years experience in production, required as Industrial Engineer by industrial and chemical organization, with headquarters in Montreal. Duties include responsibility for conducting methods engineering studies using methods of process charts, time and motion study. Salary open. Apply to File No. 3995-V.

MECHANICAL ENGINEER, required by a Montreal manufacturer of machines and equipment for work consisting of general engineering and design in connection with the manufacture of pulp and paper machinery. Salary open. Apply to File No. 4000-V.

MECHANICAL ENGINEER must be bilingual, required by paper company for general duties in line with capabilities and interest. Position in very small community in Province of Quebec. Salary open. Apply to File No. 4020-V.

MECHANICAL ENGINEER required as assistant in Chief Engineers Department by large paper company. Paper experience essential. Some knowledge of French language would be helpful. Must be able to complete investigations and write reports. Age 28-40. Salary $350-$450. Apply to File No. 4022-V.

MECHANICAL ENGINEERS required in Ontario by a firm specializing in machine tools. Vacancies exist for Junior Salesman with ability and interest in sales engineering also engineer experienced in Production control. Salaries open. Apply to File No. 4026-V.

MECHANICAL DRAUGHTSMAN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for colliery plant, screening equipment, hoists, simple steel structures, etc. Salary $240.00 up depending upon ability. Apply to File No. 4030-V.

MECHANICAL ENGINEER preferably with heating and ventilating experience required in Montreal for design and draughting. Salary depending on experience. Apply to File No. 4034-V.

MINING

MINING ENGINEERS, with varied experience required by a firm in Quebec for general mine operation, exploitation and development work. Salary from $250. Apply to File No. 3818-V.

MINING ENGINEER with several years experience required by a company engaged in large scale asbestos production in Quebec. Salary open. Apply to File No. 3935-V.

MISCELLANEOUS

STRUCTURAL STEEL DRAUGHTSMAN AND CHECKERS, preferably graduate engineers but any experienced men acceptable, are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

GRADUATE ENGINEERS, required by an industrial and chemical organization with headquarters in Montreal for all phases of research, design, operation development, production and maintenance. Salaries open. Apply to File No. 3588-V.

SALES ENGINEER with wide engineering experience, wanted by a company in Toronto for the sale of textile machinery and construction equipment. Salary open. Apply to File No. 3639-V.

CHEMICAL OR METALLURGICAL ENGINEERS, from recent graduates up, required by a Quebec firm engaged in metal production for employment as production and development engineers. Salaries open. Apply to File No. 3693-V.

MINING AND METALLURGICAL ENGINEER, age about 30, with considerable experience, required by a manufacturer in the St. Maurice Valley. Salary open. Apply to File No. 3723-V.

STRUCTURAL STEEL DETAILER AND CHECKER with considerable experience, required for checking shop details by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

DETAILER AND DESIGNER for reinforcing steel with considerable experience, required by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

SALES ENGINEER, preferably bilingual required by a Montreal firm dealing in building materials. Salary from $200. Apply to File No. 3745-V.

GRADUATE ENGINEER, required by an electrical firm in Montreal to organize publicity department and edit trade journal. Salary open. Apply to File No. 3751-V.

STRUCTURAL STEEL DRAUGHTSMAN, qualified to detail and check all classes of structural steel, and to supervise draughtsmen in a large drawing office on the West Coast. Salary open. Apply to File No. 3777-V.

BRIDGE ENGINEER, qualified to be in charge of the design and supervision of the construction of highway bridges. Apply stating qualifications, experience, age and salary wanted. Apply to File No. 3780-V.

GRADUATE CIVIL OR MECHANICAL ENGINEERS with 3 to 10 years experience in design, cost estimates, draughting, and engineering studies for a large hydro-electric power house in Quebec. Salary $225 up, according to experience. Apply to File No. 3787-V.

STEAM PLANT ENGINEER for large concern in Eastern Townships, with at least 5 years practical experience. Must be familiar with thermo-dynamics, combustion control, steam turbines, mechanical refrigeration, hydraulics, etc. Permanent position and attractive salary for the right man. Apply to File No. 3791-V.

RECENT GRADUATES OR JUNIOR ENGINEERS, with mechanical background, required by a Montreal Engineering, fabricating and contracting firm for training purposes leading to sales and service. Area Montreal. Salary $175 up. Apply to File No. 3810-V.

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open. Apply to File No. 3811-V.

DRAUGHTSMAN, preferably with mechanical background, required by a manufacturer in Montreal for design work on electrical equipment. Salary open. Apply to File No. 3829-V.

DRAUGHTSMAN of the following classes: Architectural, piping layout, equipment layout, mechanical design, steam plant, heating, and ventilating electrical and plumbing required by an industrial organization in Montreal. Salaries open. Apply to File No. 3860-V.

STRUCTURAL STEEL CHECKER AND ONE DETAILER CHECKER, wanted for large fabricating plant in Vancouver, B.C. Age between 30 and 40 years preferred. Must be experienced. Give full information and references. Salary open. Apply to File No. 3862-V.

MECHANICAL, CIVIL OR CHEMICAL ENGINEER, recent graduate up, required for sales and service in Montreal Must be bilingual. Salary open. Apply to File No. 3867-V.

GRADUATE ENGINEERS required for all phases of research, design, operation, and development by an industrial organization with Headquarters in Montreal. Salaries open. Apply to File No. 3882-V.

STRUCTURAL ENGINEER, preferably a graduate civil engineer with experience in the design of mill buildings required by a paper manufacturer in Eastern Ontario. Salary open. Apply to File No. 3896-V.

DETAILERS OR JUNIOR DESIGNERS on mechanical or sheet metal design required by an industrial organization in Ontario. Salary open. Apply to File No. 3904-V.

INDUSTRIAL ENGINEERS, with production experience required by a firm of industrial consultants in Montreal. Preferably with experience in time study, cost control, etc. Salary around $400 depending on qualifications. Apply to File No. 3910-V.

RECENT GRADUATE required by a Montreal contractor for survey and making of plans. Must be bilingual. Salary $175 up according to experience. Apply to File No. 3933-V.

TWO METALLURGICAL ENGINEERS AND ONE CHEMICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No. 3942-V.

SALES ENGINEER required by well known manufacturer of mechanical equipment to solicit industrial accounts throughout the Province of Quebec. Applicants must reply giving full details, age, training, etc. Salary open. Apply to File No. 3951-V.

INDUSTRIAL ENGINEER thoroughly experienced in time study, standard data and wage incentive installation and administration required for firm in Quebec. Salary open. Apply to File No. 3952-V.

CITY ENGINEER, required by a City in Saskatchewan to take full charge of its utilities which include electric light, power, sewer, water, sidewalk, etc. Salary open. Apply to File No. 3955-V.

JUNIOR SALES ENGINEERS with production experience required by a firm of industrial consultants in Montreal. Salary $300 depending on qualifications. Apply to File No. 3965-V.

STRUCTURAL ENGINEER DRAUGHTSMAN, required by a firm of engineer contractors in Alberta. Duties include structural detailer and requires knowledge of major concrete foundations; to detail structural steel buildings, access tower platforms and miscellaneous small steel structures. Salary $300.00. Apply to File No. 3972-V.

DRAUGHTSMAN required by a firm of engineer contractors in Alberta for layout of pipelines and details in refinery construction. Preferably background of refinery experience or alternately powerhouse piping or heavy industrial draughting. Salary $300.00. Apply to File No. 3972-V.

GRADUATE ENGINEER, with some experience in a manufacturing industry, required by Hamilton company. Some knowledge of production operations, mill scheduling, job evaluation, time study, job methods, industrial relations would be helpful. Salary open. Apply to File No. 3981-V.

GRADUATE ENGINEER, age 32 up, preferably bilingual and with 10 years experience in industrial design required by chemical organization with headquarters in Montreal. Duties include supervision of Works Design Departments, supply draughting and design service for plant, prepare appropriation requests, maintain cost estimating units, etc. Salary open. Apply to File No. 3995-V.

GRADUATE ENGINEER, three to 5 years plant experience, required by chemical organization in Montreal. Duties include assisting in developing and carrying out in various plants training programs in subject and related fields for junior industrial engineers. Develop and apply such office routine as may be necessary. Salary open. Apply to File No. 3995-V.

MECHANICAL ELECTRICAL OR CIVIL ENGINEER, age 23-30, preferably single and bilingual with some experience in maintenance required by an industrial and chemical organization with headquarters in Montreal. Duties include construction project and design studies. Salary open. Apply to File No. 3995-V.

CIVIL OR MECHANICAL ENGINEER wanted with 5 to 8 years experience for key position in moderate size plant in Manitoba doing fabrication of Plate Work and Light Steel Work, also Grey Iron Foundry and Machine Shop. This will lead to key position in a growing organization. Salary open. Apply to File No. 4003-V.

MECHANICAL AND CHEMICAL ENGINEERS, interested in entering the Pulp and Paper industry, required in Newfoundland. Vacancies in Technical Department and studying process work and improved methods of operation. Pulp and paper experience is not necessary. Salary open. Apply to File No. 4009-V.

SAFETY SUPERVISOR required for South America. Age 25-40 years. Single. To supervise safety activities, promote safety first and inspect operations to assure proper installation and use of safety devices. Salary $350 U.S. currency. Apply to File No. 4011-V.

RESERVOIR ENGINEER, required for South America. Age 25-35. Should be experienced in reservoir and production cost analysis. Capable of determining efficient flow rates for reservoirs and wells. Salary approximately $400 U.S. currency. Apply to File No. 4011-V.

MAINTENANCE ENGINEER, required for South America. Age 35-40. Duties include, refinery maintenance, inspection of units, metal inspection work. Responsible for engineering calculations, design of equipment and pipefitting work. Salary $375 U.S. currency. Apply to File No. 4011-V.

POWER PLANT SUPERVISOR required for South America. Age 30-40, single preferred. To supervise steam power plant including operating, boiler cleaning and minor repairs. Salary $375 U.S. currency. Apply to File No. 4011-V.

DESIGNING DRAUGHTSMEN preferably graduates in mechanical or electrical engineering with at least 5 years experience in manufacture of sulphite or newsprint pulp required in Province of Quebec. Good salaries and opportunities for advancement. Permanent employment. Apply to File No. 4014-V.

ASSISTANT CITY ENGINEER with experience in municipal engineering required by Sask. City. Duties include operation of pumping sewage disposal and asphalt plants also building inspection department and concrete construction. Salary $4,000 to $4,500. Apply to File No. 4017-V.

ELECTRICAL OR MECHANICAL ENGINEERS required by large Montreal firm to prepare and analyze specifications for telephone equipment manufacturing and installation. Other types of engineering work also available. Salary open. Please send photo together with particulars of education and experience. Apply to File No. 4018-V.

GRADUATE ENGINEER, required as Assistant to Manager of Sawmill and Woodlands operations. Position located in Ontario. Good commercial sense essential also some sales ability. Salary $300-$350. Apply to File No. 4021-V.

MECHANICAL, STRUCTURAL AND ELECTRICAL ENGINEERS, required in Trail, B.C., as Designers, Draughtsmen and Construction Cost Estimators for Mining, Metallurgical, Chemical and Fertilizer Plant Design and layout. Salary open. Apply to File No. 4023-V.

ARCHITECTURAL DRAUGHTSMAN experienced in industrial building construction, with natural aptitude for design work, wanted by large industry in Eastern Townships, good salary, permanent position to the right man. Apply to File No. 4031-V.

DESIGNING ENGINEERS OR DRAUGHTSMEN, preferably but not necessarily with experience in Pulp and Paper Mill work required for paper mill in Newfoundland. Salaries $300.00 per month or better depending upon experience and ability. Apply to File No. 4036-V.

GRADUATE ENGINEERS preferably with about five years light structural and mechanical experience required by growing concern in central Ontario to learn business thoroughly and thereby be in a position to accept responsibility in Engineering Department. Salary open, based on experience and aptitude. Apply to File No. 4045-V.

ENGINEERING ASSISTANT to teach some classes in first three years of Engineering course at Dalhousie University, Halifax, Nova Scotia. Appointment for one year, commencing September, 1948, with possibility of permanent re-appointment. Salary open. Apply to File No. 4048-V.

SENIOR INDUSTRIAL ENGINEER required by Management Consultants in Montreal. Experienced in installations of Production and Cost Control, Wage Incentives, etc. Free to travel, preferably bilingual. Salary open. Apply to File No. 4052-V.

SALES ENGINEER for popular line of Diesel Engines, applicants must be specialists on Power Units and Generator Sets. Required for permanent employment with well established organization. Apply to File No. 4055-V.

INDUSTRIAL ENGINEER with considerable manufacturing experience. Between 30 and 40 years of age. Required for plant surveys in Province of Quebec. Must be fluently bilingual. Permanent position. Salary according to qualifications. Apply to File No. 4064-V.

Situations Wanted

MECHANICAL ENGINEER, Jr.E.I.C., McGill University. Eight years experience Tool and Production Methods Engineer. Age 38. Married. Presently employed. Desires employment as Production Manager or Materials Engineer for large company. Preferably Montreal area Apply to File No. 551-W.

MECHANICAL ENGINEER, B.Sc. Queen's '33, M.E.I.C., M.I.A.S., P. Eng., Que. Married, age 37, over twelve years experience including design, stress analysis maintenance, inspection, administration and 5½ years as an R.C.A.F. Engineer Officer. Presently employed desires permanent position with good future prospects. Preferably in an English speaking locality. Apply to File No. 1042-W.

GRADUATE CIVIL ENGINEER, S.E.I.C., B.Sc., Queen's; P. Eng., Que.; would accept part time work during evenings or week-ends at home, preferably on steel construction and reinforced concrete design, estimating and detailing. Residing in Montreal. Apply to File No. 1487-W.

CIVIL ENGINEER, C.E., B.Sc., M.E.I.C., age 32, married with experience in road construction; surveying; industrial plant lay-out, including steel tank erection; piping design and installation, equipment installation; building construction such as offices, warehouses, service station; costings; estimates; administrative control. Working knowledge of cost and operational studies, inventory work, material necessary for all types of construction work. Will accept responsible position anywhere. Salary in accordance with responsibility and living conditions. Apply to File No. 1914-W.

PART TIME WORK: Civil engineer, age 34, R.P.E., M.E.I.C., perfectly bilingual, with post-graduate work at University of Toronto in Public Health Engineering, and at Harvard University in Industrial Hygiene, also experienced in structural and plate work and in municipal engineering, would take work evenings and week-ends, specially in consulting form to industry in problems related to Industrial Hygiene and local exhaust ventilation. Apply to File No. 2272-W.

MECHANICAL ENGINEER, McGill, Jr.E.I.C., P. Eng., Que. Age 26, single, veteran, bilingual. 6 years of varied experience covering general plant maintenance; power-house operation; gasoline and diesel trucks, tractor and locomotive maintenance; residential and some industrial construction. Well versed in Time Study and job evaluation. Position desired in Montreal. Now employed out of town. Available after reasonable notice to present employers. Apply to File No. 2338-W.

ELECTRICAL ENGINEER, B.Eng. Honors, McGill, 1943, Jr.E.I.C., A.I.R.E., P.Eng (Que.), 26, married, presently employed, desires change to smaller organization with more general scope, broader future responsible outlook, in Ontario or B.C. Experience in heavy manufacturing, radio production, standardization, specification, audio design. Apply to File No. 2727-W.

CHEMICAL PROCESS ENGINEER, Jr. E.I.C., McGill, veteran, over four years overseas as Engineer Officer (construction). Two years design, correlation and economic evaluation work on petroleum refining processes with major U.S. oil company. Present salary $4,000. Age 27, married. Desire responsible position in Canada. Apply to File No. 2778-W.

ELECTRICAL ENGINEER, M.E.I.C., P.E (N.B.), age 35, married. 12 years experience in electrical machinery including 2 years District Manager of Sub Station in North West Quebec; 3 years Assistant Electrical Superintendent of Gold Mine in North West Quebec; 3 years R.C.E. Electrical Distribution Systems; 2 years teaching in electrical department of a Canadian University. Present teaching position temporary Apply to File No. 2827-W.

MECHANICAL ENGINEER, S.E.I.C., two years experience in consulting and general engineering work desires position in consulting or industrial work. Montreal or Ottawa preferred. Available on short notice. Apply to File No. 2829-W.

CIVIL ENGINEER, Jr.E.I.C., B.A.Sc. (Toronto), P.Eng. (Ont.), with some experience in reinforced concrete and structural steel design including detailing of reinforced concrete and estimating. Would accept part time work during evenings and week-ends. At present employed and residing in the Toronto area. Apply to File No. 2910-W.

GRADUATE ELECTRICAL ENGINEER, McGill '24; M.E.I.C., Prof. Eng., Que.; over 20 years experience in High Voltage Transmission Line design and construction. Interested in part time or temporary position in general Engineering or transmission line work. Location preferably Montreal or in B.C. At present residing in Montreal area, due to certain physical defects the type of work that can be undertaken is limited. Available at once. Apply to File No. 2918-W.

CIVIL ENGINEER, M.Sc., M.I.T., Jr.E.I.C., interested in part time work in steel and reinforced concrete design. Presently employed as instructor at a Canadian University, four years practical experience in design. Must be Montreal area. Apply to File No. 2930-W.

GRADUATE MECHANICAL AND ELECTRICAL ENGINEER, M.E.I.C., P.Eng. (Ont.) Age 39, married. 16 years of experience here and in Europe includes mechanical, electrical and optical design, applications, sales, administration, inspection of production, statistical quality control. Knowledge of foreign languages. Presently engaged in Montreal area, salary $420 per month, would prefer position in Ontario or B.C. Available one month's notice. Apply to File No. 2931-W.

GRADUATE, Institution of Mechanical Engineers (England), age 25, seeks position of Junior Engineer with a firm engaged in producing consumer goods. Five years engineering apprentice; one year draughting; and three years as junior metallurgist mainly occupied in solving production problems from a metallurgical aspect. Apply to File No. 2933-W.

GRADUATE ENGINEER, M.E.I.C., age 30, veteran, married. Experience includes maintenance, construction, production, etc. Toronto area preferred. One month's notice. Apply to File No. 2934-W.

CHEMICAL ENGINEER, S.E.I.C., age 25, experience, process control in rubber and heavy chemicals; engineering in distillery. Presently employed seeks position with greater scope in engineering work. Available one-month's notice. Will travel anywhere. Apply to File No. 2936-W.

MECHANICAL ENGINEER, Jr.E.I.C., B.Eng., McGill '44, P.Eng., Que. Age 24, veteran, proceeding toward Masters Degree, seeks employment for months May to September inclusive, on research or development projects or with consulting engineer. Varied experience in production, mechanical design and layout work. Would be able to continue project part time after October if necessary. Apply to File No. 2942-W.

CAMBRIDGE GRADUATE ENGINEER, M.E.I.C., P.Eng. (Ont.), age 29, married. With Civil, Aeronautical and Mechanical background. 4½ years R.A.F. Pilot and Instructor and 3½ years practical experience in consulting and municipal engineering on surveys, design estimating and construction work. Requires responsible and progressive position where full use can be made of wide interests. Location Ontario (where presently employed) or Western Canada. Apply to File No. 2943-W.

ELECTRICAL ENGINEER, M.E.I.C., P.Eng. (Que.), B.A.Sc., Diploma in Business Administration; age 29, married; seven years industrial engineering and technical sales supervision in electrical industry. Available in May. Industrial marketing, or management engineering. Apply to File 2946-W.

CIVIL ENGINEER, Jr.E.I.C., P.Eng. (Que.) McGill graduate desires spare time work evenings and week-ends on design and detail of reinforced concrete and steel structures. Also qualified to make stress analysis of rigid frames and most statistically indeterminate, structures. Location Montreal. Apply to File No. 2947-W.

2 STUDENTS, S.E.I.C., both on executive of Junior Section, desire summer employment in Ottawa area. Have 2 years Engineering at Carleton College, specializing in Engineering Physics or Electrical Engineering. Jobs need not be together. Available April 30th, 1948. Both experienced draughtsmen but prefer work at which they can gain fundamental knowledge in Physics. Apply to File No. 2948-W.

ENGINEER, M.E.I.C., B.Sc., P.Eng., Ont. Married, veteran R.C.E.M.E. Officer. Two years in plant chemical and physical control laboratory. Two years as construction engineer, fieldwork and supervisory experience, reinforced concrete, masonry and steel structures. Chiefly interested in position as construction supervisor or concrete research. Apply to File No. 2949-W.

INDUSTRIAL AND PRODUCTION ENGINEER, Jr. E.I.C., P.Eng. (Mechanical) Ont. 5 years' experience in cost reduction and analysis, production planning and scheduling, systems and administration. Background of experience covers both industrial and mechanical engineering. Presently employed, available on six weeks' notice. Age 28. Apply to File No. 2955-W.

STUDENT, S.E.I.C., 3rd year McGill. Interested in summer employment. Field work, surveying or structural draughting preferred. Available June 1st to September 20th, 1948. Apply to File No. 2956-W.

ELECTRICAL ENGINEERING STUDENT, S.E.I.C., third year at McGill University, would like summer employment with firm in Montreal vicinity, experience in installation of all types of A.C. motors, especially in connection with refrigeration systems and wood drying kilns. Willing to take any other employment dealing with electric power. Apply to File No. 2958-W.

CIVIL ENGINEER, P.Eng. Ont., M.E.I.C., would like spare time work at design of reinforced concrete or structural steel on a fee basis or otherwise. At present employed in the Hamilton, Ont., area. Apply to File No. 2964-W.

STRUCTURAL ENGINEER, Jr.E.I.C., B.E. '46, N.S.T.C., S.M. '48, M.I.T. Interested in structural planning, design or construction, or working with consultants. Available June 15. Apply to File No. 2965-W.

MECHANICAL ENGINEER, M.E.I.C., B.Sc., Queen's 1936. Position wanted leading to design and installation of automatic controls and allied equipment; eleven years diversified experience including supervision of plant engineering and maintenance, with four years work on many types of control problems involving measurement and control of such factors as temperature, atmosphere, and flow. Available at one month's notice; Toronto area preferred. Apply to File No. 2966-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng., twelve years experience in the following fields: Automotive, Aircraft and Air Handling Equipment on product design, development and testing, improvement of production. Also on design of special machinery; Maintenance in Paper Converting Mill and six years executive in Sales and Service. Desires position with responsible firm, or partnership with Consultant. Apply to File No. 2967-W.

Mechanical Engineer

Permanent employment opportunity for a professional engineer with shop practice, preferably in automotive equipment, to assist superintendent in technical and eventually administrative capacity. At least 5 years practice. Salary from $3630 to $4950 depending on experience of candidate.

Further particulars may be obtained at the office of the Montreal Civil Service Commission, Room No. 1, City Hall.

Mechanical or Electrical Engineer

Permanent employment opportunity for a professional engineer with practical experience in pumps, motors and electrical apparatus, to take charge eventually of pumping plant personnel and equipment. At least 5 years practice. Salary from $3630 to $4950 depending on experience of candidate.

Further particulars may be obtained at the office of the Montreal Civil Service Commission, Room No. 1, City Hall.

INDUSTRIAL ENGINEERING GRADUATE

With considerable diversified experience, preferably in manufacturing or processing. Between 30 and 40 years of age; must speak French and English fluently. Required by financial organization to undertake business investigations. Permanent position with pension benefits. Salary according to qualifications. Apply to File No. 4088-V.

WANTED

AUTOMOTIVE MECHANICAL SUPERINTENDENT

To re-organize and supervise complete mechanical repair and maintenance activity of large pulpwood operations in northern Quebec.

Equipment consists of several hundred units comprising trucks and vehicles, tractors, boats and miscellaneous powered equipment. Service and repair shops comprise modern main shop and parts department and several smaller shops.

Heated house will be provided for superintendent in small town on operations.

English Canadian with thorough knowledge of the French language would be most adaptable.

Salary over $5,000.

For further information, write stating experience and qualifications to File No. 4091-V.

Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

The Canadian General Electric Company Limited, 212 King St. West, Toronto, Ontario, states that a new, fully-automatic paint machine which cleans, rustproofs, paints and dries a variety of parts in the record time of one hour and 42 minutes has been put into operation by the Control Division of the General Electric Company. It is claimed that up to 12,960 pieces pass through the huge automatic device in an hour. The painter is fully automatic and an even coat free of flaws is achieved. Paint dripping from the parts is caught in the draining section, and flows back into the main paint reservoir, thereby keeping waste to a minimum.

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Canadian Patent No. 539654, covering a very simple hydraulic pump or motor is available for licensing for manufacture in Canada. For details communicate with Ridley-Industrial Limited, Warwick Road, Kenilworth, Warwickshire, England.

•

Kennametal Inc., Latrobe, Penna., have announced the development of a new two-prong rotary drill bit for drilling nonmetallic minerals such as clay, limestone, stone, slate, etc. Bit sizes are from 1¾ to 3 inches in diameter and it can be used on regular coal augers.

•

Glyco Products Co. Inc., Brooklyn 2, N.Y., offer samples and data of a product known as "Acrawax C". It is claimed that the use of this new synthetic wax as a lubricant for dry drawing high carbon steels has proved more efficient and economical than older methods. Many other unusual advantages are claimed for this product.

The recording of physical motion by air pressure, a new development in the field of instrumentation, is said to feature the "Microtrans" now being commercially introduced by Hagan Corporation of Pittsburgh. According to the manufacturer's claim "Microtrans" translates physical movements of 0 to 0.25 inch into pneumatic pressures over a range of 5 to 30 pounds. As an example of effective application it is claimed that it can be used to record the expansion of turbine rotors, relative to the casing.

•

Three jaw crushers, two vibrating screens and two double-compartment grinding mills recently completed at Canadian Allis-Chalmers' Rockfield Works, have been shipped to the Chinese Government for the Taiwan Fertilizer Company on the island of Formosa. This equipment is needed to enable the Chinese to complete their vitally important agricultural programme. It was purchased by the Canadian Government with funds made available to the distressed countries by U.N.R.R.A.

•

The General Electric Company claims to have developed an X-ray thickness gauge, which automatically and continuously measures the thickness of a moving strip of red-hot steel without physically contacting the steel in any way. It is claimed to be the first instrument of its kind able to perform this job. Previously, thickness measurement of hot steel, moving through rolling mills in strip form, was delayed until the steel had cooled to a temperature at which measurement by hand-held micrometer was possible.

Tracerlab Inc., 55 Oliver Street, Boston 10, Massachusetts, has announced the availability of what is claimed to be the first commercially manufactured automatic sample changer for making radioactivity measurements. For complete information ask the manufacturer for details on SC-6 Automatic Sample Changer.

•

American Wheelabrator & Equipment Corporation, of Mishawaka, Indiana, has announced the development of a new Continuous Wheelabrator Tumblast for high production blast cleaning. The manufacturer claims that by utilizing a combination of tumbling and longitudinal travel of the work, the equipment offers a thorough cleaning and uninterrupted efficiency. For details communicate directly with the manufacturer.

•

Rogers Majestic Limited Leaside, Toronto 2, Ontario, state that a FM two-way radio-telephone, with a 30-watt "Motorola" FM Transmitter was installed on the San Francisco-Oakland Bay Bridge in California, and by hook-up with the service control cars movement of traffic was expedited. Telephones are located on the bridge so that motorists in trouble can report to the dispatcher. Details on the equipment used may be obtained on application to the Rogers Majestic Limited, Toronto.

•

According to the "Northern News", published by the Northern Electric Company Limited, the second phase in the movement of the Electronics Division of the Company from Montreal to Belleville commenced on March 1st. Movement of machinery awaits final completion of the manufacturing area of the modern one-storey plant and it is expected to commence in the very near future. Complete transfer is scheduled for the end of August. Company development in the district is expected to provide employment for upwards of 800 people.

•

The men who keep lonely vigil aboard the pilot ship New Jersey, anchored at sea off the Ambrose Channel, N.J., now have television to help them keep an " eye on the world ".

The vessel is anchored 20 miles from New York City and it is used for two-week periods by pilots waiting to escort large vessels to harbour. Recently the Sandy Hook Pilots Association asked RCA if television could be installed. The Company sent experts to investigate the request and after overcoming many obstacles the installation was completed. It was found that reception was better than on land.

•

A new welding machine, capable of welding such " hard to weld " metals as aluminum, magnesium, stainless steels, copper alloys, Fernico, and Inconel, is available from Canadian General Electric Company, according to a release prepared by the Company. Many special features are claimed.

Appointments and Transfers

The Pyrometer Instrument Co. formerly of Lafayette Street, New York, has moved to Bergenfield, New Jersey.

•

E. R. Watts & Son Ltd. and Adam Hilger Ltd., have merged into one Company registered as Hilger & Watts Limited. Headquarters are in London, England. The Watts Company was founded in 1856 and has specialized in the manufacture of Surveying and Engineers' Measuring Instruments. Hilgers, started in 1874, specializes in instruments for research and industry.

Personnel of the company will be augmented and it is anticipated that approximately 1,300 people will be employed in six factories. A new factory in the Greater London area has been planned and approved.

•

Robert McCreary is now Vice-President and Managing Director of Executone Communication Systems Limited. Mr. McCreary will make his headquarters at the Company's premises, 331 Bartlett Avenue, Toronto, Ont.

•

E. A. Nicholson has been appointed supervisor of the plant clearance division of the War Assets Corporation. R. Martland has been appointed regional supply manager Western region and S. V. Appleby now becomes regional supply supervisor for the Prairie region.

•

Canadian Allis - Chalmers has established the office for its Ontario District Sales at 91 Yonge Street, Toronto. J. C. Boyd, recently appointed manager of the new office, will be responsible for the sales of all equipment manufactured and sold by the Company in Canada.

•

V. Frank Segee, of the Canadian Broadcasting Corporation, has been elected President of the Canadian Industrial Editors Association and Area Vice-President for Canada on the International Council of Industrial Editors. He succeeds E. J. Blandford, Publications Manager of the Engineering Institute of Canada.

•

E. J. Hosack, president and general manager of Standard Tube Co. Ltd. has announced two appointments to the materials handling division at Woodstock, Ont. — G. A. Hutchinson, B.Sc., P.Eng., as Works Manager and D. H. Noy, B.Sc., P.Eng., as Sales Engineer.

A Mechanical Engineering graduate of Queen's University, Mr. Hutchison has had previous experience with Bailey Meter Co. Ltd., Montreal, and Chatco Steel Products, Chatham, Ontario.

Mr. Noy graduated from Royal Military College, Kingston, in 1932 and, as a civil engineer from Queen's University, the following year. He was previously associated with the Lamaque Gold Mines Ltd., Perron Gold Mines Ltd., and P. G. Noy & Sons Ltd., Orillia, Ont.

Catalogues and Brochures

A descriptive bulletin covering the Pullmax Plate Working Machine is available on request to The Canadian Fairbanks-Morse Company Limited, St. Antoine St., Montreal, Que. Pullmax equipment is manufactured in Sweden and The Fairbanks-Morse Company is the Canadian selling agent.

•

Thermidaire Corporation Limited, Long Branch, Toronto 14, Ontario, have available a brochure containing photos of completed installations. The bulletin deals with equipment designed for the treatment of water. For copies ask for brochure of " Photos of Completed Installations."

•

Link-Belt Limited, Easton Ave., at Leslie & Keating, Toronto 8, Ontario, have available copies of folder No. 1874-A which describes the Link-Belt P.I.V. gear, size H-6. This folder is a supplement to book No. 1874 which covers the complete P.I.V. gear line.

•

Nordberg Manufacturing Company, Milwaukee 7, Wisconsin, U.S.A., has announced the publication of Bulletin No. 151 on Symons Intermediate Cone Crushers for Rock, Gravel and Ore reduction. The pamphlet is illustrated and gives specification data and operating information. Copies are available.

•

Minneapolis-Honeywell Regulator Co. Ltd., Leaside, Toronto, Ont., has completed the preparation of a condensed catalogue—No. 8 — January, 1948 — covering automatic controls and industrial instruments. Copies are available.

•

Dow Corning Corporation of Midland, Michigan, have released a 16 page book entitled " Silastic Facts No. 5 ". It deals with Dow Corning Silicone Rubber and several new types of Silastic are described. Many outstanding qualities are claimed for this product. Communicate with Dow Corning Division of Fiberglas (Canada) Limited, Oshawa, Ontario, for copies.

Joy Manufacturing Company, Henry W. Oliver Building, Pittsburgh, 22 Pa., has produced a brochure-type of catalogue listing products for metal and non-metallic mines. For copies ask for bulletin No. M-204.

•

The Shawinigan Water and Power Company, Montreal, P.Q., has produced a handsome brochure to mark the 50th Anniversary of the Company. A limited number of copies are available. Requests for copies should be sent to the Public Relations Department, The Shawinigan Water & Power Company, Dorchester St., at Beaver Hall Hill, Montreal, Que.

•

Canadian General Electric Company Limited, 212 King St. West, Toronto, Ont., have produced a handsome, informative 104 page publication on G-E Arc-Welding Electrodes. Copies of this publication are available to those who have a professional interest in welding equipment.

•

The Canadian Fairbanks-Morse Company Limited, St. Antoine St., Montreal, have available a brochure describing their type "S" Motor Truck Scale. For copies apply directly to the Company.

•

Leeds & Northrup Company, 4911 Stenton Avenue, Philadelphia, Pa., have issued a new bulletin which features equipment which is said to enable refinery operators to "see" the pH of dehydrator water simply by glancing at the indicating scale of a "Micromax recorder." For copies of this 12 page publication ask for bulletin ND44-96-702(1).

•

W. B. Connor Engineering Corp., 114 East 32nd Street, New York 16, N.Y., has published an application data book on their type "H" DOREX Air Recovery Equipment which is used in the "recovery" or conversion of stale, vitiated, or contaminated air to its original freshness, according to a statement received from the manufacturer. For copies of the booklet ask for bulletin 105-A. Address enquiries to Douglas Engineering Company Limited, 190 Murray St., Montreal 3, who are Canadian agents for the manufacturer.

LIBRARY NOTES

(Continued from page 254)

ELECTRIC MACHINERY, 2 vols.

M. Liwschitz-Garik, assisted by C. C. Whipple. D. Van Nostrand Co., New York, Toronto, 1946. Vol. 1, 290 p.; Vol. 2, 576 p., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, Vol. 1, $4.00; Vol. 2, $6.50.

The author's principal aim is to provide the fundamental link between the basic laws of electrodynamics and the performance characteristics of electric machines. To this and common features are discussed in separate introductory chapters, such as: magnetic circuits of the main flux and of leakage fluxes, losses and cooling, windings and induced emfs, etc. Although written primarily for students, special consideration is given to the demands encountered in practice. A separate index and a list of further references are included in each volume.

ELEMENTS OF ENGINEERING GEOLOGY.

H. Ries and T. L. Watson. 2 ed. rev. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 469 p., illus., diagrs., maps, tables, 9 x 6 in., cloth, $5.00.

The chief change in this new edition is the inclusion of two new chapters, one an expansion of the material on the geology of reservoirs and dams, and the other on historical geology. The revision also includes the modernization of references and problems. The usual geological material, highlighted where it has important bearing on engineering, is well illustrated with maps, charts and references. An appendix giving the addresses and directors of the geological survey offices of the various States and Canadian provinces, is a useful feature of the book.

HOW TO TAKE PHYSICAL INVENTORY:

R. F. Neuschel and H. T. Johnson. McGraw-Hill Book Co., New York and London, 1946. 159 p., charts, 9¼ x 6 in., cloth, $2.00.

A practical guide, this book presents the principles and techniques for planning and taking a physical inventory. It includes the development of the inventory-taking organization and procedures, the selection and training of personnel, the physical preparation for the inventory, and the summarization and verification. The appendix contains a detailed manual of inventory instructions, applying the principles given in the text.

INTRODUCTION TO HEAT ENGINES.

E. A. Allcut. University of Toronto Press, Toronto, Canada, 1946. Paged in sections, illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $3.25.

The book provides a concise, interesting introduction to the field of heat engines in which the existence of the same general scientific principles in all types is indicated. Each chapter is illustrated by applications to steam engines, turbines, air compressors, and internal combustion engines, their similarities as well as differences being pointed out. An excellent historical survey is given. This second edition has a few revisions and some new illustrations.

SIMPLIFIED CURVE AND SWITCH WORK.

W. F. Rench. 5 ed. Simmons-Boardman Publishing Corp., New York, 1947. 212 p., diagrs., tables, 7½ x 4½ in., fabrikoid, $3.00.

Approximately the first half of this small volume covers string-lining practice for railroad curve work, with chapters on vertical curve and superelevation determinations. With the exception of a special chapter on siding location, the remainder of the book deals with the rules and methods for practical switch connections. The principal object has been to reduce the solutions of problems to their simple arithmetical relations for greater ease of use by trackmen in general. The book covers both standard and narrow-gage switch work.

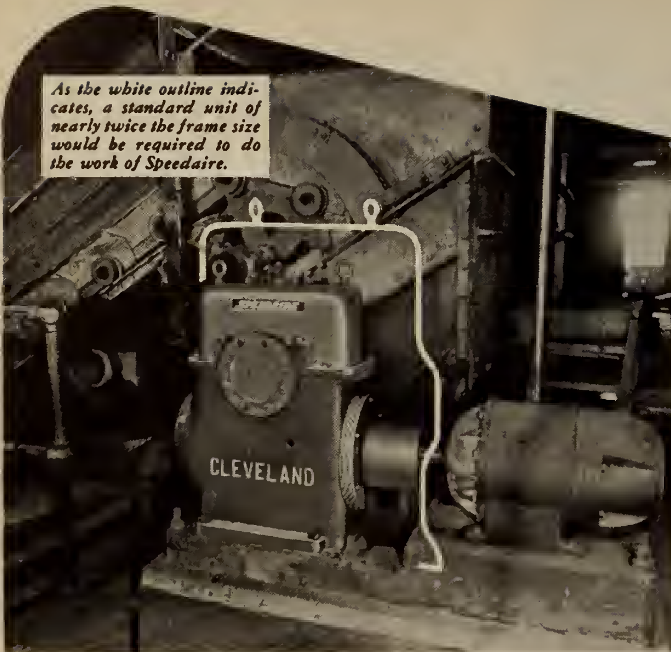
"Business & Industrial Briefs"

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

Professional Cards



As the white outline indicates, a standard unit of nearly twice the frame size would be required to do the work of Speedaire.

$330 saving . . . with SPEEDAIRE

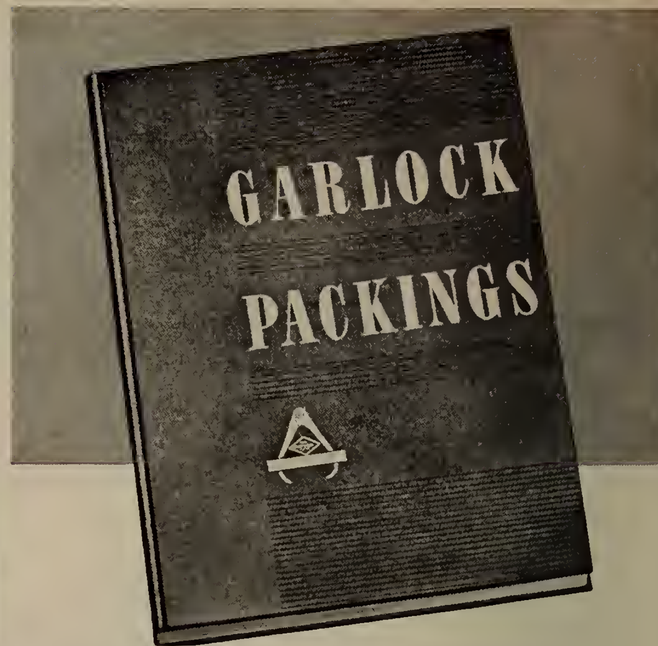
IN this Michigan chemical plant, Speedaire is doing a highly satisfactory job on pan conveyors handling limestone. Reducers run cool under heavy loads, unaffected by the lime dust. Their compactness permitted a closer hook-up between machines and motors, saving valuable floor space. And compared to conventional worm-gear reducers, Speedaire saved the company $330 per unit installed.

Speedaire is Cleveland's new fan-cooled worm-gear speed reducer. Because it is fan-cooled, Speedaire will do more work—will deliver up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantages of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

For full description, send for Catalog 300. The Cleveland Worm & Gear Company, 3287 East 80th St., Cleveland 4, O.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Speed Reducers



NEW GARLOCK CATALOG

Helps you select the Right Packing

IF YOU BUY or use packings or gaskets you need this new Garlock catalog.

Its 224 pages describe and illustrate packings for high pressures and low pressures—for water, air, steam, acids, solvents, oils and other liquids and gases. So whether you need a packing made of rubber, synthetic rubber, asbestos, cotton, flax, rayon, leather, plastics or metals, this catalog will help you select a Garlock product suitable for your job—a product manufactured in the Garlock factories and measuring up to highest quality standards which Garlock has rigidly maintained for sixty years.

Ask the Garlock representative for your copy or mail the coupon below.

THE GARLOCK PACKING COMPANY OF CANADA LTD.

General Offices: Montreal, Que.
Branch Offices: Hamilton, Toronto, Winnipeg, Calgary, Vancouver.

EJ 4-48

.... 1948

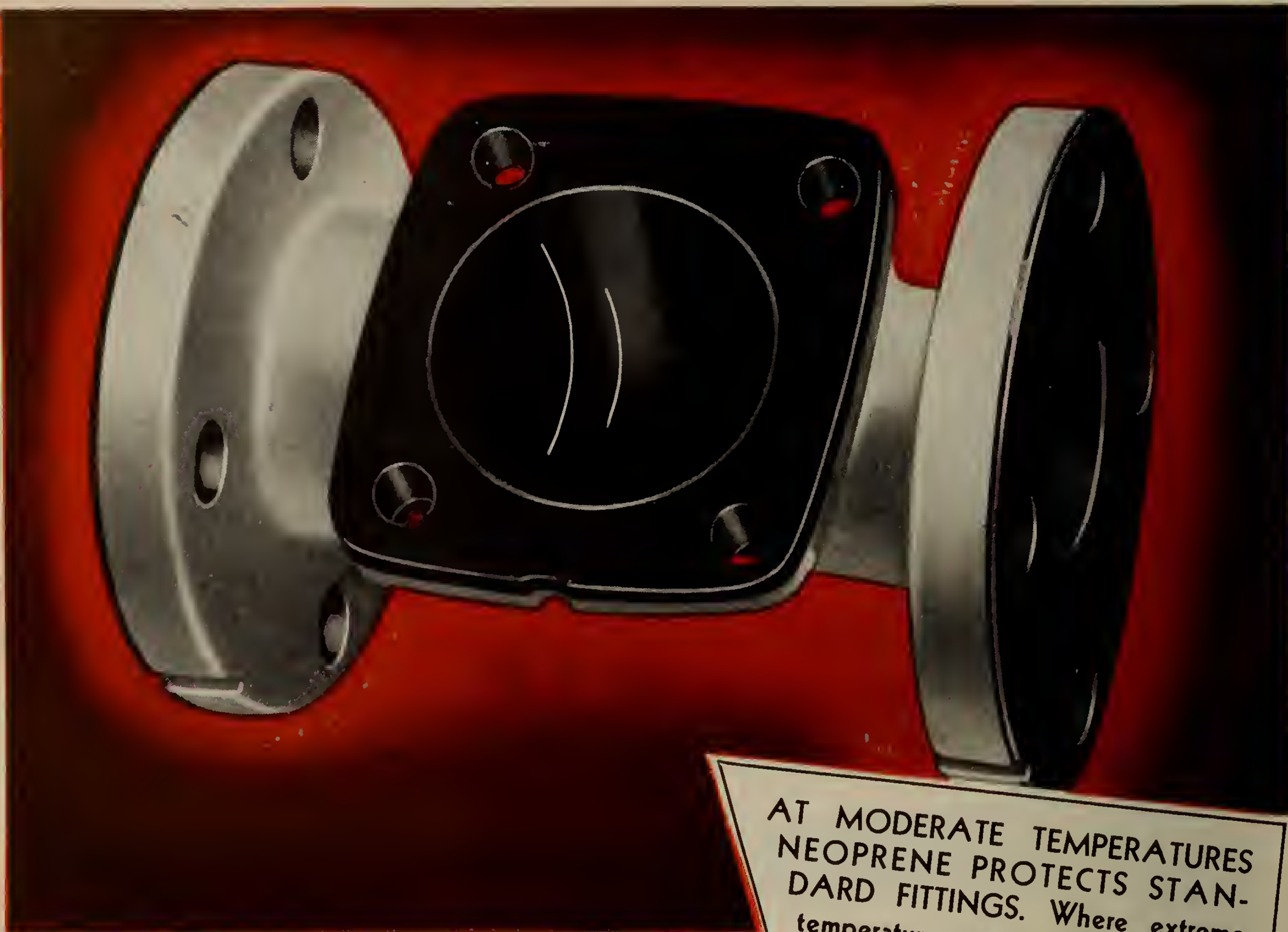
THE GARLOCK PACKING COMPANY OF CANADA, LTD.
Birks Bldg., Montreal, Que.
Please send me a copy of the new Garlock catalog.

Name ....

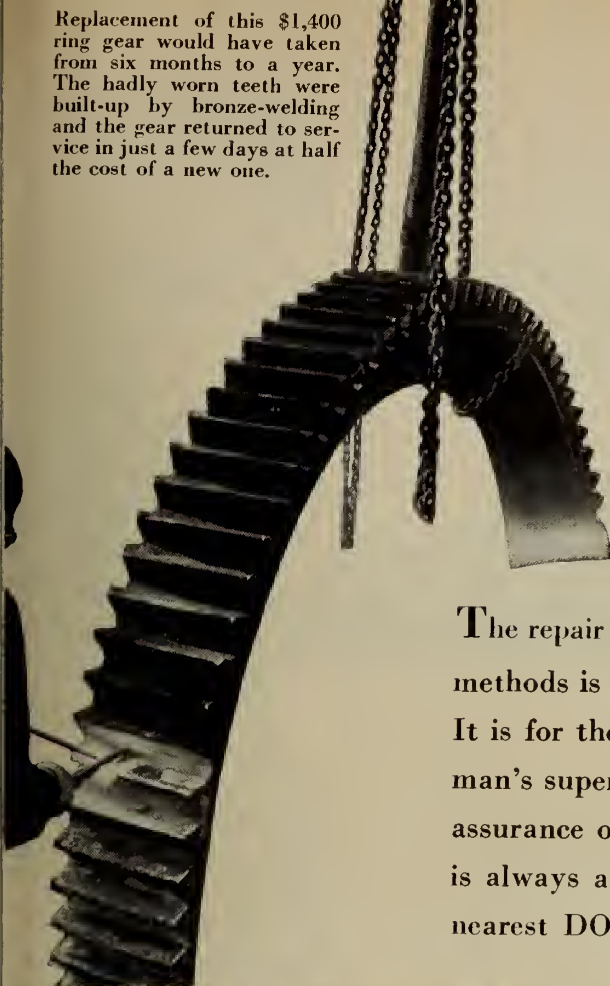
Title ....

Company ....

City .... Province ....



Replacement of this $1,400 ring gear would have taken from six months to a year. The badly worn teeth were built-up by bronze-welding and the gear returned to service in just a few days at half the cost of a new one.



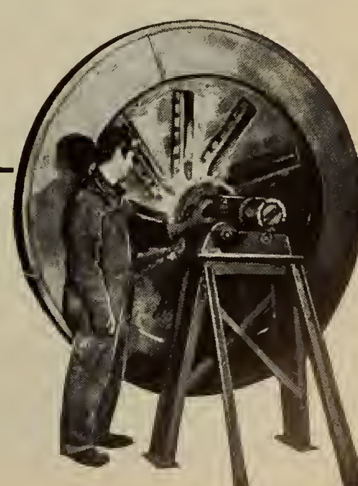
Keeping the "wheels" going 'round

The repair of vast quantities of equipment by oxy-acetylene methods is of course routine for plant maintenance crews. It is for the special job, however, that the DOC serviceman's supervision and work proves so valuable and gives assurance of success. This skilled, specialized assistance is always available to DOC customers. Just phone the nearest DOC office.

Bronze-welding this cast steel cone crusher head saved $1,000. The crack, which ran completely around the head for a distance of 9½ ft., extended through the thickness of the casting in several places. It was veed out by flame-gouging.

This cast iron steam hammer cylinder weighs 4,000 lb. Two large cracks, one on each side of the cylinder wall, were bronze-welded in only 14 hours. A new casting would have taken 16 weeks to obtain and would have cost more than 10 times as much.

Flanges are quickly joined to cast iron pipe sections by bronze-welding. DOC supplies several bronze rods to meet varying service requirements.



Bronze-welding effected a considerable saving of cost and time when four spokes of this huge cast iron pulp-chipper wheel was cracked at the hub.

"Dominion" and "DOC" are trade-marks.

DOC

DOMINION OXYGEN COMPANY, LIMITED

DOC

159 Bay Street, Toronto 1, Ontario

MONTREAL WINNIPEG VANCOUVER


ONE MORE PROOF THAT OUR
PARAMOUNT
Cub
is the
MOST EFFICIENT
PORTABLE FIRE
FIGHTING PUMP
EVER DESIGNED
Perkins (AUST) PTY LIMITED
Head Office: PARRAMATTA ROAD, LIDCOMBE, N.S.W.
FORMERLY THE STEEL AND MACHINERY DIVISION OF COMMERCIAL STEELS AND FORGE CO. (AUSTRALIA) PTY LIMITED
TELEPHONES UX 7473 (7 LINES)
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TELEGRAMS & CABLES "PERKAUST" SYDNEY
AFP/NH
LETTER NO. 2305
5th January, 1948 .
BY AIR MAIL
Pumps & Power Limited,
40 East Cordova Street,
VANCOUVER, B. C. CANADA
Dear Sirs:
We recently received seven of your Cub Pumpers which have been delivered to the Forestry Commission, Tasmania ....
This Department, who have had very wide experience with all classes of Pumpers consider yours to be the best they have ever tested. One of the units tested on a 23 ft. lift primed within seven seconds from dry and the delivery volume and pressure proved better than catalogue figures.
Yours faithfully,
PERKINS (AUST.) PTY. LIMITED.
A. F. Prior,
General Manager.
SELF-PRIMING
An exclusive automatic primer ends delays, saves vital minutes.
LIGHT WEIGHT
Less than 70 lbs. net—a one man load built to fit an ordinary pack board.
POWERFUL
Delivers 3300 gals. at 100 lb. pressure on a single gallon of gasoline.
TROUBLE-FREE
The PARAMOUNT CUB employs an aircraft type magneto vastly superior to usual equipment. A terminal voltage of 17,000 guarantees quick dependable starting.
ORDERS FILLED IMMEDIATELY FROM STOCK
PUMPS & POWER, LIMITED
35 YEARS IN HYDRAULICS
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VICKERS
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MASTERS OF MANY CRAFTS
THE MEN OF VICKERS HAVE MANY SKILLS—MAKING POSSIBLE THE PRODUCTION OF A GREAT VARIETY OF GOODS FOR INDUSTRY
BECAUSE of our highly trained staff of engineers and mechanics . . . our specialists in widely diversified fields . . . our continuous study of the newest developments and inventions — key men of Canadian industry are turning more and more to Vickers for their industrial needs.
Regardless of the nature of your requirements — sleek sea-going ships, rugged mining equipment, copper coil or metal work, engines or boilers — the men of Vickers have the experience and the equipment to meet your specifications efficiently and economically.
ALUMINUM WORK
BOILERS and PLATE WORK
COPPER WORK • ENGINES
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CANADIAN VICKERS LIMITED
HEAD OFFICE - MONTREAL
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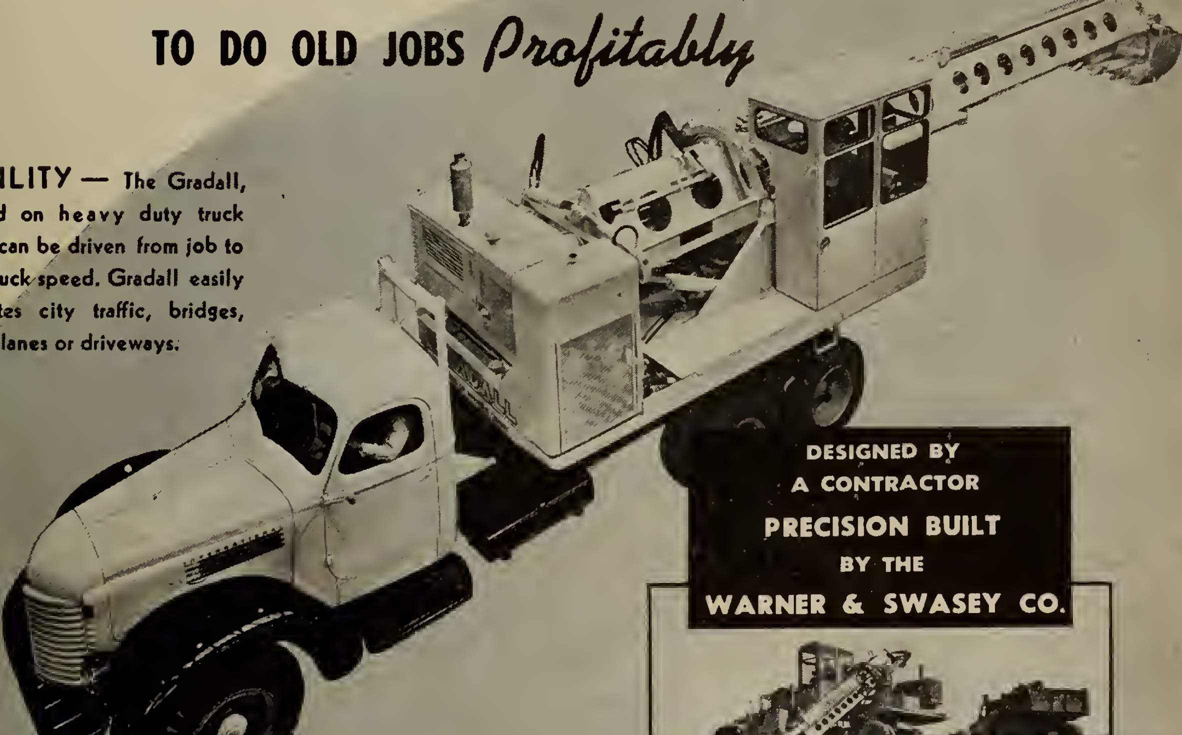
GRÂDALL

THE MACHINE THAT PROVIDES A NEW WAY TO DO OLD JOBS *Profitably*



MOBILITY — The Gradall, mounted on heavy duty truck chassis, can be driven from job to job at truck speed. Gradall easily negotiates city traffic, bridges, country lanes or driveways.

DESIGNED BY A CONTRACTOR
PRECISION BUILT BY THE WARNER & SWASEY CO.

Fast, telescoping action of boom makes digging and loading one continuous operation... loading out dirt in record breaking time.

Gradall's amazing "Arm Action" tilts the boom and tool to neatly chamfer trench edges. The result is a top quality job at no extra cost.

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It does things ONE MACHINE Never Did Before!

EXCAVATING DITCHING BACK-FILLING
TRENCHING CHAMFERING GRADING

Write TODAY for Complete Descriptive Literature

RUBBER PERMOBOND LINED
DOMINION RUBBER CO. LIMITED
MADE IN CANADA

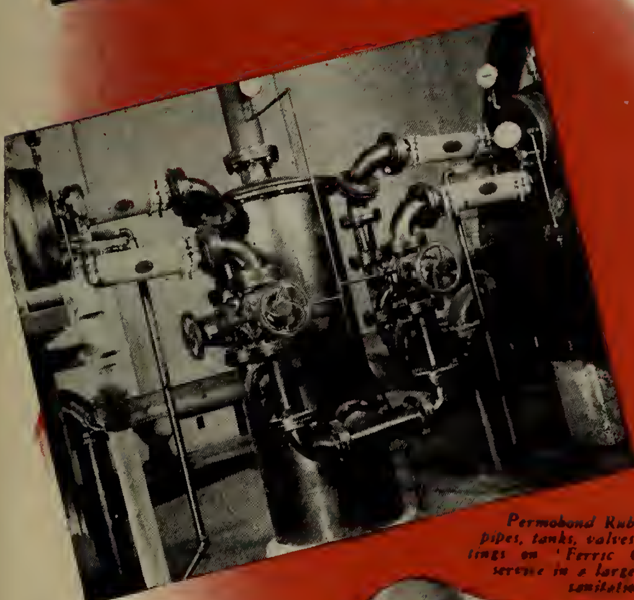
FOR Positive Permanent Protection AGAINST CORROSION

Permobond Rubber lined tank used in the acid purification of acetylene gas.

Wherever tanks, pipes, valves, fittings and process equipment are exposed to the corrosive action of acids, alkalis and other chemical reagents, positive and permanent protection is assured by the application of Dominion Permobond Rubber Linings.

Our plant and laboratory are fully equipped to assure you of the most up-to-date laboratory control and technical service. A skilled operating staff is at your service for on-the-job installations.

Dominion engineers will be glad to team up with your own technical staff to solve your corrosion problems.



Permobond Rubber lined pipes, tanks, valves, and fittings on "Ferric Chloride" service in a large Western sanitation plant

Permobond Rubber lined muriatic acid storage tank, size 8 feet x 30 feet. Capacity 9000 gallons.

Permobond Rubber lined acid storage tank designed for working pressure of 40 pounds. Capacity 4870 gallons.

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DOMINION RUBBER

ENGINEERED RUBBER PRODUCTS FOR EVERY INDUSTRY

HALIFAX - SAINT JOHN - MONTREAL - TORONTO - WINNIPEG - CALGARY - EDMONTON - VANCOUVER

Index to Advertisers

The revenue derived from the sale of advertising space enables the *Institute* to publish the *Journal* on a regular monthly basis. Listed below are the names of the Companies and Individuals whose advertisements appear in this issue.

IR AIR POWERED
SCREW DRIVER IS THE ANSWER

MINIMUM SPOILAGE
EASE OF HANDLING
INCREASED PRODUCTION

The picture above shows an Ingersoll-Rand Size OOOBLC air-powered screw driver applying four No. 8 screws that hold the leads to the brick on an automatic waffle iron. This insulating brick is very brittle and torque on the screw must be accurately controlled.

The I-R Screw Driver features a cushion clutch that minimizes rotary impacts and allows delicate torque adjustment. An integral part of the cushion clutch is an engaging clutch which permits the motor to run but rotates the bit only when the operator exerts a slight forward pressure on the screw driver.

Air tools are definitely superior for screw driving. I-R Screw Drivers offer you many advantages . . . small size . . . light weight . . . more power per pound . . . accurate torque adjustment . . . dependability . . . run cool to the touch.

Air-powered screw drivers may be the answer to some of your problems. A reversible model is available in every instance where a reversible tool can be used to greater advantage. Call our nearest branch office for further details or a demonstration.

Canadian Ingersoll-Rand Co. Limited
head office - MONTREAL QUE. —— *works* - SHERBROOKE QUE.
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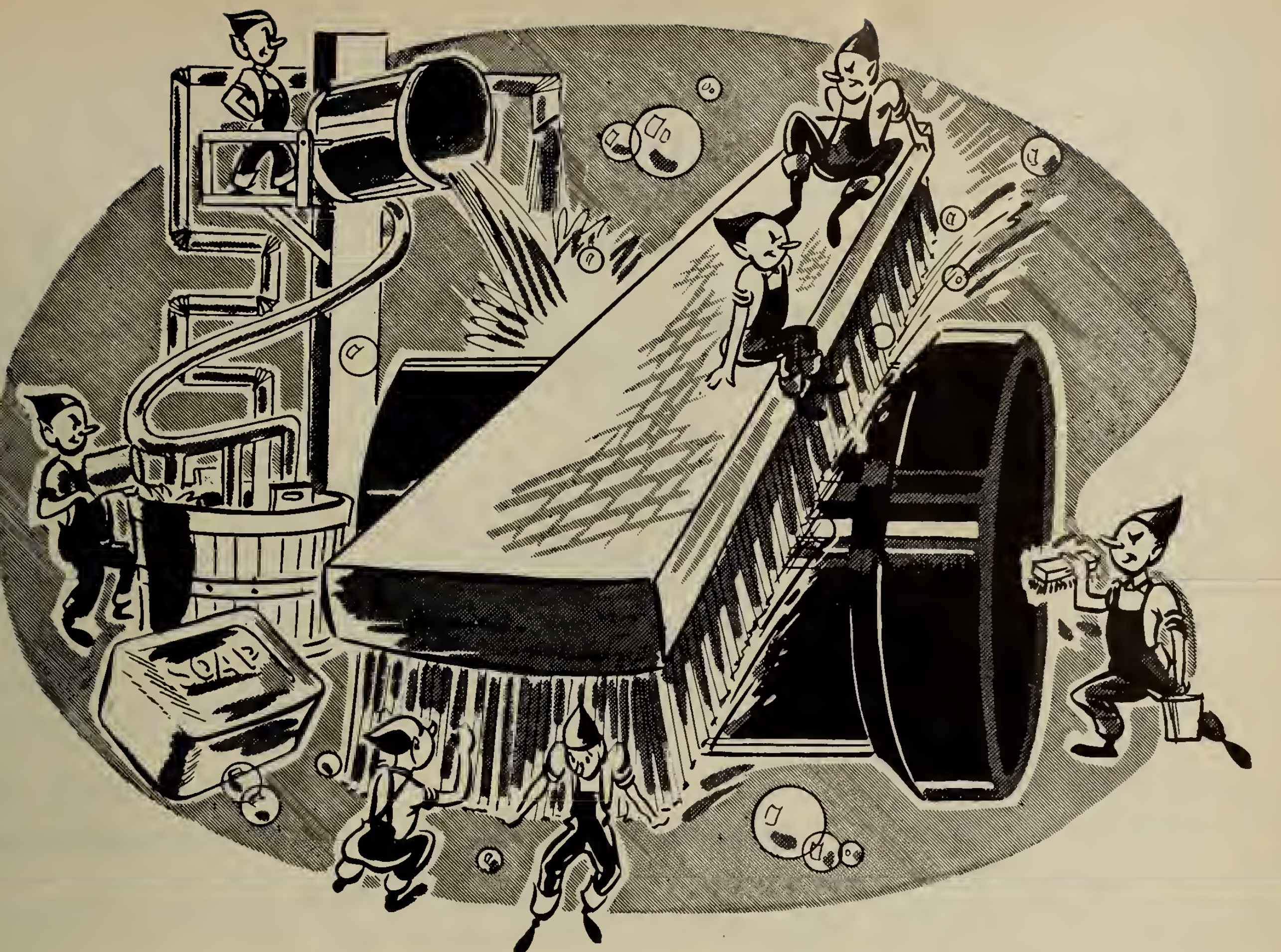
AIR AND GAS COMPRESSORS • ROCK DRILLS • HOISTS • PUMPS • BLOWERS • CONDENSERS • AIR TOOLS

THE ENGINEERING JOURNAL

VOLUME 31 NUMBER 5
MAY 1948

THE ENGINEERING INSTITUTE OF CANADA
FOUNDED 1887

PUBLISHED MONTHLY BY
THE ENGINEERING INSTITUTE of CANADA



RESISTANT TO SCOUR

For a Thousand Years!
VITRIFIED CLAY PIPE

Mid-summer conditions in the average combined storm or sanitary sewerage system may vary from minimum to maximum velocity. On a clear Summer day minimum flow permits the inside of the pipe to dry out. Then comes a heavy rain storm, taxing sewers to their utmost. This alternate wetting and drying creates conditions favorable to disintegration unless the pipe is made of Vitrified Clay.

Vitrified Clay Pipe is absolute proof against these vagaries of the weather. In fact, it meets every test—the acid, alkali, crush, water absorption, flow, scour, gas, and all known enemies of sewer pipe. Specify Vitrified Clay Pipe for permanence and economy.

VITRIFIED CLAY PIPE

PERMANENT AS THE PYRAMIDS

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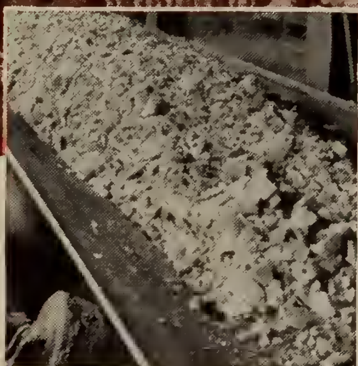
ASSOCIATED FOR PUBLICITY PURPOSES

ALBERTA CLAY PRODUCTS CO. LTD.
MEDICINE HAT ALBERTA

CLAYBURN COMPANY LTD.
VANCOUVER BRITISH COLUMBIA

STANDARD CLAY PRODUCTS LTD.
ST. JOHNS, QUE. NEW GLASGOW, N.S.
Sales Offices: University Tower, Montreal



THIS GUTTA PERCHA BELT WRITES ITS OWN SUCCESS STORY

This conveyor belt was installed at Walker Brothers Quarries in 1940. Its job—to carry crushed rock a distance of 150 feet up an incline of 12 degrees. In the first seven years of its life it has handled over 1 million tons of material up to minus 5 inch stone so satisfactorily that Walker Brothers have praised its record in these words—

"This belt up to date has handled approximately one million tons of material and is still in excellent condition. I might say we are well pleased with the performance of this belt; and this is mainly the reason we gave you the orders for all conveying equipment which we have had installed, since that time."

**Gutta Percha Engineering Service is available to Canadian Industry to help meet and beat production problems with Industrialized Rubber. You are invited to make use of it. Just write our nearest branch.*

GUTTA PERCHA & RUBBER, LIMITED *The Largest All-Canadian Rubber Company*

HEAD OFFICE — TORONTO • BRANCHES FROM COAST TO COAST

511-M-7

The Signature of Industrialized Rubber

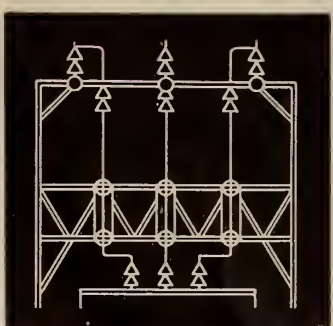
GUTTA PERCHA BELTS


TYPE
SERIAL
SAFETY
GAPS
POTENTIAL INDICATOR
BEPCO CANADA LIMITED
MONTREAL TORONTO

Your best bet FOR FAST GROWING LOADS

WESTINGHOUSE UNIT SUBSTATIONS

When required, Unit Substations can be supplied with co-ordinated, metal-clad, "Unitized" switchgear for incoming power supplies of 13,800 volts and below.



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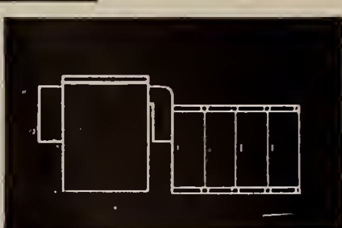

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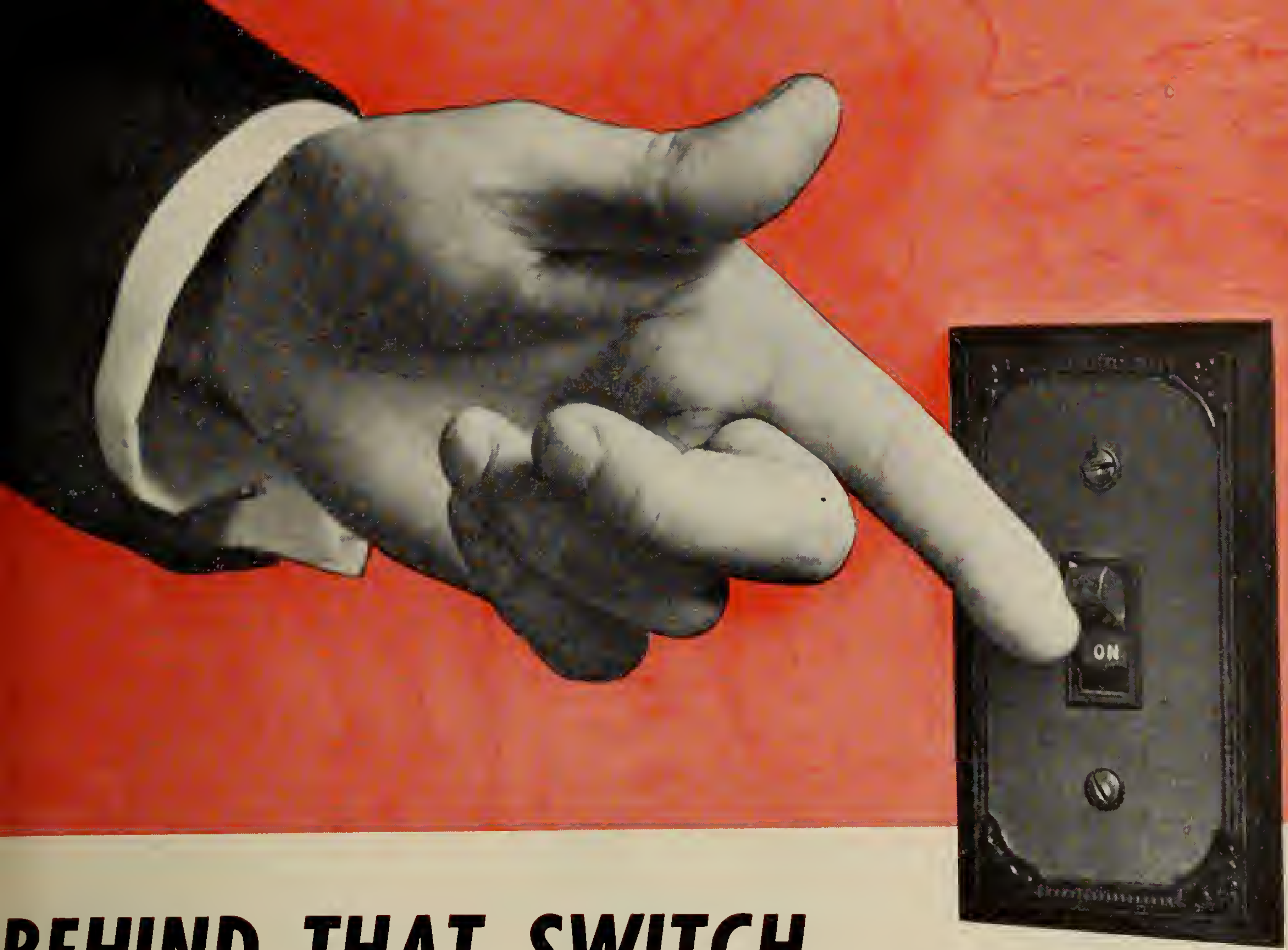

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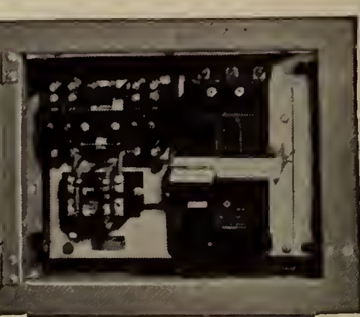

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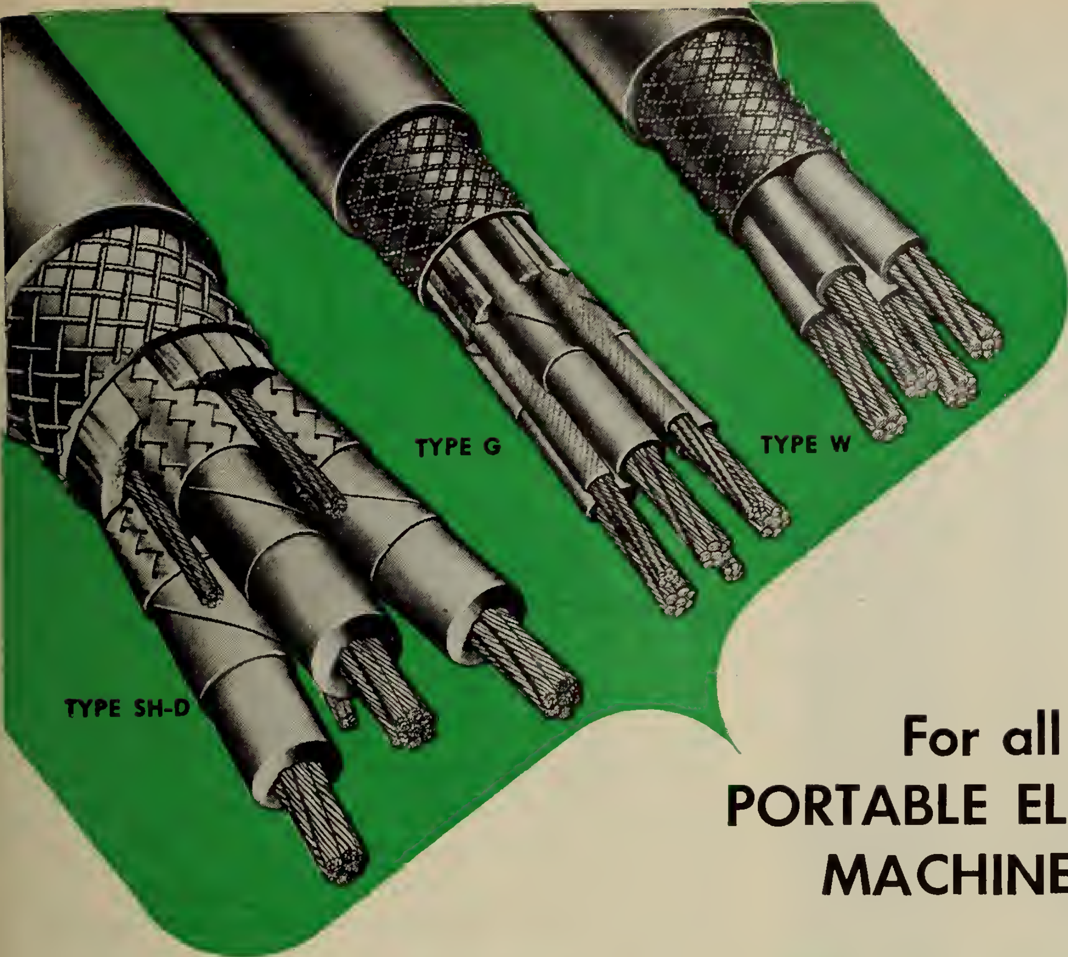

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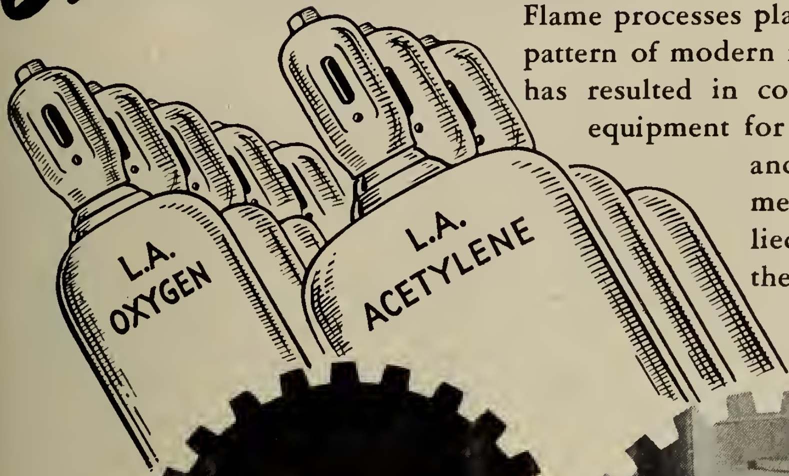

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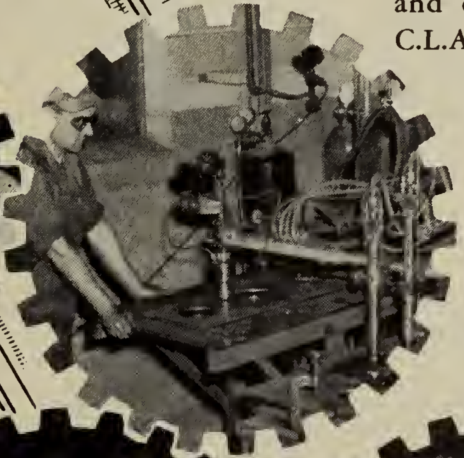

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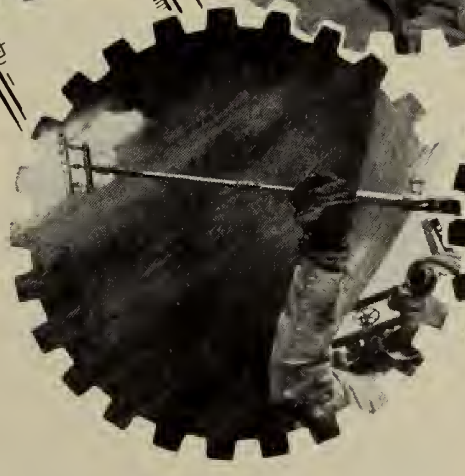

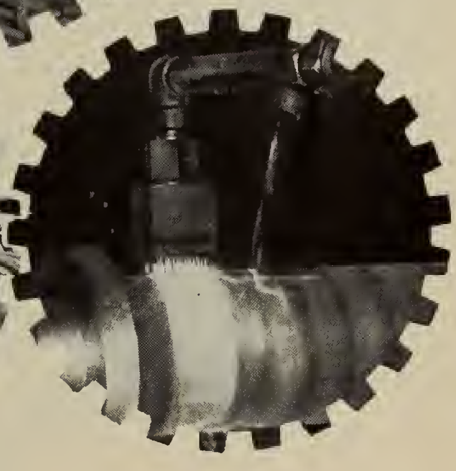

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOLUME 31 | MONTREAL, MAY 1948 | NUMBER 5

"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

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COVER PICTURE

On this month's cover is a view of the gigantic pulp mill of Marathon Paper Mills of Canada Ltd., at the Company's own townsite of Marathon on the shore of Lake Superior, 184 miles east of Port Arthur.

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Photo courtesy The Foundation Co. of Canada Ltd.

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A Message from The President

I welcome the opportunity of thanking the members of the Institute for the high honour conferred on me in my election as your President for the year 1948. I shall do what I can to overcome geographical obstacles and other well-recognized limitations during my term of office. With the co-operation of the vice-presidents, councillors, committeemen, and the membership at large, I cherish the hope that the rate of progress during the preceding years will be continued.

The history of the first sixty years of the Institute's existence has been set forth on the pages of the *Journal* with clarity and emphasis. That period witnessed the evolution and recognition of engineering as a learned profession. There are no longer any arguments on that subject. It is conceded that the modern world is becoming more and more dependent upon processes that require the knowledge and the skills of trained engineers. The increasing complexity of our civilization is constantly providing new avenues in which engineering skill can be added to scientific knowledge to improve one's art of living.

A study of the early Proceedings indicates that the engineer of those days was concerned mainly with problems of transportation and structures. His interests were centered on problems of raw materials, production, design, fabrication and methods of erection, on the operation of transportation systems. He was not greatly interested in the problems of management, administration, sales, publicity, industrial relations or legislation. Gradually he has associated himself with developments having economic, social and political consequences which effect men and women in all walks of life. Without neglecting the new and difficult technical problems that confronted him, he found time to study methods of overcoming the resistances found in *human* nature, to make studies of industrial relations, with the result that the effectiveness of the profession was raised to new heights. Lord Tweedsmuir, addressing the Institute on the occasion of its fiftieth anniversary, hailed the engineer as the principal empire-builder.

It is a bold man who would attempt to predict the status of the engineer sixty years hence. As the invention of the steam engine brought in a new era vastly different from all preceding ages, so the development of new sources of power may induce corresponding changes in our physical, social and political ways of life. The engineer will play an important role in creating the new order. New branches and sub-branches of engineering will arise, new societies and institutes will appear and The Engineering Institute of Canada will continue to attract to its membership leading engineers of every designation and at the same time continue to enjoy cordial relationships with other professional bodies at home and abroad.

J. N. Finlayson.

President.

Some Standards & Procedures for COMMUNITY PLANNING

by

J. Alexander Walker, M.E.I.C.

Executive Engineer, Vancouver, B.C., Town Planning Commission

A paper presented before the Annual General and Professional Meeting, The Engineering Institute of Canada, Banff, Alberta, June 4, 1948

Listing the factors involved in the selection of a site and in the preliminary planning of a townsite thereon, the author describes the various conditions affecting townsite design, and discusses street systems and types, as well as the relationship to existing railway and harbour facilities, lots and lot dimensions, public utilities, zoning, land use, parks, parkways, and recreation areas. Considerations affecting layout of transit systems are pointed out as well as for the best arrangements of trackage facilities and for airport development.

In presenting this paper, it must be undestood that the "standards" which will be considered as pertaining to the various phases of planning, are not expected to be completely rigid or immutable; rather they should be considered as convenient "yardsticks", by the use of which the work of planning may be more readily expedited and done with a greater degree of assurance. The procedures here outlined are presented with the same objectives in view. It is anticipated and expected that many of both, to be detailed in this thesis, will be subject to challenge and vigorous debate. However, they have been proven over the years as a result of "trial and error" to be as nearly infallible as it is humanly possible to envisage.

As time goes on apace, new inventions will tend to create new modes of living. New ways of living will in turn outmode many of the standards and procedures in the practice of planning that have been considered acceptable up to the present. Furthermore, it is well realized and admitted that there will be conditions encountered wherein the presently accepted standards could not possibly apply.

To better illustrate the application of the numerous "standards", it is proposed to proceed by outlining the steps necessary in the design of a new, complete, self-contained townsite,—the dream of all planners. Most of these standards would apply equally well in the cases of new subdivisions in or near existing municipalities; the resubdivision of land which had been so poorly subdivided as to be impractical of development (usually referred to as "replotting"), and the replanning of established cities.

Townsite Planning

In the initiation of any plan for a well designed townsite or a future city, a thorough study of all the factors involved must be made. The design will depend upon the type of the city,—whether it is a seaport or an inland city; a railway divisional point or a terminal; an industrial centre; the seat of government; a recreational or tourist resort; an educational centre (university); an agricultural centre; a lumbering community; a mining town; or a combination of any two or more of these types. Moreover, the size of the city, whether large or small, and its prospects of growth, rapid or slow, will have to be given consideration. The essential point is to grasp the fundamental reason for the city's being and to plan to the end that the specific reason or reasons for its existence are given every encouragement to thrive. In addition to the main reason for the town's existence or the nature of the predominant industry, the townsite's geographical location, topography, probable character of its population and the natural resources of the country surrounding the site must be given consideration also. The last is most important, as, should there be any likelihood of the natural resources such as timber or minerals, becoming extinct after a few years, the knowledge that there were other resources such as agricultural possibilities, would eliminate much uncertainty relative to the town's future.

It is a comparatively easy matter to design a city when the ultimate population is known within reasonable limits. But real difficulty arises when the design is made for a small community and then an unexpected influx of population occurs. The reverse is also difficult to control, the case where provision is made for a fairly large town and the expected population fails to materialize. In the first instance the streets, utilities and community features become inadequate. In the second, large areas which were reserved for business and industry remain unoccupied and the town presents huge gaps of vacant land. Thoroughfares are unnecessarily wide, and utilities, such as sewers and watermains, are of unnecessarily large capacity. Admittedly any design should be capable of growth and evolution, but the most economical results will be obtained when the planning engineer is given some assurance by the principals or the promoters as to the probable population.

Factors Involved in Selection of Site

Prior to the final choice of the site by the owners, a consultation with an experienced planner should be made, as all too frequently it has been found that a selection of a future townsite by laymen has proved to be very costly to develop. Among the factors to be considered in the selection of site for a future town, the following are extremely important; *The terrain in general;* whether too steep or too level or broken by ravines, etc.; *Soil*—the degree of porosity or imperviousness and its suitability for garden purposes. Other considerations involve the density of timber and brush growth, the amount of solid rock, the depth of the water table, the convenience of the source of water supply, the facilities for sewage disposal, and the facilities for surface drainage. Cognizance must also be taken of the range of temperatures, and of prevailing winds. Finally a complete topographical survey of the site on a large-scale plan must be made, showing contours of at least five-foot intervals, and all physical features of the terrain and existing developments. This is fundamental and importtant.

Conditions Affecting Townsite Design

The three main conditions affecting the whole, and therefore the basic, design of the townsite, are: waterfront, railways, and main highways leading to other communities.

(a) *Waterfront:* If the townsite is situated on a harbour or large river, the business district will be fixed for all time and the town will naturally spread landward, along and back from the water. If the river is small and can be economically bridged, some foresight and consideration must be given to the possible future expansion of the town on the opposite side. The class of shipping—deep sea, lake or river—and its probable volume, will dictate the extent and type of wharf facilities needed and the provision for street access. The matter of coordinating the railway, harbour and shipping facilities must also be given due consideration.

(b) *Railways:* The size of the town will govern its relation to the railway. In some instances, if the town is likely to remain small, practically all of it will be located on one side of the railway. The railway yards and heavy industrial area are then usually placed on the opposite side. If the town straddles the railway, it is usual to locate the railway yards and industry some distance from the business and residential district. Care must be taken to provide for proper street facilities for access to the passenger and freight depots and for safe railway crossings.

(c) *Highways:* The main highway of the district may or may not pass through the site of the proposed town. In spite of the usual protests from merchants, modern practice dictates that the provincial trunk highway should be located to one side of the townsite. It would appear that more consideration for the safety of the inhabitants from heavy through vehicular traffic is now being given than to the probable loss of the business that might have been obtained from through-travellers. Many of the provincial highways now by-pass the town to avoid congestion, thereby lessening traffic dangers within it. In the long run the use of such a marginal thoroughfare has been proven to be sound. However, convenient wide thoroughfares must be provided for easy access to the heart of the town from the trunk highway. The matter of visiting the town or passing by is then left to the individual traveller.

The Street System

The street system of any community may be termed its framework or civic pattern. This framework as a whole may be said to express the individualism or the main characteristic of that community. Indeed, some cities are noted for their street systems owing to their being unusual, and it may be on account of a city having an unusually good and efficient or an unusually poor and inefficient street system, that it is famous.

The whole problem of townsite design has a definite intricate relationship between streets and blocks, and the solution is possible only after due consideration is given to the many factors involved. Modern transit methods (or mass transportation) and the use of the automobile have altered many conceptions of townsite design in vogue in the past.

Streets are primarily highways for traffic and serve a secondary purpose in affording sites for buildings. They also furnish a location for the transportation of water, sewage and gas, and the transmission of power and light, etc. Therefore, it is essential that they should be considered in relation to all of these functions, and in order of their relative importance. As a matter of fact, every decision relative to the street design must be considered important; location, width, direction, subdivision, grade, planting and lighting.

Street Types

Inasmuch as the primary service of streets is the circulation of traffic, it is essential that the street system is so designed as to facilitate traffic movements. For this purpose streets are classified into various types according to the degree of traffic they will bear;

1. *radial thoroughfares,* being arterial highways which not only provide continuous and direct communication between the business centre and all parts of the community, but frequently radiate throughout the surrounding country. They also serve as a connection between the city centre and the provincial highways. 2. *secondary streets;* These streets are usually associated with industrial areas or densely populated residential districts, i.e. apartments. 3. *minor streets.* These local streets serve limited areas only and they are tributary to but do not form part of the major street system, and 4.

boulevards, parkways and similar thoroughfares.

Types of Street Patterns

Relative to the town's framework, there are many types of street patterns which may be used; namely rectangular (the so-called grid system), radial, curvilinear or circumferential, a combination of any two or all of these, and miscellaneous.

Rectangular: This is the most common arrangement, with square or rectangular blocks and with streets perpendicular to each other. It has a simplicity which commends it to the engineer or surveyor who must plan and lay it out, and to the architect who must fit his structures to the abutting building sites. However, owing to its formal design, it frequently tends to monotony and it totally disregards many vital factors such as grades and topographical features, consequently often incurring heavy cuts and fills. It makes no provision for any diagonal traffic flow.

Radial: This fan-shaped street system offers opportunities to proceed in all directions from the centre of the community, and furnishes a directness of route between focal points of special interest. It provides sites for squares and open spaces for public buildings and the like. It aids materially in the distribution of traffic. However, when buildings are erected to the property line on the acute angled lots which the radials create, expensive construction results.

Circumferential streets connect the radial streets, which spread fanwise from the centre of the town, to provide convenient facilities for cross-town and round-the-city communication. The extensive use of radials and circumferential or curved streets results in a concentric arrangement.

Curves should not be used on main traffic arteries except for topographical urgency or to ease a deflection or angle. The deliberate use of curves for the sake of curvature only, is preferable only in minor residential streets as monotony is eliminated and the general aspect of the street enhanced. The surveys, both for land and the installation of utilities, are more costly than for straight streets, but the extra expense is usually justified in the more aesthetic effect obtained.

Miscellaneous: Among other street patterns which have been advocated in theory or actually employed in various towns are the hexagonal system, and the "cul-de-sac" arrangement of which Radburn, New Jersey, is the most notable example. This plan is an attempt to cope with the requirements of a motor age. The large blocks are bounded by major thoroughfares but the homes within the blocks, instead of facing on the streets, are arranged along cul-de-sacs that open off the main highways. In these residential districts traffic hazards and undue noises are thus eliminated.

Table I

—Widths in Feet —

Type	Between Property Lines	Between Curbs	Lanes of Traffic	Parking Permitted
Major	100	72	8	Both Sides
	80	56	6	Both Sides
Secondary	60-66	42	4	Both Sides
Minor	40-50	24	3	One Side
Elevated Viaducts		44 (at least)	4	None

The Ideal Plan

In choosing the most appropriate system of streets the contour of the site must be given careful study and all the factors must get due consideration. Usually it is found that a combination of the above systems will best solve the problems and an experienced planner will intelligently employ the most appropriate to meet the variety of conditions.

In practice, the principle to apply is to endeavour to obtain the most pleasing and efficacious effect at the least cost. The street system should not be a mere pattern on paper. It should be a well-ordered system in which each portion not only is fitted to the contour of the terrain but contributes efficiency to the aggregate result. It should provide for the safe, comfortable and speedy circulation of traffic and be conducive to the economical and efficient installation of utilities. The topography of the site usually precludes the theoretical adaptation of any orthodox street system in its entirety, but the skilled planner can approximate the tried and proven systems to meet the contingencies.

Street Widths

Theoretically, wide major streets, 100 feet between property lines, are located from one to three miles apart, and normal major streets, 80 feet, at one-half mile intervals. However, it is not always practical to obtain this desirable spacing. Streets of secondary importance are from 60 to 66 feet in width and minor residential streets, from 40 to 50 feet wide. Boulevards or parkways range from 100 to 120, or even 150 feet in width. They usually have a generous medial strip and wide boulevards.

Widths between curbs, or ditches, are measured by "lanes" of traffic. Major streets should have always an even number of lanes, 10, 8 or 6, and secondary streets 4 lanes, according to the width of the street allowance. Minor streets may have only a 3-lane roadway but automobile parking should be permitted on one side only. On major streets, the width of the lanes should be generous to allow for the rapid movement of large wide vehicles; trolley coaches, motor busses and trucks, etc. Table I is a summary pertaining to street widths. Local conditions will no doubt warrant more or less variation from these standards.

Major streets should have as straight alignment as possible and have a dominant direction. Curves should have generous radii from 500 to 1,000 feet. Minor streets should intersect major streets at approximately right angles—from 80 to 100 degrees. Corners at street intersections should be rounded, with radii varying from 15 to 40 feet. All streets should have a maximum and minimum grade. For drainage purposes there should be a minimum grade of 0.5 per cent. Maximum grades vary according to the locality, and winter conditions will dictate the safe maximum grades. Major streets should not exceed 8 per cent and minor streets 12 per cent. Business streets should be straight and fairly level for safe, economical and efficient shopping.

Deadends or Cul-de-sacs

Deadends are almost universally discouraged, and have been used only when normal street intersection arrangements are impracticable. However, for residential streets modern practice dictates that they may be used as they discourage through traffic. Cul-de-sacs are dis-favoured for many reasons, chiefly for obstruction to fire fighting. At their terminals a circular, rectangular or square turn-around is essential. The required radius for the roadway turn-about ranges from 30 to 50 feet. It should be ample for delivery and collection trucks. In residential property a diameter of 100 feet (for property lines) has proven satisfactory. Frequently a 12 foot pedestrian lane is extended from the cul-de-sac to the next street. Normally blocked against vehicular traffic, this lane could be used by fire apparatus in cases of emergency.

Relationship to Railways

The regulations of many cities require that where a sub-division is laid out adjacent to a railway right-of-way, a street shall be placed parallel to the railway. Others require that there be from 100 to 150 feet between the street and the railway and that the intervening land be dedicated as a park buffer. If a railway crossing is involved the street arrangement should be made to facilitate the development of a crossing that will be as safe as possible and provide for a future grade separation.

Lanes

The provision for lanes or alleys is extremely debatable. There is little or no argument that lanes of 20 foot widths should be provided in all business and apartment districts, as they are essential for the proper servicing of the buildings. In residential districts lots of a frontage of 60 to 50 feet or less should have lanes to allow for the greater use of the lot for the dwelling in not having to provide a private driveway. On all right-angle turns on 20 foot lanes the interior corner should be truncated at least 10 feet on each side. Lanes are also of great value at the rear of property abutting major streets as the servicing of these lots and the access of automobiles thereto from the rear will not militate against the easy flow of traffic on the major street.

Blocks

The size, shape and proportion of the blocks should be chosen from an economic viewpoint, but they are controlled of course mainly by the location of the roads. A variety of shape and size prevents monotony, and a diversity will of course ensue when a combination of street systems is employed in the general design.

The length of residential blocks varies considerably, but in later years owing to the extended use of the automobile greater lengths are now possible. The long block lessens the number of cross-streets and therefore it is more economical. Whereas at one time blocks of a greater length than 500 or 600 feet were not permitted, those of double this length are now allowed. It is advisable, however, in blocks of 800 feet or more to introduce a pedestrian cross-walk near the middle.

On major streets especially, the blocks should be placed lengthwise to expedite traffic flow. In order to obtain an equitable distribution of sunlight, the orientation of the block frontage as nearly as possible north-west or north-east is preferable. Blocks in industrial areas should be large enough to permit factory units of 300 by 100 feet or an equivalent area. Business blocks are usually from 400 to 500 feet in length.

Lots

The matter of size and shape of lots is debatable, but there are certain principles or standards which are becoming universally accepted. The lots will and should vary with each project. In small towns it is usual to make the lots greater than in larger towns and cities, as city residents usually have so many other interests to occupy their leisure that they have little or no time to indulge in intensive gardening.

All lots should be planned to suit the types of buildings that it is proposed to erect thereon. They should be arranged with regard to the appropriate building development and to the appearance and healthfulness of the buildings to be erected. Although it is not always practicable, all side lines of lots should be perpendicular to straight street lines or radial to curved street lines.

Lot Dimensions

Residential: In fixing the widths, depths and areas of lots for small dwellings in residential areas they should have dimensions that are essential to provide adequate air and light for healthful occupation, and be such that their cost will be within the means of those who require them as sites for homes. They should not be less than 50 feet in width and from 100 to 120 feet or more in depth.

Business: The usual width of a lot for business development is 25 feet and the depth of from 70 to 100 feet.

Apartments: A frontage of at least 60 feet and a depth of 120 feet will allow for front, side and rear yards for apartments.

Corner lots should have an extra width sufficient to permit the maintenance of building lines on both front and side. Lots with double frontage should be avoided except where topographical conditions admit of no other form of planning. It is often advantageous to create double frontage lots in following contour lines on a steep slope, for the reasons that it is usually better and more economical to have two narrow streets than one wide street. Their greatest value is in the use of local streets paralleling a major thoroughfare. The entry and exit to properties from a wide major street will impede greatly the even rapid flow of traffic. Properties abutting heavily travelled roads should be serviced from local parallel streets.

Easements are of considerable advantage for trunk line utilities and should be specified and marked on the townsite plan before it is registered or any lots sold or leased. They are specially useful in keeping pole lines off the streets.

Miscellaneous Considerations

The organization of the town into its component functional parts or use zones must be made at the time when the planner's ideas of the general design, (i.e. the street system), are crystallizing. To make a zoning by-law comprehensive and constructive it must be co-ordinated with a specific system of streets and public utilities. For architectural, public health and financial reasons, variations in street widths should be adapted to variations in heights and densities of buildings and vice versa.

A knowledge of the theory and practice of sewage disposal and water supply and distribution is essential in the design of the street system and the town as a whole. Proper street grades for storm and sanitary sewers must be obtained. Provision for the outlet of the former, and for the disposal of the effluent of the latter must be made also.

In adjusting the street design to the natural conditions and topography, every effort should be made to conserve and accentuate fine trees, running streams, wooded or rocky ravines and other rugged areas unsuitable for development as home or commercial sites.

A point which has long been the subject of controversy is the problem of creating private property along a waterfront, or on the brow of a steep hill from which splendid views may be obtained. In many cases where it has been allowed in the past, the properties later had to be obtained for the public at great cost. It would appear, therefore, that it would be a wise procedure to preserve such sites for the public. If it is impossible to impress the promoters of the townsite with the desirability of this, the planner should attempt a compromise whereby most of the property so situated would be preserved for the public. This could be effected by swinging the marginal road to and from the waterfront or hilltop as it traverses along, and thus provide frequent look-outs.

Zoning

After the design of the framework of the townsite and the subdivision of the blocks into lots have been completed, the zoning districts should be delineated upon the plan and the regulations governing each district should be prepared. Following these, the zoning plan and regulations should be made legal and binding by the proper governmental agencies through the observance of the procedure prescribed by the provincial statutes in that respect.

Zoning is the creation by By-law, of Districts in which injurious or unsuitable buildings and uses of buildings and land are prohibited by law. The first and foremost essential relative to zoning is a sound and comprehensive zoning enabling act. Considerations which should be given in preparing a zoning district plan and zoning regulations are usually prescribed in more or less detail in the statutes. The following excerpt, which is recited as an example, is from the British Columbia Town Planning Act:

"In determining the regulations to be made under this section, the Council shall have due regard to the following considerations:

(a) The promotion of public health, safety, convenience, and welfare:

(b) The prevention of the overcrowding of land and the preservation of the amenity of residential districts:

(c) The securing of adequate provisions for light, air, and reasonable access:

(d) The value of the land and the nature of its use and occupancy:

(e) The character of each district, the character of the buildings already erected, and the peculiar suitability of the district for particular uses:

(f) The conservation of property values and the direction of building development".

Zoning relates to health, safety, morals, good order and the general welfare of the community. Health is conserved by residential buildings being required to have spaces about them on all sides, thus providing light and air. Safety is provided in that fire risks are minimized by the spacing between buildings. Morals are protected by the prevention of overcrowding. Good order and general welfare are maintained because only one type of use is allowed in each district.

With respect to the districts, there are three main classifications; residential, commercial and industrial. Each of these is further subdivided into two or more classes, depending upon the size and nature of the community, and usually each district is given a precise, self-explanatory name. There may be from 5 to 12 use districts, again depending upon the extent and type of the community.

Residential districts are usually subdivided into single-family dwelling, two-family dwelling, and multi-family dwelling (apartment) districts. Frequently the single-family district is divided further into sub-districts, the only difference being the size of the lots or building sites. In some instances an agricultural or country-home district is included in the single-family district.

Commercial districts are divided into two or three districts—depending upon the size of the community—local business, commercial, and general business districts. The latter covers the city's main or "downtown" business area, the commercial district is designed for secondary shopping centres, and the local business district to serve the smaller neighbourhood areas.

Industrial districts are divided into two subdivisions—light and heavy industrial districts. Occasionally in larger cities restricted industrial districts are also established. The attainment of proportion, what may be termed "balanced zoning", is very important and withal, difficult. However, considerable zoning data are now available and the task of proportioning a community is accomplished more readily and more reliably if intelligent use is made of the information. It would be very unwise to attempt to experiment if a precedent, which has operated successfully in other cities, is at the planner's disposal.

Land Use

Table II shows the averages of the various uses, compiled from a survey of conditions existing in 16 North American cities (including Vancouver, B.C.) having populations ranging from 8,000 to 130,000:

Even with this information relative to the percentage of a community required for streets, parks, railways, commerce, industry and

Table II

LAND USE*	Percentage of Total area Occupied	Percentage of Developed Area Occupied	Percentage of Developed Area Occupied Sts. Deducted
Single-Family Dwellings	21.8	36.1	53.8
Two-Family Dwellings	1.3	2.1	3.1
Multi-Family Dwellings	0.7	1.1	1.6
Total Dwelling Areas	23.8	39.3	58.5
Commercial Areas	1.4	2.4	3.6
Light Industry	2.0	3.2	4.8
Heavy Industry	1.7	2.7	4.0
Railroad Property	3.2	5.5	8.2
Combined Industry & Railroad	6.3	10.8	16.2
Streets	20.2	33.6	...
Parks & Playgrounds	4.0	6.3	9.4
Public & Semi-public	4.5	7.6	11.4
Vacant Areas	39.8	..	..

* From "Urban Land Uses" by Harland Bartholomew (Harvard Press).

for residential purposes, the type of community must be analyzed and considered in order to make an intelligent allotment of areas for the various uses.

Another method of computing land uses and allocating areas for the various use districts is, instead of percentages, a certain number of acres per 100 persons of the city's population is allocated for each use. With respect to commercial districts, an approximate "measuring stick" that is frequently used is that 50 feet of business frontage for every 100 persons should be set aside.

District Regulations

Zoning regulations for one district will differ from those in another but they must be uniform for the same type of district. District boundaries should be located at the rear of property rather than along a street. The density of population per gross acre in any district is controlled by the site or lot area per family.

Parks, Recreation and Schools

There is a definite relationship between parks and schools. Parks are essential for the recreational opportunities they offer and they also provide open spaces, especially needed in residential districts. Public school facilities are also an essential part of the city's structure. The school playground is becoming an equally important part of the educational system and ample play area should adjoin each school. It is only logical that these playgrounds should be used throughout the whole year, thus making it unnecessary for another public agency to duplicate the school playground facilities for use during the summer months.

The generally accepted standard for the amount of land that should be set aside for park purposes is one acre for every 100 persons. Parks should be not more than one-half mile apart.

Similarly, elementary schools should be located not more than one mile apart. Junior and Senior high schools may be located from 2 to 2½ miles apart but should be within a block or two of a transit route.

In providing school accommodation for a given population it is important to know the ratio of pupils to population. This ratio varies from 15 to almost 20 per cent. Of the school enrolment, 50 to 55 per cent will attend the elementary schools, about 25 per cent, the junior high schools, and from 20 to 25 per cent, the senior high schools.

With respect to enrolment and area of playgrounds, it has been proven by experience that the following are satisfactory standards:

School Type	Enrolment	Area Grounds (Acres)
Elementary	350- 500	5- 7
Junior High	600- 750	10-15
Senior High	1,000-1,500	15-25

Parkways, scenic drives and boulevards are important links in a park system. They are in reality elongated parks and should be wider than a normal city street and attractively planted and landscaped. A location along waterways or ravines is particularly desirable. Large parks of 50 to 100 acres or more, usually selected on account of outstanding topography, in the outlying portion of the city, are also desirable. They are utilized for golf courses, swimming pools, picnic areas, etc. Much of these parks should be retained in a natural wooded condition.

Transit

In developing a transit system—street cars, trolley coaches or motor buses—to best serve the population, there should be as little duplication as possible and endeavour should be made to locate transit routes in developed areas so that there will not be a greater walking distance than ¼ mile from any transit line. Routes should extend from residential sections to the main centres of employment. A fast schedule is desirable for both passengers and operators. Headways of from 15 to 20-minute intervals between the transit vehicles on the same route are regarded as maximum desirable spacing for satisfactory service except on heavily travelled routes more frequent service should be given. If it should cost from 35 to 40 cents per mile to operate a transit vehicle, it is obvious that it would require at least from 5 to 6 passengers per mile of operation to make the system pay. If a system is successful there is more likelihood of increased and better service.

In the consideration of the grouping of public buildings, generally to form a Civic Centre, the choice of a site should be governed largely by:

Its proximity to the main business district. (It should not be in the heart of the business area but near the periphery thereof); its focal position with respect to the major streets and transit routes; the character of the site and of its surrounding buildings, and the cost of the land and existing improvements.

Transportation

A most important feature is that, harbours and railways being very closely allied, there should be complete co-ordination between them and there should be provision for an adequate system of street service to the waterfront, as well as trackage. Frequently, a rearrangement of trackage will give a much better service to both the operating companies and the city.

Air transportation has had an extremely rapid growth especially since the war. A progressive city must make provision for airport facilities, and steps should be taken to secure sites for future development. Inasmuch as senior governments as well as municipalities have an interest in airports, the problem can be solved only by cooperation of all concerned. In large centres especially, provision should be made for airports, on a metropolitan basis, to accommodate the different types of aircraft. Most of the regulations pertaining to the operation and location of airports and airstrip zoning emanate from the Department of Transport, and the planner must observe them when making provision for airports. These include minimum distances between airports and the permissible heights of buildings in the zones at the ends of runways.

Conclusion

It will be realized that there are many phases of planning upon which further discussion should be given, but time will not permit. In recommending any plan or project the planner must have vision and realism constantly before him. He must have vision in order to take care of possible and probable eventualities, and realism so that the plan will have the approval of those who supply the funds. Even with extensive experience in planning technique and procedure, the planner must also have comprehensive and factual data concerning his project, for only then can his recommendations be on a sound basis.

Research in Canada for National Defence

A paper prepared for presentation at the Annual General and Professional Meeting of The Engineering Institute of Canada, Banff, Alberta, on June 4, 1948

by
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Tracing the growth of Defence Research during the war years, the author shows how this new branch of the Services has been fitted into the peace-time establishment of the armed forces. The objectives of Defence Research are discussed. Canada's progress in developing weapons for chemical warfare is told. Procedure in the development of a typical chemical weapon is followed through from experimentation to testing to manufacture. Examples are given to show how discoveries in chemical warfare research may have practical peacetime applications. Finally it is emphasized that new weapons never do away with the need for a well trained army, navy, and airforce. Preparation for war is possible only during peace, the author warns.

During the first world war although limited contributions were made by Canadian scientists, no organization existed for research on armament development. Canada depended entirely on the well organized establishments in the United Kingdom and the United States. Fortunately these had been maintained on a reasonable scale in the years between World War I and World War II. Although in many ways we entered the war in an unprepared state, certain novel and invaluable developments particularly in the fields of radar and aircraft design were in our possession. It is no exaggeration to state that these developments were in a large measure responsible for the defeat of the German air force in the Battle of Britain.

In the years between the two world wars Canada had developed markedly as an industrial nation. During the same period facilities for research both pure and applied had shown a considerable growth. Although expenditure on research in this country on a per capita basis compared unfavourably with that in Britain and the United States, at the outbreak of war there existed in Canada a large group of scientifically trained personnel. The problem arose as to how these individuals were to be mobilized to make full use of their abilities.

This mobilization was carried out in the first instance in two ways. Canada had the National Research Council Laboratories with a highly trained staff, who were already involved in a small way with certain defence problems. An immediate expansion in this staff occurred and their interests broadened to cover a variety of fields of research including radar and explosives, armament development, submarine detection, fuse design and later atomic energy, to mention only a few. Secondly a group of public spirited citizens made available to the Government a large grant of money to finance war research at any institution in Canada capable of carrying it out. Thus at most universities and at many industrial laboratories research teams were at an early date engaged in a wide diversity of investigations.

As far as the armed forces were concerned they still possessed no research establishments of their own, though they were deeply involved in production problems on armaments and munitions of standardized design. As the war progressed research establishments within the services were built up in many cases with the assistance of small numbers of key personnel from the United Kingdom. The result was that with the cessation of hostilities there existed in Canada fully equipped and staffed establishments for research on chemical, flame and smoke warfare, explosives, armament development, radar, electronics and naval problems. In addition there were several medical research units equipped to handle problems of a medical nature. This list does not include the many problems that were being handled for the services by the National Research Council.

In most of these fields, due to a free and frequent interchange of personnel between Canada, the United States and the United Kingdom, there existed in Canada scientists who had become experts and who were familiar with the latest developments in all three countries. They could thus apply the knowledge accumulated in the much larger establishments existing in the United States and Great Britain, to the problems being investigated in Canada. Canada's contribution to the common research programme was of necessity smaller on a volume basis than that of the United States or the United Kingdom. Yet the work turned out was of a high quality, and Canadians can be justly proud of the very real contribution made by their country in the field of military research.

Peace-time Reorganization of Armed Services

At the end of the war a decision had to be taken as to what was to be done with the facilities for defence research that then existed. It was apparent from the start that maintenance of defence forces on a much larger scale than was considered necessary following World War I was going to be essential for national security. It was further apparent that successful prosecution of any future war would depend largely on possession of the most modern and efficient weapons. Past experience indicated that failure to be fully prepared in every way would undoubtedly be an invitation for aggressive action. With these considerations in view, reorganization of the Department of National Defence was undertaken. For greater economy and efficiency the defence forces were set up under a single Minister, with an establishment for Army, Navy and Airforce sufficient to supply a highly trained nucleus in case of emergency. At the same time great emphasis was placed on the training of a large reserve force in peacetime.

Early last year a fourth service, Defence Research, was instituted as a permanent part of the defence forces of the country. This is primarily a civilian service within the Department of National Defence, consisting of a board serving under a full time chairman. The board consists of five ex officio members and six appointed members. The ex officio members are the Chiefs of Staff of the three services, the President of the National Research Council and the Deputy Minister of National Defence. The appointed members are six top-ranking scientists from Canadian universities and industry. To ensure that research receives adequate consideration at the highest level, the Chairman of the Defence Research Board has been given the status of a Chief of Staff, is a member of the Chiefs of Staff Committee and Defence Council, and attends meetings of the Defence Committee of the Cabinet.

Organization of Defence Research Board

The organization under the Defence Research Board consists of a headquarters staff, advisory committees recruited from experts in all fields of science from the universities and industry across Canada, and research establishments. These establishments are in many cases the ones already mentioned that were built up during the war years. They include the Chemical Defence Research Laboratories in Ottawa, the Canadian Armament Development Establishment at Valcartier, the Naval Research Establishment at Halifax, the Defence Research Establishment at Kingston and the Experimental Station at Suffield. Others, such as the Arctic Research Unit at Churchill, are now being organized. In addition to these permanent establishments arrangements are made to finance defence research at university and other laboratories, including the National Research Council, in fields where, because of staff or equipment, the work can be more economically undertaken.

Objectives for Research

This brief history and outline of the organization of Defence Research in Canada leads to a consideration of its objectives. For security reasons these can obviously only be given in the broadest outline.

It is apparent that Canada with her small population can not hope to develop any of the major weapons of war. The annual budget for defence research in 1947 amounted to approximately 5 per cent of the defence budget, or about $13 millions. This is a large sum when applied to certain types of research or development, but infinitesimal when applied to others. This sum could easily be expended on developing a single new type of aircraft. Development of the atomic bomb involved an expenditure of 150 times this amount. Even if funds were made available for developing major weapons of war, Canada lacks sufficient numbers of scientifically trained personnel to embark on projects of this magnitude. Furthermore the size of her armed forces is insufficient to make it economically feasible to tool up for production of unique weapons no matter how desirable they may be, unless these were acceptable to the armed forces of the United States or the United Kingdom, or both.

This last factor makes it essential that the weapons adopted by the Canadian services are interchangeable from the production standpoint, at least with those of the United States and the United Kingdom. For this reason, should conditions in Canada require that proposed United States or United Kingdom weapons be modified, these modifications will have to be agreed to by all three countries at a very early stage in the weapon's development. Agreement of this type can only be reached rationally if we have in Canada trained individuals working on some aspects of the problem at least, who at the same time are fully familiar with what is being planned in the U.S. and the U.K. It is the intention of the Defence Research Board that this will be the case.

Chemical Warfare

In other specialized fields such as chemical, flame and smoke warfare, Canada built up an enviable reputation during the war and now possesses some of the best testing facilities in the world for weapons in this category. Canada was responsible for major contributions in the use of flame and smoke, more particularly on the tactical side. Although the use of toxic weapons as such was not implemented during the last war, the high state of preparedness existing in the U.K., the U.S. and Canada in this field was in a large measure responsible for Germany's failure to initiate this type of warfare. Due to the discovery and development of new materials during the war that are more toxic by orders of magnitude than the conventional agents, mustard and phosgene, it is more than ever necessary that research in this field be prosecuted fully, and that the search for newer and more effective agents be continued.

It certainly cannot be assumed that because toxic agents were not used in the last war one can afford to be unprepared in this field. The imaginative large scale use of gas by the Germans in world war I, at a period before defence against it was available, could easily have been decisive. Even now the conventional agent, mustard, used on a large scale as a strategic weapon can not be overlooked. We now must be prepared for the employment of agents many more times as toxic and in many cases difficult or impossible to detect. It is of the utmost importance that research on these newer agents be prosecuted now, since experience has shown that when war has started one is forced to seal the design of the best weapon then available in order to produce it in sufficient quantities. It is only in exceptional circumstances that any weapon developed in wartime exerts an effect on the current conflict. There is invariably a period of not less than five years between the completed laboratory stage of an investigation and the large scale production of a weapon.

In spite of the effort expended on military research in Germany during the thirties we know now that Germany initiated this war unprepared. Another year or two spent on the development of guided missiles and jet propelled aircraft, to say nothing of the high speed submarines which were appearing in small numbers at the close of the war, might easily have turned the tide in Germany's favour before the full weight of U.S. production could be brought to bear.

Development of a Chemical Weapon

The last part of this discussion deals with the question, "Of what does defence research consist?" In many ways, particularly in the purely research phase, it does not differ markedly from research in any other field. Like all factors associated with war, however, it is many times more complicated, and requires the close co-operation of experts in many fields. Thus, development of a new chemical warfare weapon, for example, requires a team of chemists, physicists, meteorologists, physiologists, pharmacologists, biochemists, and engineers even at the laboratory level of investigation. As the weapon progresses to the production stage the list of experts increases.

Let us follow the course of development of a hypothetical new weapon in this field. Recorded in the world's chemical literature there are over a million chemical compounds. The files of industrial research laboratories contain many more. Unfortunately the living body is so complex that one can not forecast with any certainty whether a material is toxic or not. On the other hand a reasonable approach is to choose materials which are similar to ones which have already proved to be toxic. This procedure is usually not too successful; more frequently a highly toxic material is accidentally discovered incidental to some totally unrelated investigation. With a hint, however, that an untried material may be useful, it is first necessary to establish quantitatively how toxic this substance is.

Testing

This involves the use of large numbers of animals of as many species as possible. One determines for each species a dose which will consistently kill or incapacitate 50 per cent of a large group. Almost always this dose varies from species to species by a factor of 10 times or more. That is, it may require ten times as much material to kill a goat as it does to kill a monkey or vice versa. It is usually assumed that the sensitivity of man lies within the range of sensitivity of the species tested provided their number is sufficient. If this assumed toxicity for man is appreciably greater than that of the conventional agents, phosgene and mustard, the substance must be considered a potential chemical warfare agent.

A multitude of other factors must be taken into consideration at this stage of the investigation. Can the material be synthesized on a large scale, and how easily? Is it stable to storage and to explosive forces? How easily can it be detected by subjective symptoms or analytical means? How rapidly does it act? Does a respirator give protection? From what type of weapon can it be most efficiently dispersed? Is there a means of treating individuals poisoned with it? What precautions must be taken in large scale manufacture? Some of these and many other questions may require years of intensive effort to find an answer. It is apparent therefore that the early experiments must indicate that the new agent possesses a decided advantage over mustard or phosgene before one is warranted in embarking on this long term investigation.

Manufacture

The problems associated with full scale manufacture can only be solved by constructing expensive pilot plant installations. Likewise the design of weapons is a slow and costly procedure. Before a decision to finally accept any agent is taken, trials must be carried out with the actual production weapon and charging in which animals and sampling devices are used in large numbers to assess the effectiveness of the finished weapon. If the results of such trials are unsuccessful the effort expended is to a large extent wasted. This is not infrequently the case, since it is not ever too certain that the results of trials undertaken on a small scale will predict what will happen when full scale trials are carried out. This is one of the reasons that the development of the atomic bomb represents one of the biggest gambles in history, since in this case a minimum amount of fissionable material had to be produced before any trial at all could be done. Thus the effort of full scale production had to be expended before even an indication could be obtained that the result would be successful.

Discoveries May Be Applied to Other Uses

In spite of the fact that the final weapon may not be an improvement on existing ones all of the work expended is not necessarily useless. For example: during the last war one of the notable contributions to scientific knowledge resulted from a search for a material that would counteract the effects of mustard gas. Although no such material was found, a substance that was therapeutically effective in Lewisite poisoning, (another war gas) and one containing arsenic, was discovered by Dr. Peters at Oxford University.

From the chemical warfare standpoint this discovery was of little importance, since as a war gas Lewisite is so inferior to mustard that it is unlikely that it would be used in war. Further experiments, however, proved that this antidote was extremely effective in controlling poisoning by other arsenic compounds, including many drugs used in the treatment of syphilis. In addition, it proved useful in the treatment of lead and mercury poisoning. Thus a discovery of major medical importance resulted. Although a great deal of military research is applied research, the example given indicates that investigation of any problem brings to light phenomena which, although not having an immediate direct application, can be profitably studied.

Of perhaps more interest are phases of defence research which have immediate peacetime application. A good example of this type of study is given by the work carried out at the Entomological Section at Suffield. In this section, in close collaboration with the Dominion Department of Agriculture, a search for new insecticides is under way as well as new and better methods of applying them. This section is a natural outgrowth of the activities of the station. In view of the fact that new materials of high toxicity to mammals, in particular man, are being continually sought, many of these substances are tested for their toxicities to insects.

At the same time the techniques employed in dispersing chemical warfare agents, including aircraft spray, smoke generation and even bombs, can be usefully used against insect infestations. After all factors have been investigated on the laboratory or pilot scale, actual full scale trials against infested crops are carried out. The economic importance of this type of investigation is obvious. From the purely military standpoint the section investigates means of controlling insects such as mosquitoes, flies and lice which can be vectors of disease.

In this paper an attempt has been made to summarize Canada's position in Defence Research. If undue emphasis is placed on certain phases of the programme, it is only because it is these phases with which the author is most intimately connected and hence most familiar. The question of security makes it impossible to be specific about the types of weapons envisaged, but there is no doubt that Canada is keeping abreast of the latest developments in all fields, and is making original contributions in many.

Armed Services Still Needed

It is not desired to convey the impression that the development of new weapons has outmoded the necessity of a well trained army, navy and airforce. Although the sensational press suggests the next war will be fought by remote control with guided missiles and pilotless aircraft, this state of affairs is a long way in the future. There is little doubt that such weapons will play an increasingly important role, and that any future war will in the end probably be decided as the last one was, by strategic attack on centres of industry, transport and population, yet fully prepared armed forces will be of equal importance. Victory will go to the side that is prepared in every way. Really, the change that has occurred in war is the fact that it has now become total, and that development of weapons of mass destruction — atomic bombs, toxic agents, or, with sufficient air strength, high explosives and incendiaries—now makes it possible to knock out centres of production to prevent adequate supplies reaching the forces in the field. Probably the only guarantee of peace today is that these newer weapons are so mutually destructive to the population as a whole that any nation might well hesitate attacking another which was fully prepared. Let us remember that such preparation will only be possible in the years of peace. After war has started it will be too late.

Correction — April Issue

In the April *Journal,* in the first paragraph of the paper, **Novel Concrete Headframe for Asbestos Mine,** page 214, the structure was described as being 30 feet in height.

This was obviously a typographical error, and the correct height of 115 feet was given elsewhere in the paper. The *Journal* regrets sincerely that this should have occurred.

THE JOHN GALBRAITH PRIZE PAPER

EFFECTS of LIGHTNING on BURIED TELEPHONE CABLE

by

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The author discusses the theory of lightning, and describes step by step with the aid of diagrams how a flash of lightning is formed. Effects of lightning on buried telephone cable are analysed, and various remedial measures for the avoidance of cable failures are listed, amply explained by the aid of illustrations.

The theory of lightning is a subject that is generally approached with considerable trepidation. The phenomena are extremely vivid and—from the standpoint of the ordinary observer—are inspiring, and many times of great grandeur. Yet from the point of view of the scientific observer, they are somewhat intangible. Observations are difficult to make. The subject still is, and will be for some time, in the stage where it is a problem for the physicist. The engineer usually has the duty of interpreting the work of the physicist into practical values, but in this case the necessity for remedial measures requires that the engineer take what the physicist has found and supplement it with such experimental work as he is able to carry out. Recent progress in the mastery of lightning problems through combined research in the laboratory and field has been so rapid that it seems important at this time to make a review of the present status of the various phases of the subject. The following indicate how rapid the progress has been:

The wave shape of lightning has been pictured by the cathode ray oscilloscope; the time required for a cloud to discharge has been measured by this instrument; the attenuation of lightning waves travelling on a transmission line has been determined; natural lightning has been reproduced in the laboratory where effects on transmission lines and associated equipment have been studied at will; a lightning generator producing over 3.6 x 10^6 volts has been constructed, and waves from this generator have been sent over transmission lines to test full size transformers and other apparatus to determine how to make them highly resistant to lightning. The above list is not complete, but will serve to indicate how much progress has been made.

Theory of Lightning

Modern lightning theory depends for its explanation upon the presence of large numbers of ions in the atmosphere. Many of these ions, both positive and negative, cling to minute particles of dust and extremely small drops of water, to form large ions as opposed to the unattached or small ions. The number of small ions of each sign ranges about from 300 to 1,000 per cubic centimeter, and the large ions from 1,000 to 80,000 per cubic centimeter. The mobility of an ion is the steady velocity that can be obtained under a voltage gradient of one volt per centimeter. The large ions have very low mobility, ranging from .0003 to .0005 centimeter per second. Under a gradient of 10,000 volts per centimeter this would correspond to a velocity of only 3 centimeters per second.

In a study of the behaviour of water drops when exposed to electric fields it was found that a droplet of radius r centimeters becomes elongated until, at a critical field determined by the relation $F\sqrt{r}=3{,}875$, it becomes unstable. This sets a limit to the size of drops in a thunderstorm. No drops greater than .15 centimeter in radius can persist in fields of 10,000 volts per centimeter. Air pressure has no influence upon the field at which this occurs.

The latest theory premises the existence of the normal field which occurs during fair weather. This is generally directed downward in the positive direction. At the surface of the earth it is of the order of one volt per centimeter, and gradually decreases with altitude until at 30,000 feet it is only about .02 volt per centimeter. A relatively large drop of water (say one millimeter radius) in such a field will become polarized by induction, the upper side acquiring a negative charge and the lower side a positive charge. The velocity of fall under the influence of gravity of such a charge will be approximately 590 centimeters per second, which is large with respect to the velocity of the slowly moving ions, even under the maximum field strength of 10,000 volts per centimeter.

At the under surface of the drop a selective action with regard to the slowly moving ions occurs. The negative ions tend to be attracted and the positive ions repelled. No such selection occurs at the upper surface, since the drop is moving far too quickly for the slower, smaller positive ions. As a result of this action the drop accumulates negative charge. With the loss of the negatively charged ions the remaining large ions are predominantly positive. The smaller drops descend with a lower velocity and thus their velocity becomes more nearly equal to that of the velocity of the large ions under the influence of the electric field. It becomes possible then for the small drops of water to pick up positive charge by impact with the positive ions.

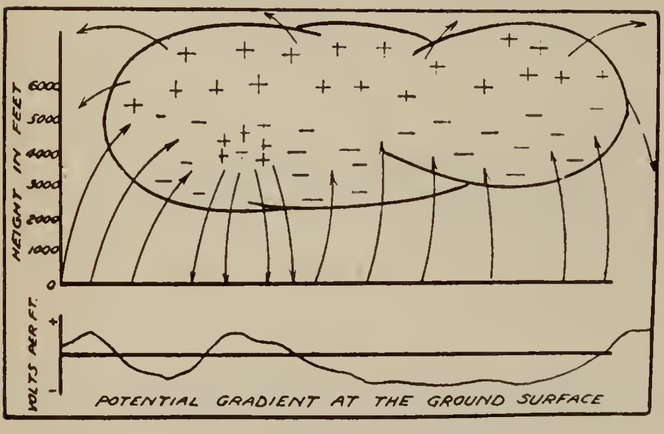


Fig. 1.

Thus the original charges which were distributed at random and produce an essentially neutral space charge, become separated. The large drops carry the negative charges to the lower portions of the cloud and the small drops retain the positive charge in the upper portion. Hence the lower portion of the cloud is negatively charged and the upper portion positively.

To investigate the charge distribution in a more direct manner free balloons equipped with clock-operated apparatus to measure the electric gradient, atmospheric pressure and relative humidity were released during storms. It was found that in general the main body of a thundercloud is negatively charged and the upper part positively charged. A concentration of positive charge appears to exist frequently in the base of the cloud. Fig. 1 offers a satisfactory explanation of practically all the soundings obtained in the investigations. The positive charge at the top of the cloud gives rise to the positive field encountered at the ground as the storm approaches and as it recedes. The negative charge contained in the lower half produces a negative field everywhere under the cloud, except where the local concentrations of positive electricity produce positive fields.

Fig. 2.

The potential gradient diagram in Fig. 1 shows that the approach and recession of a storm is usually accompanied by positive gradients, while the centre of the cloud produces a negative gradient. This is what would occur if the lower portion of the cloud carried negative charge and the upper portion positive charge. Observations have shown quite conclusively that the boundary between the positive electricity in the upper part of the cloud and the negative electricity in the lower is in every case in a region of the cloud where the temperature is well below the freezing point and generally below −10 degrees centigrade. In this part of the cloud, raindrops cannot exist. The precipitation in the upper part of a cloud is in the form of crystals, either needles or plates, which tend to lie horizontally and to fall slowly in a series of nearly horizontal motions, first in one direction and then in another.

It has been suggested that the impact of ice crystals results in the ice becoming negatively charged and the air positively charged. The general settling of the negatively charged ice crystals relatively to the positively charged air would then result in a separation of electricity with the positive charge above the negative. Whatever the explanation may be, there is little doubt that the upper separation of charge in a thunder cloud is in some way connected with the pressure of ice crystals.

The processes occurring within cloud formation are so complicated that it is quite possible that all the foregoing phenomena, the selective attraction by polarized drops, and interactions between wind and ice crystals at subzero temperatures, are involved.

Fig. 3. Damage to cable sheath by lightning.

Field Distribution and Mechanism of Stroke

The field between cloud and ground has been found to be more or less independent of height and of the order of 50 to 100 volts per centimeter. Thus the gradient in the region between cloud and ground is about 1,000,000 volts per thousand feet, so that for 10,000 foot cloud the potential at the cloud base would be of the order of 10,000,000 volts. Taking into consideration the more intense fields near regions of high charge distribution, it is likely that cloud potentials are of the order of 20,000,000 volts.

The electrical charge concentrations within a cloud, of course, must be limited to the bounds of the cloud proper and in most cases are much smaller. In relation to these dimensions the earth can be regarded as infinite in extent. It follows then, from considerations of a flux plot, such as that of Figure 1, that before the discharge the electrical gradient within the cloud must be very much greater than at the earth where the gradient never exceeds about 100 volts per centimeter. Thus the discharge tends to be initiated at the cloud rather than at the ground. As mentioned previously tests have shown that in a region occupied by water droplets of the size expected in clouds the critical breakdown voltage is 10,000 volts per centimeter, a magnitude contrasted with 30,000 volts per centimeter in air without water droplets. This phenomenon likewise tends to initiate the discharge from the cloud. In addition, the lower pressure at the higher altitudes, even if there be no water droplets, decreases the breakdown gradient.

A lightning discharge which usually appears to the eye as a single flash is in reality generally made up of a number of separate strokes that travel down the same path. The interval between these components varies between .005 and .5 second. Each separate stroke consists of a downward leader that starts from the cloud. When the downward leader strikes the ground it is followed by an intense return streamer which consists of a point of intense luminescence travelling from the ground to the cloud.

The leader of the first component stroke of a flash is preceded by a "Pilot Streamer" which represents propagation of the discharge into virgin air having very low ionization. Currents associated with the pilot streamer are small, the majority being of the order of only a few amperes. The luminosity is likewise very low. Its existence is deducted by inference and by an analysis of the mechanism of the discharge. In the following discussions, velocities are given in terms of that of light (approximately 1,000 feet per microsecond) as it is the same as that of waves on transmission lines. It therefore provides a very convenient bench mark when the phenomenon is applied to considerations of the effect upon systems. The most frequent velocity of propagation of the pilot streamer is about 1/20 of one per cent of that of light.

As the pilot streamer proceeds it is accompanied by points of luminescence which travel in jumps, giving rise to the term "stepped leader". The velocity of these steps exceeds one-sixth of that of light and the distance travelled in one step is about 50 meters. The path of each step is essentially straight but each fresh step, in general, takes a different direction. The change in direction at each junction thus gives rise to the tortuous path characteristic of lightning. The electrostatic lines of force from the stroke to ground should form essentially smooth curves, another fact which suggests that the zigzag path must be attributable to some variable condition at the head of the discharge, this condition being either variations in the head itself or variations in space ionization.

As the leader strikes the ground an extremely bright return streamer propagates upward from the earth to the cloud following the same path as the main channel of the downward leader. The charge distributed along the leaders thus is discharged progressively to ground, giving rise to the very large currents usually associated with lightning discharges, currents varying between 1,000 and 200,000 amperes. The rate of propagation, about 10 per cent of that of light, is determined by the rate at which the head of the lightning channel can become sufficiently conducting to accommodate these large currents. The charge that had been lowered from the cloud to the antenna-like system of streamers by this means is further lowered to ground. The former of these processes is relatively slow, requiring a time of the order of 10,000 microseconds, whereas the latter is relatively fast, requiring only about 50 to 100 microseconds. Since the same charge is involved in both stages the difference in time explains the large difference in currents involved in the two stages.

With the development of a high conducting arc path between the charge centre and ground, the potential of the charge centre is lowered considerably. This process may develop high potential differences between this charge centre and another charge centre within the cloud, resulting in the continued progress of streamers into the cloud, and the information and attraction of streamers from the other charge centre. Upon the meeting of two such approaching streamers, a relatively

Fig. 4.

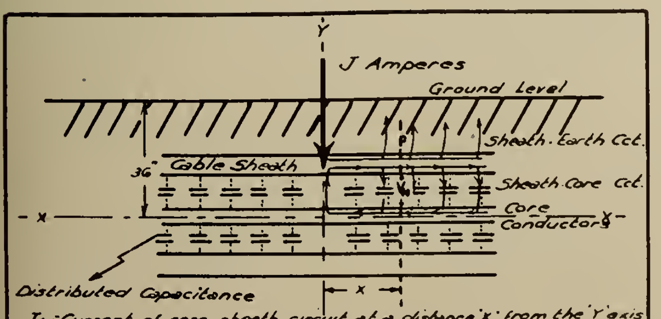
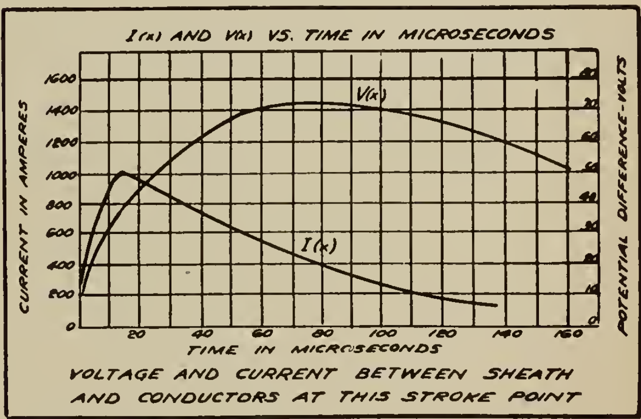


Fig. 5.



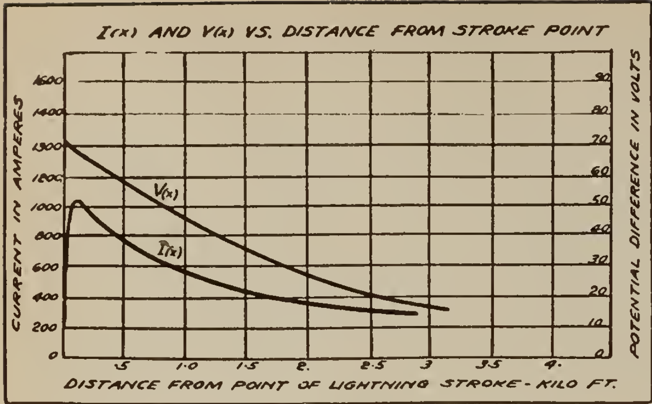


Fig. 6.

low conducting path to ground for the new charge centre is formed. The resulting discharge traverses the same path blazed by the first stroke. The leader streamer of this stroke differs from that of the first stroke in that the stepped phenomenon is absent; there is no branching, and the velocity of propagation is much higher, being of the order of three per cent of that of light. Because of these characteristics this leader is known as a dart leader. Upon reaching the earth, a return streamer travels back to the cloud just as for the first stroke.

The stroke current at the ground is also similar in character to that of the first stroke, rising rapidly from zero to a maximum, falling slowly for several hundred microseconds and then more slowly for a much longer time. The crest magnitude of the stroke is the greatest, probably because the branching of the antennae system of streamers permits a lowering of a larger charge before it is released to earth. This is not always the case, as the second or subsequent strokes are sometimes the greatest.

As the charge in the second charge centre is dissipated by being carried to ground, the streamer in the cloud might tap a third centre and the same process be repeated. In general, approximately half the flashes are of this multiple character. Flashes having as many as 40 component strokes have been observed. The relative time involved in these processes is given in Fig. 2.

In general, the rates of propagation of the discharges discussed vary inversely as the amount of previous ionization of the path. Thus, the initial pilot streamer progressing into virgin air with very little ionization was the slowest, being about 1/20 of one per cent of that of light. The stepped strokes that followed in the path blazed by the pilot streamer have a velocity of the order of 15 per cent of that of light. The return streamer is also quite rapid, as it follows the intense ionization of the initial streamer and has a velocity about 10 per cent of that of light.

Storms versus Metallic Circuits

It is desirable to lay particular stress upon the chief differences between electric phenomena in thunder storms and in engineering practice. We are ordinarily concerned with complete metallic circuits handling large quantities of electricity at constant and relatively low voltages for long intervals of time. On the other hand in a thunder storm the quantities of electricity are small, in the form of isolated electric charges located on water drops forming a volume distribution of electricity. The masses of water drops are so large compared to their charge that for the duration of a lightning stroke the distribution of electric charge remains fixed. The charged water particles are acted upon by the electric field and their slow motions give rise to displacement currents. The actual velocities obtained by the charged particles are sufficiently low to enable the wind to do work upon them against the electric field and thus raise the potential to breakdown of the air when a lightning flash takes place.

The voltages present in thunderstorms may be extremely high, of the order of 10^8 volts and are subject to wide and sudden variations. The quantities of electricity in lightning flashes are small, of the order of 20 coulombs. Yet as the time during which they are mobilized is short, the current in a flash may rise to 200,000 amperes. This may be seen from the following simple analysis.

Let q coulombs of electricity exist on a particle of water. Under the action of the electric field F the charged particle will move from one point to another. Now, by definition, an electric current $I = \frac{dq}{dt} = \frac{\text{coulombs.}}{\text{sec}}$ Since q is constant in our case, and the time element is extremely small during the particle's motion from one point to the other, due to the high electric field F, then $I = \frac{dq}{dt}$ will be high.

Effects of Lightning on Buried Telephone Cable

Practically all of the toll cable installed since 1939 has been buried where possible, in order to secure greater immunity from mechanical damage. It was realized, however, that burying the cable would not prevent damage due to lightning and that, on account of their smaller size, more damage was to be expected on the new carrier cables than on the much larger voice-frequency underground cables then in use. Moreover when damage by lightning does occur, such as fusing of cable pairs, or holes in the sheath, (See Fig. 3) it is not so easy to locate and repair as on aerial cables, since excavations may have to be made at a number of points. Studies have been made of the factors affecting damage of buried cables by lightning. Remedial measures have been devised and put into effect in cases where a high rate of lightning failure was anticipated on new installations, or was experienced with cable already installed. Most of the cable installed was thus provided with extra core insulation, and shield wires were plowed in on many of the new routes.

It was recognized early in these studies that more effective lightning protection might be secured, by providing the lead sheath with a thermoplastic coating of adequate dielectric strength and an outside copper shield. Such cable might be required in such territory where experience has indicated that other types of construction would propably be inadequate. Since such cable has advantages also from the standpoint of corrosion and mechanical protection, it may be used also where lightning is not of such decisive importance.

When lightning strikes, the current spreads in all directions from the point where it enters the ground. If a cable is in the vicinity it will provide a low resistance path, so that much of the current will flow to the cable and in both directions along its sheath to remote points. The flow of current in the ground between the lightning channel and the cable may give rise to such a large voltage drop, that the breakdown voltage of the soil will be exceeded, particularly when the earth resistivity is high. The lightning stroke will then arc directly to the cable from the point where it enters the ground, often at the base of a tree. When this happens practically all the current reaches the cable sheath. Furrows as long as 1,000 feet have been found in the ground along the path of such arcs.

The current entering the sheath near the stroke point is attenuated as it flows toward remote points. The current leaving the sheath must flow through the adjacent soil, and the amount of this leakage current per unit length of cable is, therefore, smaller if the soil resistivity is high than if is it low. Thus the current will travel farther the larger the earth resistivity. The flow of current along the sheath produces a voltage between the sheath and the core conductors, which is largest at the stroke point. This voltage is substantially equal to the resistance drop in the sheath between the stroke point which is sufficiently remote that the current in the sheath is negligible. Since the higher the earth resistivity, the farther will the current travel, this resistance drop will also increase with the earth resistivity. The maximum voltage between sheath and core is thus proportional to the sheath resistance. It is also proportional, as it turns out, to the square root of the earth resistivity. Carrier cables now being used are of smaller size and have a higher sheath resistance than full size voice frequency cables. For this reason they are more subject to lightning damage, particularly when the earth resistivity is high.

Direct Strokes — Current Propagation along Sheath

As mentioned before, a lightning stroke to ground may arc to a buried cable in the vicinity, in which case virtually all of the current will enter the sheath near the stroke point. When a sinusoidal current J (see Fig. 4) enters the sheath at $x = 0$ and the sheath is assumed to extend indefinitely in opposite directions from this point, the sheath current at the distance x is given by the following approximate expression,

$$I_{x)} = \frac{J}{2} e^{-ax}$$

where a is the propagation constant of the sheath-earth circuit and is given by the following expression,

$$a = \frac{I}{V} \left[jw \left(jw + \frac{1}{\sigma} \right) \right]^{1/2}$$

where V = velocity of propagation along sheath.
w = in radians per second
k = capacity of earth in farads per meter
σ = earth resistivity in meter-ohms
$j = \sqrt{-1}$

Direct Strokes—Voltage for Sinusoidal Current

The current along the sheath gives rise to an electric force along the latter. The electric force along the inner surface of the sheath is given by,

$$E_{(x)} = ZI_{(x)} = \frac{J}{2} Ze^{-ax} \quad \text{volts}$$

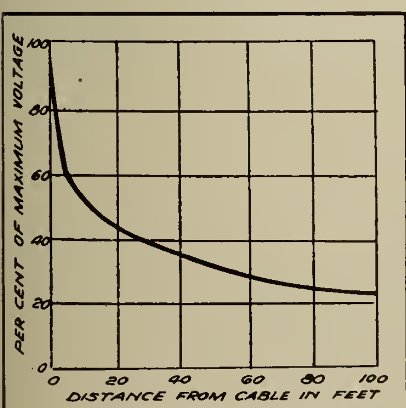
where Z is the mutual impedance of the sheath-earth and core-sheath circuits.

The latter mutual impedance is equal to the ratio of electric force along the inner surface of the sheath at any point to the total current along the sheath at the same point, and for low frequencies equals the direct current resistance of the sheath.

The largest voltage between sheath and core conductors is obtained for $x = 0$, since at this point the entire lightning current J enters the sheath. (See Figs. 5 and 6 for voltage and current curves.)

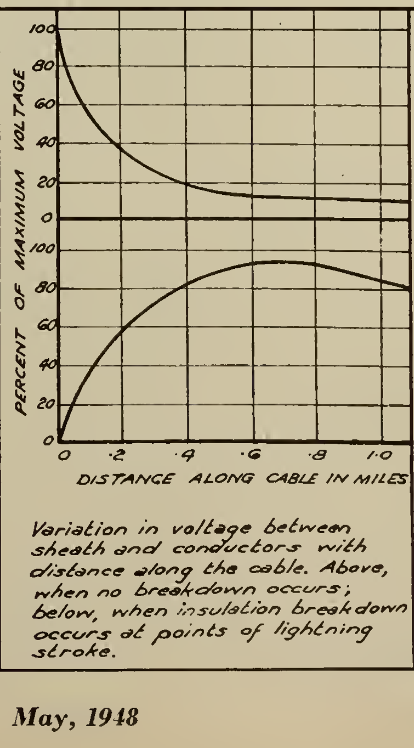
To secure experimental verification of the theory outlined above, tests were made on a typical cable, using a surge generator, which generates a short time surge of current similar to that of a lightning discharge but of much smaller magnitude. A ground was established remote from the cable, and the surge generator was connected between this ground and the cable sheath, and between the remote ground and grounds at distances of 10, 25 and 100 feet from the cable. The voltage between conductors and sheath was then measured for various conditions. The results obtained with the surge generator connected between sheath and remote ground are shown in Fig. 5, which gives both the cur-

Fig. 7.



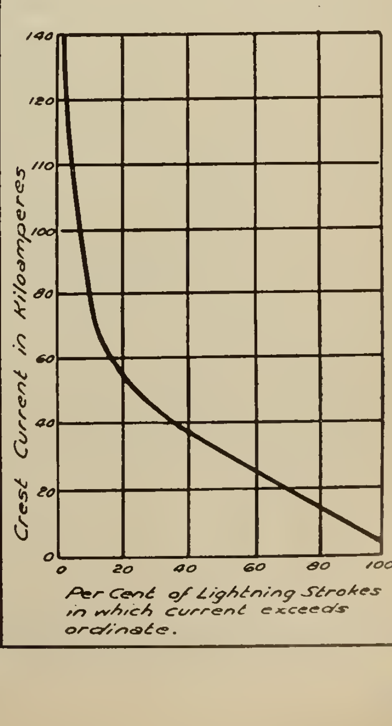
Reduction in voltage between sheath and conductors as the ground representing the point of lightning stroke is moved farther from the cable.

Fig. 8.



Variation in voltage between sheath and conductors with distance along the cable. Above, when no breakdown occurs; below, when insulation breakdown occurs at points of lightning stroke.

Fig. 9.



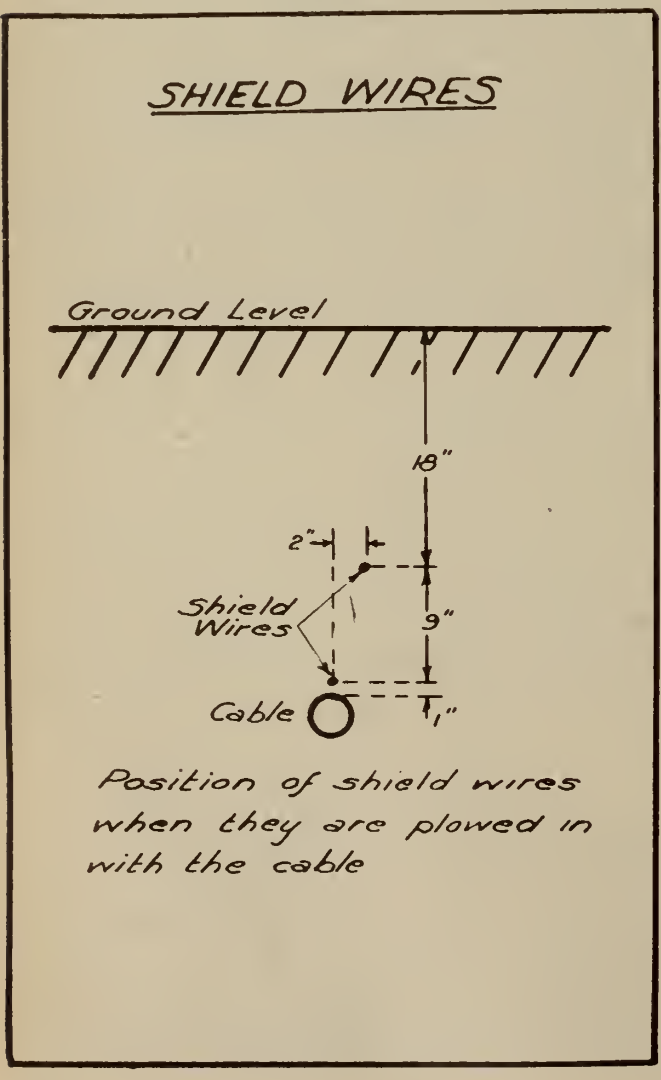
Per Cent of Lightning Strokes in which current exceeds ordinate.

rent flowing into the sheath, and the voltage between conductors and sheath, as they vary with time. Allowing for the difference in the magnitude of the current, such a test would represent an arcing of the lightning directly to the cable.

Voltages between conductors and sheath, when the surge generator was connected between the remote ground and grounds near the cable, are given in Fig. 7. These voltages are plotted as percentages of the maximum voltage shown in Fig. 5. Tests such as these are comparable to lightning strokes to ground at various distances from the cable when arcing to the cables does not occur. The observed voltages are in good agreement with those calculated from theoretical considerations.

The voltages of Fig. 5 were those observed at the point where the current entered the sheath. As the current flows along the sheath it is attenuated, however, with the result that the voltage decreases. The rate of decrease is indicated by the upper curve of Fig. 8 where the voltage is plotted as a percentage of the maximum voltage of Fig. 5. There is some unavoidable variation in the dielectric strength of the core insulation. Thus although the voltage decreases rapidly with distance, actual failure may not occur at this point where the current enters the sheath, but at some distance away, where the dielectric strength of the insulation may happen to be less.

Fig. 10.



When the voltage at the point where current enters the sheath is great enough to break down the insulation, the conductors and sheath are brought to essentially the same potential by the arcing. Under these conditions, the voltage between conductors and sheath will increase with distance along the cable, as shown by the lower curve of Fig. 8. A maximum is reached at some distance from the original fault, and beyond this point the voltage slowly decreases. After a puncture of the insulation where the current enters the sheath, other failures may therefore occur at some distance from this point in either or both directions. A single lightning stroke may thus cause insulation failures over a considerable distance along the cable.

The crest value of the current in a lightning discharge varies over wide limits. Measurements made largely with magnetic links by engineers of the power industry have indicated that a relationship somewhat like that shown in Fig. 9 exists between various values of crest current and the percentage of the total flashes in which they occur. Although measurements of wave shape are not extensive, they indicate that the current reaches its crest value in from 5 to 10 microseconds. They also show that it decays to half its maximum in from 25 to 100 microseconds—the average being about fifty microseconds. This type of wave shape was simulated by the surge generator used in the tests shown in Fig. 5.

For voltages of short duration, such as those arising from lightning strokes, the dielectric strength of normal core insulation is about 2000 volts. Based on the data of Fig. 5, this voltage would be reached for a lightning current of some 28,000 amperes for a cable of the particular size and construction tested and as shown in Fig. 9. A surge of this magnitude occurs in about 50 per cent of the strokes. If the stroke reached the ground 100 feet from the cable instead of arcing directly to it, the lightning current would have to be of the order of 127,000 amperes to cause a breakdown potential between conductor and sheath. Currents of this magnitude estimated from Fig. 9 occur in less than 5 per cent of the strokes.

The application of the various remedial measures depends largely upon a detailed study of the proposed cable route. The important factors in this study are the earth resistivity measurements, the positions of trees which may tend to attract lightning strokes and the probable extent of damage to the cable. Considering also the costs of the various types of measures in conjunction with the above factors, the best engineering solution can be determined.

Remedial Measures—General

It is evident that the rate of cable failures to be expected, and hence the need for remedial measures, depend greatly on the earth resistivity. Experience has indicated that lightning damage is likely to be encountered even when the surface resistivity is fairly low, provided the resistivity beyond depths of 10 or 20 feet or so is very high. On the other hand when the surface layer resistivity is high the lightning stroke may then channel through the surface layer to the good conducting lower layer. Consequently direct strokes are not experienced as frequently, in spite of the high surface resistivity.

Extra Core Insulation

One method of reducing failures caused by lightning strokes to buried cable is to increase the insulation between the cable conductors and the sheath. This does not require extra insulation between individual cable conductors. This has already been done for most new installations. The cable itself, cable stubs, loading cases and gas alarm contactor terminals are all provided with sufficient extra insulation to double the dielectric strength between cable conductors and sheath. Such increased insulation would reduce the number of lightning strokes that could cause failure to about 15 per cent of the total, and would almost entirely eliminate the danger of breakdown when lightning strikes the ground as much as one hundred feet from the cable.

Shield Wires

Another method, which may be employed in addition to the extra insulation where excessive lightning damage would otherwise be expected, is to bury shield wires over the cable. These conduct away part of the lightning current, and thus reduce the amount that flows along the sheath. These wires may be plowed in with the cable, or they may be installed afterward. When wires and cables are plowed in together, one of the practical arrangements is that of Fig. 10. The percentage of the current carried by the wires depends to a greater extent to their inductance relative to that of the sheath than on their resistance. Two wires are employed rather than a single wire of smaller resistance, in order to obtain a lower inductance than would be possible with a single wire.

Surge measurements made after these wires were installed indicated that the wires reduced the voltage between sheath and core conductors about 60 per cent, in substantial agreement with theoretical expectations. The shield wires should thus reduce the number of direct lightning strokes that would be expected to cause failure to about 10 per cent.

Lightning Resistant Cable

Buried cable may be covered by jute, thermoplastic, or rubber for protection against corrosion. The coating may be damaged by rodents or by lightning. Severe corrosion may be experienced at points where the coating is ruptured, particularly when thermoplastic or rubber coating is used. Even when the earth resistivity is low, and protection against core insulation failures due to excessive voltage would not be required, the sheath coating may be damaged rather frequently.

Shield wires may affect a considerable reduction in core insulation failures. They may also prevent damage to the coating in the case of strokes to ground at some distance from the cable. In the case of direct strokes however, arcing between shield wires and the sheath will damage the sheath coating. It may also fuse a hole in the sheath, although there may be no insulation failures due to excessive voltage between the sheath and the cable conductors.

Reduction of damage to the coating and to the sheath occasioned by lightning, rodents or corrosion, and protection against core insulation failures occasioned by excessive voltage or crushing of the sheath, may be secured by providing the sheath with a thermoplastic rubber or rubber coating and an outside copper shield. If various auxiliary equipment connected to the sheath, such as load coils, gas pressure contactors and terminals, are also properly insulated from ground, currents will not enter the sheath, except through the capacitance to the outside shield. The voltage across the core insulation will then be so small that core insulation failures will not occur, unless the voltage between the outside shield and the sheath is large enough to puncture the coating. In estimating in advance the need for specific remedial measures, the probable incidence of lightning strokes to the cable and to ground near the cable is of course an important consideration, in addition to the factors discussed.

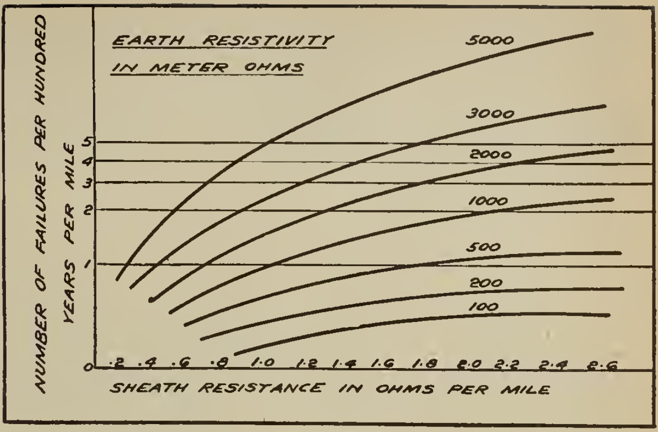


Fig. 11.

From Fig. 11 it is evident that the rate of cable failures to be expected, and hence the need for remedial measures, depends greatly on the earth resistivity. Of particular importance in the majority of cases is the resistivity up to a depth of 10 feet or so. With low resistivity to this or greater depths, the danger of a direct stroke to the cable is small, and if the resistivity is low to considerable depths, a few hundred feet, strokes other than direct strokes are not usually of importance. When, however, the resistivity at depths beyond ten feet or so is very high and the cables are of small size, strokes to ground may cause insulation failures, and this is also true of discharges between clouds. Earth resistivity measurements along new cable routes are now regularly made as a guide in applying protective measures.

Summary

Current in the sheath of buried cables, due to lightning strokes, strokes to ground near the cables, or discharges between clouds, gives rise to voltages between the cable conductors and the sheath. The voltages are practically proportional to the square root of the earth resistivity and to the direct current sheath resistance. For the latter reason they are substantially large for carrier cables (having smaller cross-section and therefore a higher resistance) of the size now used than for the much larger voice frequency cable.

For cables with thermoplastic or rubber coating the voltages between the sheath and the core conductors are much the same as for jute covered cables. The coating of such cable is likely to be damaged by direct strokes and strokes to ground near the cable, in which case corrosion of the sheath may occur at such points.

Based on theoretical lightning expectancy curves, the incidence of lightning troubles increases faster than the sheath resistance or the earth resistivity. When the breakdown voltage of the core insulation is doubled by use of extra core wrap, or when shield wires are installed in situations where lightning damage is anticipated or has been experienced, a substantial reduction in lightning failures is to be expected. Shield wires will, however, not prevent damage to the sheath and the sheath coating.

Where the earth resistivity is high and lightning storms occur frequently, doubled core insulation together with shield wires may not provide sufficient protection, even for cable of substantial size. Protection against various forms of lightning damage may then be secured by use of thermoplastic sheath coating of adequate dielectric strength together with an outside concentric copper shield.

Appendix

Definitions:

r = resistance in ohms
l = inductance in henrys
c = capacitance in farads
g = conductance in mhos
f = frequency in cycles per second of the voltage or current
w = angular frequency in radians per second
$j = \sqrt{-1}$ (a rotation factor)
$z = r + jwl = \sqrt{r^2 + w^2l^2}$ ohms
$y = g + jwc = \sqrt{g^2 + w^2c^2}$ mhos

Direct Strokes—Current Propagation Along Sheath

It was assumed that $I_{(x)} = \frac{J}{2} e^{-ax}$

The derivation of this formula is as follows:
Let P be any point along the cable at x. (See Fig. 4)
Denote by e the potential at P
Denote by i the current at P

let r = resistance of the cable conductor per wire mile
l = inductance " " " " " " "
g = conductance " " " " " " "
c = capacitance " " " " " " "

At a point dx miles to the right of P we have a voltage $e + de$, and a current $i + di$ where

de = voltage drop in dx miles $= -i(r + jwl)\,dx$ volts
and
$di = -l(g + jwc)\,dx$ amps
let $r + jwl = z$ ohms/mile
let $g + jwc = y$ mhos/mile

then (1) $de = -\,i\,z\,dx$ and (2) $di = -eydx$

hence (3) $\frac{de}{dx} = -iz$ and (4) $\frac{di}{dx} = -ey$

differentiate (4) and insert (3) in (4)

$$\frac{d^2i}{dx^2} = -y\frac{de}{dx} \text{ but } \frac{de}{dx} = -iz$$

therefore $\frac{d^2i}{dx^2} = yzi$

now yz is a constant, let it equal a^2

$$\text{now } \frac{d^2i}{dx^2} = a^2i. \quad . \quad . \quad . \quad . \quad . (5)$$

To solve this second order differential equation assume a solution of the form

$i = Ae^{-ax}$ where A is a constant
$e = 2.718.....$

if this is a solution then it must satisfy (5)

differentiate, $\frac{di}{dx} = -aAe^{-ax}$ and $\frac{d^2i}{dx^2} = a^2Ae^{-ax}$

hence putting these two expressions in (5)

$a^2Ae^{-ax} = a^2Ae^{-ax}$

therefore our assumption was correct.

let $A = \frac{J}{2}$ and we have

$$I_{(x)} = \frac{J}{2} e^{-ax}$$

Journal Wins Important Award

Just as this issue was going to press, the Editor was informed by W. B. Saunders, 1948 Contest Chairman of the International Council of Industrial Editors, that the *Journal* had been judged the leader in its class in the International Industrial Publication Contest, which is sponsored by the Association.

Judging was based on accomplishment of purpose, editorial achievement, appearance achievement and production achievement. Out of a possible score of 100 points, the *Journal* was awarded 97 points. 650 publications were submitted for judging.

Power Development
on the
Kootenay River

by

W. J. Tindale, M.E.I.C.

Chief Engineer, West Kootenay Power and Light Company Ltd., Trail, B.C.

A paper presented at the Annual General and Professional Meeting of The Engineering Institute of Canada at Banff, Alberta, June 4th, 1948

This paper records the early mining developments around Rossland, which led to the building of the Trail Smelter, and the resulting demand for power. The watershed and its climate, as well as the Kootenay River and its flow, are discussed.

Outlining the early plants on the Kootenay river, built around the turn of the century, the author enumerates the characteristics common to all the later plants of the West Kootenay Power Co. System, and describes each plant in turn. The value of the additional six feet of storage on Kootenay Lake, provided in 1938, is assessed.

In 1890, two prospectors "Bourgeois and Morris" staked the Centre Star, War Eagle, LeRoi, Virginia and Idaho claims on Red Mountain near the present city of Rossland. These five claims were staked all in one day. Preliminary investigations disclosed high grade gold-copper lodes.

This discovery created intense interest in the mining world, and resulted in a large influx of people, among whom was F. Augustus Heinze, noted mining operator from Butte, Montana. So impressed was Mr. Heinze, that in 1895, he built a Smelter at Trail and also a railway, of 3 foot gauge, from Trail to Rossland. In February 1896 the first furnace was blown in.

This was a period of great rivalry between the Canadian Pacific and Great Northern Railways. In 1896, the Great Northern extended its railway from Northport into Rossland, to give connections with transcontinental lines. In 1898 the Canadian Pacific extended its line from Castlegar to Rossland, and in the same year acquired the Heinze interests.

Development of the Trail Smelter disclosed the necessity for electric power. To produce this power, the West Kootenay Power and Light Co. Ltd., with Sir Charles Ross as President, was formed. After investigation of a site at Lower Bonnington, eleven miles downstream from Nelson, the Company began construction of the first hydro-electric unit on Kootenay river in 1897. Further enlargement of the smelter and the development of electrolytic processes brought about a constantly increasing demand for

Fig. 1 — (above). No. 2 Plant (foreground), completed in 1940 and rated at 84,000 hp., is located at Upper Bonnington Falls. In the background is the City of Nelson plant built in 1905-1906 and enlarged in 1947-48. ***B.C. Government Travel Bureau photo.***

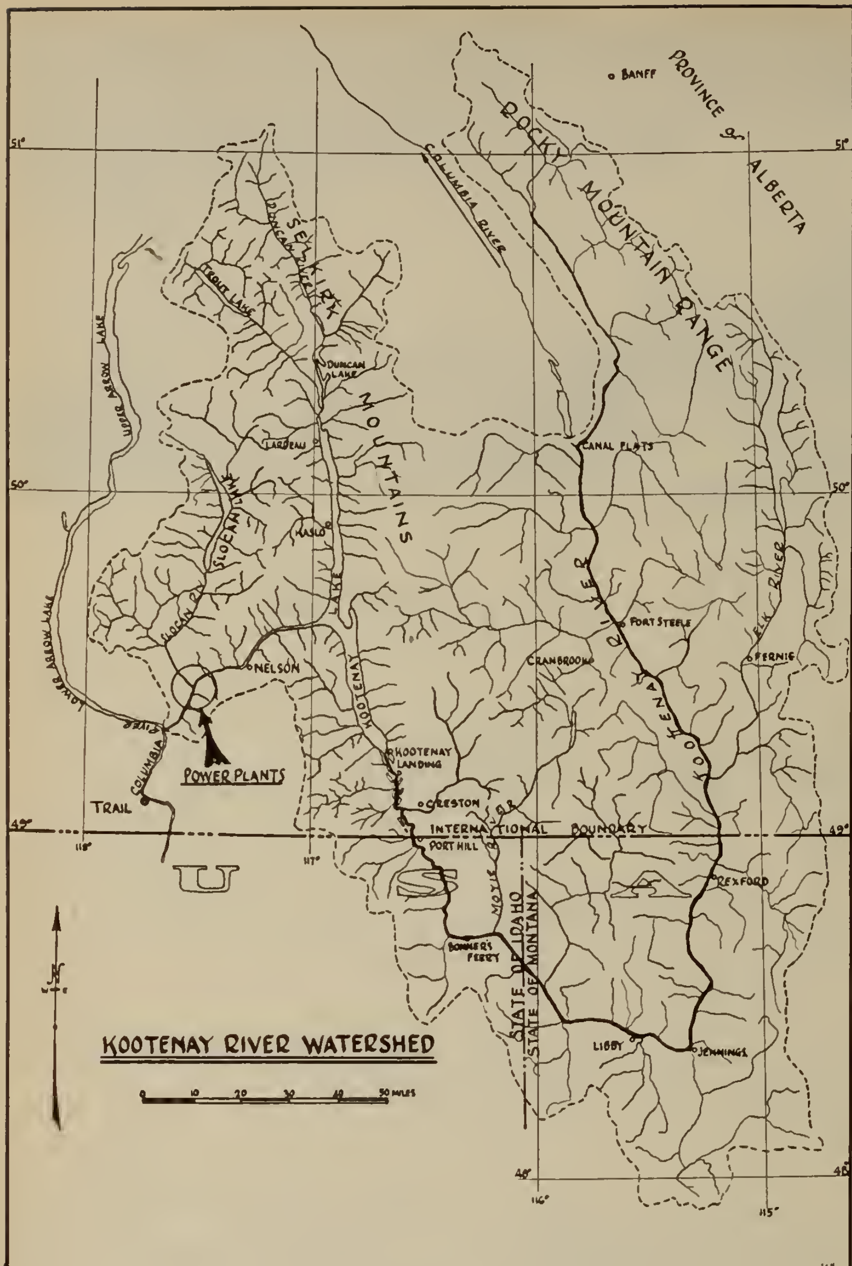


Fig. 2

power, with the result that the West Kootenay Power and Light Co. constructed additional capacity to keep pace with this demand.

The Kootenay River

A brief review of the Kootenay River is of interest before description of the various hydro-electric plants now operating. The Watershed lies inland some 400 miles from the Pacific Coast. It has an area of 19,450 square miles, three quarters of which is in Canada; it contains valuable mineral and timber resources, good agricultural land and splendid tourist resorts. For 175 miles, its eastern boundary follows the Continental Divide, along the backbone of the Canadian Rockies. In the east it embraces thousands of square miles of this range, and in the west thousands of square miles of the Selkirk and Purcell ranges. It is one of the most scenic and mountainous regions in North America; much of the basin is over 4,000 feet elevation, and many of the mountains are over 10,000 feet in height.

The climate has continental characteristics, but its relative mildness compared with similar latitudes further east indicates, to some extent, the moderating influence of the Pacific Ocean. The mean annual temperature in the valleys is roughly 44 deg. F., summer daylight temperatures range from 70 to 100 deg., the night temperatures from 40 to 70 deg. Winter temperatures occasionally drop to zero. Precipitation varies from about 17 inches in the valleys to 70 in. in the high mountains, and is mostly in the form of snowfall.

The Kootenay River

The flow follows an annual cycle marked by considerable regularity. It is low during winter months and increases gradually from March to a peak in June. It decreases more or less gradually after June, dependent on climatic conditions. The average annual flow is about 26,000 c.f.s. and the normal peak flow is roughly 110,000 c.f.s.

The stream, 400 miles in length, rises high in the Canadian Rockies, and from its source flows 60 miles southward parallel to and approximately 10 miles from Columbia River, which flows north from its source in Columbia Lake. Its course may be readily followed by referring to Fig. 2. In its final 21-mile reach to its confluence with the Columbia River near Castlegar, it drops 360 feet, providing the head for all the hydro-electric developments on this section of the river. Kootenay Lake and its west arm, with an area of 175 square miles, is the main reservoir.

Early Power Developments

The knowledge and ability of the late Lorne A. Campbell, General Manager and Electrical Engineer, enabled the many intricate and then new problems of transmission and distribution of power and of operations to be dealt with capably during the earlier stages of development. Much information that proved most valuable in further developments was obtained under his guidance. Mr. Campbell later became President and Managing Director, and under his management four succeeding plants were built.

Judged by today's standards, both No. 1 and No. 2 plants are far from modern. No. 1 Plant, built in 1897-1898, and designed to develop 4,000 hp. under 34-foot head, was constructed to house three Stilwell-Bierce horizontal, Victor type turbines, connected to three C.G.E. 1,100 volt, 60 cycle, 3 phase, 180 r.p.m. generators, each having a direct current exciter of 40 kilowatts, 125 volts, driven by a single runner obtaining water from a pipe connected to the turbine pressure case. Power was stepped up to 22,000 volts, 3 phase, 60 cycle, through banks of air blast transformers, and was delivered 32 miles over two transmission lines of No. 0 medium hard-drawn copper to substations at Trail and Rossland, where it was stepped down for general use. The insulator pins used on pole cross arms were of locust wood boiled in paraffin oil. (Fig. 5.)

Construction of No. 2 Plant was started in 1905 and completed in 1907. It was designed by Ross and Holgate, Consulting Engineers of Montreal, with four generating units having a total capacity of 34,000 hp. under 70-foot head. Two units of 8,000 hp. with I. P. Morris turbines were in operation in 1907 under partial head of 63 feet (later increased to 70). Two additional units with Canadian Allis Chalmers turbines were installed in 1914 and 1916 respectively.

All turbines were of vertical Francis type, each having 3 bronze runners on its vertical shaft direct connected to drive C.G.E. generators with 2,200 volts, 3 phase, 60 cycles and having a total rating of 26,250 kva. Current at 2,200 volts was stepped up to 66,000 volts, 3 phase, 60 cycles, through four banks of oil-insulated water-cooled indoor type transformers having a total rating of 23,125 kva. Power was delivered 81 miles over newly installed 66,000 volt, 3 phase, 60 cycle transmission lines, through Trail, Rossland and Phoenix to Greenwood. An additional bank of 3,750 kva. 3 phase, 2,200 to 22,000 volt transformers was provided to enable No. 2 Plant to operate in parallel with No. 1 Plant for delivery of power to Rossland and Trail.

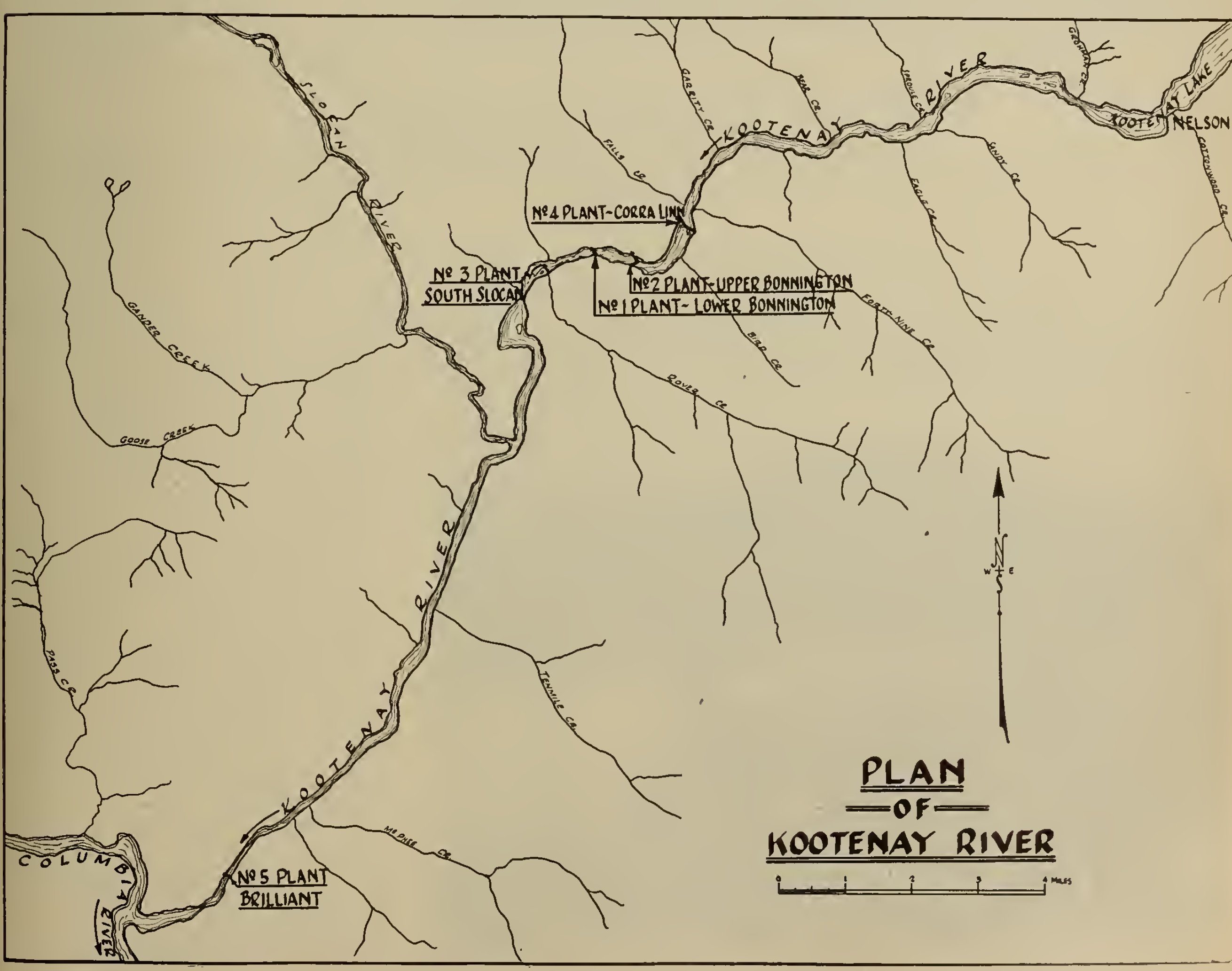
This plant has a remarkable record for continuous and successful operation. The two initial units have been in operation for more than 40 years, and the original 60-inch bronze runners, though becoming worn, are still operating.

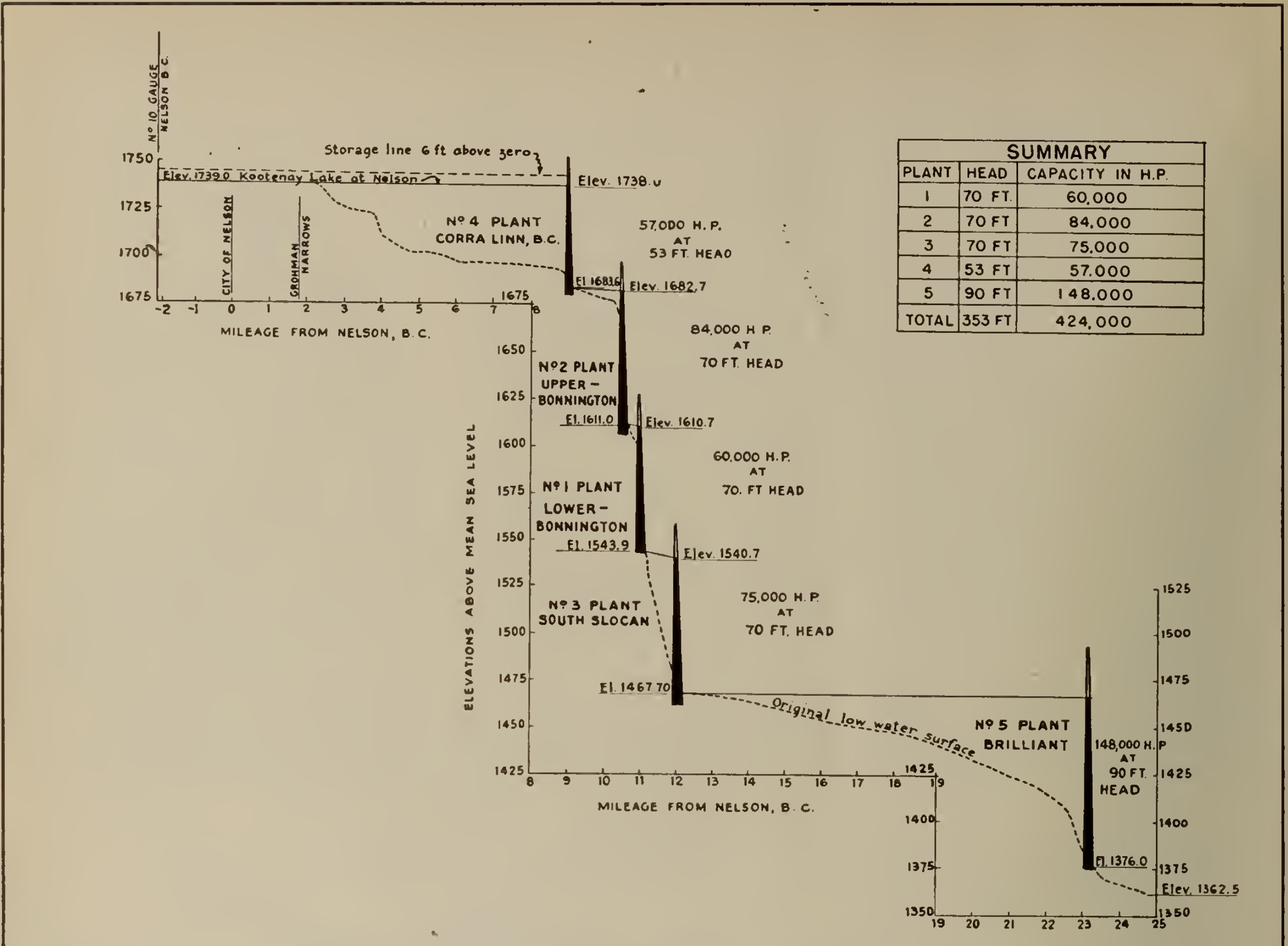
Recent Additions to the System

From 1923 the demand for power steadily increased, not only for the vast operations of the Consolidated Mining and Smelting Company, but also for mining, industrial, irrigation, agricultural and general uses. To meet this rapidly increasing demand, five plants have since been constructed, in the following order: Plants No. 1 (a replacement), No. 3, No. 4, No. 2 Extension and No. 5.

These plants have many common features. All structures are built on solid rock. All plants are designed to discharge safely more flood discharge than the record flood of 1894, estimated at more than 200,000 c.f.s. Power plants with their substructures, superstructures, floors, walls, piers, intakes, headworks, and dams are of monolithic reinforced concrete, provided with copper seal expansion joints where necessary. Steel columns, embedded in building walls, extend up to support crane girders and roof trusses. Water intake passages (two for each turbine) are rectangular, separated at the intake openings and at the trash racks by concrete piers, 6 feet wide, to accommodate recesses for steel head-gates and supports for trash racks. They converge to a

Fig. 3





SUMMARY		
PLANT	HEAD	CAPACITY IN H.P.
1	70 FT.	60,000
2	70 FT	84,000
3	70 FT	75,000
4	53 FT	57,000
5	90 FT	148,000
TOTAL	353 FT	424,000

PROFILE OF KOOTENAY RIVER SHOWING HYDRO ELECTRIC DEVELOPMENTS.

Fig. 4

Fig. 5. The original No. 1 Plant, the first hydro-electric plant on the Kootenay River, was built by the West Kootenay Power and Light Company in 1897-98 and was designed to develop 4,000 hp. In the background is Lower Bonnington Falls. This plant was replaced in 1925 with a new plant of 60,000 hp. capacity.

common entrance of the steel spiral casing, which conducts the water to the turbine runners.

Draft tubes have 6-foot wide piers, extending downstream to divide the exits into two rectangular openings, having recesses to accommodate steel tailrace gates. These are interconnected by a system of piping and valves extending to a single 24-inch vertical pump of 12,000 g.p.m. capacity, directly connected to a 300-hp. vertical motor. The piers and recesses are carried up to the tailrace deck to accommodate a motor-operated travelling gantry. This is used to operate steel tailrace closure gates, when it becomes necessary to inspect or repair runners or draft tubes.

The basements contain generator piers; oil storage and filter tanks, oil, air and water pipes; draft-tube pump motor and other miscellaneous items. The main floors have generators, spare exciter, main control switchboards, governors, governor oil-pressure tanks and pumps, and railroad spurs. All conduit for control wiring and the main leads is embedded in the floor. Roof decks are of concrete, or of fir timber laminated on edge, overlaid with 20-year guarantee roofing.

Operating and Hydraulic Equipment

Headgates operating in recesses in the piers are placed upstream from the trash racks and are operated by motor-driven hoists located on an overhead steel structure. Trash racks of steel bars are cleaned from a special 3-motor, travelling gantry. A power house crane with main and auxiliary hooks travels the full length of each power house for handling all machinery. Air for cooling the generators enters the basement either through filter banks of Midwest type, installed in the downstream wall, or from a washed-air plant, used only in hot weather.

Turbines are vertical Francis type, with single runner, actuated by oil-pressure governors, and direct connected by vertical shaft to flanges on the generator shaft.

Electrical Equipment

Generators deliver power at 3 phase, 60 cycles, to transformers. They have Kingsbury thrust-bearings mounted on the upper bracket arms, carrying the suspended load of the turbine runner and shaft, the hydraulic thrust, the generator rotor and shaft, and the direct connected exciter rotor. Transformers and switch structures have concrete foundations and steel overhead framework, to accommodate transformers, oil-circuit breakers, busses, lightning arresters, gang switches, and outgoing lines. Transformers are the single phase, oil-insulated, water-cooled outdoor type, in banks of three, stepping up generator voltage to 66,000, 3 phase, 60 cycles.

Description of Plants

The No. 1 Replacement Plant was built between 1923-1925. More modern equipment increased the capacity of the original plant to 60,000 hp. The Honourable T. D. Patullo, then Minister of Lands of British Columbia, threw the switch to put this plant in operation on August 1st, 1925. Rock excavation during construction amounted to 160,000 cubic yards and concrete placed was 49,000 cubic yards. The crane has a span of 45 feet, 6 inches, and carries a 120-ton main hook and a 10-ton auxiliary hook.

Fig. 6. Aerial view of No. 3 Plant of the West Kootenay Power and Light Company, showing in the background the new No. 1 Plant. Note the rugged mountainous country through which the Kootenay River flows on its way from the Kootenay Lake to the Columbia River.

The three turbines each have a capacity of 20,000 hp. under 70-foot head, and drive generators of 17,500 kva., 100 r.p.m., 7,200 volts, with a direct current exciter of 150 kilowatts. The current from the generators is stepped up from 7,200 to 66,000 volts through banks of oil-insulated, water-cooled transformers, having a total capacity of 45,000 kva. Oil-circuit breakers protect the transformers and outgoing transmission lines. Modern switchboards and bench boards are conveniently located.

No. 3 Plant located at South Slocan, 5,000 feet downstream from No. 1 Plant, was designed not only to generate more power but also to function as the main control and switching station for all plants. Constructed from 1926 to 1928, the amount of concrete placed was 121,000 cubic yards. A level area to accommodate railway spurs, maintenance and housing structures was created by placement of 170,000 cubic yards of excavated rock behind a 60-foot high, concrete and masonry wall extending 200 yards downstream from the plant.

Its three turbines have a total capacity of 75,000 horsepower under 70-foot head. They are directly connected to the vertical shafts of three generators having a total capacity of 52,500 kva., at 7,200 volts, 100 r.p.m. Each has a direct current exciter of 165 kilowatts, 250 volts. The thrust bearing carries a total suspended load of 535,000 pounds. Power at the generator voltage is stepped up to 66,000 volts for delivery to the transmission lines through three banks of transformers having a total rating of 54,000 kva. The powerhouse crane spans 47 feet 3 inches with a main hook capacity of 120 tons. The auxiliary hook is of 10 tons capacity. The washed-air plant has a capacity of 195,000 cubic feet of air per minute.

No .4 Plant, with the control dam is situated 6,000 feet upstream from No. 2. It was designed not only for production of power but also for control of storage in Kootenay Lake.

Construction started in 1930 and was completed in 1932.

The Government highway bridge crossing the Kootenay, was raised 7 feet requiring the placement of 60,000 cubic yards of fill at the approaches. Construction of the plant necessitated relocation of 3,300 feet of the C.P.R. track, raising it a maximun of eight feet. Excavation for plant and river improvements amounted to 810,000 cubic yards and concrete placed was 141,000 cubic yards.

The dam is 1,700 feet long with a control section 686 feet in length in the direct line of flow, containing 14 sluice gates, each 34 feet wide, 32 feet high and weighing 50 tons apiece. These gates have fixed rollers operating on planed surfaces of steel embedded parts, recessed into the piers. Control of the gates is by two motor-operated screw hoists travelling on an overhead steel structure from which gates can be suspended. For close regulations of flow and water levels both hoists are equipped for operation from push button stations located at the powerhouse switchboard. One hoist is equipped with an auxiliary gas engine, while both may be operated manually. The powerhouse has three turbines of 19,000 hp. 53-foot head direct connected to three generators of 15,000 kva. 7,200 volts, 85.7 r.p.m. having top mounted, 150-kilowatt, 250-volt, direct-current exciters. Transformers are in 3 banks having a total rating of 45,000 kva. The powerhouse crane has a main hook capacity of 120 tons, auxiliary hook is of 10 tons capacity. The washed-air plant has capacity of 180,000 c.f.m.

No. 2 Plant Extension, completed and placed in operation in March 1940, increased the capacity of that plant from 34,000 hp. to 84,000 hp. Construction of this plant raised the production capacity on the river to 276,000 hp. and created a temporary balance of power above the demand.

The two new generating units were identical, having 25,000-hp. turbines, direct connected to 17,500-kva. generators, which delivered power at 7,200 volts to step-up transformers having a total rating of 36,000 kva. The powerhouse crane had capacity of 120 tons with an auxiliary hook of 10 tons capacity. The washed-air plant delivered 225,000 cubic feet of air per minute.

No. 5 Plant. To enable The Consolidated Mining and Smelting Co. Ltd. to increase the output of much-needed war materials, No. 5 Plant, one mile upstream from the Columbia River, was built between April 1942 and August 1944. Its ultimate capacity is 148,000 hp. It was constructed by the Kootenay Engineering Co. for The Consolidated Mining and Smelting Co., but the extensive preliminary research, actual design and detail were carried out by the engineering staff of The West Kootenay Power and Light Co. Ltd. Construction of this plant necessitated relocation of the Canadian Pacific track for 2 miles with a maximum lift of 18 feet. Rock excavated during construction was 410,000 cubic yards, and concrete placed was 212,000 cubic yards.

The structure was designed to accommodate four units, two of which were in operation in August 1944. The turbines are of 37,000 hp. with a 90-foot head, direct connected to generators of 32,000 kva., 13,200 volts, 100 r.p.m., delivering power to banks of 3 - 11,000 kva., 13,200- to 66,000-volt single phase transformers and thence through oil-circuit breakers to the transmission lines. A direct current 265-

Fig. 7. No. 4 Plant and the main control dam for the whole Kootenay River. Completed in 1932, it contains three 19,000-hp. turbines. *Cominco photo.*

Fig. 8. No. 5 Plant, the most recently completed hydro-electric plant on the Kootenay River, is at Brilliant, B.C. Its ultimate capacity will be 148,000 hp. *Cominco photo.*

kilowatt exciter and a 10-kilowatt pilot exciter are mounted on top of each generator. The thrust bearing is a 61-inch Kingsbury bearing, carrying a total suspended load of 865,000 pounds.

From the powerhouse headworks the control dam, 140 feet high, extends across the river and accommodates 8 sluice gates. Each gate has 34 feet clear span, and is 36 feet high. Gates are operated by two overhead hoists, designed and regulated like those of No. 4 Plant. The crane has a main hook capacity of 225 tons and auxiliary hook is of 20 tons capacity. The plant is also equipped with an automatically controlled passenger elevator travelling 200 feet per minute, with a capacity of 2,500 pounds. The washed-air plant, the largest installed on the river, has capacity of 300,000 cubic feet of air per minute.

The main transmission system includes six 60,000-volt lines, extending 26 miles from the main switching station at No. 3 Plant, to large substations at Tadanac and Warfield. Two lines extend 150 miles further westward to the cities, towns and villages, and agricultural areas of the Okanagan valley. Another line extends 50 miles eastward from No. 4 Plant to the Salmo mining area, while yet another extends 16 miles from No. 5 Plant to Tadanac.

City of Nelson Plant. In 1905-1906, the City of Nelson constructed a plant at Upper Bonnington across the river from No. 2 Plant. Its present capacity of about 5,000 hp., through three units, will soon be increased to 11,000 hp. by the addition of a fourth generating unit. Power is delivered to the City at 12,000 volts, 3 phase, 60 cycles over their two transmission lines, each 12 miles in length.

Storage on Kootenay Lake

The granting in 1938 of the right to store an additional 6 feet of water in Kootenay Lake has been of inestimable value. This not only makes possible more uniform power production in low flow months. It also is effective in lowering river flood levels along the dikes which protect some 54,000 acres of reclaimed land in the fertile Kootenay Flats in British Columbia and in the State of Idaho. This was made possible by the excavation of 364,000 cubic yards of material at Grohman Narrows.

The highest total plant head of 365 feet is reached in low flow months. The average total head is 353 feet, falling off to 300 feet under flood flow of 120,000 c.f.s. due to tailrace backwater rise, and due to the necessity of lowering No. 4 Plant forebay for maximum flood lowering upstream. The tailrace backwater rise at Brilliant reaches 30 feet or more in high floods, but eventually the loss of head and the consequent temporary decrease in power capacity will be compensated for by installation of the fourth unit at No. 5 Plant, together with further river improvements.

The total output of power in 1947 from the West Kootenay system was 1,703,278,000 kilowatt hours, with an average output in December of 224,000 kilowatts, and peak output of 248,500 kilowatts. The present installed plant capacity of 350,000 hp. under 353 feet of head, will be greatly exceeded when plans now under way and contemplated are executed.

From Month To Month

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

Engineers May Design Buildings

Engineers generally will be interested in changes made recently in the Saskatchewan legislation for engineers and for architects, particularly in view of the court's decision in Quebec that engineers must not design buildings.

The Saskatchewan architects act of 1942 stated—

"No plans, drawings or specifications for the erection, construction, enlargement or alteration of any building shall be passed, approved or accepted by any person appointed to pass, approve or accept the same, where the total cost of the erection, construction, enlargement or alteration exceeds the sum of $15,000, unless the plans, drawings and specifications have been prepared by or in consultation with a registered or licensed architect."

In March of this year the Saskatchewan Legislature repealed the above restrictive section and at the same time added to the schedule of work that could be done by an engineer under the engineers act, the following:

"The mechanical, electrical, chemical, electro-chemical, mining, or metallurgical treatment of any element whether organic or inorganic and combinations thereof for all purposes whatsoever.

"Factories, warehouses, swimming pools, rinks, garages, cold storage plants, grain elevators and flour mills, hospitals, schools and public buildings.

"All buildings and structures necessary for the proper housing, administration or operation of the works mentioned in paragraphs 1 to 7."

This appears to be a common sense arrangement. Neither group has a monopoly, and therefore the owner may decide for himself whether he wants his work done by an architect or an engineer. After all he is the one who should make this decision.

The Saskatchewan government seems to have been in the mood for cleaning up the entire situation for at the same time amendments were made to The City Act and to The Town Act by the addition to each of the following clause.

"No plans, drawings or specifications for the erection, construction, enlargement or alteration of any building to be used as a place of public assembly with a seating capacity in excess of one hundred and twenty-five persons, and no plans, drawings or specifications for the erection, construction, enlargement or alteration of any other building costing more than $20,000, shall be passed, approved or accepted by any person appointed to pass, approve or accept the same unless the plans, drawings and specifications have been prepared by or in collaboration with an architect or a professional engineer operating within the provisions, respectively, of The Saskatchewan Architects Act, 1942, or The Engineering Profession Act."

Saskatchewan architects and engineers have surely shown the way to the other provinces. At the time, the Quebec case held the stage, word came to the officers of the Institute of differences of opinion and some argument between these groups in several provinces. It appears that the situation remains the same today. Perhaps Saskatchewan's good example will encourage others to tackle this problem and arrive at a sensible and useful understanding that will reflect credit rather than ridicule on both.

Official Course in Welding of Interest to Engineers

The Canadian Welding Bureau, acting as a division of the Canadian Standards Association, has been set up by the combined sponsorship of firms in Canada interested in welding. Its activities are of particular importance to engineers because the standards which it has established and will continue to establish will permit the specification of welding materials and procedures with precision equal to that afforded by specifications for other fabrication processes. The courses to be offered by the bureau are directed primarily to the supervisory or foreman level but many engineers concerned with welding very often find themselves acting as supervisors and could undoubtedly derive benefit from the courses.

C.S.A. Qualification Code W47 requires that approved fabricators employ competent welding personnel. To ensure that this condition is adequately fulfilled with respect to its present members, and to enable others to be certified, the Bureau will undertake a nation-wide programme of welding education. This will be made available to member-firms, prospective members and to individuals who may want to establish or advance themselves in this rapidly developing field.

Both the Canadian Welding Bureau, as an approvals body established by industry for its own self control, and the proposed programme of education are unique Canadian developments with no counterpart elsewhere. Certainly no such nation-wide comprehensive programme of education for an industry has ever before been attempted. The course will take about a year and is not likely to be again available. It is a 'one-time' opportunity.

Combined Correspondence and Lecture Course

Recognizing that industry could ill spare important key men at present to attend a lecture course involving the weeks that would be necessary, the Bureau has devised a scheme whereby the series will be presented first by correspondence and supplemented at intervals with one or two days of lecture sessions in the principal university and industrial cities such as Toronto, Montreal, Winnipeg, Vancouver and others.

These lecture sessions will be held at two to three month intervals and will serve to supplement the course itself by actual demonstration and example, as well as providing a means for discussion, questions and answers.

For distant firms who are unable to send representatives, the Bureau's engineers on their periodic visits will in a measure serve in the same capacity as the original lecturers. Indeed it is expected that the whole programme will be largely handled by the Bureau's personnel but in addition many prominent engineers have promised assistance and lectures in their own special field of welding and welding application.

Although the lecture series will be a valuable part of the course, it will nevertheless be presented fully complete by correspondence and although desirable it will not be necessary to attend the lectures. Likewise examinations are not compulsory but may be sat for only if desired.

Designed to cover the basic principles of welding, the course has been purposely kept simple and direct, covering only the essentials without padding or superfluity. It is equally suitable for the welding operator or the graduate engineer, offering an equivalent amount to each.

However, it will be most directly developed for the foreman or supervisor with the purpose of fitting him to meet the qualification requirements of C.S.A. Code W47.

Course Includes Design and Production Methods

Although these qualifications are of an essentially practical nature dealing with the practice, supervision and technique of welding, it is deemed highly desirable that men in leading positions be more highly trained and it is proposed that the course shall be considerably in advance and excess of these minimum requirements.

Inasmuch as welding is of no importance unless it is competitive with other processes, part of the course will be devoted to production methods and economies, costs and estimating.

At present the courses as well as the time table and schedule for various centres are being worked out. It is anticipated that the first lecture releases will be made in approximately two months' time.

Those apart from the Bureau's Members who may be interested should apply for further details to the Bureau at 22 College Street, Toronto.

Meetings of Other Societies

The twenty-first International Industrial Chemistry Congress will be held at Brussels, Belgium, September 11 to 19, 1948, under the auspices of the **Society of Industrial Chemistry and the Federation of Chemical Industries of Belgium.**

A programme may be procured from the Secretariat of the Congress, c/o Societé de Chimie Industrielle, 28, rue Saint-Dominique, Paris (VII).

Concurrently, September 4 to 20, there will take place at Charleroi, an International Exposition of Pure and Applied Chemistry, and visits thereto form part of the programme of the Congress.

Dr. John Gaillard, mechanical engineer on the staff of the American Standards Association and lecturer at Columbia University, has scheduled a second five-day seminar, June 21 to 25, 1948, in Room 503, Engineering Societies Building, 29 West 39 Street, New York City.

For an outline of the ten lectures and details about registration, write Dr. Gaillard at his home address, 400 West 118 Street, New York 27, N.Y.

The Low-Pressure Industries Division of the **Society of the Plastics Industry** will hold an industry-wide seminar on June 29-30, at the Statler Hotel, Washington, D.C. The seminar is to foster a mutual exchange of information between industry and government bureaux on the latest developments and future requirements in low pressure plastic materials.

The address of the Society is 295 Madison Avenue, New York City.

The 45th Annual Convention of the **American Road Builders Association** and the 1948 Road Show will take place at Soldier Field, Chicago, Ill., July 16 to 24, 1948. The latter is described as the largest display of highway and airport construction equipment ever seen in one place at any time.

Hotel reservations for the Road Show can be made through ARBA Housing Bureau, c/o Convention Housing Bureau, Room 808-105W Madison St., Chicago 2, Ill., U.S.A.

The 21st Annual Meeting of the **Federation of Sewage Works Associations,** is to be held at Detroit, Mich., October 17 to 21, 1948.

Headquarters of the Federation are at 325 Illinois Building, Champaign, Illinois.

Personals

Notes of the Personal Activities of Members of the Institute

An Industrial Defence Advisory Board was established in April by the Canadian Government. It includes the following Institute members:

Major-General N. E. Rodger, M.E.I.C., Quartermaster-General of the Canadian Army, who serves on the Board as one of the three principal supply officers of the Armed Forces. 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. In 1941 he became D.A.Q.M.G., First Canadian Infantry Division, and later that year was appointed G.S.O. 2 (Liaison) at headquarters of the 1st Canadian Corps. From December 1941 until September 1942 he was personal assistant to General A. G. L. McNaughton, with the rank of lieutenant-colonel, then being promoted to the 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 in Washington, D.C., followed. He was promoted to his present rank and appointed Quartermaster-General of the Canadian Army in March, 1946.

Dr. O. M. Solandt, Affil. E.I.C., Director General of Defence Research and chairman of the Defence Research Board, is also a member of Industrial Defence Advisory Board.

The career of Dr. Solandt, who possesses the degrees of M.A., B.Sc., M.D., and, M.R.C.P., has been in the field of academic science generally. Shortly after the outbreak of war, with the rank of colonel, he was appointed director of the South-West London Blood Supply Depot and continued to act until March, 1941. He was then appointed director of the Medical Research Council Laboratories Experimental Station at Lulworth. In the summer of 1942 he was appointed deputy director of the British Office Operational Research Group, and in May, 1944, became director. In the spring of 1945 he was selected to join Lord Mountbatten's SEAC staff as special scientific adviser.

J. R. Donald, M.E.I.C., is one of the representatives of Industry on the new Canadian Industrial Defence Advisory Board. Mr Donald is president of J. T. Donald & Co., Montreal Chemical Engineers and Consulting Chemists, a firm with which he has been associated since 1922, and he is also president of Donald Inspection Ltd., Inspecting and Testing Engineers, of Montreal, Que.

In World War I he was chief inspector of explosives, Imperial Ministry of Munitions, Ottawa, and in the Second World War (1939) he was appointed chief of the Chemical Division, War Supply Board. From 1940 to 1945 he was Director-General of the Chemicals and Explosives Branches, Allied War Supplies, and in the latter year he was Mr. Howe's personal representative to the Combined Intelligence Objectives Sub-Committee meeting in London, England.

J. G. Notman, M.E.I.C., general manager, Dominion Engineering Works Ltd., Montreal, also represents Industry on the Industrial Defence Advisory Board of Canada. Since 1922, after graduating from McGill University, (B.Sc. in M.E.) Mr. Notman has been associated with the Dominion Engineering Works Limited. In 1941 he was appointed special assistant to the Co-ordinator of Production, Department of Munitions and Supply, and in 1943 he became Assistant Co-ordinator of Production He was also associated with the Department of Reconstruction for a time, resigning from service with the government in November, 1945.

G. A. Cunningham, M.E.I.C., of Imperial Oil Limited is transferred by the company from Welland, Ont., to be manager of industrial sales for the Maritimes Division. He will be located in Halifax, N.S.

C. S. Clendening, M.E.I.C., has been elected president of the Association of Professional Engineers of Alberta. He is project manager of the Lethbridge Northern Irrigation district. He is a Councillor of the Institute, a member of its Prairie Water Problems Committee and of the H. N. Ruttan Prize Committee.

Originally from Walkerton, Ont., Mr. Clendening studied at the University of Toronto, and spent four years with the C.E.F. in World War I. He had completed a number of years in engineering before joining the service. Returning in 1919 to his position as an engineer with the Grand Trunk Pacific Railway he remained two years, after which he went to Lethbridge as resident engineer for the Lethbridge Northern Irrigation District. He was located at Diamond City, Alta., as manager in 1932 and returned to Lethbridge in 1940 to his present position as project manager for Northern Irrigation District.

H. W. McLeod, M.E.I.C., chairman of the Winnipeg Branch of the Institute for the year 1948, is principal assistant engineer, of the engineering department of Canadian Pacific Railway Company at Winnipeg. He has been with C.P.R. since 1906 He is from Saint John, N.B., a graduate in civil engineering of the University of New Brunswick. He worked for the Intercolonial Railway and for Pennsylvania lines before joining C.P.R. at Calgary.

R. T. Hollies, M.E.I.C., chairman of the Calgary Branch of the Institute for the year 1948, is assistant superintendent with the Waterworks Department of the City of Calgary. He received that appointment in 1945 on his return from overseas. He had served from 1940 with the R.C.E., attaining the rank of Captain. He had previously been with the Waterworks Department and was superintendent of the Glenmore Water Supply for the city.

Kenneth B. Dundas, M.E.I.C., is no longer with Canadian Pacific Railway, but is plant engineer and assistant works manager for Dominion Tar and Chemicals Company Limited creosoting plant, Edmonton, Alta. For the railway he was located at Medicine Hat, Alta., as transitman and assistant to the division engineer.

H. W. McLeod, M.E.I.C.

R. T. Hollies, M.E.I.C.

N. R. Crump, M.E.I.C., of Canadian Pacific Railways, who has been vice-president, eastern lines, since early 1947, received the appointment in April as vice-president at Montreal, with jurisdiction over all lines. Mr. Crump, who joined C.P.R. in 1920, became vice-president after a 26-year rise through the ranks, during which time he managed to obtain a university degree in mechanical engineering. It was in the machine shop and motive power department that he worked until 1942, when he moved from Winnipeg to the position of assistant to the vice-president in Montreal. At Toronto headquarters of the eastern region since 1943 he was successively general superintendent of the Ontario District, assistant general manager, and general manager.

D. B. Sommerville, M.E.I.C., recently resigned his position as vice-president of St. Catharines Steel Products Ltd., and director of Canadian Comstock Company Ltd., to form the Canada Construction Company Ltd., Toronto, of which firm he is president. Mr. Sommerville is a graduate of University of Toronto, class of 1935.

(Photo by Albert Dumas)
Ignace Brouillet, M.E.I.C.

Ignace Brouillet, M.E.I.C., has been appointed a member of the National Research Council. He is a member of the firm of Brouillet and Carmel, consulting engineers, Montreal, and is dean of the Faculty of Engineering of University of Montreal (Ecole Polytechnique).

G. W. Moule, M.E.I.C., is the newly elected secretary-treasurer of the Winnipeg Branch of the Institute. He was born at Luton, Bedfordshire, England, but was educated in Canada at The Pas, Man., and at the University of Manitoba. He graduated from the latter in 1937 with the degree of B.Sc. in electrical engineering. He worked for three years at electrical draughting for Canadian Industries Limited, Montreal, and for a time as an electrical engineer for Defence Industries Limited, Montreal. He was transferred to Winnipeg by D.I.L. in 1941, and was a shift super-

N. R. Crump, M.E.I.C.

D. B. Sommerville, M.E.I.C.

visor for a year before returning to Montreal as an electrical engineer. In 1945 he returned to Winnipeg and joined the Winnipeg Hydro as a designing engineer. Quite recently he was appointed contract engineer.

T. M. Parry, M.E.I.C., is secretary-treasurer of the Calgary Branch of the Institute. He is technical vice-president of Western Canada Composite High School, Calgary, Alta. He is from Lancashire, England, but was educated in Canada and graduated from the University of Alberta, in 1929, with the degree of B.Sc. in electrical engineering. He followed the Canadian Westinghouse Company Limited test course at Hamilton, Ont., for a time, but transferred that year to the Bell Telephone Company at London, Ont. He was assistant transmission engineer in the construction department. Three years later he joined Western Canada High School's technical department. He was instructor in automotive mechanics and draughting for six years, and was then named instructor and head of the motor department. He was given his present position in 1941.

G. J. T. Gunn, M.E.I.C., is now with Surveyer, Nenninger and Chênevert, Montreal, employed as an electrical engineer. He was at Bowaters Newfoundland Pulp and Paper Mills Ltd., Corner Brook, since 1946, engaged on the extension of the Mills, on the staff of R. A. Hanrigh, Toronto consulting engineer.

J. P. Millenbach, M.E.I.C., general manager and director of Canadian Malartic Gold Mines Limited, is now at the Toronto offices of the Company. He has been with the Company since 1934.

D. D. C. McGeachy, M.E.I.C., is vice-president and managing director of Canada Vulcanizer and Equipment Co. Limited, London, Ont. He was located at Owen Sound, Ont., employed by Wm. Kennedy and Son, since his return from overseas early in 1946. He then terminated his service with the R.C.N. V.R., with the rank of lieutenant.

D. L. McLaren, M.E.I.C., is division manager of the generator division of Canadian General Electric's apparatus department, Toronto. He has been with C.G.E. since his graduation in 1914 from University of Toronto with the degree of B.A.Sc. He joined the engineering department at Peterborough, but later worked as a sales engineer and an electrical engineer at Toronto.

B. W. Pitfield, M.E.I.C., has resigned from his position as general superintendent of Northwestern Utilities, Limited, Edmonton, to become general manager of Northwest Industries Limited in Edmonton. Northwest Industries is engaged primarily in the repair of civilian and R.C.A.F. planes and in the manufacture of Bellanca Skyrockets.

Neil Carr, JR.E.I.C., has been promoted from the head office engineering department of Burns and Company Limited, Calgary, to become assistant mechanical superintendent of the Burns Vancouver plant. Mr. Carr, is a graduate of McGill University, of Montreal, having received a B.Eng. degree in mechanical engineering in 1946.

A. H. Hoffer, JR.E.I.C., is a member of the General Electric Advanced Engineering Program at Schenectady, N.Y., taking post-graduate study in electronic and electromechanical engineering. Mr. Hoffer graduated from University of Manitoba in 1946, and went to Schenectady that year.

Gordon Rosenthal, JR.E.I.C., who was formerly with the aerodynamics laboratory of National Research Council, Ottawa, is in Montreal. He is an engineer with the Aerodynamics Section of Canadair Limited. He was with N.R.C. since his graduation in 1946 from the University of Toronto.

John W. Langlois, S.E.I.C., is employed by E. B. Ludwig, Construction Company, New Orleans, La. He is responsible for all engineering work carried out by the company.

G. F. McLean, S.E.I.C., has been with Canadian General Electric Company on the student test course, since June last, when he graduated from University of Manitoba, with the degree of B.Sc. in electrical engineering.

John Norison Finlayson

M.E.I.C., A.S.C.E., M.Sc., LL.D.

President

OF

The Engineering Institute of Canada

Dean of the Faculty of Applied Science,
UNIVERSITY OF BRITISH COLUMBIA

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JOHN NORISON FINLAYSON, M.E.I.C., A.S.C.E., M.SC., LL.D., joined the Institute as a Student member in 1908. He became an Associate Member in 1912, a Member in 1919, and was elected to Life Membership in January of this year.

A native of Pictou County, Nova Scotia, the President was educated at Merigonish Public School, Pictou Academy and McGill University where he was graduated as a B.Sc. in 1908 and gained his M.Sc. the following year.

He has served the Institute as chairman of the Winnipeg Branch, 1928; chairman of the Vancouver Branch, 1941; and as a member of Council 1945-46. He is a member of the American Society of Civil Engineers and a member and past-president of the Association of Professional Engineers Province of Manitoba. During his presidency of that Association a complete revision of the Act respecting the engineering profession was passed by the Manitoba legislature. In 1942-43 he was chairman of the Engineering Bureau of the Vancouver Board of Trade and a member of the council of that body in 1944. While a resident of Vancouver he served as a member and chairman of the Vancouver Section of the Institute of International Affairs, a member of the British Columbia War Metals Research Board, 1942-45, and as a member of the Rehabilitation Section of the Co-ordinating Council for Greater Vancouver.

During his period of residence in Manitoba he acted as chairman of the Land Drainage Arrangement Commission for the Province. This commission was set up to determine the amount of drainage debenture debt for which land was liable under the Land Drainage Act in each municipality.

Following his graduation from McGill the President served that University as a lecturer in mathematics. In 1910 he joined the staff of Waddell & Harrington, Bridge Engineers, Kansas City and acted as the Company's representative during the erection of C.N.R. bridges in British Columbia.

In 1913 he was appointed Professor of Civil Engineering at Dalhousie University.

He acted for a period as a consulting engineer in Halifax and Winnipeg and was responsible for the design of a number of important bridges and buildings.

In 1919 he was appointed Professor and Head of the Department of Civil Engineering at the University of Manitoba and in 1936, Head of the Faculty of Applied Science, University of British Columbia, which appointment he now holds.

Newly Elected Officers of the Institute

J. A. Vance, M.E.I.C., who has been elected vice-president of the Institute for the Province of Ontario, is an engineer and contractor at Woodstock, Ont.

Born in the County of Oxford, Ont., he was educated at the University of Toronto. On the death of his father in 1914 he took over the contracting business and became responsible for the administration, engineering and construction of steel and concrete highway bridges. He is now the proprietor and engineer of the firm of J. A. Vance, contractor, at Woodstock. The business has grown to include the design and construction of factory buildings, sewers, dams and various concrete and steel structures.

Mr. Vance joined the Institute as a Student in 1914, transferring to Junior in 1919. He became an Associate Member in 1924, a Member in 1939. He was re-elected Councillor for the London Branch each consecutive year from 1933 to 1945.

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

Alex Lariviere, M.E.I.C., newly elected vice-president of the Institute for the province of Quebec, is vice-president of the Provincial Transportation and Communication Board, Quebec, Que. He was born at Lotbiniere, Que., and educated at Montreal College, Levis College, and Ecole Polytechnique, graduating from the last in 1913 with the degree of B.A. Sc. in civil engineering. He received his degree in electrical engineering in 1915.

In 1913, Mr. Lariviere was connected with the Montreal Harbour Commission as draughtsman and assistant electrical engineer. From 1913 to 1919 he acted in various capacities as an engineer with the Province of Quebec Roads Department, during which period he was in charge of the construction of the central section of the Montreal-Quebec Highway. He was with J. J. Seguin Electrical Enterprises, Ltd., carrying on electrical contracting business throughout the Province of Quebec, in 1919 and 1920. He was in partnership with Edouard Hamel, consulting engineer, Quebec City, for two years before being appointed, in 1922, engineer for the Quebec Public Service Commission, for which he had been acting in a part time capacity since 1916.

Later appointments by the commission were as follows: chief engineer, 1926; member of the Commission, 1931. He became controller in 1939 of the Provincial Transportation and Communication Board, which replaced the Public Service Commission. The following year when this board was replaced by the Quebec Public Service Board, he became controller for the latter. He was appointed to his present position in 1945.

Mr. Lariviere was Councillor for the Quebec Branch in 1938-1941. He is a past councillor also of the Corporation of Professional Engineers of Quebec. He joined the Institute as a Student in 1910, transferring to Junior in 1914, to Associate Member in 1917 and to Member in 1932.

Photo by Montminy, Que.

A. Lariviere, M.E.I.C.

I. P. Macnab, M.E.I.C., general manager of the Public Service Commission of Halifax, has been elected vice-president of the Institute for the Maritime Provinces.

Born at Malagash, N.S., he studied engineering at Mount Allison University and Nova Scotia Technical College, receiving from the latter, in 1913, the degree of Bachelor of Science in mechanical engineering. Between the years 1901 and 1908 he had served four years as an apprentice machinist and three as a journeyman machinist.

I. P. Macnab, M.E.I.C.

After graduation he was for two years machine shop manager. From 1915 to 1922, with Nova Scotia Light and Power Co., he was successively draughtsman, engineer in charge of construction, general master mechanic, general superintendent Tramways. He was then in consulting practice for two years before going to Monterey, Mexico, as manager of the Venezuela Power Consolidated, steam power plant construction. Returning in 1930, he practiced as a consulting engineer again for two years before becoming a Member of the Nova Scotia Board of Commissioners of Public Utilities. He remained with the Board of Commissioners until March, 1947, when he received the appointment to his present position. Mr. Macnab was a member of Cumberland County Municipal Council in 1932-35. He was chairman of the Civic Planning Commission which prepared the new master plan for the city of Halifax, and is on the Board of Governors of Nova Scotia Technical College.

Mr. Macnab was Councillor of the Institute representing the Halifax Branch in 1939-40. He is vice-president of the Association of Professional Engineers of Nova Scotia. He joined the Institute as a Member in 1919.

S. H. Frame, M.E.I.C., has been elected councillor of the Institute representing the Victoria Branch.

Born in Colchester County, N.S., he studied at Dalhousie University and at McGill, Montreal. He began his engineering career with the Grand Trunk Pacific Railway. He was with the railway for ten years, latterly as resident engineer on construction. This was followed by a short period in Southern Alberta with the Federal Government Hydrometric Surveys. After a few years in municipal engineering with the City

Photo by Ken, Victoria

S. H. Frame, M.E.I.C.

of Calgary he was appointed, in 1918, as assistant engineer on the Canadian Pacific Railway's large irrigation scheme east of Calgary. After ten years on irrigation, in 1928 he became hydraulic engineer on water power investigation for the Department of Lands and Forests of the Province of British Columbia, at Victoria, which position he filled until his retirement in May 1947. He had completed then forty-four years in engineering.

He is a Member of the American Geophysical Union in the Hydrology Section and an Associate Member of the American Society of Civil Engineers. At the beginning of 1948 he was made a Life Member of the Association of Professional Engineers of British Columbia, and also a Life Member of the Engineering Institute.

He joined the Institute as a Student in 1903, becoming an Associate Member in 1911 and a Member in 1936. He served the Victoria Branch as secretary-treasurer for the past year.

R. S. Lawrence, M.E.I.C., has been elected councillor of the Institute, representing the Lethbridge Branch.

He was born at Sydenham, London, England. He studied at the Crystal Palace Engineering School and gained admission to the Institution of Civil Engineers, London, England. He travelled to Angola, Portuguese West Africa in 1909 and was assistant engineer on survey for the Benguella Railway Company. In 1911 he proceeded to Venezuela, South America, where he was assistant engineer for the Bolivar Railway Company, for a year. In Canada from 1913 to 1915 he was surveyor and draughtsman for the City of Calgary, when he enlisted in C.E.F. serving as a lieutenant until 1917. He entered the employ of Canadian Pacific Railway as assistant engineer in the Department of Natural Resources at Lethbridge, Alberta, in 1917 and remained with the firm in the Irrigation Office at Lethbridge until April 1946. With the Alberta Government, Department of Water Resources, Mr. Lawrence is now Superintendent of the northern division of the St. Mary and Milk River Development, Lethbridge.

Mr. Lawrence, who was chairman of the Lethbridge Branch in 1946, joined the Institute as an Associate Member in 1920, transferring to Member in 1940.

R. S. Lawrence, M.E.I.C.

K. W. Mitchell, M.E.I.C., is the newly-elected councillor of the Institute representing the Calgary Branch.

He was born in Edmonton, Alberta, and educated in Calgary public and high schools. He graduated in 1934 from Queen's University with the degree of bachelor of science in civil engineering. He worked for the Ontario Department of Highways for a brief period and then returned to the West, entering the employ of the Canadian Western Natural Gas Company Limited, in Calgary, Alberta, in the fall of 1934 as a junior engineer. He is at present the distribution engineer of that Company, in charge of maintenance, construction and operation of natural gas distribution plants in Calgary and adjacent towns. He is also in charge of all new building operations, as well as maintenance of existing buildings of the Company.

Mr. Mitchell joined the Institute in 1938 as an Associate Member, transferring to Member in 1940. He was secretary-treasurer of the Calgary Branch for two years, and acted as member of the Executive Committee on another occasion, as well as serving on various committees from time to time. He is a member of the Association of Professional Engineers of Alberta, and of the Executive of the Southern Alberta Division of the Navy League of Canada. He is on the board of directors of the Probus Club.

K. W. Mitchell, M.E.I.C.

R. W. Dunlop, M.E.I.C., who has been elected councillor of the Institute representing the Sarnia Branch, was born at Hamilton, Ont.

He received his elementary education in Calgary. The first two years of undergraduate work were done in the University of Alberta, after which he transferred to the University of Toronto and graduated in mechanical engineering in 1927. He returned to Calgary, joining the Imperial Oil Limited, Calgary Refinery. Since then, he has been continuously with Imperial Oil Limited in engineering work, excepting for the period from 1943 to 1946, when he was mechanical superintendent with the St. Clair Processing Corporation in Sarnia, an Imperial subsidiary which operated part of the synthetic rubber plant. On returning from this work, he became group supervisor for construction engineering in the Engineering and Development Division of the Manufacturing Department.

Mr. Dunlop joined the Institute as a Junior in 1928, transferring to Associate Member in 1936, and to Member in 1940.

D. M. Stephens, M.E.I.C., who has been re-elected as councillor of the Institute representing the Winnipeg Branch, is Deputy Minister of Mines and Resources for the province of Manitoba.

D. M. Stephens, M.E.I.C.

Born near Reston, Man., he graduated from the University of Manitoba with the degree of B.Sc. in civil engineering. During 1929-30 he was engaged on topographic, reconnaissance and control surveys in the Churchill river area for the Topographic Surveys Branch, Dominion Department of the Interior. For the next two years he did similar work with the newly organized Department of Mines and Natural Resources, Province of Manitoba. In 1933 he joined the permanent staff of that Department as a technical draughtsman and was subsequently promoted to the position of office engineer in charge of design. After five years with the Department he was granted leave of absence to do other special work, but in 1938 was recalled by the Department and appointed Deputy Minister of Mines and Resources, Province of Manitoba.

R. W. Dunlop, M.E.I.C.

P. E. Buss, M.E.I.C.

Mr. Stephens joined the Institute as a Junior in 1934, transferring to Associate Member in 1935. He became a Member in 1940. He was chairman of the Winnipeg Branch in 1942.

P. E. Buss, M.E.I.C., has been re-elected councillor of the Institute representing the Niagara Peninsula Branch.

Born at Three Rivers, Mich., he received his engineering education at the University of Michigan. During World War I, he served with the United States Army Engineers in France. Mr. Buss was employed on the engineering staff of Provincial Paper Limited on construction of the first sulphate plant at the head of the lakes at Port Arthur, Ont. He later worked on the engineering staff of Dominion Engineering Works, and for a number of years was plant engineer at the Thorold division of Provincial Paper Limited. During 1932-33 he and his brothers carried on experiments in developing the new process for producing rock wool by the spinning method.

Photo by Hubert Beckett
W. A. T. Gilmour, M.E.I.C.

He is now president of Spun Rock Wools Limited at Thorold.

Mr. Buss joined the Institute as an Associate Member in 1927, becoming a Member in 1940. He served as secretary-treasurer in 1931 and as chairman in 1935, of the Niagara Peninsula Branch.

W. A. T. Gilmour, M.E.I.C., newly elected councillor of the Institute representing the Hamilton Branch, is secretary-treasurer and chief engineer of the Smart-Turner Machine Company Limited of that city.

He was born at Hamilton, Ont. He attended McGill University, graduating in 1925 with the degree of B.Sc., mechanical and winning the British Association Medal for applied science. The following year he received a B.Sc. in Electrical Engineering. He joined the staff of The Smart-Turner Machine Co. Limited in 1926 and he was later appointed secretary-treasurer and chief engineer. He served in the Royal Canadian Engineers (Reserve) Hamilton, from 1943 to 1946. He is on the Board of Governors of Appleby College, Oakville, Ont., and is president of the Amity Association of Hamilton.

Mr. Gilmour joined the Institute as a Student in 1924, transferring to Junior in 1930, to Associate Member in 1936 and to Member in 1940.

E. A. Cross, M.E.I.C., newly elected councillor of the Institute for the Toronto Branch, was born at Petersfield, Hants, England.

He attended Birmingham University, graduating in 1909 with the degree of B.Sc. (civil engineering). In 1920 he became associated with Birmingham Canal Navigations, England, as assistant engineer and in 1917, after two years with the Royal Engineers in France, he became research engineer at the Royal Arsenal, Woolwich, England. He returned to Birmingham Canal Navigations as chief assistant engineer in 1919, remaining until 1920.

Photo by Randolph Macdonald, Toronto
E. A. Cross, M.E.I.C.

In the United States in the subsequent two years, Mr. Cross was superintendent of construction for W. L. Stoddart, architect, New York City, on such projects as the Mica Insulating Factory, Schenectady, N.Y., Hotel Sheraton, High Point, N.C. and the Lycoming Hotel, Williamsport, Pa. He then accepted the position of structural engineer for Albert Kahn, Detroit, Mich., remaining until 1927 when he associated himself with Chapman and Oxley, Toronto, as structural engineer. In 1930, Mr. Cross established his private practice as consulting structural engineer in Toronto.

Joining the Institute as an Associate Member in 1925, he transferred to Member in 1935.

L. R. Brown, M.E.I.C., the newly elected councillor of the Institute representing the Sault Ste. Marie Branch, is a contractor in that city.

He was born at Delhi, Ont. He graduated with the degree of B.A. Sc. in 1915 from Toronto University. After some years spent with Algoma Steel Corporation and its associated industries, he became city engineer, Sault Ste. Marie. He remained in that position from 1921 to 1926. Then he became construction engineer Newfoundland Power & Paper Company, Corner Brook. From 1928 to the present he has been engaged in a private capacity in the construction business, since 1934 under the name of L. R. Brown & Co. Limited, general contractors.

Mr. Brown joined the Institute as a Student in 1914, transferring to Associate Member in 1917, and to Member in 1940.

G. R. Turner, M.E.I.C.

Major-General G. R. Turner, who has been elected Councillor of the Institute representing the Ottawa Branch, was born at Four Falls, N.B. and was educated in that province.

He was engaged on railway construction for several years and enlisted in the Engineers at the outbreak of war in August 1914. He had attained the rank of Major by 1918 and had been mentioned in dispatches and awarded the Distinguished Conduct Medal and the Military Cross and bar. In 1920 he was appointed to the R.C.E. (Permanent Force) with the rank of captain and attended the School of Military Engineering, Chatham, England for two years. Returning to Canada, he became instructor in military engineering at Royal Military College, Kingston. He later attended the Staff College at Quetta, India, for two years and in 1927 was appointed district engineer officer at Winnipeg, Man. Two years later he was made Assistant Director of Engineer Service, National Defence Head-

Photo by Salmon Studios, Montreal

Drummond Giles, M.E.I.C.

quarters, Ottawa, with the rank of major and from 1933 to 1937 he served in the General Staff and M.G.O. Branches at N.D.H.Q. Ottawa with the rank of lieutenant-colonel. In 1938 he attended the Imperial Defence College, London, England for a year and on his return was appointed General Staff Officer, grade 1, at M.D. No. 11, Victoria, B.C. His service also included periods of duty at Halifax, St. John, N.B., Quebec and Toronto on Engineer Works.

At the outbreak of World War II he went overseas as General Staff Officer, grade 1, with the 1st Division. On formation of the Canadian Corps in 1940, he was appointed deputy adjutant and quartermaster general of the corps with the rank of brigadier, and on formation of the First Canadian Army of 1942, he received a similar appointment there with the rank of major-general. He was made a Companion of the Most Honourable Order of the Bath in 1943. Returning from overseas service in 1944, he was loaned for several months to the Department of Veterans Affairs as Special Assistant to the Deputy Minister for work on accommodation projects. In 1945 he was made Inspector General of the Army in Western Canada with headquarters in Calgary and, having reached the age limit for service in the postwar Army, was retired in 1946.

Maj.-Gen. Turner joined the Institute as a Student in 1914, tranferring to Junior a year later. He became an Associate Member in 1920 and a Member in 1940. He is past chairman of the Ottawa Branch. Major-Gen. Turner is president of the Ottawa Branch of the Military Engineers Association of Canada.

Drummond Giles, M.E.I.C., has been elected to represent the Cornwall Branch on the Council of the Institute.

A Montrealer by birth, Mr. Giles is executive vice-president of Courtaulds (Canada) Limited, Cornwall. He is a graduate of McGill University, Montreal, having received a B.Sc. degree in 1927. He joined Canadian SKF Limited that year as an engineer at Montreal. He transferred to Toronto two years later as assistant chief engineer, and was made chief engineer in 1930. In Montreal, he was district manager for the Company from 1932 to 1938, and he was then named vice-president. He joined Courtauld's (Canada) Limited, Cornwall, in 1944, relinquishing his post as special assistant to the co-ordinator of production in the Department of Munitions and Supply, Ottawa.

J. M. Crawford, M.E.I.C.

Mr. Giles joined the Institute as a Junior in 1929, transferring to Member, in 1939. He had already held the office of Councillor for the Cornwall Branch since November 1947, completing the term of the late Baron de Hueck.

A. L. Malby, M.E.I.C., has been elected councillor of the Institute representing the Peterborough Branch.

He is from London, England, but received his education at St. Johns Technical High School, Manitoba, and graduated as a bachelor of science in electrical engineering from the University of Manitoba in 1934. Upon graduation he joined the staff of the Canadian General Electric Company Limited, at Peterborough, Ont. For one year he followed the company's test course. He then transferred to the Engineering Service Department, remaining six months. From 1935 to 1942 he was assistant engineer in the Industrial Control Engineering Division. In 1942 he was appointed senior assistant engineer of the Division, and has recently been named division engineer.

Mr. Malby joined the Institute in 1936 as a Junior, transferring to Member in 1942. Recipient in 1941 of the John Galbraith Prize of the Institute, he is a past secretary-treasurer of the Peterborough Branch.

H. F. Finnemore, M.E.I.C.

J. M. Crawford, M.E.I.C., is one of the new Councillors of the Institute representing the Montreal Branch.

He was born at Howick, Que., and holds B.Sc. and M.Eng. degrees from McGill University, Montreal, the latter received in 1932. He demonstrated in the electrical engineering department of the university during the 1929-30 session, and then entered the Shawinigan Water and Power Company, Montreal. He was assistant electrical engineer in 1943, and since 1945 he has been assistant superintendent of the engineering division of the Operating Department of the Company.

Mr. Crawford, immediate past-chairman of the Montreal Branch joined the Institute as a Student in 1928. He transferred to Associate Member in 1935, to Member in 1940.

H. F. Finnemore, M.E.I.C., has been elected as one of the new councillors of the Institute, representing the Montreal Branch.

He was born in Chicago, Ill., but studied engineering in Canada. Graduating from Queen's University with a B.Sc. degree, he enlisted in the First World War with the Canadian Engineers at Kingston, Ont., in 1914. On demobilization in 1918, he joined the Canadian Government Railways at Moncton, N.B., as a draughtsman in the electrical engineering department. Five years later he became assistant electrical engineer in the Canadian National Railways mechanical department at Montreal, and, in 1938, electrical engineer. He was appointed assistant chief

A. L. Malby, M.E.I.C.

electrical engineer in 1943, and chief electrical engineer in May 1945. Mr. Finnemore also has been actively engaged in the development of electric motive power and installations and the introduction of air-conditioning on the Canadian National passenger equipment.

Mr. Finnemore joined the Institute as an Associate Member, in 1921, transferring to Member in 1940. He has served the Institute for several years on the Library and House Committee.

E. D. Gray-Donald, M.E.I.C., is the newly elected councillor of the Institute representing the Quebec Branch. He is chief engineer, Quebec Power Company and Quebec Railway, Light and Power Company.

Born in Amoy, China, in 1900 he was educated at George Watson's College, Edinburgh, Scotland, McGill University, Montreal and Laval University, Quebec, obtaining the degree of B.Sc. (Elect.) at McGill in 1926, and that of M.Sc. at Laval in 1934. He entered the service of the Quebec Power Company and Quebec Railway, Light & Power Company in 1926 as assistant engineer, and his subsequent appointments have been as follows: 1928—assistant superintendent, Power Division; 1930—superintendent, Power Division; 1937—assistant general superintendent; 1938—general superintendent; 1942—chief engineer.

Mr. Gray-Donald joined the Institute as a Student in 1922 and he was transferred to Junior in 1926. He was made an Associate Member in 1934 and was transferred to Member in 1939. Mr. Gray-Donald is president of the Canadian Transit Association, to which post he was elected in 1946, and he is also vice-president of the Canadian Electrical Association, to which position he was elected in 1947.

W. C. MacDonald, M.E.I.C., has been elected as councillor of the Institute representing the Moncton Branch.

Born in Shelburne, N.S., where he received his early education, he studied engineering at St. Francis Xavier University, Antigonish, N.S., and Dalhousie University, Halifax, N.S. He worked first for the National Transcontinental Railway at Edmundston, N.B., as draughtsman, instrumentman and resident engineer. He then joined Canadian Pacific Railway and in 1912-1914 he was resident engineer in the Lake Superior District, Ontario. He came to Montreal in 1914 to a position as engineer for the Cook Construction Company on the Montreal Aqueduct. In 1916 he joined Kennedy and MacDonald Company to work as engineer and superintendent on construction of the St. John and Quebec Railway. From 1918 to 1925 he was an engineer for Bedford Construction Co. Ltd., on construction of Halifax Shipyards, St. John Dry Dock, and Jamaica Government Railway, Jamaica, B.W.I.

He then joined Anglin and Norcross Ltd., and was engineer on construction of the Singer Manufacturing Company plant and railway at Thurso, Que. From 1926 to 1929 Mr. MacDonald was secretary-treasurer in Montreal and in Jamaica, B.W.I., for La Société Générale de Ponts et Chaussées, Limitee, and then until 1937 he had a private practice in engineering and contracting in Kingston, Jamaica. He returned to New Brunswick that year and joined the Department of Public Works as highway engineer, and in 1940 he became resident engineer for the Department of Transport, engaged on surveys and construction of Airports in the Maritimes. At present he is district airway engineer at Moncton, N.B., for the Civil Aviation Division of the Department of Transport.

Mr. MacDonald joined the Institute as an Associate Member in 1919, transferring to Member in 1940.

C. D. Martin, M.E.I.C

W. C. MacDonald, M.E.I.C.

C. D. Martin, M.E.I.C., is the newly-elected Councillor of the Institute representing the Halifax Branch.

Born at Amherst, N.S., he graduated in electrical engineering from the Nova Scotia Technical College in 1938. He entered the services of the Halifax branch of the Northern Electric that year and has remained with the Company. He is Manager of Wire and Cable Sales and Overhead and Underground Sales for the Maritime District, which covers the Maritime provinces and Newfoundland.

Mr. Martin joined the Institute as a Student in 1938, transferring to Junior in 1941, and to Member in the same year. He was chairman of the Branch in 1946.

W. A. MacDonald, M.E.I.C., the newly-elected Councillor of the Institute representing the Cape Breton Branch, is an engineering graduate of Mount Allison University, Sackville, N.B., 1927, and of Nova Scotia Technical College, 1929.

Originally from Halifax, N.S., he worked for Northern Electric Company, in Montreal from 1929 to 1931. He was at first on a course with the Automatic Telephone Engineering Division and later he completed a plant course with the Technical Development department. In 1931 he joined the Provincial Highways Department of Nova Scotia. He did survey work, was an office engineer, and was finally in charge of a survey party on Cabot Trail area in Cape Breton. He left in 1934 to join the Dominion Steel and Coal Corporation, Sydney, N.S., as an assistant to the chief electrical engineer, with charge of field work and new construction projects.

Mr. MacDonald, a member of the Association of Professional Engineers of N.S., joined the Institute as an Associate Member in 1939. He became a Member in 1940.

W. A. MacDonald, M.E.I.C.

Photo by Rice, Montreal.

E. D. Gray-Donald, M.E.I.C.

Obituaries

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

James L. Tighe, M.E.I.C., of Holyoke, Mass., died in April, 1947, after a long and distinguished career as a consulting hydraulic engineer in Massachusetts.

He was born in Ireland in 1864. He studied in Canada, receiving the degree of B.A.Sc. from McGill University, Montreal, in 1892. He worked first in Holyoke, Mass., where he was assistant engineer of the city's Water Works. Later, as chief engineer, he proposed, designed and executed extensions to the water supply. He became city engineer of Holyoke, in addition to his previous appointment, in 1899. He was also consulting engineer to the County Commissioners of Hampden Co., Mass., from 1900, dealing with power and water supply dams. He advised individuals and corporations on water power development and water supply.

He remained in Holyoke, and was still in consulting engineering at the time of his death. He had held memberships in the American Society of Civil Engineers, the American Water Works Association, the American Public Health Association, and others. He became a Student member of the Institute in 1890, an Associate Member in 1900 and a Member in 1906. He was awarded Life Membership in 1947.

F. G. McPherson, M.E.I.C., passed away at his home in Bridgewater, N.S., on March 13, 1948. Born in Halifax, in 1881, he attended Dalhousie College for two years. On leaving, he was employed by the Provincial engineer in Nova Scotia as a draughtsman. Then he worked on the construction of the Halifax and South Western Railway. Following this

F. G. McPherson, M.E.I.C.

he had a contract for a railway in Ontario, and from there he went to British Columbia and worked from 1909 to 1914 as resident engineer for MacKenzie and Mann in railway construction. Later he was called east. There he made a survey of the Guysborough Railway, and he was later employed as engineer with the Halifax Harbour Commission. He also spent some time as resident engineer during the construction of the cold storage plants, before being employed by the Department of Highways for several years as engineer for Lunenberg County. He surveyed and was in charge of construction of the Bedford Highway.

Mr. McPherson joined the Institute as an Associate Member in 1907, and transferred to Member in 1940.

Charles Flint, M.E.I.C., who was superintendent of construction in the Department of Transport Air Service, for the past year, died in Ottawa on April 13, 1947.

He was born in Toronto in 1888, and graduated from the School of Practical Science of University of Toronto in 1910. He served with the C.P.R. at Winnipeg as assistant engineer and locating engineer—and at Edmonton, Alta., as resident engineer, maintenance—before joining the Canadian Army. He served four years, returning with the rank of major and decorated with the D.S.O., the Military Cross and the Croix de Guerre. He returned then to C.P.R. at Winnipeg, as assistant engineer. In 1927 he became president of the firm of Duff, Flint and Co., engineers and contractors, and he remained in the consulting firm in Winnipeg for a number of years. From 1941 he was with McNamara Construction Co. Ltd., in Toronto, until 1946, when he was supervisor of veterans placements in Ontario for the Department of Labor, with headquarters in Toronto. He joined the Department of Transport Air Services Branch at Ottawa in 1947.

Mr. Flint joined the Institute in 1909 as a Student. He transferred to Associate Member in 1912 and to Member in 1920.

W. H. G. Flay, M.E.I.C., who was branch manager of Dominion Structural Steel Limited, Ottawa, died at his home in Ottawa on March 16, 1948.

He was born at Exeter, England, in 1885. He received his education there and graduated as a civil engineer. He came to Canada about thirty years ago, and was first employed by the Canadian Pacific Railway in Montreal. He went to Dominion Bridge Company, Lachine, Que., in 1913, and the next year to Imperial Munitions Board, Ottawa, where he was a draughtsman. In 1919 he joined Canadian Nickel Corporation, Deschenes, Que., as a draughtsman. From 1920 he was a structural engineer for the Ottawa School Board, designing reinforced concrete for several buildings, until 1923. Joining Dominion Structural Steel Limited, Ottawa, then, he was manager and director of the Ottawa and District Office at the time of his death.

Mr. Flay joined the Institute as an Associate Member in 1921, transferring to Member in 1940. He was also a member of the Association of Professional Engineers of Ontario.

William Burns, M.E.I.C., of Winnipeg, Man., retired C.N.R. construction engineer, after an active career in railway development in Western Canada, died at Winnipeg on March 27, 1948.

Mr. Burns was born in 1860, at Renfrew, Ont., and began his railway construction career in 1879 on surveys for the Canada Central Railway west from Pembroke, Ont. A few years later, he travelled west as far as Fort McLeod and south to the mining fields of South Dakota. In 1883 he returned to the new Canadian Pacific Railway and continued on location and construction for that Company, largely in the east, until the Crows Nest Pass Railway was begun, when he was entrusted with much of the exploration and location of its most difficult stretches.

In January, 1899, Mr. Burns joined the engineering staff of MacKenzie Mann and Co. on the active construction of the Ontario and Rainy River Railway west from Port Arthur. In the following two years, he continued survey and construction operations in the northern portions of Manitoba and Saskatchewan. By this time the Canadian Northern plans were being laid for a transcontinental road, and Mr. Burns was commissioned to report on the possibilities of routes through the northern passes of the Rocky Mountains.

In the space of one year, thousands of square miles of Western Canada's vast territory were explored for the first time by an experienced railroad engineer. His reports recommended the Yellowhead Pass as the most favourable for a western outlet through the Rocky Mountains, and Fort Churchill as the best port for the terminus of a railway to Hudson Bay. The Canadian Northern main line surveys westerly were completed under his personal direction three years later to the Yellowhead Pass, and the same year the Grand Trunk Pacific, after extensive surveys on other routes, confirmed Mr. Burns' early findings by deciding to use the Yellowhead Pass jointly with the Canadian Northern for a Pacific outlet through the Mountains. The extension to Hudson Bay was later taken over by the Dominion Government and once more the recommendations contained in Mr. Burns' early reports were confirmed, when in 1927 it was finally decided to make Churchill the terminus of the Hudson Bay Railway.

During the next ten years, 1904-14, an extensive branch line programme was undertaken and completed by the Canadian Northern Railway, and Mr. Burns was actively engaged in the field on location and construction of these. In 1918, when the Canadian Northern and the Grand Trunk Pacific were amalgamated into the Canadian National Railways, Mr. Burns was appointed engineer of construction with headquarters at Winnipeg.

Mr. Burns joined the Institute as an Associate Member in 1890, becoming a Member in 1902. He attained Life Membership in 1932, the year in which he retired from railroading.

Andrew R. MacGowan, M.E.I.C., of Seatrain Line, New York City, died in hospital at New Caanan, Conn., on February 22, 1948. He had been superintendent for Seatrain Line in New York for the past several years.

He was born in 1883 in Moncton, N.B. He was educated there and graduated in civil engineering, then becoming a member of the staff of the chief engineer of Intercolonial Railway, Moncton. Later he was advanced to the post of superintendent of the National Transcontinental Division of the railways with headquarters in Edmundston and occupied that position until he resigned in 1916 to accept a superintendency with the Delaware and Hudson Company at Albany, N.Y. He served with the D. and H. until his association with the Seatrain Line commenced some years ago.

Mr. MacGowan joined the Institute in 1903 as a Student. He transferred to Associate Member in 1909 and to Member in 1940. He attained Life Membership in 1947.

Otis Weeks, M.E.I.C., of Ogden, Utah, died in hospital there on January 7th, 1948. Mr. Weeks had been retired for several years from the position of division engineer at Salt Lake for Southern Pacific Railroad.

Mr. Weeks was born in 1875 at Wakefield, Mass. He studied civil engineering at University of Nebraska, receiving the degree of B.S. in 1895. He went to work that year for the Boston and Maine railroad as a section labourer and when he left the company in 1897 he was a foreman. He served as assistant roadmaster for the Maine Central at Bangor, Me., from 1897 to 1900; roadmaster for the Union Pacific at Junction City, Kan., at Oakley, Kan., and Kansas City, from 1899 to 1905; division engineer for the Union Pacific at Denver from 1905 to 1907. He was in Canada as track engineer for the Grand Trunk Pacific from 1907 to 1908, at Portage la Prairie, Man.

In 1908, he became an employee of Utah Copper Company mine in Bingham Canyon as level foreman and soon rose to general foreman of the surface workings. In 1911 he returned to railroading, this time as general foreman for the Southern Pacific at Suisun, Calif., and later as assistant engineer. In 1912 he went to Stockton, Calif., as division engineer, and in 1913 he became division engineer in Ogden. He retired in 1940.

He served in France during World War I as first lieutenant with the 48th engineers.

Mr. Weeks joined the Institute in 1907 as an Associate Member, transferring to Member in 1940. He attained Life Membership in 1947.

NEWS of the BRANCHES

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented at their meetings

Calgary

J. F. Langston, M.E.I.C.
Secretary-Treasurer

T. M. Parry, M.E.I.C.
Branch News Editor

The last regular meeting of the season was held on Thursday, March 4, at 8.00 p.m. in the Palliser Hotel, with Chairman M. W. Jennings presiding.

After the reading and adoption of the minutes of the previous meeting, time was given by the chairman for some discussion and enquiries concerning the annual general meeting of the Institute to be held in Banff in June.

The speaker of the evening was R. H. Wray, Jr.E.I.C., electrical engineer for the Calgary Transit System, whose paper dealt with the subject **Trolley Coach Operation and Overhead Construction.** He discussed the mechanical and operating principles of Calgary's new trolley coaches which have been in operation here since last summer, giving his hearers an interesting outline of the overhead facilities which must be made available before the coaches can operate.

Positive and negative wires have to be strung overhead so that two parallel trolley wires instead of the customary single one for the street car, have to be provided. Power at 600 volts is supplied by feeder lines, with 400 volts minimum at end of the line. The two lines are 24 inches apart with the nearer (negative) wire 12 feet from the curb in this city. The wire is supported in spans not exceeding 100 feet and sag not over 3 inches. Special fixtures provide a smooth path on curves and intersections.

The vehicles are Canadian Car-Brill trolley coaches, manufactured in Canada at Fort William.The coach is driven by a single, 600-volt, compound-wound, D.C. motor of 140 horse-power, located behind the rear axle. This motor is directly connected by a short propeller shaft to the rear axle which, through double reduction gears, gives a ratio of 11.42 to 1. Operation of the coach is controlled by two foot-pedals—one power pedal and a brake pedal to the left of it. Maximum speed is rated at 43 miles per hour.

After answering many questions put to him by his hearers, Mr. Wray was the recipient of a hearty vote of thanks, moved by F. K. Beach. The meeting, attended by 45 members and 18 guests, was adjourned at 10.10 p.m.

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The annual meeting of the Calgary branch was held at 4.00 p.m. on Saturday, March 13, in the Palliser Hotel, with retiring Chairman M. W. Jennings presiding.

The meeting opened with the reading of the minutes of the last annual meeting and their adoption. The chairman announced that H. R. Younger had been awarded Life Membership in the Institute. Mr. Younger rose to acknowledge this honor. Also announced was the award to P. M. Sauder of the Julian C. Smith medal for achievement in the development of Canada, the official presentation to be at the annual meeting of the Institute in Banff next June.

Mr. Jennings expressed the appreciation of the chair to all committee chairmen and members for their efficiency and co-operation during the branch year.

Some lengthy discussion took place on the coming visit of the President, and the annual meeting at Banff. Discussion centred around the programme, ways and means of expressing a real western welcome to visiting members, and the place and responsibility of the Calgary branch in the general arrangements.

The retiring chairman then introduced the new officers and executive for 1948-49. S. G. Coultis moved a vote of thanks to the retiring executive.

The incoming chairman, R. T. Hollies thanked the Branch for the honor bestowed upon him and spoke with confidence of the outlook for a busy and interesting year.

The meeting adjourned at 5.35 p.m.

Cornwall

G. G. M. Eastwood, M.E.I.C.
Secretary-Treasurer

T. B. Webster, Jr.E.I.C.
Branch News Editor

The last general meeting of the winter season was held on April 20 when an illustrated lecture **Fluid Drives in Industry** was presented by R. R. Noyes.

In the short business meeting preceding the lecture, R. H. Wallace, branch chairman, reviewed the work of the executive and called on W. P. Nesbitt, chairman of the newly-formed Civic Affairs Committee for a report of its activities. Mr. Nesbitt outlined

Above—D. Ross-Ross, past chairman of the Cornwall Branch; President L. F. Grant; R. H. Wallace, branch chairman; and General Secretary L. Austin Wright. The photo was taken at the banquet of March 16 at Cornwall, which was described in the April *Journal.*

the formation of the committee, its objectives and its current projects.

H. E. Meadd introduced Mr. Noyes who is the Montreal manager of the Canadian Sirocco Company. Mr. Noyes related the history of fluid drives from their application 30 years ago in Germany on marine installations and their adoption on this continent 15 years ago. The speaker showed lantern slides that indicated the action of the basic unit consisting of impeller, fluid vortex and runner.

The drives are of two types—constant speed or variable speed and are used for cushioning shock loads, minimizing motor starting load and obtaining stepless speed variation. Speed range variations up to five to one are obtainable and various methods of control may be employed to suit each application.

Successful installations have been made on textile spinning machines, boiler house fans, feed water pumps and conveyor drives. Mr. Noyes indicated that in some cases power savings realized were sufficient to pay for the fluid drive in three or four years.

The speaker was thanked by Mr. L. Snelgrove at the conclusion of an open discussion.

Edmonton

W. W. Preston, jr.e.i.c.
Secretary-Treasurer

A quick trip along the fourteen hundred miles of the Alaska Highway from Dawson Creek to Fairbanks by means of colour photography, and a running commentary on **Problems Encountered on the Alasko Highway** were assignments handled by Lt.-Col. J. R. B. Jones, D.S.O., O.B.E., senior engineer officer at Western Command when he addressed a joint dinner meeting of the Edmonton Branches of the Engineering Institute of Canada and the Military Engineers' Association of Canada, on April 6, in Merrick's Embassy Room.

Colonel Jones reviewed the highlights of the Highway's history, showing how, at the transfer of the portion of the road between Dawson Creek and the Alaska-Canada border to Canada, in April, 1946, maintenance of the Alaska Highway became a problem of Canadian Army Engineers.

He described the Highway from Dawson Creek to its northern end. Haste in building the road made it necessary to correct many curves, grades, culverts and bridges. Many permanent bridges have been built but many are of a temporary nature and must be replaced. Flash floods, rising thirty feet overnight or carrying fallen trees to the abutments of bridges, keep maintenance workers on the alert. Drainage and construction in cold weather, permafrost, and the operation of machinery present difficulties. Maintenance crews give twenty-four hour service on snow removal from the Highway. For contrast the speaker showed pictures of large colourful flowers grown during the long days at Whitehorse. Another shot showed an experimental farm along the Highway.

Because of the isolated location of the Highway, the army must supply all kinds of services. The organization is divided into operational and administration wings. Under the former, there are eighteen highway maintenance camps, spaced about seventy miles apart, each made up of five to ten families. The crews are largely civilian, but operate under Army engineers. The administrative wing handles buildings and utilities. The power house at Whitehorse, the home of the Army Headquarters, supplies 19,000 k.w.h. per day and 19 million gallons of water per month. The Army Medical Corps operates a fifty-bed hospital for the civilian and military population, and there is a dental clinic. A work shop at Fort Nelson and one at Whitehorse are run by the Royal Electrical and Mechanical Engineers. The Ordinance Corps supplies such things as spare parts and furnishings. The Army Service Corps looks after food rations and ground freight.

The E.I.C. branch chairman, J. E. Cranswick, opened the meeting and then vacated the chair in favour of Lt.-Col. P. L. Debney, m.e.i.c., chairman of the recently formed local branch of the M.E.A.C. Col. Debney introduced Col. Jones. At the conclusion of a discussion period, Capt. R. H. Nicholson, secretary-treasurer of the M.E.A.C. proposed a hearty vote of thanks, which was well applauded. Among the visitors to the joint meeting was Col. H. L. Meuser, director of engineering for the Canadian Army. Attendance was eighty-five.

Kootenay

E. B. Broadhurst
Secretary-Treasurer

A meeting of the Kootenay Branch was held on March 10, with an attendance of 31 members and guests.

The highlight of this meeting was an address by E. W. Henderson of the English Electric Company, whose topic was **Factors Affecting the Design of Electric Motors.**

Using slides to illustrate developments in motor design, Mr. Henderson traced the history of the electric motor back to Tesla in 1888. He pointed out that as Edison in later years had to develop the vacuum pump to carry on his work, the most important phase of Tesla's work with electric motors was the development of polyphase distribution.

The first demonstration of power transmission was made in 1891, by Swiss engineers, by means of Tesla's system at 30,000 volts. The first induction motors were not of squirrel cage type, but were wound rotors.

The speaker made some very interesting comparisons of the horsepower, diameter, and weight of the motor in various stages of development, as follows:

1888 Tesla's motor	5 hp	30″ dia.	1000 lbs.
1897	5 hp	21″ dia.	640 lbs.
1905	5 hp	15″ dia.	210 lbs.
1930	5 hp	13″ dia.	147 lbs.
1948	5 hp	11⅜″ dia.	135 lbs.

Mr. Henderson remarked that manufacturers are inclined to improve their product in performance, economy of manufacture, and appearance or sales appeal. Modern research, the advent of welding and new and better materials have all contributed to a better product. No one man or company is responsible for today's designs. The progress made has been the outgrowth of experience to which all designers have contributed.

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A luncheon meeting was held on Wednesday, April 21, 1948 with 36 members and visitors in attendance.

The meeting was highlighted by an address by Claire White of the Consolidated Mining and Smelting Co. Ltd., Mines Department, whose topic **Bulk Petrol Supply**, was extremely interesting. Mr. White described events leading up to the development of petrol pumping for supplying the Allied armies invading France. Extensive surveys and experiments were carried out before the operation familiarly known as " Pluto ", was commenced.

His description of pumping, pipe laying and the amounts of materials handled were of great interest to members who engage in peacetime engineering.

Following the address a business meeting was held to discuss the coming visit of the President and General Secretary.

Montreal

The Branch would like to take this opportunity of congratulating: **J. B. Stirling,** m.e.i.c., on his recent election as president of the corporation of Professional Engineers of Quebec; **W. A. Mather,** m.e.i.c., on his recent election as president of the Canadian Pacific Railway; **N. R. Crump,** m.e.i.c., on his recent election as vice-president of the Canadian Pacific Railway in Montreal.

Members are reminded of the Chemical and Industrial Exhibit of the Chemical Institute of Canada which is to be held during the Institute's Convention in Montreal. This exhibit will be shown in Cardy Hall in the Mount Royal

Hotel on Monday, June 7, from 12.00 noon to 10.00 p.m.; Tuesday, June 8, from 10.00 a.m. to 10.00 p.m.; and on Wednesday, June 9, from 10,00 a.m. to 6.00 p.m. Notice of this event was mailed to members early in May and it is not the intention to send out any further notice.

Replies to the Questionnaire indicate the desire on the part of some members for Paper Nights in addition to the usual Thursday Nights, as well as for Papers on non-technical subjects. In response to this request, additional publicity will be given to the Programme of the Junior Section whose meetings are open to all members. The Junior Section has in the past arranged excellent papers and it is hoped that they will receive greater support in the future.

It is planned to hold the opening meeting of the Autumn Session on September 30. It is hoped to repeat the success of last year's meeting by holding it away from Headquarters where the space is insufficient to take care of the large attendance. An attempt will be made to have President-elect, Dean J. N. Finlayson attend.

It is planned to have on October 7th an exhibit consisting of 21 panels of the work of Mr. Robert Maillart, a famous Swiss engineer, on reinforced concrete bridges. J. F. Brett, M.E.I.C., will discuss this work. The exhibit will be on display for about 5 days so that Members and others interested may view it at their leisure. The Branch is indebted to the Canada Cement Company for generously offering to defray the expenses of bringing this exhibit to us.

The following papers were arranged for the first half of 1948 and are listed here for the benefit of interested persons or branches.

Jan. 8—Economical Design of Rural Power Systems — R. F. Quinn. Joint meeting with A.I.E.E.

Jan. 15—The Sperry Cars and Testing Rail in Track—J. W. Dickerson.

Jan. 22—The Weather in War and Peace—G. H. T. Kimble.

Jan. 29—Wage Incentives—J. Keith Louden.

Mar. 4 — 84 in. Drain — Prestressed Concrete Pressure Pipe—R. M. Doull, M.E.I.C.

Mar. 11—Planning Building and Operating Canada's International Shortwave Broadcasting Service — G. W. Olive, O.B.E., D. G. McKinstry, W. A. Nicols, R. D. Cahoon, J. E. Hayes. Joint meeting with I.R.E.

Mar. 18 — Design of Suspension Bridges with respect to Dynamic Wind Action—Dr. O. H. Ammann.

Apr. 1—Automatic Control for Steam Boilers and Industrial Processes—P. S. Dickey.

Apr. 8—Steam Turbine Electric Locomotive for Main Line Service—Charles Kerr Jr.

May 11 — Demonstration of Basic Control Principles—R. N. Pond. Joint meeting with Cdn. Pulp & Paper Co.

June 7—Exhibit of Chemical Institute of Canada.

Junior Section

On April 12, the Junior Section held a meeting to discuss next season's programme. The meeting was under the chairmanship of Paul Salvas.

After some discussion the following programme was tentatively set up.

1. Opening Night.
2. Mr. Maillart's Concrete Exhibits.
3. Fourth Annual Dance to be held in the Ritz-Carlton Hotel on November the 19th, 1948.
4. Ladies Film Night. On this occasion the wives and lady friends of the full membership will be the guests of the Junior Section.
5. An Oyster Party for the Montreal Membership.
6. Study Groups which will sponsor public speaking courses, etc.
7. A debate with each side being made up of a Member of the Senior Section and a Member of the Junior Section.

Items 5, 6 and 7, above, have not been finally decided upon but will probably form a part of next season's programme.

It will be noted that the Junior Section is following its past policy, in that a large proportion of its activities will be of a non-technical nature.

Ottawa

C. G. Biesenthal, M.E.I.C.
Secretary-Treasurer

R. C. Purser, M.E.I.C.
Branch News Editor

The Scientific Development of the North American Arctic was the subject of an address delivered at a noon luncheon before the Ottawa Branch on March 18. The speaker, W/C K. C. Maclure, A.F.C., director of Arctic Research, Defence Research Board, was introduced by Dr. J. J. Green, technical adviser, Air Transport Board. Branch Chairman J. L. Shearer presided.

North of Ottawa a distance of 2100 miles, stated Wing Commander Maclure, there is a small Canadian settlement inhabited by Canadians and Americans. It is the new weather station of Resolute Bay, Cornwallis Island. North of that 380 miles is another Canadian weather station, Eureka Sound, on Ellesmere Island, where four Canadians and four Americans have been living and working for the past year. The most northern coast of Canada reaches further north another 270 miles.

In other words, Cape Columbia, the northern tip of Canada lies over 2600 miles north of Ottawa, or about as far away as Vancouver. To reach Ellesmere Island by air would take about ten hours by fast modern aircraft, or about the time it takes to drive from Ottawa to London, Ontario.

Into this northern land the sudden surge of post-war exploration has been brought about by the long range aircraft. Long range flights, however, are not new, and the speaker traced the history of polar exploration by air from 1897—when Andree tried to reach the North Pole in a balloon from Spitzbergen—to the present day. The most remarkable flights were those of the Russians in 1937. In May of that year they landed on the ice at the North Pole, setting up a weather station, and observers remained there on the ice throughout the summer and following winter.

But it was not until the recent war that aircraft and instruments had de-

MONTREAL BRANCH VISITS DOMINION BRIDGE

On Saturday, May 1, a group of 125 members of the Montreal Branch visited the Lachine Plant of the Dominion Bridge Co. Ltd.

The centre of interest was the new boiler plant, with a peak capacity of 75,000 pounds of steam per hour. This installation will replace the original plant of six H.R.T. boilers which has a combined output of 30,000 p.p.h. The new installation consists of three Dominion Bridge water tube boilers, each with maximum continuous capacity of 23,000 p.p.h. Each boiler can be coal or oil fired. There is also a 4,600-p.p.h. auxiliary boiler.

Shown in the illustration are, among others—extreme right, Mark Bain, M.E.I.C., of the Dominion Bridge Co. Ltd.; second from right Robert White, M.E.I.C, chief engineer, Williams & Wilson Ltd., and immediately behind Mr. Bain is Frank Block, M.E.I.C., of the "Bridge" Company, his collaborator in the supervision of design of the new boilers.

veloped sufficiently for routine Arctic flying to be feasible for normal air crews. Long range aircraft, radar, and precision navigation instruments were the wartime developments that have proved most valuable for Arctic operations. Today, heavy aircraft can fly in almost any weather, anywhere in the Arctic, by day or by night. Nevertheless there are still many problems to be solved.

However, meteorological stations and flights are only one aspect of the present development of the North American Arctic. A great many other types of survey and research must be carried out if white people are to live more comfortably and work more efficiently in the north.

The weather stations give an excellent example of the international co-operation which can take place. Another good example is the Arctic Institute of North America, with offices in Montreal and New York. Canadian and American university men were spread all over the North American Arctic last summer, and will be again this year, on Arctic Institute projects.

Scientists are being required in increasing numbers to investigate and explore the Arctic. Behind them must come the engineers, the doctors, and administrators. Modern scientific methods must be employed, and the best technical qualifications are needed. But it is still a frontier, and it needs men with a pioneer spirit.

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At a noon luncheon, April 1, the story of the building of the Beaver class ships for Canada's merchant fleet was told by means of a motion picture produced by the C.P.R. The planning and building of a 10,000-ton freight ship on the Clyde river in Scotland was depicted. Included were scenes taken during the war when the merchant fleet was under constant attack by enemy planes.

Branch chairman J. L. Shearer presided. J. D. McNee, C.P.R. city passenger agent who arranged the showing of the film, was one of the guests at the head table.

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The Ottawa branch held a joint evening meeting with the local sub-section of the American Institute of Electrical Engineers on April 6 at the National Research Auditorium. Bruce R. Prentice, of the General Electric Company, Schenectady, N.Y., spoke on the **Development of Atomic Power**.

Mr. Prentice is assistant to H. A. Winne, vice-president in charge of engineering policy of the General Electric Company, in the general direction of the G-E Nucleonics Project. This project involves fundamental nuclear research, and the development of atomic power for constructive peace-time purposes.

Mr. Prentice dealt with the problem of utilizing the heat which is a by-product of the atomic pile, and converting it into electrical energy. Present barriers to the operation are purely technological and are expected to be solved through extensive research. He said his company expected to have an experimental power station in actual operation within three years.

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At a noon luncheon on April 15, J. L. E. Price, Montreal, spoke on the subject of **Housing**. Mr. Price is president of J. L. E. Price & Co., Ltd., and chairman of the management committee of the Canadian Construction Association. He was introduced by J. H. Irvine and thanked by R. F. Leggett.

Mr. Price could foresee no immediate cuts in the high cost of building commodities as demand still exceeds supply. Labour, too, is " still on the march " and further increases in wage rates may be expected. Delays in waiting for materials that are slow in coming also help to add to construction costs. He thought ways and means should be found to take more work into the shop where it can be handled by mechanization and by the most expert and dependable labour. The precutting and prefabrication of materials should help. The development of new materials might help too, but so far new materials in the way of light metals or plastics have not brought down costs. " Some day ", said Mr. Price, " we may see a man who will do for housing what Henry Ford did for the automobile ".

He referred to research now being done by the Department of Building Construction of the National Research Council. Toward this research construction interests should extend every possible assistance as we cannot expect the Government to do everything. The problem really will never be solved until every small builder once again will be building homes, preferably on a lump sum plan rather than a cost plus basis. He pointed out that two-thirds of the people requiring housing can only afford to pay from $20 to $40 a month on their dwellings.

More young men should be trained for the building trades. Of all our resources, manpower rates as No. 1. The destiny of Canada rests with them.

Junior Section

The Junior Section was inaugurated at the instigation of the Senior Section Executive during the fall of 1947.

On December 6, 1947, a tour was made through the City of Ottawa Purification Plant. The Ottawa establishment is the first known to successfully treat river water of this type to give clear pure water. After a talk by H. P. Stockwell, M.E.I.C., and Mr. Heeney, a guided tour was made, culminating in a demonstration of the cleaning or flushing technique of a sand filter bed.

A visit was paid to the Canadian International Paper Company plant on Saturday afternoon, January 17, 1948. After a short explanation, by G. D. Davidson, M.E.I.C., of the two processes used in preparing paper, conducted tours were made through the paper and fibre board plants.

The Combined Film and Constitution Discussion Night took place in the National Museum Hall on February 3, at 8 p.m. After the showing of National Film Board Talkies on: Smoke Control, Atomic Theory, Housing, Muskox Expedition, Fishing and Football; the meeting was thrown open for the reading and discussion of the proposed Junior Section Constitution.

On Saturday afternoon, February 14, the Junior Section visited the Hull plant of the Canada Cement Company. T. T. Truesdell and R. F. Haskett of the Company explained the general organization of the plant and the methods employed in the manufacture of Portland Cement.

The First Annual Senior and Junior Sections Joint Luncheon was held in the Chateau Laurier at 12.45 p.m. Thursday, March 4. The executive of the Junior Branch was introduced to the membership. The address by C. S. Parsons, chief of the Bureau of Mines, on **Practical Research** has already been summarized in the Senior Section News.

The Mechanical Engineering Division of the National Research Council of Canada was host to the Junior Section on Saturday afternoon, March 13. After a brief address by the division chief, J. H. Parkin, M.E.I.C., the Junior Section was conducted through each building by the head of the section.

The Junior Section Public Speaking Competition was held in the Auditorium of Carleton College on Wednesday evening, March 24. The contest was divided into two sections, student and graduate. The Student First Prize was won by Mr. Clyde Kennedy, S.E.I.C., of Carleton College on **The Smoke Survey at Trail, B.C.** Cliff Thompson, S.E.I.C., of Carleton College earned the Second Student Prize with **St. Lawrence Seaway Project. Construction Work at Bahrein** by John Watt, JR.E.I.C., won the Graduate First Prize while Lionel Peckover, JR.E.I.C., was awarded the Second Graduate Prize for **A Visit to the Brooklyn Battery Tunnel.** Four students and 8 graduate papers were heard by the Judges—R. F. Legget, M.E.I.C.; W. E. Wakefield, M.E.I.C.; and N. B. MacRostie, M.E.I.C. At the close of the speaking a short film " White Safari—on Expedition Muskox " was shown while the judges were making their decisions.

Peterborough

J. M. King, Jr.E.I.C.
Secretary-Treasurer
J. C. Allan, M.E.I.C.
Branch News Editor

Meteorology and Its Application to Engineering was the subject of an informative and entertaining address delivered to the Peterborough Branch on March 18 by W. J. Green.

The economic aspects of weather forecasting were outlined to show the importance of the subject and some of its unexpected ramifications. Particular reference was made to the use made of weather forecasting by power companies.

A number of standard weather charts for the day were circulated and something of the basis for prediction explained from them. The meaning of the charts and the organization back of them was also discussed.

New trends including the possibility of using dry ice to promote precipitation from clouds were also discussed.

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Tools for Dimensional Quality Control, was the subject of an address by O. H. Somers of the Standard Gage Co. Inc., Poughkeepsie, N.Y. About 70 members and guests including many inspectors and others interested in dimensional control from the local factories were present.

Mr. Somers' address dealt mainly with statistical methods and was illustrated by the use of several pieces of special equipment, including a Frequensonar.

Following the address there was an exceptionally lively question and answer period.

D. J. Emery thanked the speaker on behalf of the meeting.

Saguenay

J. E. Dyck, M.E.I.C.
Secretary-Treasurer

Research and Industrial Progress was the topic of an address given by G. E. Bourne to the Saguenay Branch of the Institute on April 1, 1948. Mr. Bourne is manager of the Special Products Section, Apparatus Division, Canadian General Electric Company, Toronto, Ont.

He pointed out that the value of research, as a means of introducing new products for manufacture was being realized more than ever, and he stated that governments and private industry have increased considerably their research facilities in recent years.

Mr. Bourne then went on to describe pieces of apparatus developed by C.G.E. in their laboratories, illustrating his descriptions with slides. Most of the apparatus illustrated was of the type used in industry for quick, accurate measurement of elements such as thickness of materials, vibration of machines, r.p.m. of machines, time intervals, color analysis, etc. The vibration indicators measure electrically the frequency and amplitude of vibration of a machine. Electric thickness gauges developed by his company measure down to .00005 in. Tachometers of the photoelectric type can record up to 60,000 r.p.m. Color analysers measure accurately the color intensity of textiles and have been used in grading such foods as tomatoes. Mr. Bourne discussed also the spectrometer, which determines the composition of any compound which can be gasified.

Concluding, Mr. Bourne showed slides illustrating how the research programme of his company began in a small building and has steadily developed into a large modern laboratory.

H. R. Fee thanked the speaker on behalf of the Branch.

Junior Section

F. H. Duffy, Jr.E.I.C.
Secretary-Treasurer

A meeting of the Junior Section, Saguenay Branch of the Engineering Institute of Canada was held at the Saguenay Inn at 8.15 p.m., Wednesday, April 21, 1948. W. A. Dayton, of the Aluminum Company of Canada, Limited, addressed the meeting on the subject of **The Course of Copper and Gold**.

Mr. Dayton spent some time in the Noranda District and gave a very interesting address on the production of copper and gold from the mining of the ore, through the smelter processes, to the finished product. He described the district around Noranda and the locations of the various mines, and provided sketches to show these locations. He also traced the history of the development of the mines, with the various ups and downs due to market conditions and other causes, and provided very interesting descriptions of such items as the method of reclaiming pillars in the open stopes, ventilating of the stopes, and the types of ore obtained.

The speaker then outlined the process used at the smelter to obtain the metals from the ore and gave a general description of the equipment used. Reference was made to the laboratory tests which are used to determine the grade of the ore and finally a brief mention of the methods of refining the ore was made.

A discussion period followed during which the speaker provided answers to the questions presented by those attending the meeting. The speaker was introduced by the Chairman, C. J. Tanner and thanked on behalf of the Section by F. E. Hogg.

This meeting took the form of an informal smoker, and at the close of the discussion period refreshments were served.

Saint John

J. H. C. MacLure, M.E.I.C.
Secretary-Treasurer

A. R. Bonnell, M.E.I.C.
Branch News Editor

The regular monthly dinner meeting of the Saint John Branch of the Institute was held Wednesday, March 24, in the Admiral Beatty Hotel with the chairman T. C. MacNabb presiding.

Austin Wright, who had been in Saint John advising the steering committee of the Maritime Professional Meeting, spoke briefly on the activities of Headquarters in promoting the status of the engineering profession.

The films " Clear Waters " and " Story of F.M. " were shown. The former depicts modern trends in sewage disposal to combat pollution of water in urban areas and at pleasure resorts. The latter shows the advantages held by frequency modulation in radio reception over the older method of broadcasting.

St. Maurice Valley

R. E. Kirkpatrick, M.E.I.C.
Secretary-Treasurer

One hundred engineers, members of the Institute, met at the Cascade Inn on April 16 to hear the results of the election of officers for the coming Branch year, the reports from the Executive, and the lecture of Dr. J. T. Rettaliata on the subject of **Gas Turbines and Jet Propulsion.**

The retiring chairman, E. T. Buchanan, in reviewing the activities of the past year, mentioned that the Branch had held six meetings, its membership had increased and Branch affairs were generally in excellent condition. Junior Sections in Three Rivers and Shawinigan Falls had been formed during the year. By-laws have been re-written and will shortly be submitted to the Branch for approval. R. E. Kirkpatrick, the Secretary-Treasurer, reported on the Branch's finances.

It was then reported that officers for the coming year are: chairman, M. Eaton, vice-chairman, S. E. Williams, committee men, J. M. Jopp (La Tuque), A. S. Holder (Shawinigan Falls), Nesbit Gray (Three Rivers). These members, with J. C. Beique and E. A. Delisle who are completing their second year of office, will compose the Executive for the coming year. G. W. Ince accepted the appointment of Secretary-Treasurer for the coming year.

Dr. J. T. Rettaliata was then introduced by Professor H. O. Keay, as director of mechanical engineering at the Illinois Institute of Technology.

His address, which was thoroughly illustrated by slides, traced from earliest times the history of the present gas turbines, which are now being used in central power stations, locomotive equipment, aeroplanes, etc. In explaining the cycle which was used he showed how air was drawn in, compressed, and passed to a combustion chamber. There a fuel such as kerosene was burned in it, and the large volume of hot gases of combustion were passed through a turbine and exhausted to atmosphere. As the turbine can produce more power than is required by the compressor there is power available for driving other equipment such as electric generators; alternately, if all the energy of the exhaust gases is not absorbed by the turbine these gases can be made to produce a " thrust " by deflecting them out through a nozzle, as is done in the engines powering jet propelled aeroplanes.

Dr. Rettaliata discussed the engines installed in various aircraft during and since the war, and pointed out that planes are now being designed for speeds of the order of 1300 to 1500 miles per hour. In the question period after the address, he was deluged by questions covering every aspect of the subject, from the types of metals required to withstand the very high temperatures encountered, to the type of fuels which had been used and might be used in future engines.

The speaker was thanked by J. W. Whyte.

Saskatchewan

D. W. Houston, M.E.I.C.
Secretary-Treasurer

R. Bingo-Wo, M.E.I.C.
Branch News Editor

The regular monthly meeting of the Saskatchewan Branch was held on Friday, March 19, in the Kitchener Hotel.

E. K. Phillips, past chairman of the Branch, introduced the guest speaker, W. R. Young, of the British American Oil Company, Limited, who spoke on **Expedition Muskox.**

The purpose of the exercise was primarily to test manpower and equipment in an overland route during the winter months, both for civilian and military purposes. The scheme was a combined effort of all arms, the Army, Navy and Airforce of Canada, with some American personnel and equipment participating. The base of operations was Fort Churchill, Man., and the scheme called for a route overland through Canada's north via Grand Prairie, Alta., to Edmonton. The expedition was supplied, on the move, by DC3 aircraft from which food and other material were dropped by parachute. Norsemen aircraft were to be used for emergency evacuation. Two B24 bombers were also held in reserve at Winnipeg and Calgary should a mass evacuation become necessary. These were never used.

The vehicles used on the operation were equipped with Cadillac V8 engines. They were fully rubber tracked with treads 3 feet wide running on steel sprockets. The vehicles weighed 11,000 lb. Four men were assigned to each vehicle which was a self-sustaining unit. Radio facilities were also carried and communication could be carried on between the vehicles, with the base or with aircraft.

Mr. Young continued his interesting address with a detailed description of the entire trip, the rations, clothing, and personal supplies of the personnel. He gave a clear picture of the difficulties encountered, the type of country traversed, and many other incidents over the route. He described the value of the data collected and how these could be used in designing equipment and material for use in the north under winter conditions, for military and civilian purposes.

The interest of the audience was shown by the large number of questions which the speaker was asked to answer.

M. J. Spratt expressed the appreciation of the group for Mr. Young's talk of the evening.

Toronto

R. A. Muller, M.E.I.C.
Secretary-Treasurer

D. D. Whitson, M.E.I.C.
Branch News Editor

On Thursday, February 26, 1948 at the U. of T. Botany Lecture Room, 100 members of the Toronto Branch heard a very interesting paper on **Load Testing Applied to Airport Runway Design** by Dr. Norman W. McLeod of the Dept. of Asphalt Technology of the Imperial Oil Ltd.

Loads of between 50 and 100 tons were applied at numerous points on operating airport runways all across Canada. The loading apparatus therefore had to be mobile, and the method arrived at was simple but ingenious—a tractor-drawn haulage float loaded with available material, such as pig-iron, an army tank, cement bags, etc., was moved over a succession of pre-selected spots. On the spot was cemented a round steel plate covered with a succession of graduated smaller diameter plates to remove the effect of bending in the plate. Then a jack was placed on the plates and operated against the underside of the loaded float above it. Levels were taken by surveying instruments set up to one side. In all cases, the spots were chosen far enough apart so that no "effect" could spread from one spot to another. In all cases the plates were placed at the level of the particular sub-grade, base-course or surface being tested. This involved a great deal of careful excavation and painstaking replacement afterwards, a large expenditure of money, and praiseworthy co-operation by airport authorities.

The results were worked into a formula with which an experienced man can predict bearing capacities with satisfactory accuracy after determining certain data through the use of simple equipment, and can then use a chart to find the proper thickness of base-course and surfacing for highway or runway construction to meet any required loading.

The investigation proved that many existing runways have been constructed with thickness of material far in excess of what was needed, and that some fairly new American runways still are constructed in a wasteful or unnecessarily heavy manner.

Victoria

S. H. Frame, M.E.I.C.
Secretary-Treasurer

Jas. H. Blake, M.E.I.C.
Branch News Editor

J. Ralph Johnston, who is assistant forester in charge of Forest Protection Research and Planning for the British Columbia government, delivered a most interesting address on **Fire Weather and Forecasting in B.C.** to the members of the Victoria Branch of the E.I.C. at Prince Robert House, Victoria, on Friday, March 19. Members of the Canadian Society of Forest Engineers and other allied organizations were present.

Mr. Johnston told of the vital importance of the recognition of the approach of fire weather; he cited the problems encountered in forecasting it and the methods adopted in co-relating the various factors involved. The address was illustrated by numerous graphic charts showing methods of keeping track of temperature, rainfall, humidity of ground cover, advance or retrogression of fire hazard, etc.

Reports from the Dominion Meteorological Stations, the R.A.F., and the B.C. Forest Service weather stations, when co-ordinated, provides every forest district with a daily, or more frequent, report of what is expected in fire weather within the next few hours. This advice is forwarded through the B.C. Forest Service radio network of around 300 stations so that all interested personnel are kept in close touch at all times.

Mr. Johnston showed a very fine coloured film of a trip through Tweedsmuir Park, illustrating the diversity of flowers, game, fish and scenery found in this magnificent playground in the heart of British Columbia. This film was prepared and supplied by the Publicity and Parks Divisions of the B.C. Forest Service.

Vancouver Student Section

Alan M. Eyre, Jr.E.I.C.
Secretary-Treasurer

Stuart Lefeaux, Jr.E.I.C.
Branch News Editor

STUDENTS' NIGHT

Students' Night is an annual affair at which student members present papers before the Vancouver Branch of the Institute. This year John McPhail spoke on **Three Methods of Road Surfacing,** Robin Fjarlie discussed **An Oceanographic Model of the Alberni Canal,** and Don Jamieson described **The Erection of the Pine River Bridge.**

Each student entered in the preliminaries was granted one years' free membership in the Institute by the Vancouver Branch. The wide variety of topics that were presented at these talks proved very interesting to the student audiences and the experience gained by the competing speakers was undoubtedly worthwhile.

FILMS

The following films drew good audiences: "From Rapids to Electricity"—the building of a hydro-electric plant by Shawinigan; "Highways Ahead"—highway development in the United States; "River of Paper"—the making of paper at Powell River, B.C.

ANNUAL SPRING BANQUET

The new executive was installed at the annual spring banquet on March 5. Next year's executive is as follows: honorary president, Professor S. H. de Jong; president, John McPhail; secretary-treasurer, Dick Cook; film representative, Don Jamieson; advertising representative, Ivan Sorenson. The vice-president and recording secretary are to be elected in the fall.

The highlight of the evening was the address of the guest speaker, Sir Charles Wright, wartime Director of Scientific Research for the British Admiralty, who described some of the measures employed in combatting the enemy in the Battle of the Atlantic. He recalled that the Germans were baffled for a long time by the centimeter radar developed by the allies, and that the allies had developed a counter-weapon for rendering ineffective the acoustic torpedo before the Germans put the torpedo into use and were able to employ effective counter methods one week after the acoustic weapon was introduced.

Sir Charles had many interesting and entertaining experiences to relate and provided an extremely profitable and enjoyable evening for the students and guests.

First Aid Course

Noon hour first aid lectures were conducted on the campus by instructors of the St. John Ambulance Association and two nights of practical work and an exam were completed at the Association headquarters. The course proved to be interesting and very successful. Students who wish to go further may take three nights additional work and qualify for an Industrial First Aid Certificate.

Speaker

Mr. T. V. Berry, Councillor for the Vancouver Branch, spoke to the students on **The Engineer in Business** on March 25.

President Grant's Visit

President Grant visited the University in February in the course of his tour of the universities. He was welcomed by more than 600 student engineers. The enthusiasm with which Colonel Grant was applauded gave credit to him as an effective speaker and as a very able and sincere representative of the Engineering Institute of Canada.

Winnipeg

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

R. H. Tivy, Jr.E.I.C.
Branch News Editor

Dr. A. E. Berry, director, Sanitary Engineering Division, Department of Health, Province of Ontario, addressed some 73 Winnipeg engineers at a joint meeting of the Winnipeg Branch of the Institute and the Association of Professional Engineers of Manitoba, March 18.

The speaker touched on the various aspects of sanitary engineering, such as waterworks, sewerage, industrial waste and stream pollution, and municipal engineering. Dr. Berry showed lantern slides of the different types of water and sewage plants. He also showed a second set in full color which were taken to show the extent of the pollution of boundary waters between Ontario and the United States.

He mentioned that many small centres in Ontario were now undertaking waterworks installations and in some cases sewers. In the field of water treatment he mentioned in particular the experiment now in progress at the city of Brantford where fluorine is being tried in the water for its effect on the prevention of dental decay. A definite improvement in the teeth of school children has resulted in the two years in which the experiment has been carried out although it was emphasized that the results could not be considered conclusive until the experiment has run its full seven years.

The visitor inspected the newly opened City of Winnipeg refuse incineration plant during his stay in the city and commented favourably upon it. He also said that the Winnipeg sewage disposal plant is still among the up-to-date ones in the Dominion in spite of its having been completed over ten years ago.

Some discussion followed the formal address when Dr. Berry undertook to answer questions put to him from the floor. He was thanked at the end of the meeting by W. D. Hurst, city engineer.

A feature of this meeting was the presentation of Winnipeg Branch prizes to three students from the University of Manitoba. These prizes are awarded annually for the best summer theses and the winners were as follows: P. J. Harris, civil engineering, introduced by Prof. A. E. Macdonald; L. W. Locke, electrical engineering, introduced by Dean Fetherstonhaugh; R. A. Ducker, mechanical engineering, introduced by Prof. N. M. Hall.

Refreshments were served at the close of the meeting, after H. McLeod, branch chairman, addressed a few appropriate and well chosen words to the prizewinners.

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The regular monthly meeting of the branch was held on April 8 with 53 members and guests in attendance. D. M. Stephens, Deputy Minister of Mines and Natural Resources, Province of Manitoba, presented a paper on **Some Problems in the Development and Administration of Natural Resources.**

If natural resources must be under public administration for their most economical utilization, then well-informed public opinion is necessary and planning must be in terms of decades or centuries, and not for the immediate future. The future economy of Canada relies on the north country, the resources of which are minerals, water power, forests, wild life and fish, and a particular kind of people.

The phases in the development of the mining industry with which a local government are concerned are exploration, transportation, taxation and community planning. Mr. Stephens dealt with each one of these with particular reference to the province of Manitoba. He also discussed forestry in Manitoba, whose adverse factors are low precipitation, short growing season, thin soils, remoteness, large area required to produce the necessary volume of timber, fire hazard, high cost of protection and a low direct return.

Mr. Stephens made interesting observations on several other matters of provincial administration. Beaver and muskrat raising has developed into a considerable industry in Manitoba, and it is expected that the number of pelts obtained this year will be more than double the yield of five years ago, and in ten years time it will have increased two or three times over this year again. In the speaker's opinion more attention should be paid to improving the economic means of the Indians, since without them much of the pioneering and initial development of our natural resources would not have been possible. Manitoba's settled areas are mostly at the bottom of the watersheds and therefore are not advantageously situated with regard to water power. Some thought must also be given to the low cost transportation of fuel from the Rocky Mountain Region. Mr. Stephens stated that co-ordination of the utilization of all resources is necessary to achieve a balanced economy.

The speaker was introduced by M. A. Lyons, and was thanked by C. V. Antenbring.

H. H. G. Moody, guest speaker at the March 12 meeting of the Electrical Section. At his right is Mrs. Fetherstonhaugh; at his left, M. D. Young (hidden) and Mrs. Moody.

Electrical Section

D. C. Bryden, M.E.I.C.
News Editor

Meetings held by the Electrical Section in February and March were as follows:

On February 12, M. B. Mallett, chief engineer, English Electric Company, spoke on **Progress in Transformer Design.** Mr. Mallett is well known for his advanced ideas on transformer design and although his talk was of a general nature, his presentation of ideas stimulated considerable discussion.

On March 4, W. D. Garbutt, technical sales manager, Hackbridge & Hewittic Electric Co. of Canada, outlined **Sixty Years of Rectifier Development.** Mr. Garbutt is very well informed on his subject, and he brought considerable information to the meeting on the manufacture and design of glass bulb rectifiers. His talk was supplemented by a film showing the details of manufacture of this equipment.

The annual Dinner and Dance was held at the Marlborough Hotel, on March 12. M. D. Young presided as Chairman. W. Scrimes opened the formal part of the programme by introducing the guest speaker H. H. G. Moody, architect, who gave a short address on **Modern Trends in Architecture.** The speaker was thanked by J. Greenlaw. A. Thompson proposed a toast to the ladies, which was ably responded to by Mrs. C. D. Osterland.

After the formal part of the meeting was completed, Harold Green and his orchestra provided dance music. The committee in charge of arrangements deserves considerable credit for an excellent programme enjoyed by well over 100 people.

Library Notes

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEW

CHEMICAL PROCESS PRINCIPLES PART III—KINETICS AND CATALYSIS*

O. A. Hougen and K. M. Watson. N.Y., Wiley; London, Chapman and Hall, 1947. 348p., illus., 8¾ x 6 in., cloth, $4.50.

Reviewed by W. H. Gauvin†

Among the recent technical publications, Part III of Hougen and Watson's trilogy on Chemical Process Principles constitutes perhaps the most important addition to a chemical engineer's reference library.

Primarily concerned with the kinetics of industrial reactions and their applications to economic and design problems, this book should be of particular interest to graduate students, technologists, practising engineers and research workers. Except for a few illustrative examples in Chapters XVIII and XIX, the general level of this book is too high for undergraduate work in Chemical Engineering. We should not conclude from this, however, that it cannot be read without considerable effort or extensive preparation: a good grasp of the fundamentals of Thermodynamics and some knowledge of theorical Chemical Kinetics and Kinetic Theory are the only essential prerequisites. Although a few sections undoubtedly require close attention—and those who make the necessary effort will be amply rewarded—the bulk of the treatment exhibits the same clarity and simplicity of exposition which characterize the authors' earlier works.

* *Part II—Thermodynamics—was reviewed in the April issue of The Journal. —Ed.*

† *Associate Professor, Chemical Engineering, McGill University, Montreal.*

The book begins (Chapter XVIII) with a brief discussion of the applicability of Eyring's Theory of Absolute Reaction Rates, in its present stage of development, to process design. The remaining sections of this Chapter deal with the quantitative treatment of design problems involved in homogeneous systems: reactions of simple and complex order, interpretation of laboratory results and pilot-plant data, graphical reactor design. The problems of catalytic reactions—which account for roughly half of the book—are covered in Chapter XIX, which deals mainly with the development of the reaction rate equations, in Chapter XX, on mass and heat transfer in catalytic beds, and in Chapter XXI, on catalytic reactor design. In this last chapter, incidentally, will be found an excellent discussion of the difficult problem of diffusional and temperature gradients between fluid and catalyst. Chapter XXII deals with the treatment of uncatalyzed heterogeneous reactions.

The numerous illustrative examples discussed are no longer drawn exclusively from reactions in the gaseous state—although these predominate in a large measure. Owing to their clarity and extensive treatment, they constitute perhaps the most interesting feature of the whole book. It should be pointed out that this text is essentially concerned with the practical aspects of applied kinetics, and, although written in accordance with the modern theories of absolute reaction rates and surface chemistry, the expert will undoubtedly be disappointed in the theoretical aspects of the development: he will probably deplore the apparent omission of a statistical treatment of reaction rates and of the kinetics of photochemical reactions, the sketchy attention given to chain reactions and reactions in solutions. In view of the uncertainties and complexity of Eyring's method and the extreme difficulty of a quantitative approach to these topics, their omission is quite understandable.

There is little to criticize in this book, except possibly the fact that no answers are given to the problems proposed at the end of each chapter. The book is well bound, and the table headings, figures and diagrams are clear and well presented. Few typographical errors were observed. The quality of the paper is, however, mediocre.

HEATING AND VENTILATING'S ENGINEERING DATABOOK:

Clifford Strock. N.Y., Industrial Press, 1948. 549 pp., illus., 11¼ x 8½ in., fabrikoid, $7.00.

This databook deals with heat and moisture in air; fuels and combustion; piping; air handling and ventilation; heating and heat transmission; cooling and air conditioning; motors and drives; contract law; and mathematical and drafting room standards.

It is intended for use by heating, ventilating and air conditioning engineers, contractors, architects, plant engineers, and engineering students. Its purpose is practical, and emphasis is placed on the data needed in actual design with a minimum amount of text.

Information is included on such subjects as the heat pump, electrothermal storage, snow melting, heating with diesel engines, solar water heating, and radiant (panel) heating. There is a section devoted to the law of contracts, and treats of the validity of contracts, subcontracting, guarantees, distinction between employee and contractor, patent infringement, real estate law, relations with municipalities, "cost plus" contracts, and other legal data of interest to the heating and ventilating engineer. M.B.

ABSTRACTS

AIRPORT RUNWAY EVALUATION IN CANADA:

Norman W. McLeod. Washington, U.S. Highway Research Board, 1947. 133 pp., illus., 9¾ x 6¾ in., paper, $2.00. (U.S. Highway Research Board Research Report No. 4B). Ottawa, Dept. of Transport, 1947. illus., 11 x 8 in., paper.

This paper outlines the results of an investigation of the runways at a number of Canada's principal airports, which was conducted by the Department of Transport during 1945 and 1946. The programme of testing included: a pedological soil survey and the preparation of a pedological soil map for each airport site; field moisture and density tests in place on the base course and on each 6 inch layer of the upper 18 to 24 inches of the subgrade; securing large disturbed samples of base course and of each layer of subgrade for physical and compaction tests in the laboratory, and undisturbed samples for CBR (both field and soaked condition), triaxial compression, shear, and consolidation tests; cone bearing and Housel penetrometer tests on layers of subgrade in the field; plate bearing tests (repetitive) on subgrade, base course, and surface, to determine the load supporting values of the runways, and to obtain information required for the design of either rigid or flexible pavements.

DESIGN OF LARGE VERTICAL-SHAFT WATER-TURBINE-DRIVEN A.C. GENERATORS

E. M. Johnson and C. P. Holder. London, Institution of Electrical Engineers, December 1947. 11 pp., illus.

Abstracted by
Hubert R. Sills, M.E.I.C.*

This paper will probably be of interest to Canadian users and designers of large vertical hydraulic turbine driven generators. In general the design practice outlined by the British authors differs little from that of Canadian or United States designers. The problems and possible solutions differ in emphasis. For instance the author's preference for the true or partial umbrella type machine appears to be influenced more by their conventional setting in their masonry ventilating housings than by reason of the coupling elevation and machine and turbine clearances.

The paper deals with vertical-shaft a.c. generators of large diameter in the speed range 50-500 r.p.m. The influence of turbine and hydraulic characteristics is first considered. This is followed by a discussion of factors which determine the generator dimensions. A brief summary of the considerations affecting rotor design leads to a detailed review of different types of rotor and pole construction and their range of application.

An important feature of this type of machine is the thrust bearing and its support, which carry very heavy loads. Alternative types of bearing and bearing arrangement are therefore examined and their merits compared. Methods of bearing cooling are briefly considered.

In a Section on the special arrangement of air coolers required for this class of generator, reference is made to the use of generator ventilating air for station heating. This is followed by a Section on the arrangement and operation of brakes and jacks.

The stator frame, core and windings; the rotor windings; the exciters and governor generator are briefly considered, and the paper concludes with a short review of special electrical characteristics.

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ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Allen's Dictionary of Abbreviations and Symbols:
E. F. Allen. N.Y., Coward-McCann, 1946. 189 pp., cloth.

Asphalt Handbook:
Asphalt Institute, N.Y., 1947. 304 pp., illus., cloth. (Asphalt Institute Construction Series No. 81).

British International Plastics Annual, 1947:
Croome Hill International Ltd., London, 1947. 459 pp., illus., cloth.

Centrifugal and Axial Flow Pumps; Theory, Design, and Applications:
A. J. Stepanoff. N.Y., Wiley, 1948. 428 pp., illus., cloth.

Chamber's Technical Dictionary, rev. ed.:
C. F. Tweney and L. E. C. Hughes. N.Y., Macmillan, 1944. 975 pp., illus., cloth.

Construction Estimates and Costs, 2nd ed.:
H. E. Pulver. N.Y., McGraw-Hill, 1947. 653 pp., illus., cloth.

Construction Specifications:
Asphalt Institute, N.Y., 1947. 303 pp., illus., cloth. (Asphalt Institute Construction Series No. 80).

Diary and Sundry Observations of Thomas Alva Edison:
Dagobert D. Runes, ed. N.Y., Philosophical Library, 1948. 247 pp., illus., cloth.

Dwelling House Construction:
Albert G. H. Dietz. N.Y., Van Nostrand, 1947. 371 pp., illus., cloth.

Frequency Modulation, Volume I:
Alfred N. Goldsmith, etc., ed. Princeton, N.J., Radio Corporation of America, 1948. 515 pp., illus., cloth.

Hot-Dip Galvanizing Practice, 2nd ed.:
William H. Spowers, Jr. Cleveland, Penton, 1947. 188 pp., illus., cloth.

How to Organize and Manage a Small Business:
Nelms Black. Norman, Okla., University of Oklahoma Press, 1946. 367 pp., illus., cloth.

Literature Search on the Solvent Extraction of Oleaginous Materials, with Additional Reference to By-products from the Solvent Extraction of Peanuts:
B. H. Weil, Marjorie Bolen, Nathan Sugarman. Atlanta, Ga., Georgia School of Technology, 1948. 190 pp., fabrikoid. (Georgia School of Technology State Engineering Experiment Station Special Report No. 26).

Manual of Design for Arc Welded Steel Structures:
LaMotte Grover. N.Y., Air Reduction Sales Co., 1947. 281 pp., illus., fabrikoid.

Masonry Simplified:
J. Ralph Dalzell and Gilbert Townsend. Chicago, American Technical Society, 1948. 2 vols., illus., cloth.

Photoelasticity, Volume II:
M. M. Frocht. N.Y., Wiley, 1948. 505 pp., illus., cloth.

Preparation and Characteristics of Solid Luminescent Materials; Symposium held at Cornell University, October 24-26, 1946; sponsored by the American Physical Society:
National Research Council. N.Y., Wiley, 1948. 459 pp., illus., cloth.

Report on German Blast Furnace Practice and Plant:
British Iron and Steel Federation, London, 1946. 57 pp., illus., paper.

Tables of Properties of Gases, with Dissociation Theory and its Applications:
E. W. Geyer and E. A. Bruges. London, Longmans Green, 1948. 102 pp., illus., cloth.

Trade Unions in Canada; their Development and Functioning:
H. A. Logan. Toronto, Macmillan, 1948. 639 pp., illus., cloth.

Welding Encyclopedia, 12th ed.:
L. B. Mackenzie, rev. by T. B. Jefferson. N.Y., Welding Engineer Publishing Co., 1947. 1,024 pp., illus., fabrikoid.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

Alberta, Dept. of Lands and Mines:
Annual Report for the Fiscal Year ended March 31, 1947.

British Standards Institution.
Yearbook, 1947.

Canada. Dominion Water and Power Bureau:
Water-Power Resources of Canada, Mar. 15, 1948.

Engineering Societies:
Yearbook, 1948.

Manitoba Water Power Commission:
Report, 1948.

Ontario. Dept. of Mines:
Forty-fourth Annual Report, Part II, 1945.—Fifty-fifth Annual Report, Parts I and II, 1946.—Fifty-sixth Annual Report, Part III, 1947.

TECHNICAL BULLETINS, ETC.

Edison Electric Institute. Publications:
No. P-8—Turbines, Condensers and their Auxiliaries, 1945-46.—No. P-10—Boiler Auxiliaries, 1946-47.

Illinois Institute of Technology. Research Publications:
Vol. 5, No. 1—Stability of Arcs.—No. 2—Geometry and Dynamics.—Vol. 5, No. 1—Molecular Spectra II.

Institution of Electrical Engineers. Publications:
Analysis-Synthesis Telephony, with Special Reference to the Vocoder, R. J. Halsey and J. Swaffield.—Behaviour of High-Voltage Solid-Type Cable Accessories in Service, C. J. Armstrong and C. T. W. Sutton.—Development of Locators of Small Metallic Bodies Buried in the Ground, B. Roston.—Development and Use of Magnetic Apparatus for Bomb and Mine Location, A. Butterworth.—Factors Governing Specifications for Flexible Electric Cables, W. Bowen.—Influence of Inverse-Time-Relay Characteristics on Discriminative Time, E. W. Connon, and E. Smith.—Load Dispatching and the Reasons for it, with Special Reference to the British Grid System, A. R. Cooper.—Three-Dimensional Cathode-Ray Tube Displays, E. Parker and P. R. Wallis.

Institution of Mechanical Engineers. Publications:
Criterion of "Yield" of Gun Steels, J. L. M. Morrison.—Plastic Stress-Strain Relations, W. M. Shepherd.—Wave Action Following Sudden Release of Compressed Gas from a Cylinder, F. K. Bannister and G. F. Mucklow.

International Civil Aviation Organization. Publications:
Final Report of the Statistics Division, First Session, January 1948 (Doc 5205-STA/526).—ICAO Regional Manual—North Atlantic. Amendment No. 8, March 15, 1948.—ICAO Regional Manual—North Atlantic. Amendment No. 9, April 1, 1948.—Survey on Ownership of Airlines, as at November 30th, 1947 (Doc 4954-AT/633).

Kungl Tekniska Hogskolans. Handlingar:
No. 14—Photogrammetric Orientation Data and Determination of their Accuracy, Percy Tham. — No. 15 — Temperature Measurements in High-Velocity Gas Streams, Lars Malmquist.

North-East Coast Institution of Engineers and Shipbuilders. Publications:
Experiment Work on Merchant Ship Models during the War, A. Emerson.—Measurements of Water Flow and Pressure set up by Ships in Motion, E. G. Richardson.—Resistance to Buckling of Light-Alloy Plates, W. Muckle.

Philips' Gloeilampenfabrieken Laboratoria. Separaat:
No. 1718—Physical Properties of Glasses, J. M. Stevels.—1738-39—Physical Properties and Cation Arrangement of Oxides with Spinel Structures, E. J. W. Verwey, P. W. Haayman, and F. C. Romeijn.—1741—Investigations on Sterols: 1. New Synthesis of 7-Dehydrocholesterol (Provitamin D), J. A. Keverling Buisman, W. Stevens, and J. v. d. Vliet.—1742—High Energy Ions in Crystal Lattices, A. H. W. Aten, Jr.—1743

APRIL JOURNALS NEEDED

Owing to a heavy demand for copies of the April, 1948, issue of the *Journal*, the supply at Headquarters has been exhausted.

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Additional copies will then be available at Headquarters for future reference.

—*Note on the Influence of the Water-Content of an Electrode-Coating on the Hydrogen-Content of Weld Metal, W. P. van den Blink.—1744—Manifold of Physical Quantities, K. W. de Langen.— —Texture of Copper Wire Drawn with Backpull, J. F. H. Custers.—1746—Note on the Measurement of Specular and Diffuse and Photographic Density, J. F. H. Custers.—1747—New Technical Possibilities in the Micro-Reproduction and Multiplication of Documents, P. M. Van Alphen and C. J. Dippel.—1749—Diffusion of Water into a Polymer, J. F. H. Custers.—1751—Variational Principles in the Theory of the Cathode Fall of a Glow Discharge, N. Warmoltz.—1752—New Method for Computing the Energy of Interaction between two Spheres under a General Law of Force, C. J. Bouwkamp.—1753—On a Cavity Resonator of High Quality for the Fundamental Frequency, K. F. Niessen.—1754—Experiments on the Effect of Low Temperature on some Plastic Properties of Metals, M. J. Druyvesteyn.—1757—On Spheroidal Wave Functions of Order Zero, C. J. Bouwkamp.—1758— Nature of the Hydrogen Bond in Potassium Hydrogen Fluoride, D. Polder.*

Purdue University. Engineering Experiment Station. Research Series:

No. 101—Stress-Rupture Characteristics of Various Steels in Steam at 1200°F, J. T. Agnew, G. A. Hawkins, and H. L. Solberg.

Radio Corporation of America. RCA Technical Papers:

Index to Volume II(b), 1947.

United Steel Companies Limited. Statistical Section. Publications:

Investigation into the Effect of Variations in Coke Quality and Burden Composition on the Performance of No. 2 Blast Furnace at Workington Iron and Steel Company Ltd., G. H. Jowett.—Relation between the Actual Time of Charging Open Hearth Furnaces and the Melting Time, Part II, W. T. Hale.—Relation between the Time for Heating to Clear Melt and the Actual Time of Charging Open Hearth Furnaces, W. T. Hale.

University of Illinois. Engineering Experiment Station. Bulletin Series:

No. 365—Experience in Illinois with Joints in Concrete Pavements, J. S. Crandall, etc. — No. 368 — Effect of Eccentric Loading, Protective Shells, Slenderness Ratios, and other Variables in Reinforced Concrete Columns, F. E. Richard, etc.

STANDARDS, SPECIFICATIONS, ETC.

American Standards Association. Standards:

B20.1-1947—Safety Code for Conveyors, Cableways and Related Equipment.

British Standards Institution. Codes of Practice:

CP(B) 719—Dense Concrete Walls.

British Standards Institution. Standards:

No. 12:1947—Portland Cement (Ordinary and Rapid-Hardening).—146:1947—Portland-BlastfurnaceCement.—915:1947—High Alumina Cement.—1381:1947—Gas Lighting Units and Fittings for Single-Family Dwellings.—1429—Annealed Steel Wire for Oil-Hardened and Tempered Springs.

Canadian Standards Association. Standards:

B73-1945—Standard Specification for Acme Threads.—C83.1-1942—Standard Specification for Communication Line Harduare. C83.2-1942—Standard Specification for Power Line Hardware.—XT601-1943—Tubing—Standard Sizes for Round Aluminum 2S½H.—Z74-1944—Rules for Rounding off Numerical Values.

PAMPHLETS, ETC.

Canadian Gold Mining; the State of an Industry:

Canadian Metal Mining Association Toronto, 1948.

Causes of Industrial Peace.

Clarence Francis. N.Y., General Foods Corporation, 1947.

Community Planning:

Saskatchewan Dept. of Municipal Affairs, 1948.

Constructive Labor Relations; Experience in Four Firms:

R. A. Lester and E. A. Robie. Princeton, N.J., Princeton University Industrial Relations Section, 1948.

Enameler's Dictionary:

Ferro Enamel Corporation, Cleveland, 1947.

Expansion Continue du Systeme Metrique:

Albert Perard. Paris, Masson et Cie, 1948. (La Nature, No. 3155, March 1948).

Flow Properties of Lubricating Greases—Relationship of Apparent Viscosity:

Texas Company, N.Y. 1947. (Lubrication, Vol. 33, No. 12, December 1947).

Flow through Standard Nozzles, Orifice Plates and Venturi Tubes:

J. R. Finniecome. Manchester, Emmott, 1948. (Mechanical Worl Monographs No. 39).

Future of the Forest Undergraduate of To-day:

C. D. Schultz. Vancouver, 1948.

Handbook of Frame Constants; Beam Factors and Moment Coefficients for Members of Variable Section:

Portland Cement Association, Chicago, 1947.

Incomes of Professional Engineers in Public Employment:

Arthur Richards. Chicago, American Association of Engineers, 1947.

Machines — More Jobs and More Things for More People:

Harry E. Conrad. Detroit, American Society of Tool Engineers, 1948.

Materials for Better Floors:

Webster and Sons Ltd. Montreal, 1948.

Metrical System and the Anglo-Saxon Countries:

H. Moreau, 1947.

Model of a Zoning and Building By-law:

Provincial Bureau of Town Planning, Quebec, 1947.

Model of a Zoning and Building By-law for Rural Municipalities:

Provincial Bureau of Town Planning, Quebec, 1947.

Plan Book; Your New Brick Home:

Structural Clay Products Institute, Washington, 1947.

Prospector's Guide for Uranium and Thorium Minerals in Canada:

Bureau of Mines, Ottawa, 1948.

Questions and Answers about the International Bank for Reconstruction and Development:

Office of Public Relations, International Bank, Washington, 1948.

Radio Amateur's Beam Pointer Guide:

John F. Rider. N.Y., Rider, 1948.

Systeme Metrique et les Pays Anglo-Saxons:

H. Moreau. 1947.

Techniques of Job Evaluation and Merit Rating in the Library:

A. H. Munson. Chicago, Business Research Corporation, 1947.

Tidd 500-Kv Test Project; Transmission of Electric Power at Extra High Voltages and Field Test Facilities to Study Corona, Radio Influence, and Other Features:

Philip Sporn and A. C. Monteith. N.Y., American Institute of Electrical Engineers, 1947.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

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BRITISH STANDARD FOR PICKS, BEATER PICKS AND MATTOCKS. BS 1421:1947:

London, British Standards Institution, 1947. 2/..

This new standard prescribes the detail dimensions of eight implements, comprising navvy picks with chisel and point and double point ends; beater picks with point and fishtail, and point and tee ends; mattocks with point and mattock, cutter and mattock, and chisel and axe ends. For the first time, the eyes of such implements are standardized. In addition, the standard deals with the quality of steel, tolerances on dimensions, hardness and testing.

CONFERENCE GUIDE TO BASIC MANAGEMENT TRAINING; A PROGRAM OF DIRECTED CONFERENCE SUGGESTIONS FOR THE CONFERENCE LEADER:

Arthur Hotchkiss. N.Y., National Foremen's Institute, 1947. 196p., illus., 10½ x 8 in., cloth, $5.50.

This manual is designed as a guide to the direction of conferences on the subject of management and supervisory training. It aims at the solution of basic problems which the supervisor meets in his daily routine. The author stresses that it is essential for supervisors to be informed and stimulated regarding their responsibilities, and further, to actually practice their knowledge. The programme of conferences suggested is an outline and an organization of subjects to be discussed, rather than a series of lectures. It is based upon practical industrial experience as to need, content, method, and time required for the completion of each conference. Thoroughly practical, it gives detailed descriptions of each step to be taken in conducting the meetings. Charts and diagrams are used to clarify points of interest; the amount of time necessary for each activity is allotted; the chairman is told what to say, how to say it, and by what methods to illustrate his points.

DESCRIPTIVE GEOMETRY FOR ARCHITECTS AND BUILDERS:

Leslie A. Lee and R. Fraser Reekie. London, Arnold; Toronto, Longmans, 1945. 224 p., illus., 9 x 5½ in., cloth, $2.25.

The aim of this book is to provide a sound knowledge of the principles of geometry and geometrical drawing, and their various practical applications, for those in the building industry. The author has endeavoured to cover fully the work on which are based the examination questions of the City and Guilds, London (Trades), the Union of Lancashire and Cheshire Institutes, and the Union of Educational Institutes, and examples of their examination questions have been included in the book.

ELECTRONIC THEORY AND CHEMICAL REACTIONS; AN ELEMENTARY TREATMENT:

R. W. Stott. London, Toronto, Longmans, 1943. 112p., illus., 7½ x 5 in., cloth, $1.80.

This book is an elementary introduction to the theory of chemical reactions. Numerous hypotheses for the mechanisms of many reactions based on the Electronic Theory have been tested, and it is the object of this book to present some of the less complicated of these hypotheses in such a way that a beginner may be able to understand them.

ONE TWO THREE. . . INFINITY; FACTS AND SPECULATIONS OF SCIENCE:

George Gamow. N.Y., Viking; Toronto, Macmillan, 1947. 340p., illus., 9 x 6 in., cloth, $5.50.

This book is an attempt to collect interesting facts and theories of modern science in such a way as to give the layman reader a general picture of the universe in its microscopic and macroscopic manifestations, as it presents itself to the eye of the scientist today. There is no attempt to tell the whole story, but the subjects have been selected to survey briefly the entire field of basic scientific knowledge.

PLANNING; SUGGESTIONS FOR CANADIAN COMMUNITIES:

Field Service Department of the Canadian Chamber of Commerce, Montreal, 1947. 64p., illus., 11 x 8¼ in., paper, $1.50.

This book presents an overall view of town planning as it is practised in Canada under existing legislation. The author's purpose is to stimulate and assist the town planning movement by demonstrating the practical possibility of controlling urban development. It is hoped that it will encourage groups and organizations, particularly students, to make surveys of the conditions under which they live and work, and to become conscious of the different aspects of their environment. A bibliography is appended to provide further aid.

REINFORCED CONCRETE DESIGN, 2nd ed.:

G. P. Manning. London, Toronto, Longmans, 1945. 498p., illus., 9 x 5½ in., cloth, $7.00.

This work aims at establishing methods of design suitable for use in a Civil Engineer's office, and is based on the method which the author has found in use and which he has himself used in actual designs. The first part treats of the cross-sections of members and the stresses produced. The second part deals with the questions of members as a whole, and the third part is a discussion of complete structures. Although much of the book has been rewritten in the second edition, most of the revisions are arithmetical.

REPORT OF THE THIRD SESSION OF THE AERODROMES, AIR ROUTES AND GROUND AIDS DIVISION OF THE INTERNATIONAL CIVIL AVIATION ORGANIZATION:

International Civil Aviation Organization, Montreal, 1947. 138p., illus., 14 x 8⅝ in., paper. (DOC 4809, AGA/558).

This report deals with the reclassification and rearrangement of Aerodrome, Air Route and Ground Aid definitions, standards and recommended practices; examination of suggestions for altering existing practice; drafting of new sections; review of the division's work and selection of items to be considered at the next meeting.

REPORT OF "PANEL" OR "RADIANT" HEATED TEST BUILDINGS:

C. D. Niven and A. D. Kent. Ottawa National Reserach Council, 1947. 45p., illus., 11 x 8¼ in., paper, 25c. (NRC No. 1639).

The heat supplied to a floor heated by means of pipes in an air space underneath was measured and compared with the calculated heat loss from the room through the walls, windows and ceiling plus the calculated heat required to warm the ventilation air. The heat supplied to a concrete floor slab placed in contact with the ground was measured and the heat lost to ground and edges deduced by subtracting the calculated heat loss to the room. The two systems of floor heating were compared and a diagram showing isotherms indicated that a floor slab should be insulated on the underside for about four feet back from the edge.

STEEL CASTINGS:

Eric N. Simons. N.Y., Chemical Publishing Co., 1947. 208p., illus., 7½ x 5 in., cloth, $5.00.

In this book the author has attempted to bring together all the widely scattered information on steel castings. His aim is to clarify and simplify, to condense and compress, and to omit excessive detail. The book surveys the subject from raw material to finished product, and includes such aspects of it as melting processes, patterns, moulds and cores, centrifugal casting of steel, heat-treatment, machining. It is intended for designers, engineers, buyers, salesmen, lecturers, and students.

The following notes on new books appear here through the courtesy of The Engineering Societies Library of New York, and may be consulted at the Institute Library.

GAS TURBINES AND JET PROPULSION FOR AIRCRAFT.

G. G. Smith. 4th ed. Aircraft Books, New York, 1946. 256 pp., illus., diagrs., charts, tables, 8¾ x 5½ in. cloth, 12s.6d. ($5.00 in U.S.).

The principles of jet propulsion and the history of its development precede the chapters dealing with gas turbine components and construction systems. British, American, and German gas turbine types are described, and testing and maintenance procedures are dealt with. A discussion of jets versus airscrews is included, and various special types of aircraft are described as well as guided missiles and flying bombs. Separate chapters consider the metallurgical problems connected with gas turbine construction, and present extracts of several papers dealing with the prospects of turbine unit propulsion.

HEATING AND VENTILATING BUYERS' DIRECTORY, 1948 EDITION. Edited by C. Strock.

Industrial Press, 148 Lafayette St., New York; 228 No. La Salle St., Chicago, Ill. 320 pp., illus., 8 x 5½ in., paper, $1.00.

This book covers the fields of air conditioning, piping, heating, refrigeration, ventilation and air sanitation. It is primarily a classified, product directory, listing the sources of equipment, supplies and services. A trade name section includes both current and absolete terms with the name of the manufacturer. Street addresses are given in the alphabetical list of manufacturers.

I. E. S. LIGHTING HANDBOOK, the Standard Lighting Guide.

Illuminating Engineering Society, 51 Madison Ave., New York, 1947. paged in sections, illus., diagrs., charts, tables, 9 x 6 in., cloth, $8.00.

In simple terms and highly condensed style, this book presents the accumulated knowledge of the past forty-one years of lighting progress, evaluated and interpreted by specialists. Both the theoretical aspects and practical applications are considered. Many illustrations and a detailed index aid in the use of the volume. Data on many types of commercially available equipment are included. Classified references to the original literature are grouped at the end of each section.

LITERATURE SEARCH ON THE PRESERVATION OF FOODS BY FREEZING, First Supplement, January 1946-July 1947. (Special Report No. 25.)

B. Anderson and B. H. Weil. Georgia School of Technology, State Engineering Experiment Station, Atlanta, Ga., 1948. 670 pp., 8½ x 5½ in., paper, $3.00.

Some 1300 abstracts of articles and digests of patents are contained in this supplement to the original bibliography issued as Special Report No. 23. In addition to material appearing in 1946-47 on the subjects covered in the earlier list, this issue includes references on the freezing of milk, eggs and other dairy products, previously omitted. The numbering of the items is continued from the earlier publication.

PLANNING FACTORY MAINTENANCE. ("Mechanical World" Monographs, No. 41.)

F. D. Denner. Emmott & Co., Ltd., 31 King St. West and 21 Bedford St., Strand, London, W.C.2, 1947. 29 pp., tables, 6½ x 4 in., paper, 1s.6d.

This small pamphlet presents practical schedules and incentives for the effective maintenance of factory equipment and the efficient continuance of production.

POWER SYSTEM STABILITY. Volume I, Elements of Stability Calculations.

E. W. Kimbark. John Wiley & Sons, New York; Chapman & Hall, London, 1948. 355 pp., illus., diagrs., charts, tables, 8½ x 5¼ in., cloth, $6.00.

This first volume of a projected three-volume work covers the elements of the stability problem, the principal factors affecting stability, the simplified methods of making stability calculations, and the practical application of these methods to actual power systems. Information is given on a-c calculating boards (network analyzers), and curves are included which largely eliminate the need for computation of swing curves of two-machine systems. Transient stability is stressed throughout.

PRACTICAL EVALUATION OF RAILROAD MOTIVE POWER:

P. W. Kiefer, published and distributed by Steam Locomotive Research Institute, Inc., Simmons-Boardman, 30 Church St., New York, June 1947. 65 pp., illus., diagrs., charts, tables, 8¾ x 5¼ in., cloth, $2.00.

Backed by experience with steam and Diesel-electric locomotives used in the same service, the author effectively compares, from several fundamental aspects, the service value of these important types. Availability for service, cost, work capacity, and performance efficiency are considered on a basis of factual data, and the derived conclusions are given. A brief note on the gas-turbine locomotive is included.

RADIO AMATEUR'S HANDBOOK, Standard Manual of Amateur Radio Communication, 25th ed.

American Radio Relay League, West Hartford, Conn., 1948. 608 pp., illus., diagrs., charts, tables, 9½ x 6½ in., paper, $2.00; $2.50 foreign.

This annual publication covering the theory, principles and design of short-wave radio has been revised as usual and rearranged for more effective use. New chapters have been added on ultra-high-frequency, microwaves, interference, emergency operation, and assembling a station. The practical value of the book is indicated by the material on general workshop operations and the detailed instructions for the building of various types of equipment. Vacuum-tube characteristics are tabulated as usual, and there is a catalog of products of manufacturers serving the field.

RECORDS AND RESEARCH IN ENGINEERING AND INDUSTRIAL SCIENCE:

J. E. Holmstrom, 2 ed. rev. & enl. Chapman & Hall, Ltd., London, 1947. 366 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, 21s.

Of interest to those who use technical knowledge in their work, this volume shows how to obtain information concerning the work the rest of the world is doing in any field. It shows how data may be collected from technical sources, how to integrate facts and ideas, and how to transmit these facts and ideas to those who need them. Other topics discussed are the nature and methods of technical science, the principles of technical translation, and the various organizations, particularly British, that issue publications themselves or abstract the work of others.

STRESS ANALYSIS AND DESIGN OF ELEMENTARY STRUCTURES.

J. H. Cissel. 2 ed. John Wiley & Sons, New York; Chapman & Hall, London, 1948. 419 pp., illus., diagrs., charts, tables, 9¼ x 5¾ in., cloth, $5.00.

Written primarily as a text for non-civil engineers, this book presents fundamental and practical material such as would generally be of value to an engineer in any field. The section on stress analysis remains substantially the same as in the first edition, but the second section has been rewritten and rearranged in accordance with current practice. A new chapter is included on the design of light-gage steel structures, and the specification material has been revised to conform to recent changes.

(A) SURVEY OF THE PRINCIPLES & PRACTICE OF WAVE GUIDES.

L. G. H. Huxley. University Press, Cambridge, England; Macmillan Co., New York, Toronto, 1947. 328 pp., diagrs., charts, tables, 8½ x 5½ in., cloth, $6.00 (in Canada) (21s. in England).

This book is an introductory summary of the recent developments in the application of wave guides. It considers general background material, progressive electromagnetic waves in wave guides, formulas for field components, wave guide impedances and techniques, and cavity resonators. The first six chapters are based on courses given during the war and use an elementary and physical approach. The last chapter provides a mathematical treatment of selected topics for those who prefer a more formal treatment.

SYMPOSIUM ON pH MEASUREMENT, 49th Annual Meeting, American Society for Testing Materials, Buffalo, N.Y., June 24-28, 1946. Technical Publication No. 73.

American Society for Testing Materials, 1916 Race St., Philadelphia, Pa., 1947. 79 pp., diagrs. charts, tables, 9 x 6 in., paper, $1.50; to A.S.T.M. Members, $1.15.

This compilation presents seven papers on the latest theory and practice in colorimetric and potentiometric methods for making pH and closely related measurements. The following topics are covered: historical review, the fundamentals and theoretical basis for pH determinations, recent advances in principal methods and techniques, and applications to particular fields.

SYMPOSIUM ON MEASUREMENT OF ENTRAINED AIR IN CONCRETE.

American Society for Testing Materials, Philadelphia 3, Pa. 96 pp., illus., diagrs., charts, tables, 9 x 6 in., paper, $1.75. To members $1.30. Authorized Reprint from the Proc., Vol. 47, 1947.)

The nine technical papers included in this symposium cover the various methods that have been developed to measure the air entrained in concrete, this quantity of air being subject to variation from a number of influences. There are also a paper giving an analysis of these methods and one on the effect of sampling errors.

TECHNIQUES IN EXPERIMENTAL ELECTRONICS.

C. H. Bachman. John Wiley & Sons, New York; Chapman & Hall, London, 1948. 252 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $3.50.

Of interest to those engaged in production or research in the field, this book is primarily concerned with controlled beams of charged particles in vacua, or at very low pressures. Such topics as methods of applying and using fluorescent materials, cathode coatings, tungsten characteristics, and vacuum glass blowing techniques are discussed. One chapter is devoted to controls. References to recent articles and books are listed at the end of each chapter. Conduction of electricity in gases is not included.

VADE-MECUN (Radiolampen) 2 Parts 1948.

P. H. Brans. Published by P. H. Brans, Limited, Antwerp, Belgium. 198 pp., Supplement, 96 pp., illus., tables, 11½ x 8 in., paper, apply.

This regularly revised manual covers tubes made all over the world. The type of tube, manufacturer, voltage, and base-connection are given. The tubes are classified according to their heater-voltage with a general index arranged by tube type. A list of manufacturers in Europe, America, Africa, Asia and Oceania is included. Ample directions for the use of the tables are provided.

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.

(The) COOPERAGE HANDBOOK.

F. P. Hankerson. Chemical Publishing Co., Brooklyn, New York, 1947. 182 pp., illus., diagrs., tables, 8¾ x 5½ in., cloth, $3.75.

Following a brief historical introduction, this book describes the present methods of barrel manufacture, the choice of the proper kind of barrel and lining for various purposes, and the handling and storage of barrels. All expert specifications and I.C.C. regulations are included, as well as other general information.

COURSE OF REINFORCED CONCRETE DESIGN.

T. J. Bray. Chapman & Hall, London, England, 1946. 216 pp., plus 25 charts and graphs, diagrs., 10¼ x 6¾ in., cloth, 25s.

Brief consideration is given in the early chapters to concrete materials, mixes, etc., as introduction to the design information which constitutes the main subject matter. Chapters on loads, stresses, reinforcement, and the various basic components of reinforced concrete structures precede the material dealing with specific types of structures such as foundations, walls, tanks, towers, arches, etc. Various special topics, such as concrete roads, and surfaces, bearing pressures, and the characteristics of aggregates are included in the appendix together with a group of charts and graphs for practical design work.

ELEMENTS OF ACOUSTICAL ENGINEERING.

H. F. Olson, 2 ed. D. Van Nostrand Co., Toronto, New York, London, 1947. 539 p., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.50.

Presenting the principles and applications of acoustics for the engineer and applied scientist, this volume covers the important new instruments, designs, developments, and present day practices of acoustical engineering. A large number of useful formulae, tables, and graphs are included together with a consideration of acoustical elements, acoustical radiating system, mechanical vibrating systems, transducers, architectural acoustics, and the characteristics of speech, music and hearing. This second edition has been brought up to date and amplified. Two new chapters on underwater sound and super- and ultrasonics have been added.

ELEMENTS OF AIRCRAFT PROPELLER DESIGN.

F. T. Meacock. E. & F. N. Spon, Ltd., London, S.W.1, 1947. 96 p., illus.,, diagrs., charts, 8½ x 5¼ in., cloth., 12s.6d.

This volume discusses propeller design in general terms with a minimum of technicalities, and requires only an elementary knowledge of aerodynamics. It is not intended as a manual or a handbook on propeller design. Many illustrations supplement the text, and the main trends in the development of propeller design are indicated with their underlying reasons.

FREQUENCY MODULATION ENGINEERING.

C. E. Tibbs, foreword by L. H. Bedford. Chapman & Hall, Ltd. London, 1947. 310 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, 28s.

Presenting basic theory, the early chapters deal with the frequency modulation of carrier waves and with interference suppression. Succeeding chapters consider propagation, aerials, transmitters and measurements. The remainder of the book is devoted to a description of the technique and circuits employed for frequency modulation and reception. Actual equipment is described when possible, and working designs with characteristic curves are included in the material on limiters and discriminators.

GEOLOGICAL STRUCTURES AND MAPS, a Practical Course in the Interpretation of Geological Maps for Civil and Mining Engineers:

A. Roberts. Sir Isaac Pitman & Sons, Ltd., London, 1947. 66 p., diagrs., charts, maps, 9¾ x 7 in., cloth, 12s.6d.

Providing a survey of elementary geology, this book is designed to meet the needs of civil and mining engineers whose work entails the interpretation of geological maps. It contains a graded series of exercises in geological mapping. Some of the more important simple structures are illustrated by block diagrams. The graphical method is used in all dip and strike problems.

HEAT-TREATMENT OF STEEL:

E. Gregory and E. N. Simons, with a foreword by C. K. Everitt, Sir Isaac Pitman & Sons, Ltd., London, 1947. 358 p., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $4.00.

Beginning with temperature measurement by means of thermocouples and the various types of pyrometers, this book proceeds to the description of the types and operation of gas, fuel-oil and electric furnaces. Refractories, atmosphere control, heating baths, and quenching equipment are dealt with. The remaining half of the book is devoted to the principles and processes of heat-treatment and their application to all types of steel production, including spheroidizing, austempering, case-hardening, cyaniding, nitriding, and flame and induction surface-hardening.

HIGH-SPEED DIESEL ENGINES.

P. M. Heldt. 5th ed. P. M. Heldt, Nyack, New York, 1947. 479 pp., illus., diagrs. charts, tables, 8½ x 5 in., cloth, $6.00.

The theory, design, application, operation and maintenance of high-speed Diesel engines are presented. In this revised edition, new material is included on the two-stroke engine, recently developed fuels, and cold-starting. A chapter on gas turbines has been added. A number of illustrations of large-scale sectional drawings of complete engines are given.

LEGAL PHASES OF CONSTRUCTION CONTRACTS:

I. V. Werbin. McGraw-Hill Book Co., New York and London, 1946. 267 p., 8½ x 5¼ in., cloth, $2.75.

The author discusses forty-six different legal problems that have arisen in connection with construction contracts, of practical interest to engineers, architects, contractors and attorneys. The book shows the court precedents that have been established on these problems and gives, in many cases, the actual language of the contract provisions and also the facts involved. The intent is to provide the layman without legal training or experience an understanding of the import of the courts' decisions.

LUMBER, Manufacture, Conditioning, Grading, Distribution and Use.

N. C. Brown. John Wiley & Sons, New York; Chapman & Hall, London, 1947. 344 p., illus., diagrs., maps, tables, 8½ x 5½ in., cloth, $4.25.

Of interest to those concerned with wood utilization and intended as a textbook for use in professional forestry schools, this volume covers most of the phases of the industry with the exception of logging. The general manufacturing procedures for converting logs into lumber are analyzed, and equipment, sawing methods, power requirements, and the utilization of by-products are discussed. Conditioning, by air seasoning and by kiln drying, is explained, and the grading process is examined. The distribution of lumber through the manufacturer, retailer and wholesaler, and the utilization of the distributed product are dealt with. Constant emphasis is placed on the necessity for efficient and economical methods in all stages of production.

MACHINE-SHOP ESTIMATING.

W. A. Nordhoff. McGraw-Hill Book Co., New York, 1947. 486 p., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $6.00.

A scientific basis is provided for evaluating the performance of machine-shop operators by showing how to estimate the time that should be required to perform a job. The book lists all of the elements of operations performed in an average machine shop and establishes reasonable time values for their execution by the average operator. All machine operations are fully described; tables supply machinery elements which are generally variable; and sample estimates are shown for practical demonstration purposes.

NAVAL MACHINERY, 1946. 2 Vols.

United States Naval Academy, Annapolis, Maryland. Paged in sections, illus., diagrs., charts, tables, 11 x 8¼ in., cloth, Vol. 1 $4.00; Vol. 2, $4.25.

This 2-volume work, presented as a descriptive treatment of steam engines and machinery to be found aboard ships of the Navy, emphasizes construction details and operating principles. The material is grouped into four parts: Parts I and II, naval boilers and naval steam turbines, are in one volume; Parts III and IV, naval auxiliary machinery and naval reciprocating steam engines, are in the other. The detailed index which appears in both volumes covers all four parts. Twenty-one large, folded plates, relating only to parts I and II are bound in at the back of that volume, adding to the wealth of illustrative diagrams which accompany the text.

ORGANIZATION AND MANAGEMENT IN INDUSTRY AND BUSINESS.

W. B. Cornell, 3 ed. Ronald Press Company, New York, 1947. 819 p., illus., diagrs., charts, tables. 9¼ x 6 in., cloth, $5.00.

Intended for use in schools of commerce and colleges of engineering, this text presents detailed information on the varied subjects included in the field. Broad in scope, the volume covers the topics of organization and operation of a business enterprise, production control, and time study. Concrete examples are given of problems solved for well-known manufacturers. For each topic discussed details of practical value are presented. This third edition has been revised to include up-to-date practices. New approaches to the solution of problems such as those of personnel administration have been added.

REFRACTORIES IN TURBINE BLADES plus Miscellaneous Applications, PB Report 4260.

S. S. Kistler. Office of Technical Services, Dept. of Commerce, Washington, D.C.; Hobart Publishing Co., Box 4127 Chevy Chase Br., Washington, 15 D.C., January 1947. 31 pp., illus., tables, 10½ x 8 in., paper, manifold, $2.00.

This report is concerned with the efforts made by the Germans to produce ceramic substances suitable for combustion turbine blades. The various developments of several important companies are described, with discussion of the physical properties and effectiveness of application.

REVIEW OF METAL LITERATURE, Volume 3, 1946.

Prepared for the members of the American Society for Metals by Battelle Memorial Institute, Columbus, Ohio. American Society for Metals, Cleveland 3, Ohio, 1947. 811 pp., 9¼ x 6 in., cloth, $15.00.

An annotated survey of articles and technical papers appearing in engineering, scientific and industrial journals and books, here and abroad. The subjects covered range from ores and raw materials through industrial uses and applications of the finished product. Technical books in this field are also reviewed. The addresses of the 300 publications covered are given. Cross-references aid in the location of abstracts, and both an author and a detailed subject index are provided.

STATICS.

J. H. Kindle and H. L. Miller. Ginn and Company, Boston, New York, Chicago, Atlanta, Dallas, Columbus, San Francisco, Toronto, London, 1947. 171 pp., diagrs., charts, tables, 9½ x 6 in., cloth, $2.60.

Designed for use in pre-engineering college courses, this book develops a course in statics based on the principles of (1) action and reaction, (2) transmissibility of a force, (3) vector addition of forces, and (4) static equilibrium. A working knowledge of algebra, geometry and trigonometry is assumed. Included are several hundred graded problems and their answers. In examples given in the text, a graphical solution is first obtained and is followed by an analytical solution.

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 St., Montreal—Telephone BElair 3019—may be arranged *by appointment.*

Situations Vacant

Chemical

CHEMICAL ENGINEER, age 25 to 35 with experience in the Pulp and Paper Industry, preferably Kraft, required by paper manufacturer in Eastern Ontario for position of Control Superintendent. Salary according to qualifications. Apply to File No. 4099-V.

Civil

CIVIL ENGINEERS required by a Montreal firm for field inspection in Ontario, and North Shore St. Lawrence. Salary open. Apply to File No. 4084-V.

CIVIL ENGINEER with at least two years experience required in a Pulp and Paper Mill in the Province of Quebec. Salary $250 to $300. Apply to File No. 4094-V.

CIVIL ENGINEER required by a Montreal contractor for estimating and general engineering. Age 30 years. Salary $300 up. Apply to File No. 4096-V.

CIVIL ENGINEER required for consulting engineer and surveyor's office in Montreal. Work includes surveying, topographical draughting, preparation of designs and plans of engineering work etc. Must be bilingual. Salary according to experience with future depending on ability. Apply to File No. 4105-V.

JUNIOR CIVIL ENGINEER with not less than 2 or 3 years experience required in Moncton, New Brunswick for architectural and industrial building design. This position offers a wide scope for experience and has good prospects. Salary open. Apply to File No. 4108-V.

Electrical

ELECTRICAL DRAUGHTSMEN required in Montreal should be experienced in the layout of industrial electrical systems which includes 600-volt power circuits, high voltage substations and general industrial lighting systems. Salary open. Apply to File No. 4080-V.

Mechanical

*JUNIOR MECHANICAL ENGINEER with one to two years experience required in Montreal. Salary open. Apply to File No. 4081-V.

MECHANICAL ENGINEER, recent graduate required for training in Industrial Engineering by Pulp and Paper Mill in Southern Ontario. Training period of approximately three months in Time and Motion Study, Work Simplification, Scheduling, Plant Layout etc. Salary $200-$225. Apply to File No. 4083-V.

*MECHANICAL ENGINEER with around three years experience required by a manufacturer in Ontario. Preferably engineers with experience on farm implement design and manufacture or with farm background. Salary open Apply to File 4086-V.

*AUTOMOTIVE MECHANICAL SUPERINTENDENT required to re-organize and supervise complete mechanical repair and maintenance activity of large pulpwood operations in Northern Quebec. Equipment consists of several hundred units comprising trucks and vehicles etc. Salary $5,000. up. Apply to File No. 4091-V.

* Filled since appearance in advance notice.

MECHANICAL ENGINEER required in Montreal with considerable experience in machine shop practice also some administrative experience in shop work. Applicant should be around 35 years of age and bilingual. Salary depending on qualifications. Apply to File No. 4100-V.

Metallurgical

METALLURGICAL ENGINEER required by a farm implement manufacturer in Ontario to take over the necessary duties in new mechanized foundry. Salary open. Apply to File No. 4086-V.

Miscellaneous

MECHANICAL, CHEMICAL OR CIVIL ENGINEER, recent graduate up, required for sales and service in Montreal. Must be bilingual. Salary open. Apply to File 3867-V.

DRAUGHTSMAN preferably with mechanical and structural experience required by engineering firm in Toronto for design of material handling equipment such as belt conveyors also crushing plants and gold mills. Salary $200, to $350. Apply to File No. 4072-V.

SALES ENGINEER required by well known Engineering Supply Co. doing business with Mining and Pulp and Paper Co's. Excellent opportunity for advancement. Travelling not extensive. No experience necessary but desirable. Salary open. Apply to File No. 4079-V.

TOWN ENGINEER required by Town in Ontario. Duties include the supervision of Board of Works and Sanitation Departments as well as acting in an advisory capacity to the Telephone, Electric and Water Utilities. Salary from $250-$300. Apply to File No. 4087-V.

RECENT GRADUATE, mechanical or electrical background required by engineering firm in Montreal. Duties include training in Public Utility in Administration Department. Eventually for South America. Salary $225 to start. Apply to File No. 4089-V.

SALES ENGINEER preferably mechanical graduate, required for sales engineering work on blowers and vacuum pumps. Compressed air experience would be advantageous. Location Montreal. Salary and commission. Apply to File No. 4090-V.

JUNIOR ENGINEER preferably with a few years experience production control and some knowledge of the textile industry required for Montreal area. Salary $250-$275. Apply to File No. 4092-V.

SENIOR INDUSTRIAL ENGINEER with business administration and mechanical background, bilingual, with at least five years experience in production control, wage incentives and cost control required by an industrial engineering consultant in Montreal. Salary open. Apply to File No. 4092-V.

SENIOR DESIGNER with from five to ten years experience and a general knowledge of structural design in relation to buildings and bridges, required by a steel company in Southern Ontario. Salary open. Apply to File No. 4093-V.

JUNIOR ENGINEER with from one to five years experience and at least a working knowledge of structural design of buildings, required by a steel company in Southern Ontario. Salary open. Apply to File No. 4093-V.

GRADUATE ENGINEER required by well known insurance brokerage firm in Montreal to be trained for field duties consisting principally of plant surveys, plans and fire engineering work, including automatic sprinkler systems and hydraulics. Splendid opportunities for quick advancement. Salary open. Apply to File No. 4097-V.

*INDUSTRIAL ENGINEER wanted for Toronto area with four to five years experience in time study, production control etc. Preferably with knowledge of sheet metal fabrication. Salary $250. to $275. Apply to File No. 4098-V.

*DRAUGHTSMEN required by firm in Toronto area. Preferably with sheet metal experience. Salary open. Apply to File No. 4098-V.

SALES ENGINEER required by large manufacturer of Air Handling equipment in Toronto area. Applicant should have either industrial or Public Building application and sales experience. Salary open. Apply to File No. 4101-V.

GRADUATE CIVIL OR MECHANICAL ENGINEER with extensive experience in design and layout. Required for senior design duties in Montreal with Public Utility. Salary open. Apply to File No. 4103-V.

MAINTENANCE ENGINEER required in Quebec City to do installation work in heating, ventilating, refrigeration and air-conditioning, gas and diesel motors. Must be bilingual. Salary open. Apply to File No. 4104-V.

JUNIOR ENGINEER required in Quebec City. Preferably with three to five years experience in heating, ventilating and air-conditioning. Salary open. Apply to File No. 4104-V.

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

Chemical

CHEMICAL ENGINEER OR CHEMIST, preferably with Ph.D., required by a pulp and paper company with plants in Eastern Canada, for research work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER required by a pulp and paper company with plants in Eastern Canada, for mill control and plant work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER with considerable mechanic and hydraulic experience or mechanical engineer with good chemical knowledge and experience in hydraulics, required by a manufacturer in Ontario. Salary open. Apply to File No. 3928-V.

CHEMICAL ENGINEER, recent graduate is needed by a chemical manufacturing firm situated in the Province of Quebec. Some experience in oil refinery, pulp and paper, or synthetic resin manufacture would be useful. Salary open. Apply to File No. 3978-V.

CHEMICAL ENGINEER OR CHEMIST wanted by large manufacturers of bleached sulphate pulp for their Technical and Development Department. Several years experience preferably in the pulp and paper industry. Mill located in Northern Ontario. Salary open. Apply to File No. 3991-V.

CHEMICAL ENGINEER, experienced in use of physics and mathematics, under 30 years of age, required by industrial and chemical organization with Headquarters in Montreal. Duties include development work and study explosives and chemistry and hydro-dynamics. Salary open. Apply to File No. 3995-V.

SENIOR CHEMICAL ENGINEER OR CHEMIST, required by leading Paper Manufacturer in Eastern Canada. Applicant should have some experience in Paper Mill Control work. This position offers plenty of scope for advancement. Salary open. Apply to File No. 4013-V.

CHEMICAL ENGINEER required by a major Canadian Company located in Toronto as Technical Service Man. 25 to 35 years old. Definite sales personality. Position will include 6 to 12 months' training. It will carry the responsibility for servicing all types of adhesives to industries throughout Canada. Salary open. Apply to File No. 4044-V.

*CHIEF CHEMIST required to co-ordinate and supervise quality control, research and development work in laboratories of large industrial organization engaged in manufacture and processing of soaps, cosmetics, dentifrices, edible fats and oils etc. Salary open. Apply to File No. 4068-V.

GRADUATE CHEMICAL ENGINEERS OR CHEMISTS required by an industrial chemical plant in Montreal area. Preferably with experience in production and the operation of chemical equipment such as filters, presses etc. Must be able to organize work and direct workmen. Salary $200 up. Apply to File No. 4071-V.

Civil

CIVIL ENGINEER to take charge of work in a drainage district in Quebec. Must be bilingual, may be recent graduate. Salary from $200. Apply to File No. 3479-V.

CIVIL ENGINEERS with experience in detailing and designing structural steel and reinforced concrete for manufacturers are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

CIVIL ENGINEERS, recent graduate up, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

GRADUATE CIVIL ENGINEER, required by a public utility in the Montreal area with three or four years experience in design of reinforced concrete and structural steel. Salary $250-$300. Apply to File No. 3766-V.

CIVIL ENGINEERS with some experience on design and field work required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

CIVIL ENGINEERS required as draughtsman in bridge department of large transport company. Preferably with experience in steel, concrete and timber construction. Salary $200-$300. Apply to File No. 3884-V.

CIVIL ENGINEER required as Town Engineer of a town in the Maritimes. Required to supervise and layout work for Water and Sewerage Department also construction of a general nature for the Electric Light Department. Salary open. Apply to File No. 3930-V.

*CIVIL ENGINEER, recent graduate, required to understudy City Engineer of a city in Western Quebec. Salary open. Apply to File No. 3966-V.

JUNIOR ENGINEER, preferably with civil background required for sales and service by a Montreal manufacturer of waterproofing compounds. Salary open. Apply to File No. 3968-V.

CIVIL ENGINEER required in Montreal with general knowledge of re-inforced concrete and steel structures. Special knowledge of triangulation surveys, boundary surveys, also laws and procedure to be followed in regard to the purchase, transfer and registration of lands in Province of Quebec. Must be bilingual. Preferably veteran. Salary not less than $3,480. Apply to File No. 3987-V.

*Filled since appearance in advance notice.

Electrical

*ELECTRICAL ENGINEER, age 30-45, required as sales engineer in Canada for U.S. firm making special equipment for transport and industry. Must have sales training in electrical equipment instruments also experience as sales and service engineer. Salary open. Apply to File No. 3447-V.

ELECTRICAL ENGINEER, recent graduate up, required by a manufacturer in Montreal, for sales engineering. Must be bilingual and familiar with rotating electrical equipment. Salary $200 up. Apply to File 3761-V.

GRADUATE, ELECTRICAL ENGINEERS, with 3 to 10 years experience in design operation, layout of substations, switching stations, and electrical machinery, together with engineering studies, including draughting for a large hydro electric power house in Quebec. Salary $225 up according to experience. Apply to File No. 3787-V.

ELECTRICAL ENGINEER required for power sales by an electrical utility in Province of Quebec. Preferably experienced. Bilingual. Salary open. Apply to File No. 3802-V.

ELECTRICAL ENGINEER with experience in layout and design of generating and transformer stations, required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

SEVERAL EXPERIENCED ELECTRICAL DRAUGHTSMEN, for the design and layout of industrial power and control systems. Required by consulting engineering office in Montreal. Salary open. Good chance for advancement. Apply to File No. 3890-V.

ELECTRICAL ENGINEERS, required for sales engineering work in Western Canada. Graduates with some selling experience preferred. Salary open, plus expenses. Apply to File No. 3915-V.

JUNIOR ELECTRICAL ENGINEER, age about 30, required as assistant to superintendent of light department in Montreal area. Practical experience in Hydro Distribution and Steam Turbines. General office routine of administrative nature. Salary open. Apply to File No. 3950-V.

ELECTRICAL DRAUGHTSMAN, required by a firm of Engineer Contractors in Alberta for layout and plotting with a minimum of supervision. Should be accustomed to working with power lines to 2,300 volts and must be able to do lighting circuits, both overhead and underground. Salary $250 to $300. Apply to File No. 3972-V.

PROFESSOR IN ELECTRICAL ENGINEERING required by a Canadian University in the Province of Quebec for fall 1948 semester. Preferably with teaching and practical experience in power, electrical machinery design, lab., etc. Bilingual preferred. Attractive salary available for right man. Apply to File No. 3982-V.

ELECTRICAL ENGINEERS, age 30 to 40, required for the Commercial and Distribution Department of large Hydro Electric Utility. Must have experience in electrical distribution. Salary open. Apply to File No. 4002-V.

ELECTRICAL ENGINEER experienced in Power Station, Transmission and Distribution design and installation. Permanence and advancement depending upon performance. Salary open. Apply to File No. 4024-V.

JUNIOR ELECTRICAL ENGINEER, required by a mining company in Northern Ontario. Salary open. Apply to File No. 4028-V.

*ELECTRICAL ENGINEER with minimum of 5 years experience in paper industry, between 35-45 years of age, for responsible position with large newsprint manufacturing concern in Northern Ontario. Salary commensurate with qualifications. Living accommodation assured. Apply to File No. 4032-V.

*ELECTRICAL ENGINEERS with some experience in reasearch, design, and development, backgrounds in communications, electronics, power or physics are preferred. Required for the staff of a technical college in N.Y. State. Salary and rank will be commensurate with experience and training. Apply to File No. 4038-V.

*ELECTRICAL ENGINEER required by an industrial firm in the Montreal area. Duties include follow up of electrical installations and planning also layout and design. Salary open. Apply to File No. 4061-V.

GRADUATE ELECTRICAL ENGINEER with a minimum of 2 years practical experience to assist in electrical engineering design work. Field work on construction and maintenance of structures, service and installation of equipment. Required by Manitoba city. Salary $226. to $257. Apply to File No. 4069-V.

*ELECTRICAL ENGINEER, required to act as Project Engineer by an industrial organization with Head Office in Montreal. Duties include the design of industrial electrical layouts and the preparation of material requisitions for industrial installations. Salary open. Apply to File No. 4085-V.

Mechanical

MECHANICAL ENGINEERS, preferably with design experience, are required for armament research and development in the Quebec area in a government establishment. Salary from $190. Apply to File No. 3401-V.

MECHANICAL ENGINEERS, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

JUNIOR MECHANICAL ENGINEER with knowledge of precision machine shop practice and aptitude for research work in metals and plastics required for an organization in Toronto for the production of artificial limbs. Must be veteran. Salary from $225. Apply to File No. 3675-V.

MECHANICAL ENGINEERS with experience in plant layout and design or ventilation problems or general mechanical design, required by a firm in Quebec. Salary from $250. Apply to File No. 3818-V.

*MECHANICAL ENGINEER, age 35-40 with considerable experience in design and layout of machinery and equipment, required by an organization with Head Office in Montreal. Salary $300-$400. Apply to File No. 3820-V.

MECHANICAL ENGINEER with six to ten years experience in maintenance and engineering work required by alkali manufacturers in Ontario. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER, required by a manufacturer in Ontario for the plant operation staff. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER, age 30-38, required for northern Ontario Paper Mill. Preferably with paper mill experience or experience in general layout and design. Knowledge of pumps capacities, piping, conveyors, estimating and structural design essential. Salary open. Apply to File No. 3891-V.

MECHANICAL ENGINEER, age 25 to 35, experienced in industrial plant layout and machine design required by manufacturing firm in Brantford. Salary open. Apply to File No. 3907-V.

MECHANICAL ENGINEER, recent graduate, bilingual, with some experience in general plant work, required in Montreal. Industrial engineering experience would be useful. Duties include time-study in Standards Department. Salary open. Apply to File No. 3980-V.

*MECHANICAL ENGINEER, with experience in plant layout and knowledge of reinforced concrete, timber and steel design, required in an industrial manufacturing and processing plant situated 75 miles from both Ottawa and Montreal. Salary open. Apply to File No. 3990-V.

MECHANICAL DESIGN DRAUGHTSMAN with experience in reinforced concrete and structural steel required by a mining company in Northern Ontario. Housing available. Salary open. Apply to File No. 3994-V.

MECHANICAL ENGINEER, with 2 or 3 years experience, preferably bilingual, required as Mechanical Development Engineer by industrial and chemical organization with headquarters in Montreal. Duties will be conducting investigations on existing equipment and a certain amount of plant layout work and draughting. Salary open. Apply to File No. 3995-V.

MECHANICAL ENGINEER with 1 to 3 years experience in production, required as Industrial Engineer by industrial and chemical organization with headquarters in Montreal. Duties include responsibility for conducting methods engineering studies using methods of process charts, time and motion study. Salary open. Apply to File No. 3995-V.

MECHANICAL ENGINEER, required by a Montreal manufacturer of machines and equipment for work consisting of general engineering and design in connection with the manufacture of pulp and paper machinery. Salary open. Apply to File No. 4000-V.

MECHANICAL ENGINEER required as assistant in Chief Engineers Department by large paper company. Paper experience essential. Some knowledge of French language would be helpful. Age 28-40. Salary $350-$450. Apply to File No. 4022-V.

MECHANICAL ENGINEER required in Ontario by a firm specializing in machine tools. Applicant must be experienced in production control. Salary open. Apply to File No. 4026-V.

MECHANICAL DRAUGHTSMAN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for colliery plant, screening equipment, hoists, simple steel structures etc. Salary $240 up depending upon ability. Apply to File No. 4030-V.

CHIEF ENGINEER, mechanical background required by a specialized industrial plant in the Montreal area. Work covers mechanical design, preparation of work drawings, bills of materials, specifications and the ordering of all materials for contracts also design of necessary tooling. Minimum salary $450.00. Apply to File No. 4066-V.

MECHANICAL ENGINEERS with experience in the design of hydraulic turbines, valves, penstocks, surge tanks and associated equipment required by large manufacturer in Montreal to participate in expanding program of hydro electric development. Salary open. Apply to File No. 4074-V.

MECHANICAL ENGINEER with minimum of eight years experience in the design of heavy mechanical equipment required by well established firm in Montreal for general supervision and checking. Must be alert and aggressive. Salary open. Apply to File No. 4074-V.

MECHANICAL ENGINEERS with experience in estimating or design required by well known general engineering firm in Montreal. Good future for those with right qualifications. Salary commensurate with ability. Apply to File No. 4074-V.

Mining

MINING ENGINEERS, with varied experience required by a firm in Quebec for general mine operation, exploitation and development work. Salary from $250. Apply to File No. 3818-V.

MINING ENGINEER with several years experience required by a company engaged in large scale asbestos production in Quebec. Salary open. Apply to File No. 3935-V.

Miscellaneous

STRUCTURAL STEEL DRAUGHTSMAN AND CHECKERS, preferably graduate engineers but any experienced men acceptable, are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

GRADUATE ENGINEER, required by an industrial and chemical organization with headquarters in Montreal for all phases of research, design, operation development, production and maintenance. Salaries open. Apply to File No. 3588-V.

SALES ENGINEER with wide engineering experience, wanted by a company in Toronto for the sale of textile machinery and construction equipment. Salary open. Apply to File No. 3639-V.

STRUCTURAL STEEL DETAILER AND CHECKER with considerable experience, required for checking shop details by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

DETAILER AND DESIGNER for reinforcing steel with considerable experience, required by a steel fabricating firm in Montreal. Apply to File No. 3740-V.

SALES ENGINEER, preferably bilingual required by a Montreal firm dealing in building materials. Salary from $200. Apply to File No. 3745-V.

GRADUATE ENGINEER, required by an electrical firm in Montreal to organize publicity department and edit trade journal. Salary open. Apply to File No. 3751-V.

STRUCTURAL STEEL DRAUGHTSMAN, qualified to detail and check all classes of structural steel, and to supervise draughtsmen in a large drawing office on the West Coast. Salary open. Apply to File No. 3777-V.

BRIDGE ENGINEER, qualified to be in charge of the design and supervision of the construction of highway bridges. Apply stating qualifications, experience, age and salary wanted. Apply to File No. 3780-V.

RECENT GRADUATES OR JUNIOR ENGINEERS, with mechanical background, required by a Montreal Engineering, fabricating and contracting firm for training purposes leading to sales and service. Area Montreal. Salary $175. up. Apply to File No. 3810-V.

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open. Apply to File No. 3811-V.

DRAUGHTSMAN of the following classes: Architectural, piping layout, equipment layout, mechanical design, steam plant, heating, and ventilating electrical and plumbing required by an industrial organization in Montreal. Salaries open. Apply to File No. 3860-V.

STRUCTURAL STEEL CHECKER AND ONE DETAILER CHECKER, wanted for large fabricating plant in Vancouver, B.C. Age between 30 and 40 years preferred. Must be experienced. Give full information and references. Salary open. Apply to File No. 3862-V.

STRUCTURAL ENGINEER required by a Steel Company in Montreal for the design of reinforced concrete frame. Salary open. Apply to File No. 3931-V.

TWO METALLURGICAL ENGINEERS AND ONE CHEMICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No. 3942-V.

SALES ENGINEER required by well known manufacturer of mechanical equipment to solicit industrial accounts throughout the Province of Quebec. Applicants must reply giving full details, age, training etc. Salary open. Apply to File No. 3951-V.

DRAUGHTSMAN required by a firm of engineer contractors in Alberta for layout of pipelines and details in refinery construction. Preferably background of refinery experience or alternately powerhouse piping or heavy industrial draughting. Salary $300.00. Apply to File No. 3972-V.

STRUCTURAL ENGINEER DRAUGHTSMAN, required by a firm of engineer contractors in Alberta. Duties include structural detailer and requires knowledge of major concrete foundations; to detail structural steel buildings, access tower platforms and miscellaneous small steel structures. Salary $300.00. Apply to File No. 3972-V.

GRADUATE ENGINEER, age 32 up, preferably bilingual and with 10 years experience in industrial design required by chemical organization with headquarters in Montreal. Duties include supervision of Works Design Department, supply draughting and design service for plant, prepare appropriation requests, maintain cost estimating units etc. Salary open. Apply to File No. 3995-V.

GRADUATE ENGINEER, three to 5 years plant experience, required by chemical organization in Montreal. Duties include assisting in developing and carrying out in various plants training programs in subject and related fields for junior industrial engineers. Develop and apply such office routine as may be necessary. Salary open. Apply to File 3995-V.

MECHANICAL ELECTRICAL OR CIVIL ENGINEER, age 23-30, preferably single and bilingual with some experience in maintenance required by an industrial and chemical organization with headquarters in Montreal. Duties include construction project and design studies. Salary open. Apply to File No. 3995-V.

CIVIL OR MECHANICAL ENGINEER wanted with 5 to 8 years experience for key position in moderate size plant in Manitoba doing fabrication of Plate Work and Light Steel Work, also Grey Iron Foundry and Machine Shop. This will lead to key position in a growing organization. Salary open. Apply to File No. 4003-V.

MECHANICAL AND CHEMICAL ENGINEERS, interested in entering the Pulp and Paper industry, required in Newfoundland. Vacancies in Technical Department and studying process work and improved methods of operation. Pulp and paper experience is not necessary. Salary open. Apply to File No. 4009-V.

POWER PLANT SUPERVISOR required for South America. Age 30-40, single preferred. To supervise steam power plant including operating, boiler cleaning and minor repairs. Salary $375 U.S. currency. Apply to File 4011-V.

ELECTRICAL OR MECHANICAL ENGINEERS required by large Montreal firm to prepare and analyze specifications for telephone equipment manufacturing and installation. Other type of engineering work also available. Salary open. Please send photo together with particulars of education and experience. Apply to File No. 4018-V.

GRADUATE ENGINEER, required as Assistant to Manager of Sawmill and Woodlands operations. Position located in Ontario. Good commercial sense essential also some sales ability. Salary around $400. Apply to File No. 4021-V.

ARCHITECTURAL DRAUGHTSMAN experienced in industrial building construction, with natural aptitude for design work, wanted by large industry in Eastern Townships, good salary, permanent position to the right man. Apply to File No. 4031-V.

DESIGNING ENGINEERS or DRAUGHTSMEN, preferably but not necessarily with experience in Pulp and Paper Mill work required for paper mill in Newfoundland. Salaries $300 per month or better depending upon experience and ability. Apply to File No. 4036-V.

GRADUATE ENGINEERS preferably with about five years light structural and mechanical experience required by growing concern in central Ontario to learn business thoroughly and thereby be in a position to accept responsibility in Engineering Department. Salary open, based on experience and aptitude. Apply to File No. 4045-V.

SENIOR INDUSTRIAL ENGINEER required by Management Consultants in Montreal. Experienced in installations of Production and Cost Control, Wage Incentives, etc. Free to travel, preferably bilingual. Salary open. Apply to File No. 4052-V.

SALES ENGINEER for popular line of Diesel Engines applicants must be specialists on Power Units and Generator Sets. Required for permanent employment with well established organization. Apply to File No. 4055-V.

JUNIOR GRADUATE ENGINEER with civil or mechanical qualifications. Moderate salary with excellent prospects for advancement. Required for Canadian University in Montreal for its department of buildings and grounds. Apply to File No. 4057-V.

GRADUATE ENGINEER, preferably mechanical or electrical background, required for drop forging plant operation and production in Province of Ontario, by large steel company with head office in Ontario. Good commercial sense essential. Salary open. Apply to File No. 4062-V.

INDUSTRIAL ENGINEER with considerable manufacturing experience. Between 30 and 40 years of age. Required for plant surveys in Province of Quebec. Must be fluently bilingual. Permanent position. Salary according to qualifications. Apply to File No. 4064-V.

POWER STATION OPERATOR with about five years' experience principally in operation and maintenance of turbines and mechanical equipment of hydro-electric plants required by public utility in Brazil. Preferably not over 30 and single but will consider married man without minor dependents. Replies held in strictest confidence. Salary open. Apply to File No. 4073-V.

MECHANICAL OR CIVIL ENGINEER with at least four years experience in stress analysis and vibration required by one of Canada's leading manufacturers of heavy mechanical equipment. Considerable scope for man of proper qualifications. Salary open. Apply to File No. 4074-V.

Situations Wanted

MECHANICAL ENGINEER, B.Sc. Queen's '33, M.E.I.C., M.I.A.S., P. Eng. Que. Married, age 37, over twelve years experience including design, stress analysis, maintenance, inspection, administration and 5½ years as an R.C.A.F. Engineer Officer. Presently employed desires permanent position with good future prospects. Preferably in an English speaking locality. Apply to File No. 1042-W.

GRADUATE CIVIL ENGINEER, S.E.I.C., B.Sc. Queen's; P. Eng. Que., would accept part time work during evenings or weekends at home, preferably, on steel construction and reinforced concrete design, estimating and detailing. Residing in Montreal. Apply to File No. 1487-W.

PART TIME WORK: Civil engineer, age 34, R.P.E., M.E.I.C., perfectly bilingual, with post-graduate work at University of Toronto in Public Health Engineering and at Harvard University in Industrial Hygiene, also experienced in structural and plate work and in municipal engineering, would take work evenings and week-ends, specially in consulting form to industry in problems related to Industrial Hygiene and local exhaust ventilation. Apply to File No. 2272-W.

MECHANICAL ENGINEER, McGill, Jr.E.I.C., P. Eng. Que., age 26, single, veteran, bilingual. Six years of varied experience covering general plant maintenance; power-house operation; gasoline and diesel trucks, tractor and locomotive maintenance; residential and some industrial construction. Well versed in Time Study and job evaluation. Position desired in Montreal. Now employed out of town. Available after reasonable notice to present employers. Apply to File No. 2338-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C., desires part time work during evenings and week-ends. Experience in plant layout, design estimating, etc. Apply to File No. 2715-W.

CHEMICAL PROCESS ENGINEER, Jr.E.I.C., McGill, Vetrean, over four years overseas as Engineer Officer (construction). Two years design, correlation and economic evaluation work on petroleum refining processes with major U.S. oil company. Present salary $4,000. Age 27, married. Desire responsible position in Canada. Apply to File No. 2778-W.

CIVIL ENGINEER, S.E.I.C., P. Eng. Interested in part time work. Structural steel, reinforced concrete or earthwork. Estimating, designing and draughting. Apply to File No. 2817-W.

ELECTRICAL ENGINEER, M.E.I.C., P.E. (N.B.) age 35, married, 12 years experience in electrical machinery including 2 years District Manager of Sub Station in North West Quebec; 3 years Assistant Electrical Superintendent of Gold Mine in North West Quebec; 3 years R.C.E. Electrical Distribution Systems; 2 years teaching in electrical department of a Canadian University. Present teaching position temporary. Apply to File No. 2827-W.

MECHANICAL ENGINEER, S.E.I.C., two years experience in consulting and general engineering work desires position in consulting or industrial work. Montreal or Ottawa preferred. Available on short notice. Apply to File No. 2829-W.

CIVIL ENGINEER, Jr.E.I.C., B.A.Sc. (Toronto), P. Eng. (Ont.) with some experience in reinforced concrete and structural steel design including detailing of reinforced concrete and estimating. Would accept part time work during evenings and week-ends. At present employed and residing in the Toronto area. Apply to File No. 2910-W.

GRADUATE ELECTRICAL ENGINEER, McGill '24; M.E.I.C., Prof. Eng. Que; over 20 years experience in High Voltage Transmission Line design and construction. Interested in part time or temporary position in general Engineering or transmission line work. Location preferably Montreal or in B.C. At present residing in Montreal area, due to certain physical defects the type of work that can be undertaken is limited. available at once. Apply to File No. 2918-W.

GRADUATE MECHANICAL AND ELECTRICAL ENGINEER, M.E.I.C., P. Eng. (Ont.), age 39, married. 16 years of experience here and in Europe includes mechanical, electrical and optical design, applications, sales, administration, inspection of production, statistical quality control. Knowledge of foreign languages. Presently engaged in Montreal area, salary $420 per month, would prefer position in Ontario or B.C. Available one month's notice. Apply to File No. 2931-W.

CHEMICAL ENGINEER, S.E.I.C., age 25, experience, process control in rubber and heavy chemicals; engineering in distillery. Presently employed seeks position with greater scope in engineering work. Available one-month's notice. Will travel anywhere. Apply to File No. 2936-W.

MECHANICAL ENGINEER, Jr.E.I.C., B. Eng. McGill '44, P. Eng. Que., age 24, veteran, proceeding toward Masters Degree, seeks employment for months May to September inclusive, on research or development projects or with consulting engineer. Varied experience in production, mechanical design and layout work. Would be able to continue project part time after October if necessary. Apply to File No. 2942-W.

CAMBRIDGE GRADUATE ENGINEER, M.E.I.C., P. Eng. (Ont.), age 29, married. With Civil, Aeronautical and Mechanical background. 4½ years R.A.F. Pilot and Instructor and 3½ years practical experience in consulting and municipal engineering on surveys, design estimating and construction work. Requires responsible and progressive position where ful use can be made of wide interests. Location Ontario (where presently employed) or Western Canada. Apply to File No. 2943-W.

ELECTRICAL ENGINEER, M.E.I.C., P. Eng. (Que.), B.A.Sc., Diploma in Business Administration, age 29, married; seven years industrial engineering and technical sales supervision in electrical industry. Available in May. Industrial marketing, or management engineering. Apply to File 2946-W.

CIVIL ENGINEER, Jr.E.I.C., P. Eng. (Que.) McGill graduate desires spare time work evenings and week-ends on design and detail of reinforced concrete and steel structures. Also qualified to make stress analysis of rigid frames and most statically indeterminate, structures. Location Montreal. Apply to File No. 2947-W.

2 STUDENTS, S.E.I.C., both on executive of Junior Section, desire summer employment in Ottawa area. Have 2 years Engineering at Carleton College, specializing in Engineering Physics or Electrical Engineering. Jobs need not be together. Available April 30th, 1948. Both experienced draughtsmen but prefer work at which they can gain fundamental knowledge in Physics. Apply to File No. 2948-W.

WANTED—TOWN ENGINEER

Qualified to take charge of all town services, including electric (distribution system) and water utilities. State qualifications, experience and salary expected. References required.

***Apply to* L. W. GELDERT, Town Clerk**
LUNENBERG, NOVA SCOTIA

ALUMINUM COMPANY OF CANADA, LIMITED
AND ASSOCIATED COMPANIES

Have opportunities for

QUALIFIED GRADUATE ENGINEERS

Information regarding current requirements may be obtained from Employment Department, 1700 Sun Life Building, Montreal, Quebec.

Plant Engineer for Paper Mill

A leading Paper Company has immediate vacancy for a qualified Plant Engineer. *Paper Mill experience essential.* Permanent position. Starting salary $475-$550 per month — to be based on experience and qualifications.

Write, stating in full details of experience and qualifications to FILE V.4132.

ENGINEER, M.E.I.C., B.Sc., P.Eng. Ont. Married, veteran R.C.E.M.E. Officer. Two years in plant mechanical and physical control laboratory. Two years as construction engineer, fieldwork and supervisory experience, reinforced concrete, masonry and steel structures. Chiefly interested in position as construction supervisor or concrete research. Apply to File No. 2949-W.

INDUSTRIAL AND PRODUCTION ENGINEERING, Jr.E.I.C., P. Eng. (Mechanical) Ont. 5 years experience in cost reduction and analysis, production planning and scheduling, systems and administration. Background of experience covers both industrial and mechanical engineering. Presently employed, available on six weeks notice. Age 28. Apply to File No. 2955-W.

CIVIL ENGINEER, P. Eng. Ont., M.E.I.C., would like spare time work at design of reinforced concrete or structural steel on a fee basis or otherwise. At present employed in the Hamilton, Ont., area. Appy to File No. 2964-W.

STRUCTURAL ENGINEER, Jr.E.I.C., B.E. '46, N.S.T.C., S.M. '48, M.I.T. Interested in Structural planning, design or construction, or working with consultants. Available June 15. Apply to File No. 2965-W.

MECHANICAL ENGINEER, M.E.I.C., B.Sc. Queen's 1936. Position wanted leading to design and installation of automatic controls and allied equipment; eleven years diversified experience including supervision of plant engineering and maintenance, with four years work on many types of control problems involving measurement and control of such factors as temperature, atmosphere, and flow. Available at one month's notice; Toronto area preferred. Apply to File No. 2966-W.

MECHANICAL ENGINEER, M.E.I.C., P. Eng., twelve years experience in the following fields; Automotive, Aircraft and Air handling Equipment on product design, development and testing, improvement of production. Also on design of special machinery; Maintenance in Paper Converting Mill and six years executive in Sales and Service. Desires position with responsible firm, or partnership with Consultant. Apply to File No. 2967-W.

ELECTRICAL ENGINEER, M.E.I.C., P.E.Q., B.Sc., 1931. Age 40, married. Requires employment with opportunity for advancement. Have extensive experience in power generation, conversion, plant power distribution, plant design and construction. Also experience in management and the setting up of new organizations. Available on one month's notice, additional information upon request. Apply to File No. 2976-W.

CIVIL ENGINEER, M.E.I.C., B.A.Sc., P. Eng. (Ont.) Age 44. Single, past experience includes administrative, executive and sales engineering in metal products, building materials and subcontract work in construction industry. Also held responsible position in personnel administration. Desires permanent position requiring initiative with good future prospects. Apply to File No. 2983-W.

MECHANICAL ENGINEER (27), B.Sc., A.M.I. Mech. E., in responsible position with world-famous engineering concern in England is willing to emigrate to Canada if suitable opening is found there. Experienced in production development work, production planning and manufacturing methods of wide range of power station plant. With initiative and adaptability for most positions on the production side. Further particulars on request. Apply to File No. 2984-W.

GRADUATE ELECTRICAL ENGINEER, Manitoba, age 36, M.E.I.C., 12 years experience in industrial manufacturing. Married with family. Well grounded training in costs and estimating of machinery - structural - miscellaneous ironwork and platework. Same experience in sales development and promotion work. Now employed but desires position with progressive firm where opportunity for advancement not restricted either in a similar capacity or position under superintendent. For further information apply to File No. 2986-W.

The Public Service of Canada

Requires

ENGINEERS, BILINGUAL, Department of Transport, various centres in the Province of Quebec, $3,900-$4,500 and $3,300-$3,900

Poster announcements giving full details are on display and application forms are obtainable at Post Offices, National Employment Service Offices and Offices of the Civil Service Commission, Montreal, Quebec or Ottawa. Application forms should be filed immediately with the

CIVIL SERVICE COMMISSION OF CANADA
OTTAWA

SALES ENGINEER

Openings are available in a growing Canadian Company located in Ontario for Sales Engineers, experienced in the commercial side of the heavy electrical industry. Successful applicants should have a thorough knowledge of the preparation of tenders, propositions, on Transformers, Motors, and Switchgear equipment. Replies will be treated in strict confidence. Apply to File No. 4102-V.

Graduate Electrical Engineer

Required for position with large Northern Ontario Paper Mill. Preferably man with some paper mill or other industrial experience. Salary commensurate with qualifications and experience. Apply stating experience and qualifications to File No. 4032-V.

THE UNIVERSITY OF MANITOBA REQUIRES ENGINEERING INSTRUCTORS

The Faculty of Engineering and Architecture of the University of Manitoba will require additional instructors for teaching duties beginning September 1, 1948.

Applicants should be Engineering Graduates from recognized Universities. The grades required will be assistant professors, lecturers and demonstrators in Civil, Electrical, and Mechanical Engineering. Salaries dependent on experience and general qualifications. Apply as soon as possible to Dean of Engineering and Architecture, or Head of Department Concerned, The University of Manitoba, Winnipeg.

Business & Industrial Briefs

A Digest of Information received by The Editor

Appointments and Transfers

On April 9, the Canadian Standards Association formed an Advisory Committee on which many of Canada's leading industrialists, scientists and engineers will serve.

The members of the new Committee are:

Wm. F. Angus, M.E.I.C., President, Dominion Bridge Company Ltd.

Sir Frederick Carson, Executive Vice-President, Montreal Locomotive Works Ltd.

Victor Drury, President, Canadian Car & Foundry Company Ltd.

James S. Duncan, President, Massey-Harris Company Limited.

A. E. Grauer, President, British Columbia Power Corporation Limited.

R. L. Hearn, M.E.I.C., General Manager & Chief Engineer, Hydro-Electric Power Commission of Ontario.

H. G. Hilton, President, The Steel Company of Canada Limited.

Frederick Johnson, President, The Bell Telephone Company of Canada.

F. B. Kilbourn, M.E.I.C., President, Canada Cement Company Limited.

W. A. Mather, M.E.I.C., President, Canadian Pacific Railway Company.

R. E. Powell, President, Aluminum Company of Canada Limited.

J. R. Read, Chairman and President, Canadian Westinghouse Company Limited.

P. F. Sise, M.E.I.C., President, Northern Electric Company Limited.

H. M. Turner, President, Canadian General Electric Company Limited.

R. C. Vaughan, President, Canadian National Railways.

James Wilson, President, Shawinigan Water and Power Company.

At a recent annual meeting of the Board of Directors of Babcock-Wilcox and Goldie-McCulloch, Limited, R. M. Robertson was appointed Assistant General Manager of the Company. He will also continue his present duties as Chief Engineer.

Mr. Robertson was educated in Mechanical Engineering at the University of Toronto, and since graduation has been actively engaged in steam plant engineering.

He joined Babcock-Wilcox and Goldie-McCulloch, Limited, in 1934 and became Chief Engineer in 1937. For some time he was a member of the Council of Professional Engineers of Ontario.

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S. J. Beaton has been appointed to the staff of the Industrial Heating Section of Canadian General Electric Company's Head Office. He is a graduate of the University of British Columbia where he received the degree of B.A.Sc. in 1944.

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W. E. Ross, Manager of Canadian General Electric's Apparatus Department recently announced a reorganization of the Department. The change has involved the creation of new Divisions.

Promoted to Division Manager are D. L. McLaren, M.E.I.C., Generator Division; H. Rose, Switchgear Division; V. B. Ross, Transformer Division; A. G. Turnbull, Control Division, and J. D. Willis, Industrial Division.

The Company has also announced the appointment of I. M. MacLean as Manager of the Application Engineering Division. He has succeeded the late W. D. Robertson.

Ferranti Electric Limited, Mount Dennis, Toronto, has announced the appointment of Dr. J. M. Thomson, M.E.I.C., as Vice-President.

Dr. Thomson joined the Company in 1926, as Radio Engineer responsible for the design and experimental work being carried on at that time. He was also in charge of transformer development and research work, and, in 1942, became Chief Engineer responsible for all the engineering decisions of the Company. In 1946 he was appointed Assistant General Manager and in 1947 he was promoted to the post of General Manager, which position he still holds.

Dr. Thomson graduated from the School of Practical Science, University of Toronto in 1924. Following graduation he worked for some time in the test department of General Electric Co. in Schenectady and in the engineering department of the English Electric Co. of Canada Ltd., St. Catharines. In 1937 he obtained a Ph.D. degree at the University of Toronto.

He has been very active in the work of the American Institute of Electrical Engineers, having held the offices of Chairman of the Toronto Section and Vice-President of the Canadian District. He was appointed, recently, a Fellow of the Institute.

Dr. Thomson has served on many committees of the Canadian Standards Association, the Canadian Electrical Manufacturers Association, the University of Toronto Engineering Alumni and is a past Chairman of the Board of Education at Weston.

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Webster B. Todd formerly Chairman of the Board of Todd & Brown Inc., has been appointed to the Executive Committee of the American Wheelabrator & Equipment Corp., Mishawaka, Indiana.

W. F. Koehn has succeeded G. N. Curley as General Superintendent of the Ontario District of the Canadian Pacific Railway. Mr. Curley was recently appointed General Manager of the Company's Eastern region.

N. R. Crump, M.E.I.C., formerly Vice-President of the Eastern Region at Toronto has been appointed Vice-President in Montreal, with jurisdiction over all lines. William Manson has been appointed to the Prairie Region, which post was occupied by W. A. Mather, M.E.I.C., prior to his appointment as President of the Company on March 8. D. S. Thomson, formerly General Manager of the Eastern Region has succeeded Mr. Crump as Vice-President of that region with headquarters at Toronto.

J. O. Johnston has been appointed Superintendent of the Trenton Division. T. E. Wheeler, formerly of the Trenton Division has been moved to the superintendency at Schreiber, Ont., and G. E. Mayne is now Superintendent of the Montreal Terminal.

E. H. Despard has been appointed manager of the Permanent Magnet Section in Canadian General Electric Company's Chemical Division. He graduated from the University of Toronto as a B.A.Sc., in Metalurgical Engineering and has had extensive experience with his Company in the field of Carboloy and Industrial Heating.

At the fourth Annual Meeting of the Canadian Fan Manufacturers' Association held at Kitchener, Ontario on February 26, the following officers were elected for the year:

President, C. W. Johnson; Vice-President, A. H. Blake; Secretary-Treasurer, L. O. Monroe.

Mr. Johnson is Vice-President of Canadian Sirocco Company Ltd., Windsor, Ontario and Mr. Blake is General Manager of B. F. Sturtevant Company of Canada Ltd., Toronto, Ont.

Crawford Gordon, Jr., has been appointed Executive Vice-President and Director of John Inglis Co. Ltd. Mr. Gordon will continue as President of the English Electric Company of Canada Limited.

D. R. Machum has been appointed Assistant to the Manager of the Broadcast Equipment Sales Division of RCA Victor. Mr. Machum is a native of New Brunswick and he graduated from the University of New Brunswick, Fredericton, in 1947, with the degree of B.Sc. in Electrical Engineering. Upon graduation he was employed by the Radio Division of the Department of Transport at Ottawa. He will be located in Montreal.

J. D. Shortall has been appointed Wire and Cable Engineer in the Toronto District Office of the Canadian General Electric Company. His appointment covers the sales and application engineering of power cables, and special application to the new synthetic insulants.

He graduated from McGill University with the degree of B.Eng. (E.E.). He has been with the Canadian General Electric Co. Ltd. since 1936.

The Western Ontario Sales Office of the C. A. Dunham Company, Limited, is now located at 310 Main Street East, Hamilton. The Manager is F. W. Stott. The new location will enable Mr. Stott and his staff to better serve the Company's customers throughout the territory.

The Canadian General Electric Company opened, recently, a new office and warehouse in Regina. Manager is F. E. Estlin, M.E.I.C., and there are sixteen people on his staff, to provide complete electrical distribution service for the farms, homes and industries in the district.

The building cost $100,000 and it has a total of 14,200 square feet of floor space. It is constructed of reinforced concrete and Saskatchewan brick and stone.

M. C. Bailey has been appointed Manager of the Toronto Office of the C. A. Dunham Company, Limited. He has been acting in that capacity for the past year.

Mr. Bailey was engaged in the promotion of the sale of Dunham products before joining the R.C.A.F., and on discharge he returned to his former position in the Sales Department.

E. Fox has been appointed as a Sales Engineer with the C. A. Dunham Company, Limited. He will make his headquarters at the Company's Toronto Sales Office, 1139 Bay Street. Mr. Fox has been with the Company for a number of years and in his new position he will specialize in engineering counsel in the correct selection of Dunham systems and products. He is a member of the Ontario Association of Professional Engineers.

New Equipment and Developments

The Chrysler Corporation of Canada Ltd. have announced the construction of a new administration building at Windsor, Ont. The new structure will cost more than one million dollars and will be made entirely of Canadian materials. It will be located on the East side of Drouillard Road in Sandwich East Township, facing the Corporation motor car and engine plants. They intend to occupy the building at the end of this year.

The building will be two storeys high, E-shaped, 400 feet long, 147 feet deep and it will have 80,320 square feet of space.

Although Foster Wheeler Limited, of St. Catharines, Ont., have in past years completed contracts with South American countries, the first shipment by the Company to Venezuela is a 200-ton steam-generating unit. It will be installed as part of a large steam generated electric power plant. The generating equipment was designed, engineered and built by the Foster Wheeler Co. in their St. Catharines shops.

Assembled on eight railway gondola cars, the unit will be shipped direct to New York where it will be transhipped to Maracaibo, Venezuela, by freighter.

Foster Wheeler officials state that the unit which has been under construction for the past three months is one of several similar major export jobs scheduled for completion this year.

The unit has a capacity of 150,000 pounds of steam per hour at 250 pounds per square inch pressure with final steam temperature of 700 degrees fahrenheit. It will be oil fired and equipped with all necessary parts.

●

In the very near future the Canadian Standards Association will publish a new code concerning protectors for the heads and eyes of industrial workers.

●

The Solder Division of Alpha Metals Inc., have announced a new development in acid core solders, recently, engineered by the research staff. For details communicate with the Company at 363 Hudson Ave., Brooklyn 1, N.Y.

●

Lindberg Engineering Company, 2444 West Hubbard Street, Chicago, manufacturers of industrial heat treating and melting furnaces, have acquired the assets of the Electronics Division of Illinois Tool Works.

John A. Callanan, who headed this division for Illinois Tool Company, will, with his staff, join the Lindberg organization.

●

The Gardner-Denver at 400 West Madison Street, Chicago 6, Illinois have announced a new B67 Paving Breaker. It is intended for use on concrete and is a companion to the heavier Model B87. The manufacturers claim that it is especially suitable for horizontal operations, such as tearing out walls, for boulder breaking in quarries or mines, for trenching in shale or hardpan, or for preparing black-top for patching. It is also suitable for demolition work in altering and maintaining industrial plants.

For complete information communicate with the Company.

●

The Dominion Oxygen Co. Ltd., 159 Bay Street, Toronto 1, Ont., have announced that they have available "A more efficient Shutoff Valve for Oxy-Acetylene Production Welding ".

The valve is designed to prevent oxygen and acetylene waste in shops doing production welding. It is called the Oxweld V-31 Dual Shutoff Station Valve. When used with the oxy-acetylene blowpipe it controls the supply of both oxygen and acetylene or other fuel gas. When welding is interrupted, the operator just hangs the blowpipe on to a hook and gas consumption immediately stops. A blowpipe weighing as little as 12 oz., will it is claimed, tightly seal the valve.

For further information communicate directly with the company.

●

The Canadian General Electric Co. Ltd., 212 King St. W., Toronto, have announced a new portable Potentiometer.

The Potentiometer is designed for checking temperature measurement instruments and for testing rotating machines, ovens, furnaces, oil-burners, steam-driven equipment, and air-conditioning units. It was designed originally for measuring the low voltages of thermocouple outputs in testing steam turbines.

The equipment of the potentiometer, which is contained in a fabric-covered luggage case, includes the galvanometer, standard cell, working batteries and rheostats for adjusting the current through the potentiometer circuit.

The manufacturer will be pleased to supply complete details and illustrated material.

●

The Director of the Government of India Supply Mission, A. R. Palit, stated on April 22nd, in Washington, that his organization hoped to obtain between $120,000,000 and $125,000,000 worth of goods in Canada and the United States during 1948. Mr. Palit referred to the dollar shortage, but stated that he hoped to spend one-fifth of the total amount in Canada. Among the goods to be purchased are locomotives and parts, fertilizers, chemicals, ships, aircraft parts, machine tools, radio equipment and various types of machinery.

●

The American Electroplaters' Society, 473 York Road, Jenkintown, Pa., have announced a series of technical sessions for metal products manufacturers and the metal finishing industry at Atlantic City, June 28th to July 1st. These sessions will coincide with the Industrial Finishing Exposition, also sponsored by the Society, and they will be held in the Atlantic City Convention Hall. Communicate with the Society for details.

●

The Coliseum Building on the Toronto Fair Grounds has been faced with aluminum for the Canadian International Trade Fair, which will be held from May 31st to June 12th.

The Fair will feature more than 1,500 exhibits from 32 countries. It is the first event of its kind to be undertaken by a Canadian Government.

●

A new development in the search for new sources of lead and zinc has appeared through the recent granting of a concession in the Northwest Territories, to the Consolidated Mining and Smelting Company of Canada Limited, and Ventures Limited. The concession grants the exclusive right to prospect an area of some 500 square miles on the south shore of Great Slave Lake. The boundaries of the area in general terms are the south shore of Great Slave Lake, the 115th Meridian of West Longitude, an east-west line, inland from fifteen to twenty-eight miles and a north-south line twenty-eight miles east of the 115th Meridian.

●

On March 31, Canadian Industries Limited opened a new $2,000,000 paint plant in York Township near Toronto.

The new plant, fourth C.I.L. Paint works, will specialize in the production of enamels for finishing automobiles, refrigerators, washing machines and other items of industrial and household use. It will also manufacture anti-freeze from ethylene glycol.

The plant employs the latest scientific devices and methods to synchronize all its operations and embodies many features entirely new to the paint industry on this continent.

●

The Dominion Oxygen Company, Limited, 159 Bay Street, Toronto 1, claims savings, estimated at about 75 per cent of the overall welding and grinding costs, when the manufacturer of a stainless steel condenser used the Heliarc inert-gas-shielded arc welding process.

Many advantages are claimed for the process for such work. In the case referred to above, no filler metal was necessary and the welds were started and stopped without crater-crack difficulties. Welds of good corrosion-resistance properties were obtained and a low degree of porosity minimized the test and repair costs.

Publications

Dominion Bridge Company Ltd., Lachine, Que., have produced a well-illustrated and highly informative catalogue on their "M-M Safety Gratings". For copies apply to the Company at the address given above.

●

The Laurentide Equipment Company Ltd., 440 Beaumont Avenue. Montreal, have issued a new folder which gives the complete specifications of the new Laurentide "Beetle" Tractor and Angledozer.

Copies may be obtained from the Company. Please specify whether English or French is required.

●

The Canadian General Electric Company have issued a bulletin describing their "Electric Steam Boiler".

This bulletin should be of special interest to plant engineers and purchasing agents. It describes fully the equipment for the production of process steam from 0.3 to 108 boiler hp. Features of the bulletin are tables of ratings, outline drawings and installation photographs.

Direct your inquiries to the Company and ask for bulletin (4039B).

●

The R.C.A. Victor Company Ltd., Lenoir Street, Montreal have issued a brochure entitled "RCA Headliners". It lists oscillators, amplifiers, doublers, modulators, and rectifiers. It should be of particular interest to readers who are interested in electronics in the capacity of amateur or professional workers.

●

Hobbs Glass Ltd., London, Ontario, have issued a booklet giving details of a new type of glass block. This new product is designed to give a soft, diffused, light and to eliminate sun glare and heat. It features glass fiber screen sealed between two half blocks. The title of the booklet is "Daylight Where You Want It". Apply to the company for copies.

Nordberg Manufacturing Co., Milwaukee 7, Wis., have available two bulletins on their equipment. Bulletin No. 149 describes the Company's machinery for processing ores and minerals. Bulletin 152 describes Grinding Mills. Copies are available on request to the manufacturer.

●

The Northern Electric Co. Ltd., publish, periodically, a publication entitled the "Northern Circuit." It is intended primarily for the strengthening of the ties between the Company and its agents and dealers. Copies are, however, available to readers of the *Journal*. To have your name placed on the mailing list write to the Public Relations Manager, The Northern Electric Co. Ltd., 1620 Notre Dame St. West, Montreal 3, Que.

●

The Canadian Fairbanks-Morse Co. Ltd. have available literature on the American Flexible Metal Hose for which they are agents. This hose can be used in connection with air, chemicals, exhausts, gas, oil, refrigerants, steam, tar and asphalt, vacuum, water, and for vibration elimination. For copies of special bulletins dealing with the application of this hose to any particular type of work or for a complete catalogue showing all types, apply to the Company at 980 St. Antoine Street, Montreal, Que.

The B. Greening Wire Company Ltd., Hamilton, Ont., have issued a new 160 page Wire Rope Catalogue and Engineering Handbook WR 48. The catalogue is compact and fits easily into the pocket. It should be extremely useful to all users of wire rope. For copies please communicate with the B. Greening Wire Company Ltd., Hamilton, Ont., and mention, specifically, Handbook WR 48.

●

The Brunson Instrument Company of 1405 Walnut Street, Kansas City 6, Mo., manufacturers of precision surveying instruments have available a number of well illustrated bulletins describing their products. Readers of the *Journal* are invited to communicate with the Company stating their requirements so that appropriate bulletins may be mailed to them.

●

Chain Belt Company of Milwaukee have released a new brochure describing Rex Hi-Discharge Moto-Mixers. It describes truck mixers in detail and various types are illustrated. There are complete specification charts. For copies apply to the Company.

●

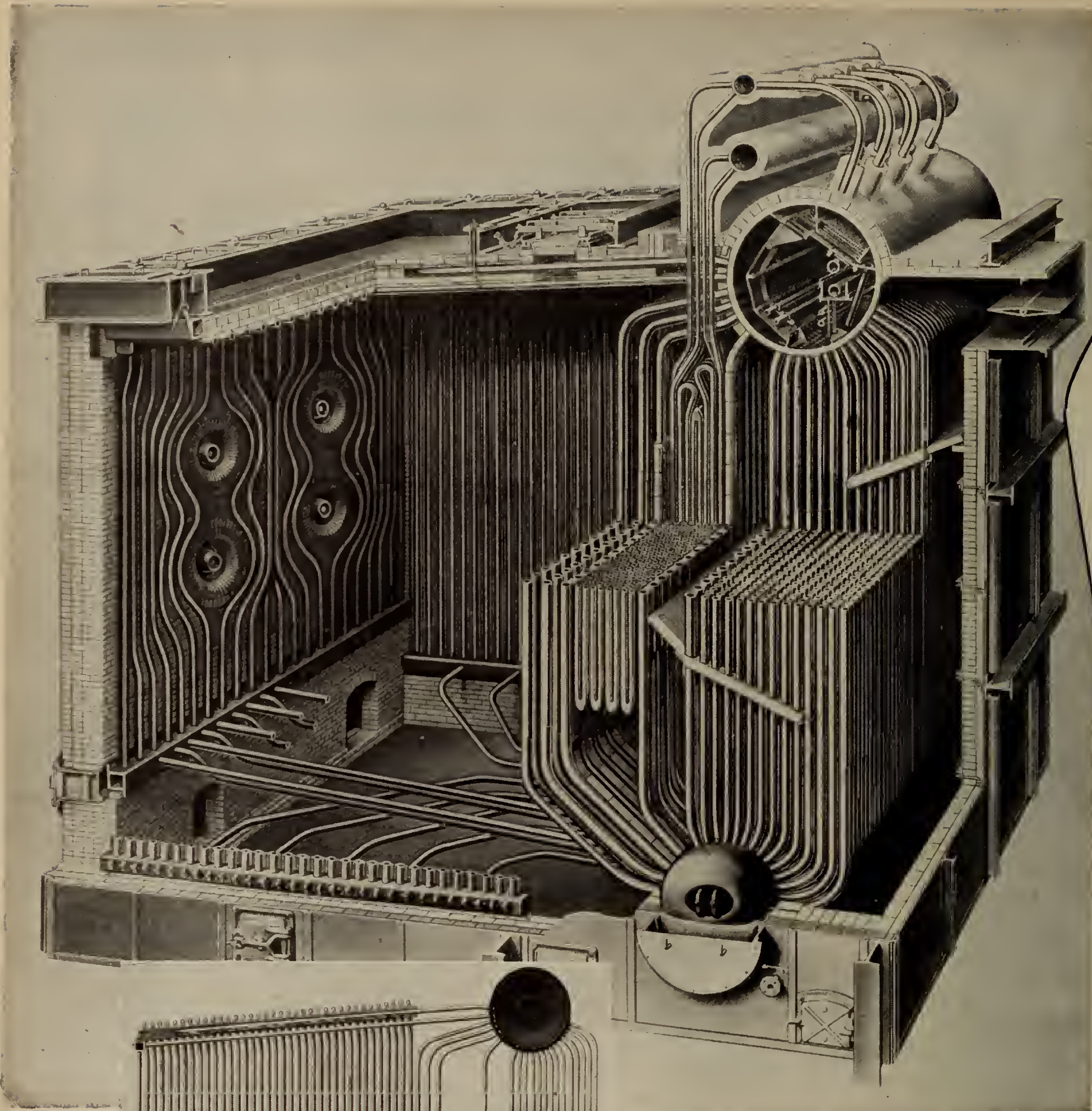
O. G. Moffat (P.Eng.) Air Conditioning Specialist, Canadian Westinghouse Co. Ltd., Hamilton, Ontario, has written a simplified explanation of Air Cleaning problems for builders and owners. It is titled "When Mechanical Air Filters? When Electrostatic Air Cleansers? When to Use Both?" It is available in sheet form. For copies communicate with the Company, requesting "Mr. Moffat's article on Air Cleaning problems."

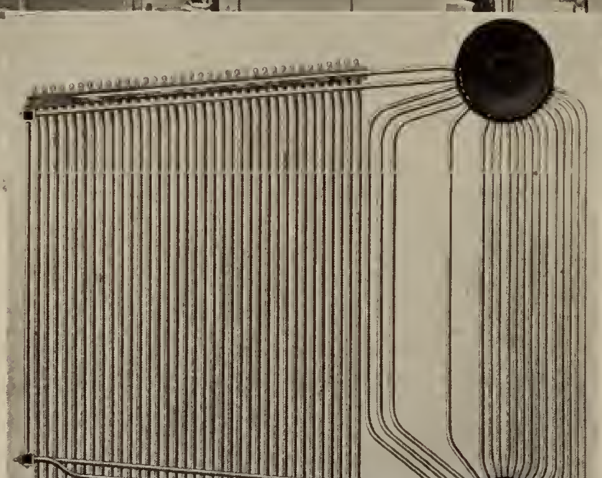
"Business & Industrial Briefs"

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





Symmetrical Design. Any section taken through the VU Unit fram front ta rear is similar to any other section so taken. The volume of gases, their velocity and temperature, at any point from front to rear, are practically constant across the width of the unit.

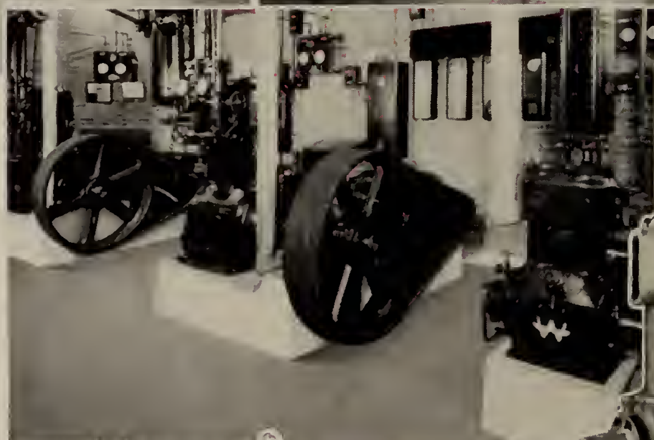
C·E

C-E-C PRODUCTS FOR THE INDUSTRY INCLUDE STEAM

COMBUSTION

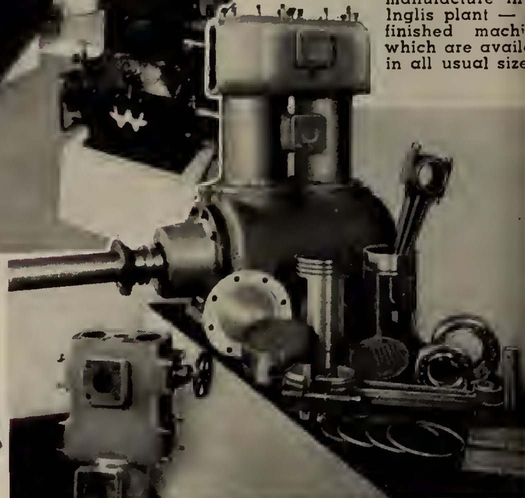
MONTREAL · TORONTO

CORPORATION

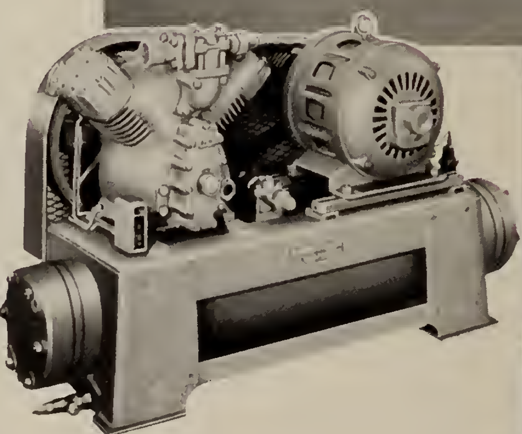


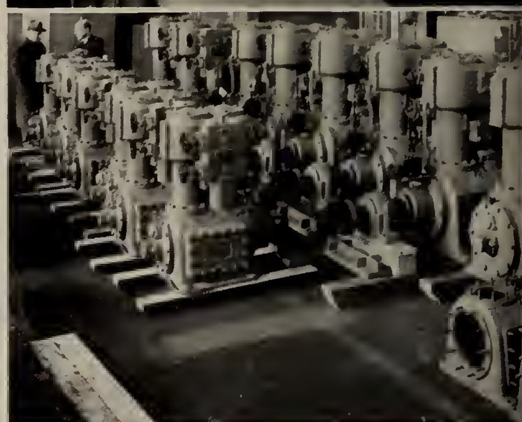
ꞮEFRIGERATION
AND
ꞮIR CONDITIONING
)F EVERY TYPE

special Inglis Refrigeration nd Air Conditioning Department is available to serve you. /hen planning an installation . . Freon, Ammonia, Centriıgal or any other type, Inglis efrigeration Engineers can oint the way to the most profitble plan. Inglis engineering nd manufacturing plus /orthington design and reptation in refrigeration, offers ɔu double assurance of faithıl performance. Call Inglis at ıe earliest stage of your roject.



The photographs above and the left show Inglis installati in a large Southern Ont Food Processing Plant. Belov displayed a 9 x 9 Worthing Ammonia Compressor du manufacture in Inglis plant — finished machi which are availa in all usual size





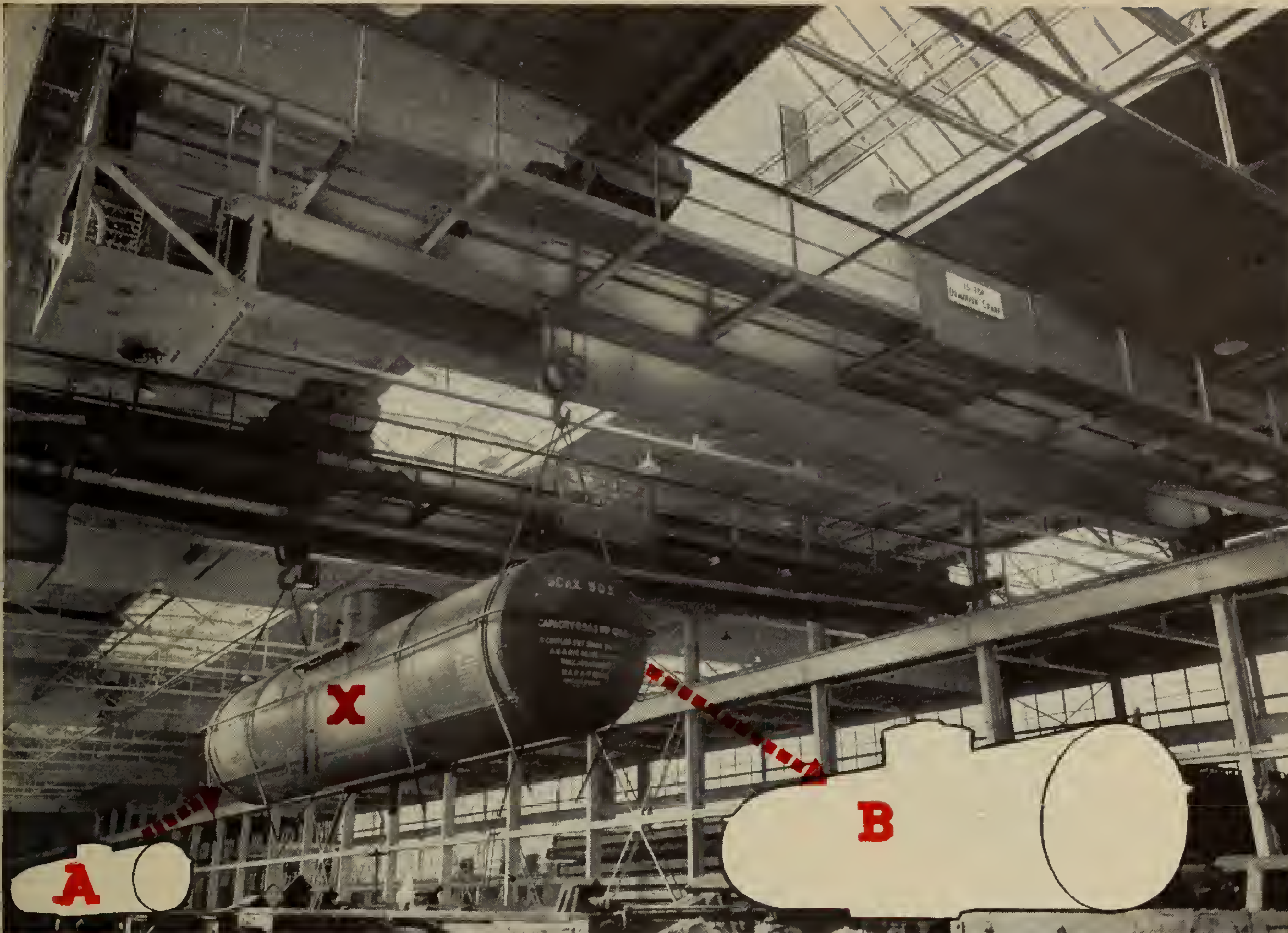
'or Hockey, Skating and Curling Rinks, Dairies, Ice ;ream Plants, Breweries, Meat Packers, Food Storage, ıocker Plants, Hotels, Fishing, Oil Refineries, Fur ıtorage, Theatres, Restaurants, Stores and all In-.ustrial Applications.

SHIPMENT FROM STOCK
— OF AMMONIA COMPRESSORS AND OTHER ITEMS

Made in Canada by . . .

JOHN INGLIS CO. LIMITED TORONTO, CANADA

Professional Cards



Two 15 ton Dominion Bridge cranes combine to lift a tank at the Dominion Works of Canadian Car and Foundry Company, Limited.

Moving **X** *from* **A** *to* **B**

This is an everyday problem in industry—a problem which is easy to solve *provided* the right equipment is available. To move loads efficiently a fraction of an inch or several hundred feet it is essential that the equipment be built for the job. Dominion Bridge Company has been building cranes and other handling equipment for over half a century and maintains a large design staff for this purpose. You are invited to make practical use of our experience in the handling of bulk materials and single units.

MECHANICAL DIVISION*
DOMINION BRIDGE
COMPANY LIMITED

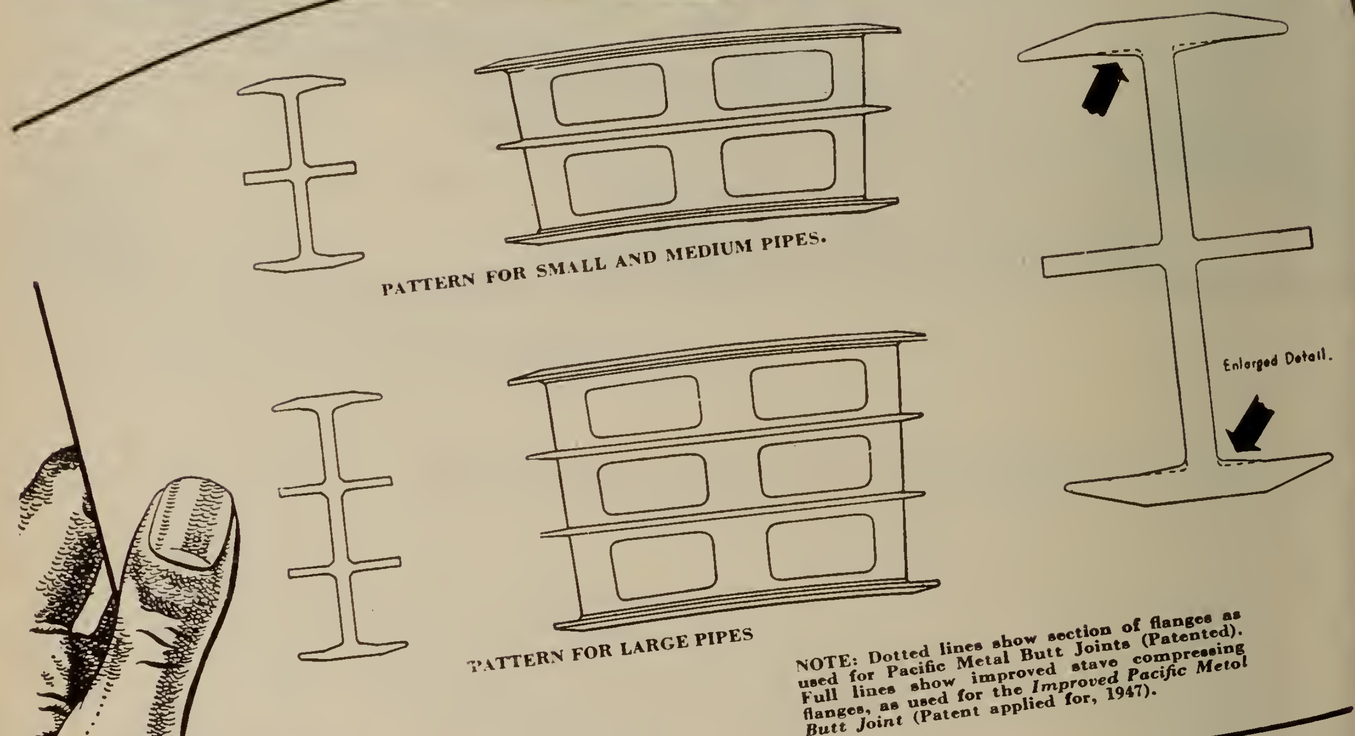
*OTHER DIVISIONS: Platework, Boiler, Warehouse, Structural.
Plants at: Vancouver, Calgary, Winnipeg, Toronto, Ottawa, Montreal.
Assoc. Companies at: Edmonton, Sault Ste. Marie, Quebec, Amherst.

PACIFIC COAST PIPE DEVELOPS *IMPROVED*

PACIFIC METAL BUTT JOINT

(PATENT APPLIED FOR 1947)

FOR CONTINUOUS WOOD STAVE PIPE



We are proud to incorporate this great advancement in wood pipe construction and we are justly enthused with its complete acceptance by our clients in Canada and foreign countries. Forty-four years of progressive engineering are represented in this Improved Pacific Metal Butt Joint (patent applied for 1947). We will be glad to explain in detail the many advantages represented by this new development.

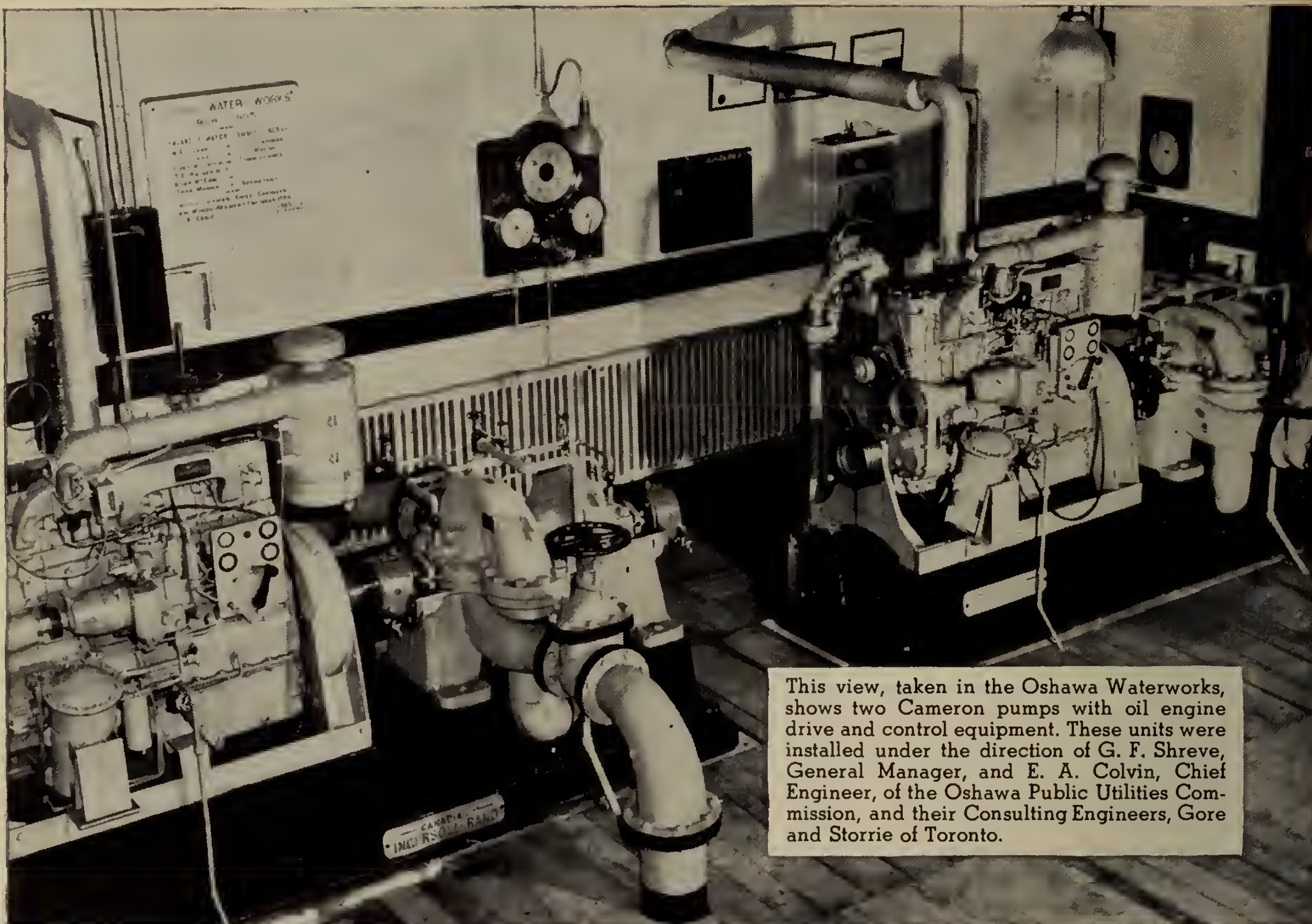
Pacific Coast Pipe Co. Ltd.

1551 GRANVILLE ST. *Established 1904* VANCOUVER, CANADA


PLATEWORK
FOR EVERY INDUSTRY
TABLE OF CONTENTS
DOMINION BRIDGE COMPANY LIMITED

Index to Advertisers

The revenue derived from the sale of advertising space enables the *Institute* to publish the *Journal* on a regular monthly basis. Listed below are the names of the Companies and Individuals whose advertisements appear in this issue.



This view, taken in the Oshawa Waterworks, shows two Cameron pumps with oil engine drive and control equipment. These units were installed under the direction of G. F. Shreve, General Manager, and E. A. Colvin, Chief Engineer, of the Oshawa Public Utilities Commission, and their Consulting Engineers, Gore and Storrie of Toronto.

Cameron Engine Driven Pumps for Auxiliary and Standby Service

BUILT at our Sherbrooke, Quebec works, these two Cameron No. 5-GT Two-Stage Pumps are rated at 1,800,000 G.P.D. each when operating against a total head of 320 ft. including 15 ft. suction. Each pump is driven by a heavy duty full Diesel Type Oil Engine developing 170 hp at 1700 rpm. Each unit is equipped with electric starting system and shutdown devices for protection against high circulating water temperature or low lubricating oil pressure and overspeeding.

In the selection of this pumping equipment, careful consideration was given not only to the use of the units for standby service, but also as auxiliaries to previously installed electrically driven pumps for peak load and emergency work. On many occasions, it has been necessary to operate the pumps as auxiliaries over long periods because of electrical power shortage or to meet the increased water demand resulting from expanding industrial and civic requirements.

Cameron Engine Driven Pumps are available in single and multi-stage types with capacities suitable for the requirements of municipalities, mines, mills and industrial plants.

Canadian Ingersoll-Rand Company Limited

HEAD OFFICE: MONTREAL, QUE.....WORKS: SHERBROOKE, QUE.

E-32

AIR AND GAS COMPRESSORS • ROCK DRILLS • HOISTS • PUMPS • BLOWERS • CONDENSERS • AIR TOOL

THE ENGINEERING JOURNAL

VOLUME 31 NUMBER 6
JUNE 1948

PUBLISHED MONTHLY BY
THE ENGINEERING INSTITUTE of CANADA

HIGHEST AWARD CERTIFICATE

Won by

THE ENGINEERING JOURNAL

In the 1948 Contest sponsored by

THE INTERNATIONAL COUNCIL OF INDUSTRIAL EDITORS

Six hundred and fifty Canadian and U.S. publications were entered in this contest. The *Journal* was judged to be outstanding when compared with the entire list of entries and the leading publication in its own class.

The judges' decisions were based on accomplishment of purpose, editorial style, appearance and production achievement.

FOR STRENGTH 4340

IN NEW EQUIPMENT, or for replacement parts, where heavy loads and sudden shocks are factors, specify Nickel Alloy Steel, type 4340.

High hardenability gives "4340" good mechanical properties in heavy sections.

In shovels such as the one illustrated, for example, this nickel-chromium-molybdenum steel is used satisfactorily in dipper handles, boom parts, caterpillar mountings and propelling machinery.

You are invited to write for a recommendation regarding the best type of steel for your application and a suggested source of supply.

E INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED • 25 KING STREET WEST, TORONT

EMBLEM OF INCO SERVICE

Dear Sirs, Please advise us concerning the best type of steel for the application named below.

____

Name______________________________________

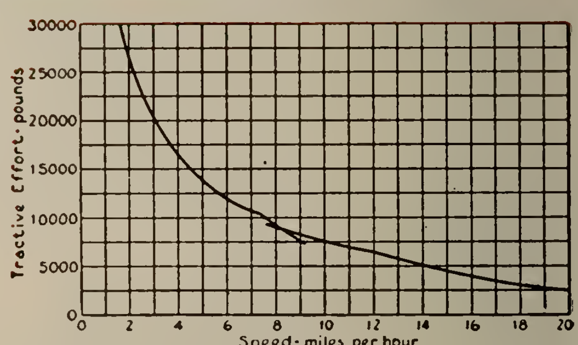
CUT SWITCHING COSTS with G.E.

A HARD WORKE

TONS THE 45-TON G-E DIESEL-ELECTRIC LOCOMOTIVE HAULS

Speed (Mph)	Level	0.5%	1.0%	1.5%	2.0%	2.5%	3.0%
10 lb per Ton Train Resistance							
3.55	1781	868	563	411	320	259	215
5	1356	655	422	305	235	188	155
7.5	990	472	300	213	162	127	103
10	718	336	209	145	107	82	64
15	414	184	108	69	46	31	20
20	209	82	39	18	—	—	—
20 lb per Ton Train Resistance							
3.55	890	579	422	329	267	222	189
5	678	437	316	244	196	161	135
7.5	495	315	225	171	135	109	90
10	359	224	157	116	89	70	56
15	207	123	81	55	39	27	18
20	104	55	29	14	—	—	—
30 lb per Ton Train Resistance							
3.55	594	434	338	274	228	194	168
5	452	327	253	203	168	141	120
7.5	330	236	180	142	115	95	80
10	239	168	125	97	77	61	49
15	138	92	65	46	33	23	16
20	70	41	23	12	—	—	—

Hauling capacity is conservatively based on 20 per cent maximum running adhesion, thus allowing for starting trains. There are no restrictions on the tonnages listed for 5 mph and above when the locomotive is used for switching or transfer service. For loads which restrict speed to less than 5 mph. maximum tonnage should be limited to that shown in the table and confined to switching, unless transfer moves are of less than 15 minutes' continuous duration.



1. Maximum speed, 20 mph—provides ample leeway against overspeed troubles in switching work.
2. Single motor connection, simple control, no transition, thus giving steady pull.
3. Full engine horsepower utilization to 12 mph gives maximum output in switching moves.
4. Smooth output curve, automatically giving equivalent of infinite number of gear ratios.
5. Double-reduction drive gives high efficiency at switching speeds.

CANADIAN GENERA

the invisible ingredient

That Makes Your Barrett SPECIFICATION* Roof Finest in the Field

You can't see the research that goes into your "SPECIFICATION" roof. But the results of it are there. And the part it plays is just as important as that of the felt, the pitch or the gravel.

Barrett research has paved every step of the way from raw materials to the finished "SPECIFICATION" roof. Research determined the quality of the felt and the pitch, introduced improved manufacturing techniques, pioneered the now time-tested Barrett specifications. The result was record-making Barrett "SPECIFICATION" roof Job. No. 1 . . . 29 years without maintenance or repair. This was the first bonded built-up roof in Canada, and the first of many Barrett "SPECIFICATION" roofs to outlast their bonds.

Today the Barrett "SPECIFICATION" roof is accepted as leader in the field of build-up roofing . . . Canada's No. 1 Roof.

Barrett* Specification* Roofs

*Reg'd. Trade Mark

Depend on that reputation. Specify Barrett all the way.

The built-up felt, pitch and gravel roof, as supplied by Barrett in the record-making "SPECIFICATION" roof, incorporates these special features:

1. Barrett "SPECIFICATION" felt—carefully processed from selected stock . . . must pass rigid tests for tensile strength and durability.
2. Barrett "SPECIFICATION" pitch—specially refined, straight-run, coal-tar pitch . . . mopped between layers of felt; *heavy-poured* on top.
3. Gravel or slag armoured top, embedded in hot pitch, protects roof against elements, mechanical damage, wear and tear. It interposes a surface of fireproof rock between building and flying embers.

Only these materials, applied by a Barrett Approved Roofer in accordance with time-tested Barrett requirements, and examined by a Barrett Inspector make the Barrett "SPECIFICATION" roof.

THE BARRETT COMPANY, LIMITED

Montreal • Toronto • Winnipeg • Vancouver

"CANADA'S No. 1 ROOF"

UP GO

PAY LOADS AND PROFITS

WITH A DOMINION "GIANT" ON THE JOB

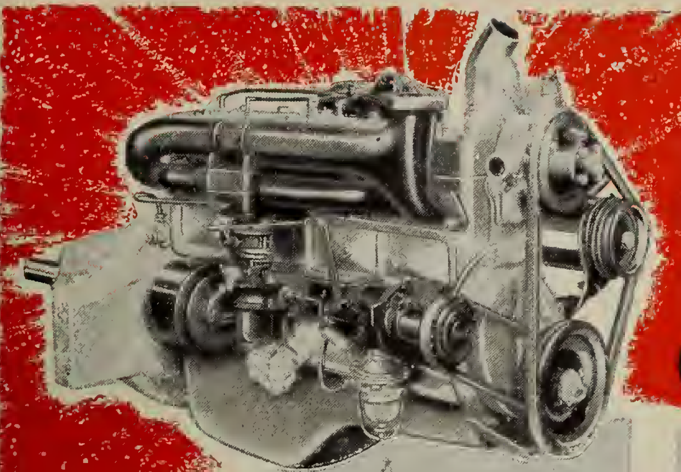
This Dominion "Giant" Conveyor Belt, 652 feet long, 32 inches wide, operates in a large Canadian quarry 21 hours a day, 6 days a week, handling sharp, abrasive rock. Despite the fact that it handles over 6,000 tons a day in this rough and tough service, the belt shows no signs of wear. *Engineered* specifically for the job, Dominion Rubber Conveyor Belts carry bigger pay loads, build bigger profits in industries throughout Canada. Dominion belting engineers will be glad to assist you in obtaining minimum cost-per-ton haulage. Call or write our nearest branch.

ANOTHER DOMINION RUBBER ENGINEERED RUBBER PRODUCT

DOMINION RUBBER COMPANY LIMITED

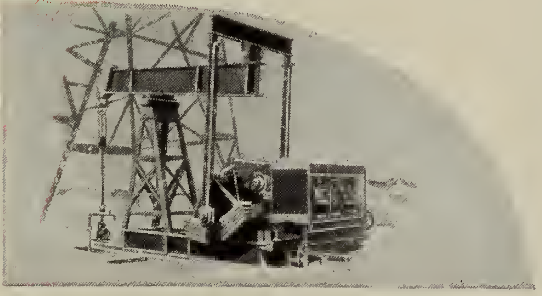
ENGINEERED RUBBER PRODUCTS FOR EVERY INDUSTRY

HALIFAX-SAINT JOHN-MONTREAL-TORONTO-WINNIPEG-CALGARY-EDMONTON-VANCOUVER

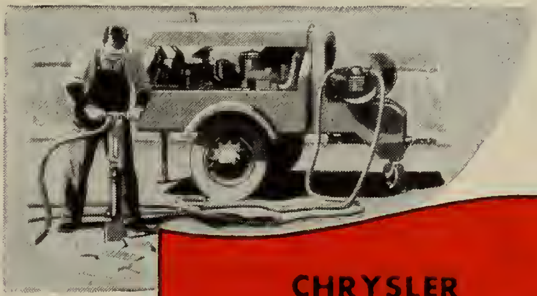


CHRYSLER INDUSTRIAL ENGINES

CAN HELP SELL YOUR PRODUCT



POWER YOUR EQUIPMENT WITH A CHRYSLER INDUSTRIAL ENGINE AND YOU ADD EXTRA SALES FEATURES!



CHRYSLER Industrial Engines feature all 9 requirements which experts have set as the standard for performance and saleability of industrial engines! Power your equipment with "horsepower with a pedigree" and you've added these extra sales points. More than that, you've added the Chrysler reputation for fine engineering and production "know-how." You've added the reputation of Chrysler Industrial Engines for dependable performance, under toughest conditions, through years of actual service in the field.

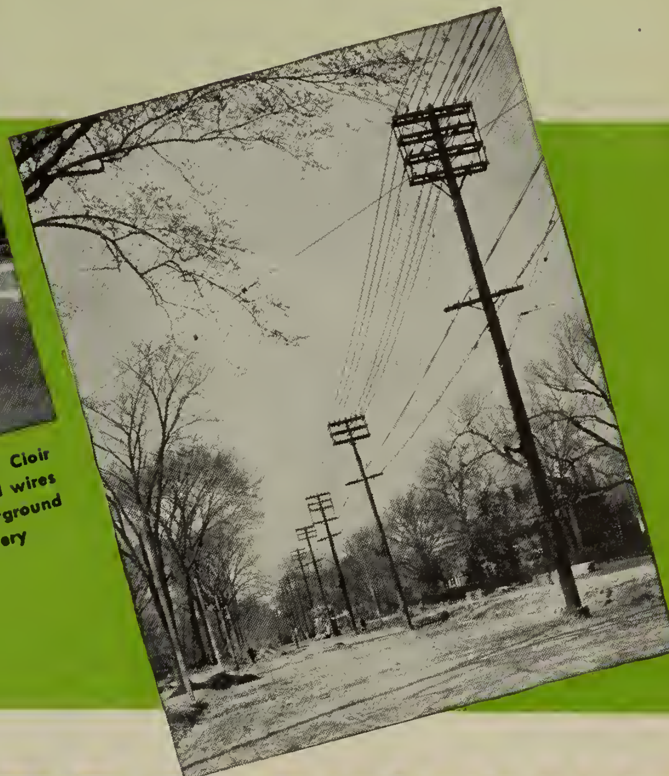
Before you buy any industrial engine, send for free booklet "Power, Coast-to-Coast." Write the Industrial Engine Division, Chrysler Corporation of Canada, Limited, Windsor, Ontario.

CHRYSLER ANSWERS ALL 9 INDUSTRIAL ENGINE REQUIREMENTS

Chrysler Industrial Engines answer all 9 industrial engine requirements. (1) adequate power and torque, (2) low first cost, (3) low operating cost, (4) parts and service availability, (5) dependability, (6) facility of installation, (7) simplicity of repairs, (8) flexibility, (9) greater sales value for your product

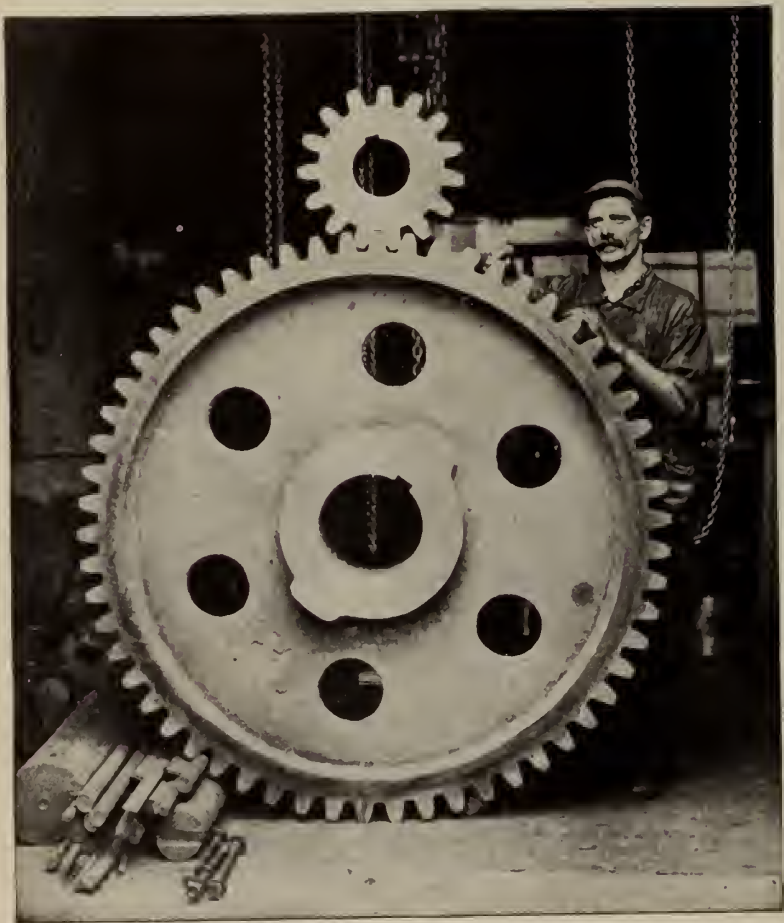
Chrysler Industrial Engines

BUILT IN CANADA BY CHRYSLER



Industrial Cut Gears
of Every Type

CUT GEARS



Industrial
Cut Gears and
Speed Reducers
Made in Canada
for 36 years

Reliable cut gears and gear drives backed by an intelligent engineering service can be a real help to you.

Chester B. Hamilton Jr.
President

Hamilton Gear and Machine Co. Limited

The Industrial Cut Gear Specialists

950-990 Dupont St. TORONTO-4

Montreal Branch Office
1120 Castle Building,
Cor. St. Catherine and Stanley,
Montreal, P.Q.

Manitoba
T. S. Taylor Machinery Co.
187 Bannatyne Ave. E.,
Winnipeg, Man.

Alberta
Waterous Ltd.
Edmonton, Alta.

British Columbia
B.C. Conveying Machinery Co.
Geo. B. Simpson, Manager
123 West Pender St., Vancouver, B.C.

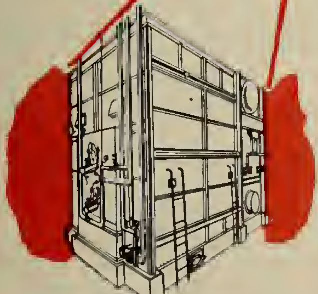
Filling Prescriptions for Industry

JUST AS EVERY DOCTOR'S PRESCRIPTION is individually compounded—each Dominion Bridge Water Tube Boiler is individually designed to meet *all* the requirements of the particular case.

This picture shows a part of our boiler design department where every contract has its start and where the established Dominion Bridge traditions are applied to the problems of supplying the steam requirements of industry.

We should be glad to co-operate with your Consulting Engineers in submitting designs for a steam generator suited to your special needs.

Plants at: **Vancouver, Calgary, Winnipeg, Toronto, Ottawa, Montreal.**
Assoc. Companies at: **Edmonton, Sault Ste. Marie, Quebec, Amherst.**

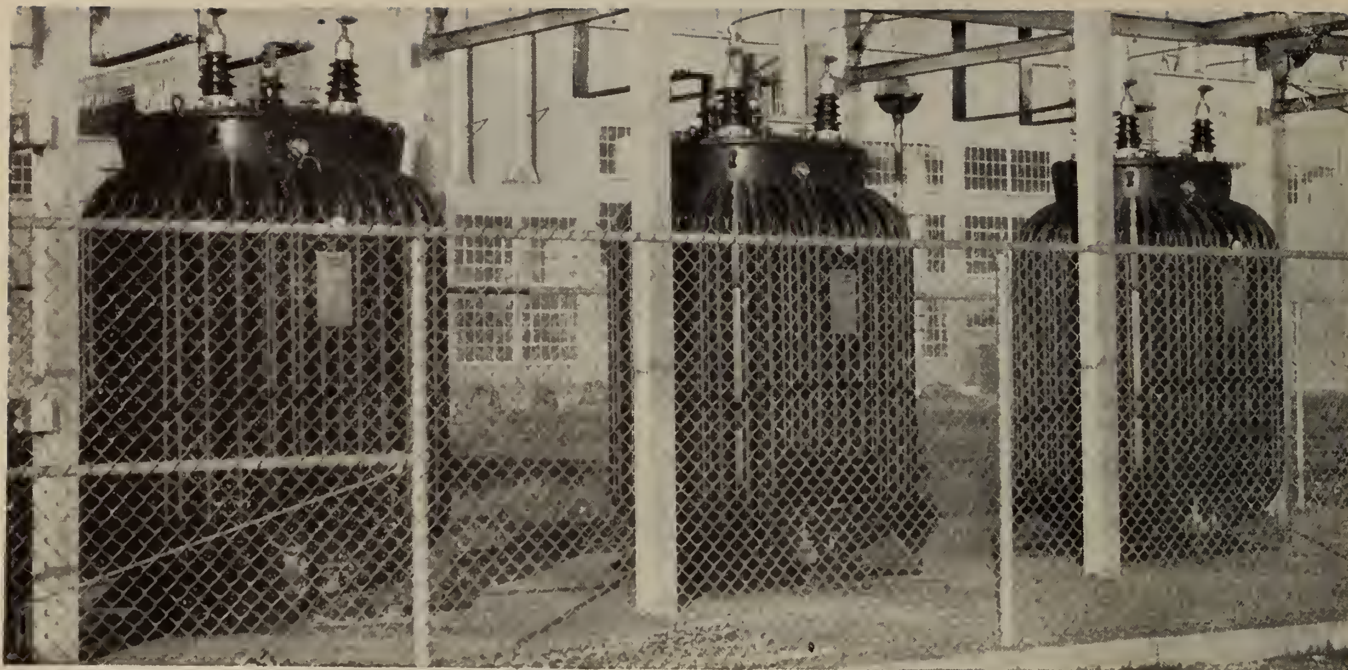


Typical Water Tube Boiler
Smaller types are also made for a great variety of applications including the Robb-Victor, Scotch Dry Back, H.R.T. and Robb-Victory straight tube boilers.

BOILER DIVISION*
DOMINION BRIDGE
COMPANY LIMITED

IN THE MARITIMES: ROBB ENGINEERING WORKS LIMITED

*OTHER DIVISIONS: PLATEWORK • STRUCTURAL • MECHANICAL • WAREHOUSE

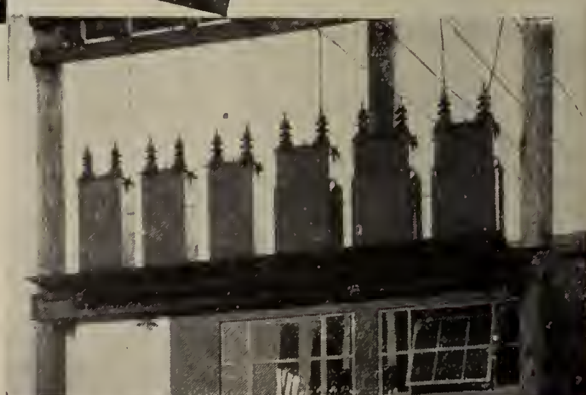


Who else wants a dependable transformer?

Above: 750 kv-a. 12000 volt Ferranti transformers.

Left: Dry-type transformers installed high up out of the way indoors.

Below: 37½ kv-a. and 50 kv-a. 12000 volt oil-insulated Ferranti transformers.



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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

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COVER PICTURE

On this month's cover is an interesting photograph taken at the Annual Meeting in Banff. It includes the delegates to the Annual Student Conference and some of the many Institute members who took a particular interest in this Conference.

Seated, left to right, are the new president, Dean J. N. Finlayson, of U.B.C.; Dr. G. R. Langley, chairman of the Institute's Committee on the Young Engineer; and Lt.-Col. L. F. Grant, the retiring president, also a former chairman of the Young Engineer Committee.

Standing, from left to right, are: J. D. Dunlop, delegate from Nova Scotia Technical College; A. M. Cameron, Halifax, N.S.; Dr. L. Austin Wright, the general secretary; Norman Simmons, delegate from Queen's and Student Conference chairman; Dr. A. E. Cameron, President of Nova Scotia Technical College; J. F. Harris, delegate from McGill; J. A. McCrodan, delegate from Toronto; D. R. Fonger, delegate from U.N.B.; S. A. Rokosh, delegate from Saskatchewan; M. L. Baker, Halifax, N.S.; Sid Hechter, delegate from Manitoba; J. C. Hurtubise, delegate from Laval University, Quebec; Gaetan Ducharme, delegate from Ecole Polytechnique, Montreal; and D. D. Dick, delegate from Alberta. John McPhail, delegate from U.B.C., was delayed by flood conditions and was not present when the photograph was made.

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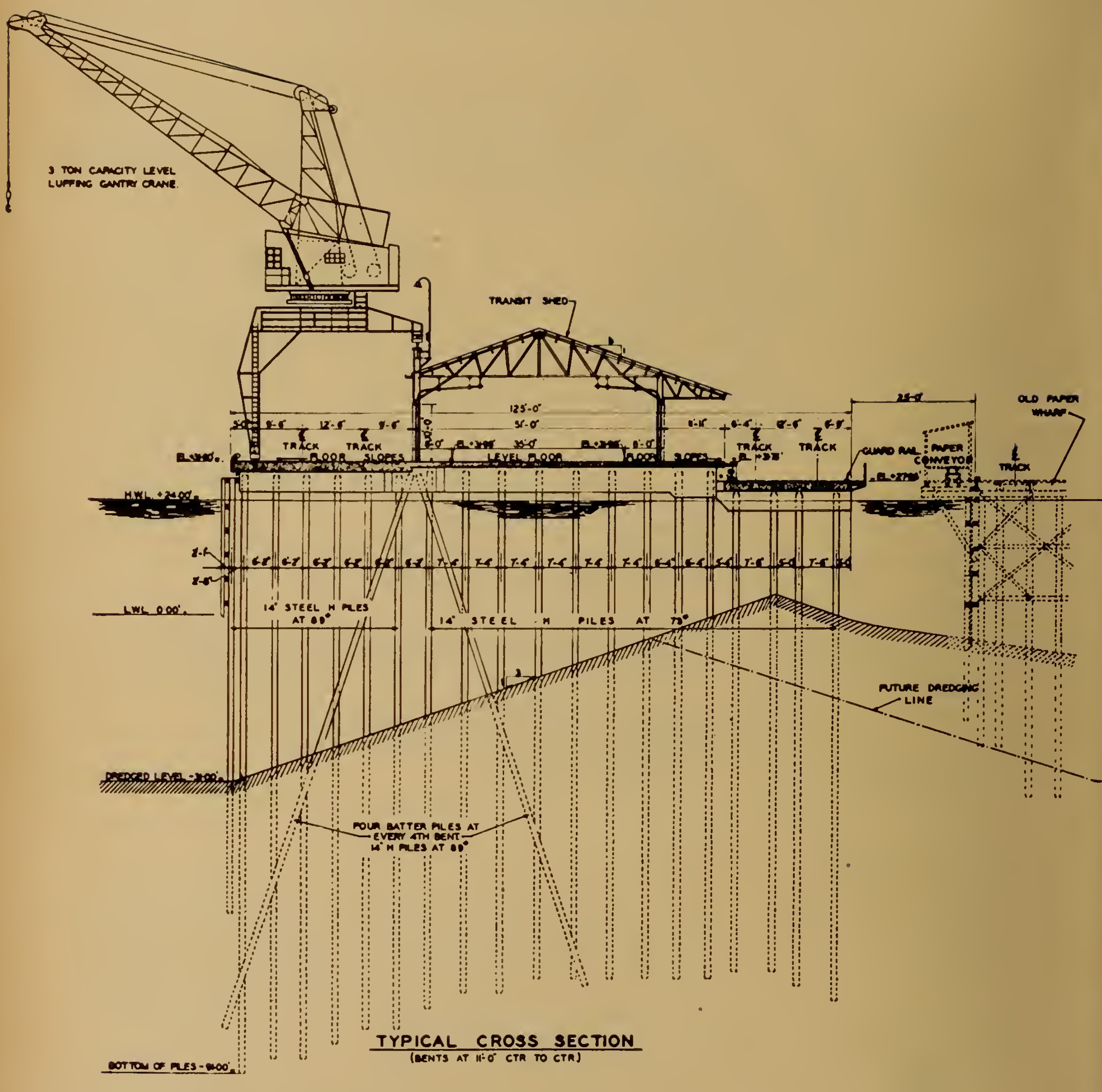


NEW WHARF - PORT ALFRED.

Test Piles for Saguenay Terminals Wharf

by

W. L. Pugh, M.E.I.C.

Assistant Chief Engineer, Aluminum Company of Canada Ltd., Montreal

Prepared for the Engineering Journal, from the Engineering Report to the owners, Saguenay Terminals Ltd., this paper records valuable data on the driving and testing of piles for a proposed new wharf at Port Alfred, P.Q. It describes the field investigations leading to the decision to drive four test piles on the site of the proposed wharf, including soil tests. The action of the soil surrounding friction piles is discussed, as well as the action of the pile itself as the load is applied. A "blow by blow" description is given of the actual driving operations, with the aid of diagrams. Details of the load testing apparatus are given and the results from the load tests are recorded and interpreted.

Port Alfred, Quebec, the home of Saguenay Terminals Limited, is an ocean port on Ha! Ha! Bay at the head of navigation on the Saguenay River. It has served for many years as the terminus for incoming cargo vessels bringing bauxite and other raw materials necessary for the production of aluminum ingot at the plant of the Aluminum Company of Canada, Limited at Arvida, Quebec. In addition, the port has handled an increasing volume of outgoing cargoes of aluminum, paper, and general ocean freight.

The original timber-crib rock-filled wharf on this site was used for shipping logs. It was rebuilt in 1920, using timber-pile construction, and was designed to handle both incoming and outgoing cargoes direct from ship to rail or from rail to ship. The berths were also dredged deeper to accommodate larger vessels. Since the chief export at this time was paper from the large paper mills located in the Saguenay and Lake St. John districts, this wharf became known as the "Paper Wharf."

As the operations of the Aluminum Company of Canada, Limited at Arvida increased, it became necessary to build a second wharf to handle the traffic. This "Duncan's Wharf", built in 1937-38, was also of timber-pile construction. It was designed to handle all incoming bulk cargo by means of two mechanical unloading towers of modern design. The "Paper Wharf" was also rebuilt thoroughly in 1938, and has been used since that time for all outgoing cargoes.

Now that the aluminum plant at Arvida, with its 8,000 employees, has become the largest aluminum ingot-producing works in the world, the tremendous amount of incoming ores and exported pure aluminum has overloaded the capacity of the two existing wharfs. In addition, the "Paper Wharf" has become badly decayed and its load-carrying capacity has been greatly reduced.

This port handled 336 vessels in the 1947 season, and a total of 1,853,000 net tons of cargo. The import tonnage of 1,576,000 tons is made up of 74 per cent bauxite, the ore of aluminum, and 26 per cent other raw materials, such as coke, petroleum products, sulphur, cryolite and fluorspar. Export cargoes amounting to 187,000 tons are 58 per cent aluminum ingot and other products of the Aluminum Company of Canada, Limited, and 42 per cent pulp and paper.

It was decided late in 1946 that a new wharf was to be constructed just south of the "Old Paper Wharf" as shown in Figure 3, and a slip dredged to Elev. − 31.0 (Saguenay Terminals datum) along the south side. The wharf deck surface will be approximately at Elev. (plus) 31.75. The tidal range at the wharf site is from Elev. 0.0 for extreme low tide to Elev. (plus) 24.0 for extreme high tide.

Considerable study was required to determine the most suitable type of construction for the wharf. Due to the extremely long unsupported pile length along the south side of the wharf, namely 62 ft., and the fact that the bottom is soft silt and clay, wood piles were finally ruled out because they were unobtainable in such lengths. Furthermore, it was desired to build a wharf of fireproof construction, so steel piles were finally decided upon. Precast concrete piles were not considered, due to the severe temperature variations and ice conditions in winter. Cylindrical steel piles were first considered, but due to the scarcity of steel plate, these were ruled out in favour of steel H piles, which were available.

The design of the new wharf is based on a maximum load of 50 tons for each pile, with a minimum factor of safety of 2 for such pile loads. The soil underlying the whole of the Port Alfred area consists of fluid silt overlying a bed of plastic clay, which is deep and of a fairly uniform character and varies in thickness from 60 ft. to 100 ft. Below this clay bed is a bed of sand and gravel of variable thickness with bed rock at approximately Elev. — 175.0. With rock at such depths and no firm bearing material existing at a lesser depth, the most economical and practical type of pile for this location is a friction pile.

Friction Piles — Description of the Action of Surrounding Soil

A friction pile is one that supports the load which comes upon it by the action of friction or adhesion along the surface of contact of pile, with the soil in which it rests. This friction force is passive in character and is induced only as required to maintain equilibrium. There is, of course, some direct compressive resistance developed at the point of the pile but with this friction type of pile such resistance is likely to be relatively small compared to the skin friction or frictional resistance of the pile.

When a pile is driven, in its effort to displace the surrounding material, a lateral expansive force is exerted, which is balanced by the reactive force of the soil against the surface of the pile. One part of this reactive force is supplied by the water phase and the other by the skeleton composed of the soil particles. With permeable materials such as sand, the pressure exerted by the water phase disappears rapidly. This is because the water can easily flow away from the surface of the pile under the hydrostatic stress difference set up when the pile is driven. This permits an immediate development of the frictional resistance of the pile surface with the soil, for this resistance is dependent on the pressure exerted by the soil skeleton on the pile. On the other hand, with impermeable soils such as clays, the development of frictional resistance takes place slowly and, in fact, only as fast as the pressure against the pile surface is transferred from the water to the soil skeleton.

The driving of piles into a clay soil results in some compression and considerable displacement, unless the forces causing the penetration act slowly. For the clay soil to be compressed, the water must be displaced from it. Driving into soft clay may be quite easy but if a rest period of a few days or even several hours is given, thus providing the necessary time for the water phase to allow some of the pressure to be transferred to the soil skeleton, further driving can be resumed only with difficulty. This condition has been clearly exhibited during the re-driving of some of the wood piles in Duncan's Wharf, constructed in 1938, and in driving the present test piles.

Fig. 1—View during driving of test piles, showing driving equipment, etc.

Description of Pile Action

After a pile is in place in the ground and before any load has been applied, there is no shearing stress in the soil. When a load is applied to the pile head, there is a downward movement of the upper end of the pile due to the elastic shortening of the pile. As the pile starts to move with respect to the surrounding soil, the movement mobilizes the shearing resistance of the soil. Since the movement begins at the top of the pile, the mobilization of shearing resistance in the soil also begins at the top of the pile near the ground surface. When a small load is applied to a long friction pile, all of the reaction for the load is developed in the soil around the upper part of the pile. The load produces no stress in the lower part of the pile and, consequently, no elastic contraction and no mobilization of shearing resistance in the soil surrounding the lower part of the pile. As the load is increased the stress in the pile approaches the pile point but it does not actually reach the point until the load attains a certain value which is de-

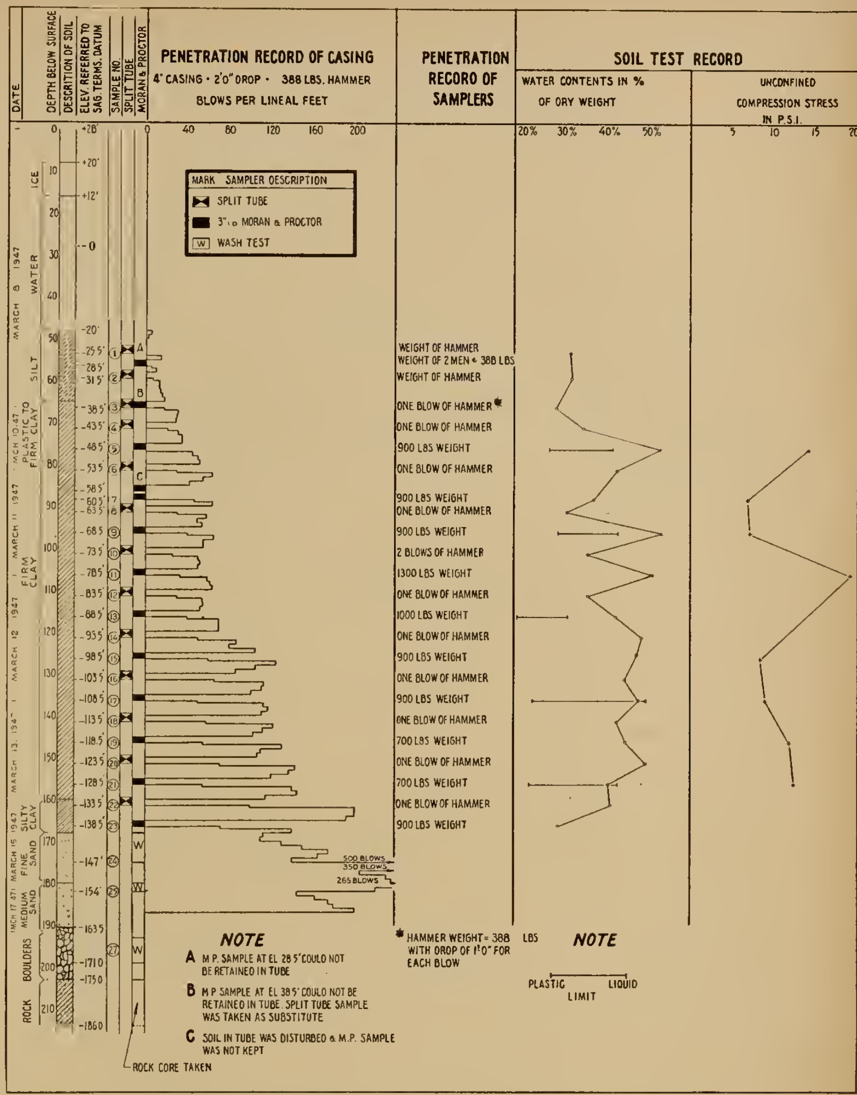


Fig. 2—Boring Investigation. Hole No. M.P.-1.

termined by the elastic properties of the pile and the surrounding soil.

The usual procedure for a pile load test is to place the load on top of the pile and then measure the downward movement of the head of the pile for each load increment. It is not possible to determine the elastic shortening of the pile from such measurements because nothing is known about the movement of the pile point. Neither can such measurements furnish any information as to the manner in which the pile transfers the load to the surrounding soil. By extrapolation of the test results, some estimate of the amount of the point resistance is made later in this paper. If the actual elastic shortening of the pile could be determined by suitable measurements, it would be possible to determine approximately how the pile was transferring its load to the soil. For example, it is a simple matter to compute what the elastic shortening of the pile will be as a free-standing strut, with no part of the load supported by friction on the sides of the strut. When any part of the load is supported by friction along the sides of the pile, the elastic shortening is always less than it would be for the same pile carrying the same load as a free-standing strut. To compensate for this condition, we have used the free strut length to the midpoint of the embedded length, for figuring the elastic shortening of the test piles. (See Fig. 10.)

Test Piles

Because of the uncertainty of how much load such a friction pile will carry, and because no pile driving formula will apply, a pile test carried to failure is definitely required to permit the selection of the proper penetration and carrying capacity of the piles with the specified factor of safety. Such a test procedure was first proposed by the author in November, 1946. The necessity was later confirmed by Mr. E. J. Quirin, Chief Engineer of Frederic R. Harris, Inc., and Mr. R. P. Pennoyer of Carnegie-Illinois Steel Corp., in August, 1947, when final arrangements were made for the tests.

Soil Testing Procedure and Results

To obtain as much information as possible regarding the soil underlying this new wharf site, a programme of soil sampling and testing was outlined and a specification prepared. A series of wash borings had been made in 1927 in the area between the "Old Paper Wharf" and Duncan's Wharf, but in view of the present day developments pertaining to soil sampling and soil mechanics, these earlier tests were discarded.

A series of drill holes were sunk over the new wharf site in early 1947 by the Foundation Company of Canada Limited, under the supervision of Mr. J. F. Mathys, Geologist. Soil samples were taken in the holes by means of a 3 in. i.d. Moran & Proctor Sampler, using a four inch i.d. pipe-cased hole, and alternately by means of a 2 in. i.d. Shelby Tube Type Sampler. As Drill Hole No. MP-1 is located adjacent to the site of the test piles, information pertaining to it is embodied in this paper. The logs of the driving of the casing and sampler are shown in Fig. 2.

All soil samples were shipped to the Laboratory of Ecole Polytechnique, Montreal, and tests and comments on same were made under the direction of Prof. J. E. Hurtubise, M.E.I.C. Table No. 1 is a summary of the laboratory tests for the soil samples from Drill Hole No. MP-1. The boring and testing programme has revealed that the stratum studied is a fairly uniform deposit of silty clay, containing thin lenses of coarse silt or fine sand. This material has the type of complicated structure resulting from soil deposition in sea water. It is brittle and has a rather high strength in the undisturbed condition. It becomes soft and sticky when remolded and the strength is reduced appreciably.

TABLE I

TABULATION OF RESULTS OF TESTS ON SAMPLES FROM BORING No. MP-1

Sample No.	Type	Elevation	Water Content W-% Dry Wt.	Compressive Strength PSI	Liquid Limit	Plastic Limit Plasticity Index P.L & P.I	Grain Size Classification	Weight of Sample as Received Lbs. Per Cu. Ft.	Description
1	S.S.	—25.5	31.3	....	....	....	....	....	Organic Matter. Roots. Some Granular Material.
2	S.S.	—31.5	31.7	....	....	....	....	....	Organic Matter. Some Granular Material, Finer.
3	S.S.	—38.5	28.1	....	....	....	....	....	Cohesive.
4	S.S.	—43.5	34.9	....	....	....	....	....	Cohesive.
5	M.P.	—48.5	48.6 57.4	.... 14.3 R-1.8	41.3	26.5 14.8	Clay	107.3	
6	S.S.	—53.5	42.4	....	....	....	....	....	Cohesive.
7	M.P.	—60.5	34.3 39.1	.... 6.9 R-1.3	....	....	....	121.8	Not Homogeneous. Pockets of Fine Sand and Silt.
8	S.S.	—63.5	30.6	....	....	....	....	....	Cohesive.
9	M.P.	—68.5	47.5 59.0	.... 7.2 R-1.9	42.7	28.5 14.2	Clay	108.9	Pockets of Fine Sand and Silt.
10	S.S.	—73.5	35.1	....	....	....	....	....	Cohesive.
11	M.P.	—78.5	48.4 54.1	.... 19.3 R-3.6	....	....	....	114.0	Thin Layers of Fine Sand.
12	S.S.	—83.5	35.4	....	....	....	....	....	Cohesive.
13	M.P.	—88.5	55.0 29.4	Could not be Done (Silty Part)	42.6	18.8 23.8	Clay	....	Not Homogeneous. Pockets of Fine Sand and Silt.
14	S.S.	—93.5	48.6	....	....	....	....	....	Cohesive.
15	M.P.	—98.5	49.0 45.5	.... 8.4 R-2.4	....	....	....	114	
16	S.S.	—103.5	44.5	....	....	....	....	....	Cohesive.
17	M.P.	—108.5	52.2 43.6	.... 9.0 R-1.6	49.8	22.4 27.4	Clay	116	
18	S.S.	—113.5	42.4	....	....	....	....	....	Cohesive.
19	M.P.	—118.5	43.4 45.6	.... 11.8 R-3.0	....	....	....	115	
20	S.S.	—123.5	49.6	....	....	....	....	....	Cohesive.
21	M.P.	—128.5	40.5 40.0	.... 12.4 R-2.1	42.9	21.8 21.1	Silty Clay Loam	116.8	
22	S.S.	—133.5	41.1	....	....	....	....	....	Some Granular Mat'l.
23	M.P.	—138.5	28.6	....	....	....	....	....	Fine Sand. Pocket of Cohesive Mat'l one end.
24	W.S.	—140 to —147	....	....	....	....	....	....	Fine Sand.
25	W.S.	—152 to —154	....	....	....	....	....	....	Fine Sand.
27	W.S.	—164	....	....	....	....	....	....	Coarse Sand.

LEGEND:
S.S. —Split Spoon.
M.P. —Moran and Proctor.
W.S. —Wash Boring Sample.
R. —Remolded.

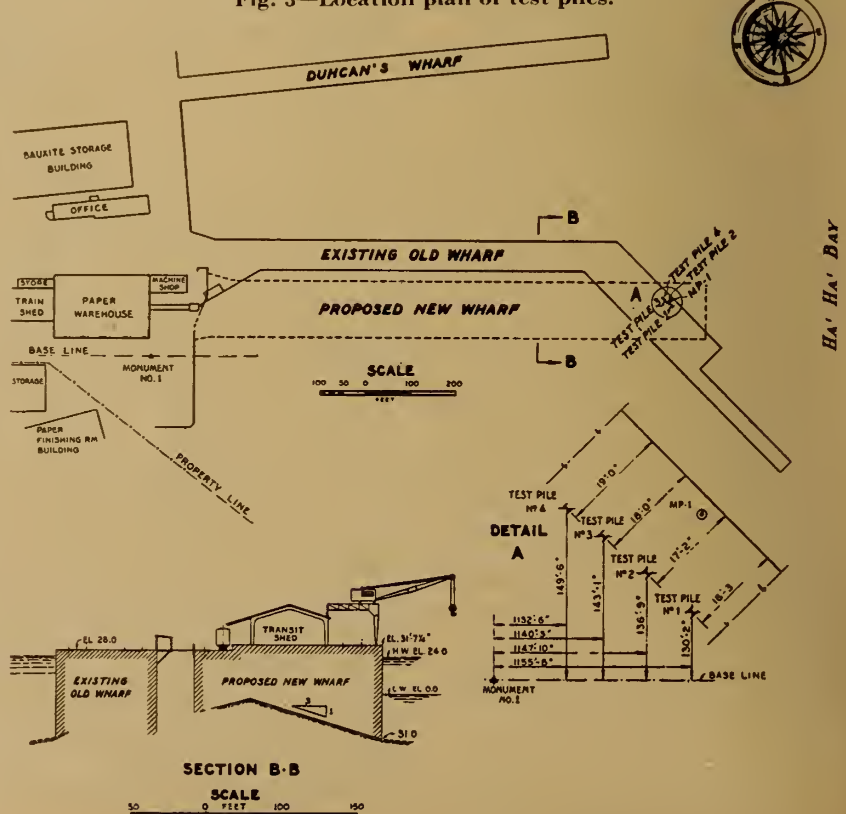
Tests Made By:
Soil Mechanics Laboratory,
Ecole Polytechnique,
April 1st, 1947.

The results of the water content determination vary between fairly wide limits, even from the same sample. It is important to note that these values are nearly always higher than the liquid limit or else practically equal to it, for the whole depth of the stratum. The variation of the limiting values of the liquid limit, plastic limit and plasticity index with depth is not very noticeable, thus indicating a fairly uniform deposit that can be classified as varying from clay and silt to silty clay.

The structure of a clayey soil should be kept undisturbed as much as possible. This is especially so in this case, as any remoulding will tend to liquify the soil. Part of the strength thus destroyed will be recovered with time, but never restored to its original value. The results of the unconfined compression tests appear to be pretty much scattered, but it should be pointed out that this soil is very difficult to sample. The least little disturbance affects its resistance and furthermore, as noted above, it is not entirely homogenous. An examination of the stress-strain curves obtained, reveal this disturbance to a variable degree on most of the samples. No general trend of variation of strength with depth could be established.

The consolidated quick direct shear tests were made on two specimens from each sample, one under an applied normal load at least equal to the overburden pressure, and the other under twice that load. The specimens were submerged and consolidation allowed for 24 hours before being tested. From graphs of the maximum shearing strength against applied normal pressure, it was observed that some of the straight lines, joining the two points obtained with one sample, intercept the ordinate below the origin when this line is produced. Apart from the ex-

Fig. 3—Location plan of test piles.



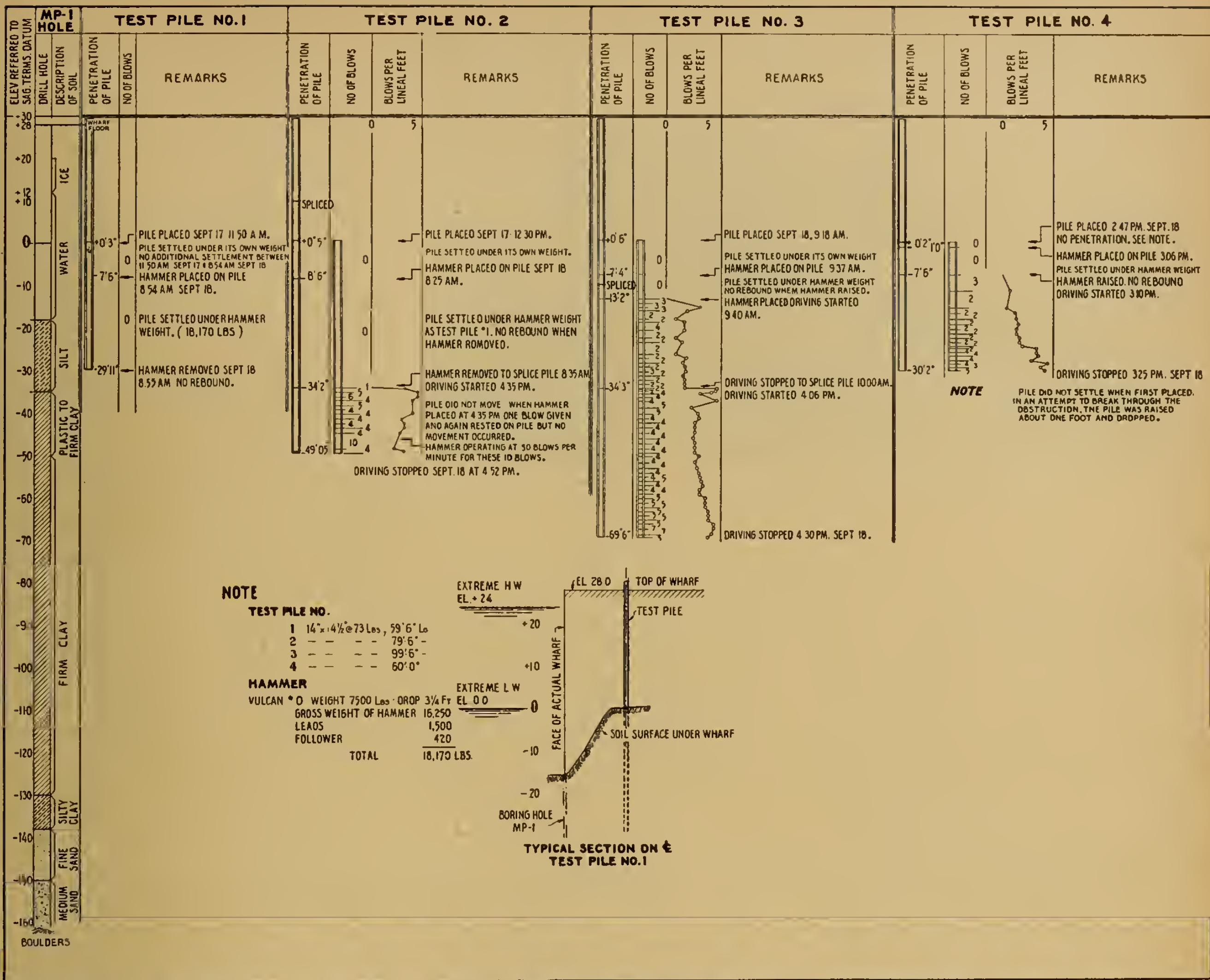


Fig. 4—Test pile driving records.

perimental error factor, it should be pointed out that usually this line tends to curve upwards when supplementary tests are made at lower applied normal pressures.

It is thus seen that this stratum of silty clay is rather uniform in its texture, that the water content is usually higher than the liquid limit and that, consequently, any kneeding or remoulding would seriously impair its resistance.

Test Piles—Driving

The Carnegie - Illinois Steel Corp., through the U.S. Steel Export Co., Montreal, were able to supply the necessary 14 in. x 14½ in. @ 73 lbs. H Pile Sections for the test. It had previously been decided by Frederic R. Harris, Inc., the consulting engineers, that three test piles should be driven with a penetration of 30 ft., 50 ft. and 70 ft., respectively, from the top of the underlying soil. Due to the uncertainty of the carrying capacity of the soil, Mr. Pennoyer of Carnegie-Illinois Steel Corp., suggested a lagged pile be used as No. 4 Test Pile, to determine if such a pile possessed a greater load carrying capacity compared with the plain pile. It was thought this was of some help when piles were driven for Duncan's Wharf.

These four test piles were located as shown on Fig. 3, and driven through the outer end of the " Old Paper Wharf " and on the centre line between existing pile bents. This site was selected due to the availability of the " Old Paper Wharf " for supporting driving equipment and test equipment. The test piles were guided at their heads from the deck of the wharf but otherwise they were free in all directions.

It was found after starting the pile driving that the piles were located on top of a steep soil slope at the face of the wharf, (see Fig. 4) and because of this condition it was later decided to disregard the upper seven (7) feet of the penetration as being effective. Thus, the penetration considered effective was 23 ft. for Pile No. 1, 43 ft. for Pile No. 2 and 63 ft. for Pile No. 3. No. 4 pile was lagged for 19 ft. of its length (commencing 5 ft. from the point) with two 12 in. by 12 in. timbers, tapered to 7 in. by 12 in. at the lower end and bolted to the pile web. It was felt that due to the clay being displaced or remoulded by the lagging, no frictional support could be considered on the shaft of the lagged pile above the top of the lagging.

The pile driving hammer used for driving the test piles was a No. 0 Vulcan single acting hammer, weighing approximately 16,250 lb. operated by steam from the crane boiler. The weight of the ram was 7,500 lb. and its normal fall or stroke is 3 ft. 3 in. The weight of the leads was 1,500 lb. and the

Fig. 5—View of static test load and supporting grillage.

follower 420 lb., thus making a total weight of 18,170 lb.

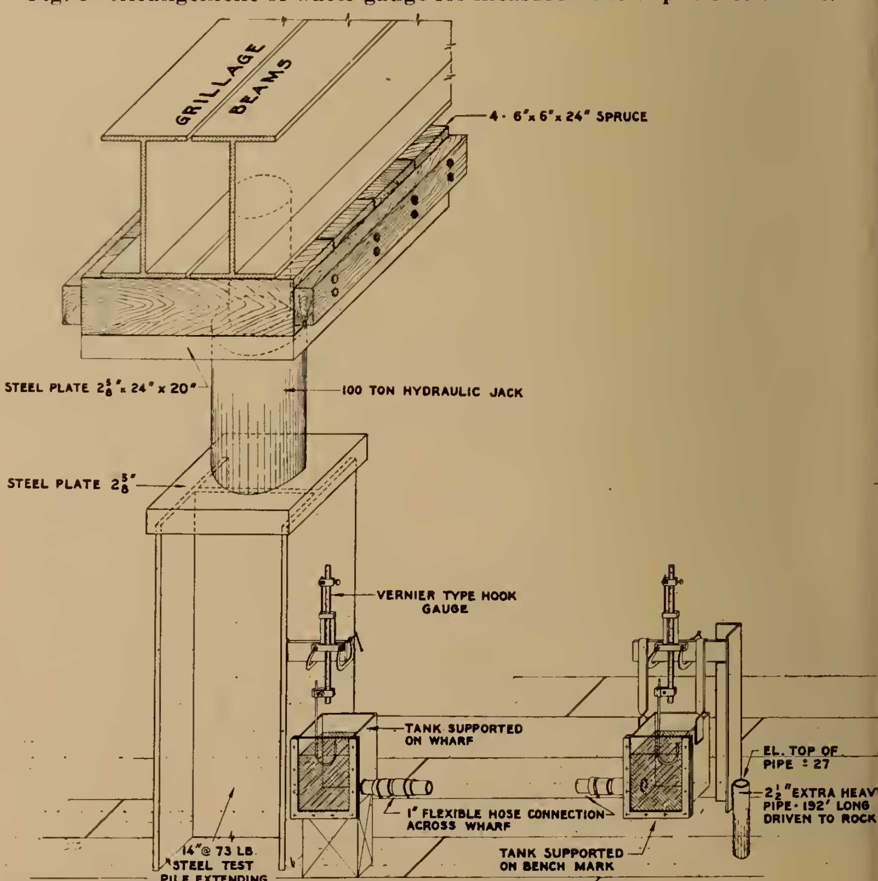
The records of the driving of the four test piles are shown in Fig. 4. Test Pile No. 1 was a single 59 ft. 6 in. length of steel section. When set in place it settled a distance of 7 ft. 6 in. into the silt under its own weight of 4,345 lb. When the weight of the hammer, leads and follower were placed on it, the pile settled an additional 22 ft. 5 in. in one minute's time. The hammer had to be removed to prevent the pile from settling more than the specified penetration of 30 feet.

Test Pile No. 2 consisted of a lower section 59 ft. 6 in. long and an upper section 20 feet long. The lower section was set in place, similarly to Pile No. 1, and settled a distance of 8 ft. 6 in. under its own weight. When the hammer was placed on this pile section it settled an additional 25 ft. 8 in. The hammer was then removed to prevent further penetration and to provide sufficient projection above the wharf deck for splicing. The top section was then spliced to the lower section by welding, using three steel plates and a butt weld. The hammer was again placed on the pile and as no further settlement occurred, driving was then started and continued until the final penetration of 49 ft. 10 in. was obtained.

Test Pile No. 3 consisted of a lower section 59 ft. 6 in. long and an upper section 40 feet long. The lower section was set in place and it settled a distance of 7 ft. 4 in. under its own weight of 4,345 lb. The hammer was then placed on the pile and it settled an additional 5 ft. 10 in. As this pile did not settle under the weight of the hammer as Piles Nos. 1 and 2 had done, it was thought that it must be resting on some obstruction. Driving was started and continued until the penetration was 33 ft. 4 in. The hammer was then removed and the top section was spliced on by welding similarly to Pile No. 2. When driving was resumed an increase in driving resistance was noted. The driving was continued until the total penetration was 70 ft. The crane, used for the pile driving, had some difficulty in slacking off its line supporting the pile driver in order to keep up with the pile settlement, hence some of the hammer blows were not entirely effective.

Test Pile No. 4 consisted of a single 60 ft. length of piling lagged with timber. This pile did not settle under its own weight at all, and after several attempts a settlement of 1 ft. was obtained. Apparently the pile was resting on some obstruction. The hammer was then placed on the pile and it settled an additional 6 ft. 6 in. under this weight. Driving was then started and continued until the final penetration of 30 ft. 4 in. was obtained. Driving resistance seemed to increase as the penetration was increased, which was as expected.

Fig. 6—Arrangement of water gauge for measurement of pile settlement.



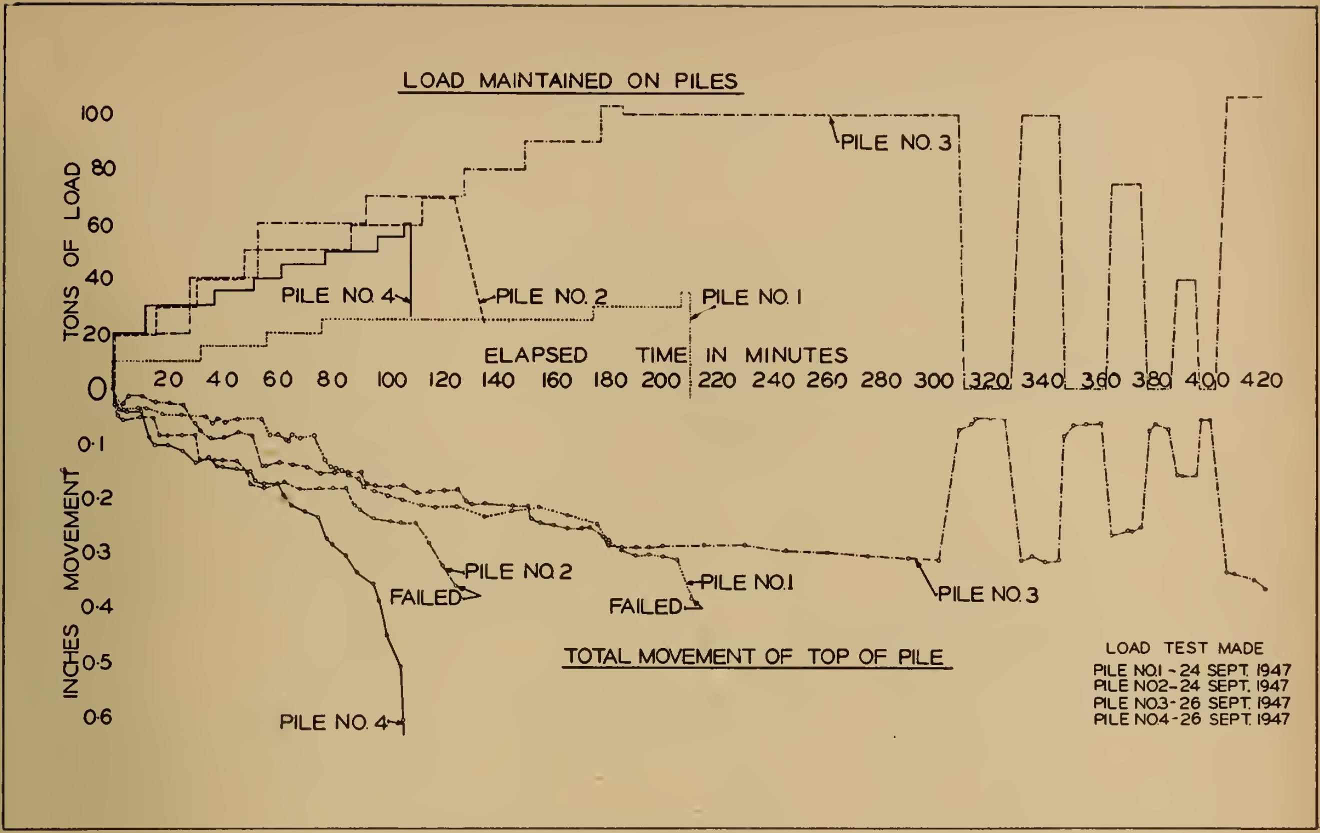


Fig. 8—Typical time-load-settlement curves for test piles.

Load Testing Apparatus

Loading Arrangement: The static loading of the test piles was carried out by means of a 100 ton capacity hydraulic jack resting on top of the test pile, and exerting a pressure against a static load above the jack. This static load consisted of a grillage of 24 in. steel beams resting on a cribwork of railroad ties on top of the wharf deck. A pile of 85 lbs. steel railroad rails, comprising a total weight of about 180 tons, was stacked upon this grillage. This load was so arranged that two piles could be tested without moving the load and there would be an effective resistance of approximately 100 tons over each pile. This load arrangement is clearly illustrated in Fig. 5.

Hydraulic Jack: The pump of the hydraulic jack was fitted with two pressure gauges, one registering to 2,000 lb. per sq. in. and the other to 20,000 lb. per sq. in. The jack was calibrated by the Donald Inspection Company on the testing machines at McGill University, and it was found that there was an error of 600 lbs. in the large pressure gauge. This 600 lb. was therefore added to actual readings for loads in excess of 40 tons.

The top or plunger of the hydraulic jack was capped by a steel plate 24 in. x 20 in. x 2⅝ in. thick and between this plate and the 24 in. grillage beams there was a wood block consisting of four pieces of 6 in. x 6 in. x 2 ft. spruce. After the completion of the test it was found that the 100 ton pressure had compressed these wood blocks for about ⅛ in. permanent set.

Settlement Measuring System: The settlement measuring system consisted of two small steel tanks connected with each other by means of a flexible one inch diameter hose lying on top of the wharf surface as shown in Fig. No. 6. A lug had previously been welded onto the side of the test pile and on this was clamped a standard Vernier depth gauge. A standard brass hook had also been attached, which projected down into water in the small steel tank mentioned above. This tank was approximately six inches square and about eight inches deep with clear glass on the one face.

Fig. 7—View of water measurement gauge at bench mark.

A similar lug and hook gauge was also attached to the bench mark (See Fig. 7). By measuring the difference between the initial hook gauge reading from this common water surface it was possible to determine the settlement of the test pile with reference to the bench mark. This system of measurement worked very effectively, and proved to be accurate to 1/1000th of an inch. As a check on this measuring system an engineer's level was used. Three wood piles had previously been driven between the existing wharf bents and a platform constructed independent of the present wharf structure and a standard engineer's "Y" level mounted on same. Level rod readings were taken but after considerable checking it was decided that the hydraulic system gave a much more consistent

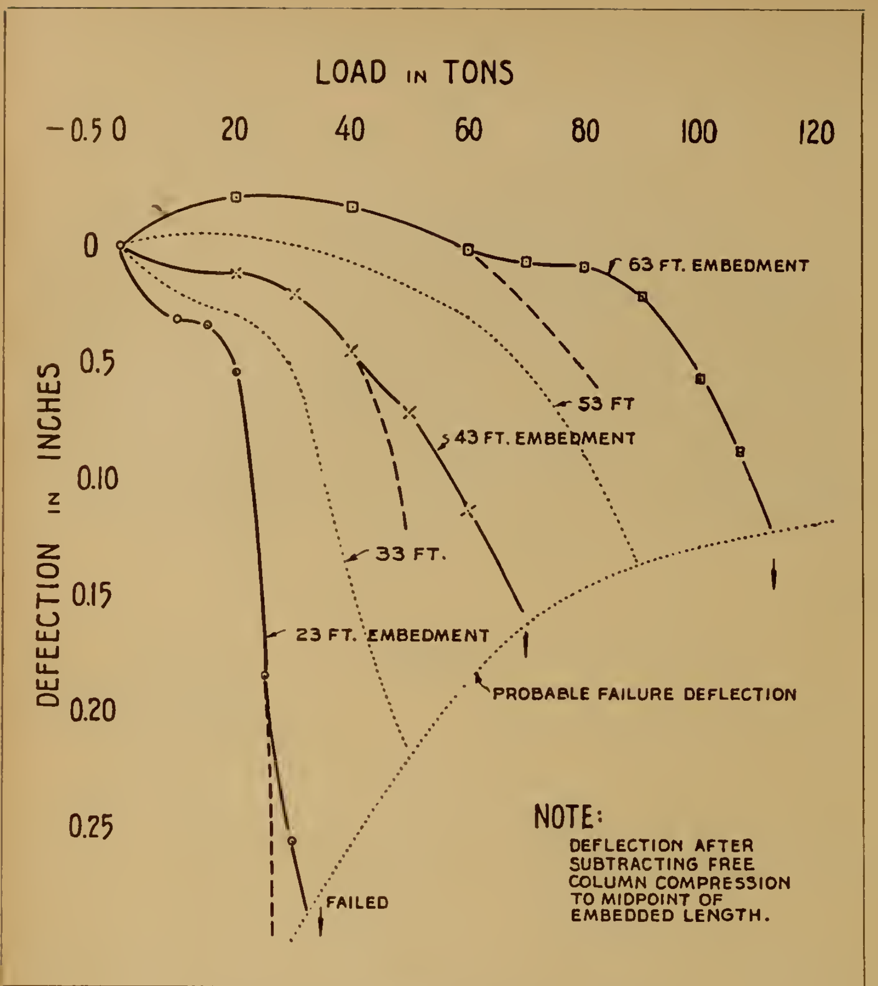


Fig. 9—Load deflection curve for test piles.

and accurate measurement of the pile settlement and the use of the level was abandoned.

Bench Mark: A bench mark was established close by the location of the test piles by means of driving 192 ft. of extra heavy 2½ in. steel pipe to bedrock. The top of this pipe was at +27.0 feet and the bottom was −165.0 feet. A steel angle was welded to the top of this pipe to provide a support for the hook gauge. After the tests of piles Nos. 1 and 2 were completed, the tank was supported on the cross-arm of the bench mark, and this system was used for piles Nos. 3 and 4. It was thought that this arrangement would better eliminate any vibration or movement of the water surface due to wharf movement.

Load Testing Results

The load tests were performed on piles Nos. 1 and 2 on September 24th, and as it took a day to move the test load, the tests were performed on piles Nos. 3 and 4 on September 26th. Thus, there was a rest period of six days between driving and tests for piles Nos. 1 and 2 and eight days for piles Nos. 3 and 4.

The time, loading and settlement readings for the test piles are shown graphically in Fig. 8. It is believed from the shape of the graphs that if smaller load increments had been used for Test Pile No. 1, especially a smaller final increment, the failure load of this pile might be nearer 33 tons than that of 35 tons as recorded, and this failure value will be used in the following comments.

The failure of piles Nos. 1 and 2 was clearly marked by the fact that, once the failure load was reached, the pile moved downward so rapidly that it was impossible to keep up the pressure on the jack or maintain a constant load on the pile. The failure of pile No. 4 was quite different from the other piles, in that the rate of settlement was much faster and larger than for other piles, but the failure was a gradual slackening off rather than an abrupt failure, as in piles Nos. 1 and 2. This was probably due to the taper of the lagging, resulting in a gradual remoulding of the clay with this wedge action tending to hold up the pile.

There was not sufficient weight in the test load to cause complete failure of test pile No. 3. With the ultimate load of 107 tons on the pile, the grillage beams supporting the rail loading were clear of the wood cribbing, indicating that all available load was carried by the pile. With this pile it was possible to observe the permanent set of the pile by repeatedly removing and applying the load in decreasing amounts.

Figure 9 shows the load vs. deflection curves for the four test piles. The straight lines superimposed on the graphs represent the axial shortening of the steel piles themselves, varying with the applied load, depending upon the column length under stress. It is apparent, in the case of pile No. 3 especially, that the lighter loads were carried entirely by the upper part of the pile in friction. As the load was increased, more of the load was transmitted to a greater depth, as the soil surrounding the upper part of the pile yielded from shearing stress, until eventually some load reached the point. Up to this time, the load-deflection curve had a smooth parabolic shape. When the point resistance comes into play, a different stress-strain characteristic becomes evident, resulting in the changed shape that appears in the curves for all of the piles.

It might thus appear that each curve is made up of two curves, one superimposed upon the other. The first of these curves would start at zero and curve steadily downward and could be extrapolated, as shown by the dotted lines in the graph, and interpreted as the relationship between stress and strain for friction support alone. The second, superimposed on the first, is probably the stress-strain relationship for the point support alone.

If we take the hypothetical failure load by friction alone from these extrapolated curves and divide the load so found by the actual failure load, the following values might be developed:

Test Pile Number	Hypothetical Frict. Failure Load (Tons)	Actual Failure Ld. (Tons)	Percent Friction	Average Friction at Failure (Lbs. per Sq. Ft.)
1	25	33	76	360
2	56	70	80	480
3	96	116*	83	590
4	35	52	67	440

* Estimated.

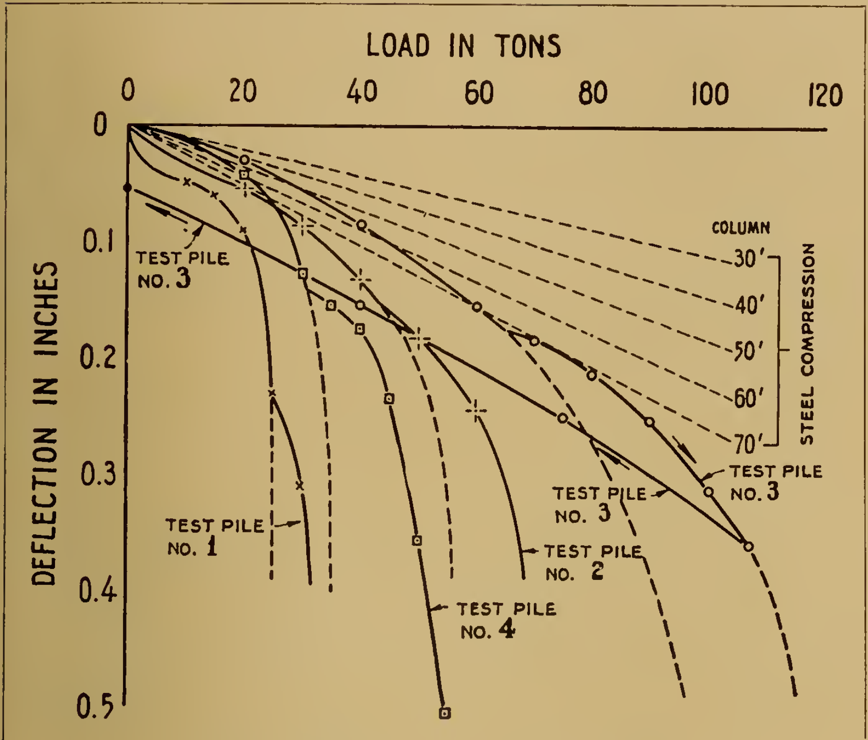


Fig. 10—Deflection of soil under pile loads.

Assuming the effective depth of penetration for piles Nos. 1, 2 and 3, as 23 ft., 43 ft. and 63 ft., respectively, and the circumference of the pile as 4.66 ft., based on the sides of a rectangular section, we have a surface area of 107, 200 and 294 sq. ft., respectively, for these piles. Based on the failure load of 33 tons for pile No. 1, 70 tons for pile No. 2 and the ultimate load of 107 tons placed on pile No. 3, we have an average surface frictional value, neglecting any point resistance or support, of 615, 700 and 728 lbs. per sq. ft., respectively, for these piles.

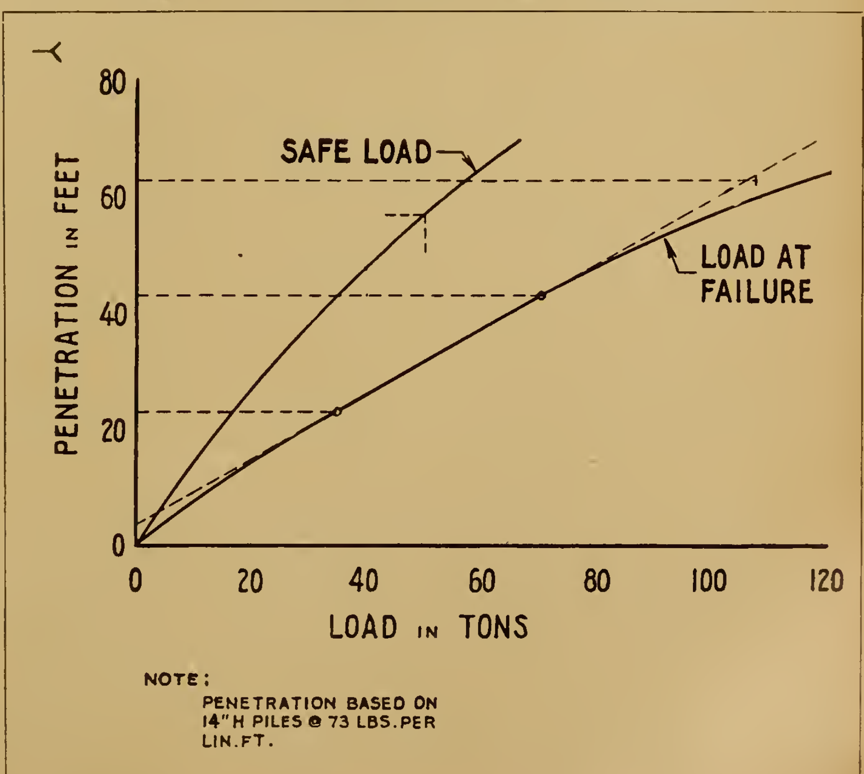
Interpretation of Test Results

The results of these pile tests have been carefully analyzed by Mr. E. H. Harlow, Foundation Engineer of Frederic R. Harris, Inc. and the comments regarding Fig. 9, in the last three paragraphs above are those of Mr. Harlow. Based on these results Mr. Harlow has prepared Fig. 11, from which we can obtain the pile load vs. penetration relationship for the design of the New Wharf. The bearing values given in this figure are based on a factor of safety of 2, determined from the pile failure values, and

It is obvious that these values are only approximations for in several cases it is difficult to extrapolate the final position of the curves with any assurance, but it is logical to assume that when a stress-strain relation suddenly changes its character, another factor has begun to exert an influence. We know that at light loads, friction in the upper soil strata carries the full load, and it is reasonable to believe that when the stressed part of the pile reaches the point, and the point tries to punch downward, the load-deflection relationship for this action will follow a different pattern from that developed by frictional resistance on the sides of the pile. It is believed that this condition is the cause for the definite break in these load-deflection curves.

Figure 10 is a load vs. deflection curve, which is developed to show the deflection of the soil under the pile load after subtracting the free column compression or shortening of the pile taken to the midpoint of the embedded lengths.

Fig. 11—Pile load penetration relation for pier design.



assuming the clay under the wharf site to be similar to that found at the location of the test piles. The soil samples taken from the other borings on the wharf site confirm this condition.

With reference to possible pile settlement over a long time period, we have an excellent reference in Duncan's Wharf and the "Old Paper Wharf". Duncan's Wharf was constructed in 1938 and supports two large steel bulk cargo unloading towers weighing approximately 140 tons each. (A third unloading tower was added in August 1947). This load is never removed from this wharf and the towers are usually tied up close together for the winter or closed navigation months. During the winter it is also estimated that this wharf carries an ice load equal to 500 to 650 lbs. per sq. ft. of wharf. With all this concentration of load, there does not appear to be any appreciable settlement of these piles up to the present time.

The "Old Paper Wharf" was constructed in 1920, and is of all timber construction with pile bents at 10 ft. centres. No records are available of the pile lengths or pile driving for this wharf. However, parts of the wharf have been known to have been loaded for long periods of time to 15 or more tons per pile, and no settlement was apparent. The soil condition at these wharfs is very similar to that found on the site of the New Wharf. Thus, with these illustrations so close at hand, we need anticipate little settling with time for the new wharf structure.

Duncan's Wharf is of all timber construction, with pile bents at 10 ft. centres. The piles are spaced to carry a maximum design load of 15 tons. An examination of the pile driving records for this wharf show that the piles used in the outer end of the wharf were from 85 to 93 feet long with 9 inch tip and 19 inch butt. The shorter piles vary from 75 to 85 feet long, and have 7 inch tip and 14 inch butt. They were all driven with a McKiernan-Terry Hammer No. 9-B-2 using steam at 125 pounds pressure. The last blow penetration of these piles for an average penetration of 35 to 40 feet varied from 0.10 to 0.60 inches.

Some of the piles were lagged with four pieces of 3 in. x 6 in. plank, with lengths varying from 4 feet to 8 feet long, and located from 6 to 10 feet from the pile tip. These piles seemed to drive to better alignment when the lagging was located more than 6 feet from the tip. The lagged piles settled from 2 to 5 feet under the weight of the hammer and the unlagged piles from 5 to 15 feet, depending on pile size and hammer.

There was considerable irregularity in the driving of all piles, whether lagged or plain, for the same total penetration. Piles in the same bent or adjacent bents without lagging might be much better than lagged ones for the same total depths of penetration, or vice versa. No definite conclusions can therefore be drawn to show that the use of lagging is superior or inferior to the plain pile.

No load tests were made on any of these piles, and the only load carrying value was that found by computation, using the "Engineering News" formula and the final blow penetration. Such values, of course, are known to be very doubtful or inconsistent for piles driven in a cohesive or clay soil. Some of the piles were left 5 feet high and then redriven again after varying periods of rest.

With lagged piles and 40 feet penetration the reduction in the penetration for the last blow was from 29 percent to 42 percent for one day's rest and from 32 percent to 80 percent, with an average near 40 percent for a two day's rest period. There was one such test made on an unlagged pile having a 47 foot penetration, which showed a 65 percent reduction in last blow penetration for an overnight rest period. These tests might indicate that while the bearing value of the pile increases during a rest period after driving, its rate of increase might be greater for the plain pile than for the lagged pile. Such a condition could be caused during the driving operation by the remoulding of the clay surrounding this lagged pile.

Removal of Test Piles

Test pile No. 1 was pulled on October 2nd. The pile was moved with a load of 38 tons on the hydraulic jack, and was then removed by the crane. The side recesses of the pile were completely filled with clay to resemble a square section. Some scattered chunks of clay fell out in handling, but most of it was still in position after the pile had been placed on the wharf deck. The clay clinging to the pile was described as a "greasy" blue clay with no sign of any sand, shell or other materials of a different nature.

An attempt was made to pull test pile No. 2, but with a combined pulling force of 210 tons this pile failed to move and was abandoned. This combined pulling force was composed of 115 tons on the hydraulic jack, two rachet jacks at 35 tons each and a 25 ton pull of the locomotive crane. This same combined loading was applied to test pile No. 3, but no movement was obtained and this pile was abandoned.

Test pile No. 4 was pulled on October 1st. This pile was moved with a load of 43 tons on the hydraulic jack. The pile then had to be jacked up vertically for about 10 feet before the crane could handle it. The recesses of the H section were completely filled with clay, both above and below the lagged section. The clay clinging to the upper end of the pile fell out during the landing of the pile but at the lower end it only fell out after the pile had been laid horizontally on the wharf deck.

Acknowledgments

The Foundation Company of Canada, Limited, are the Designing Engineers and General Contractors for this new Port Alfred Wharf, Frederic R. Harris, Inc. of New York City are the Consulting Engineers. The pile driving and testing was performed by the general contractor. Mr. J. M. Thomas was their Special Engineer in charge of arrangements, and Mr. W. H. Hunter, General Superintendent. The testing procedure was outlined by Mr. E. J. Quirin, Chief Engineer, and directed by Mr. E. H. Harlow, Foundation Engineer of Frederic R. Harris, Inc., and witnessed by Mr. R. P. Pennoyer, Special Engineer of Carnegie-Illinois Steel Corporation, Mr. A. O. Hawes and the author.

The interests of the owners, Saguenay Terminals Limited, are being protected and directed by the General Engineering Department of the Aluminum Company of Canada, Limited, of which Mr. P. E. Radley is Chief Engineer, and the writer is Assistant Chief Engineer in charge of civil engineering work. Mr. A. O. Hawes is Manager of Construction.

Notes on Units & Standards

by

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and

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An address given before conferences of officers of the Standards Division (Department of Trade and Commerce) held in Calgary on October 21, and in Ottawa on October 28, 1947.

This address outlines in simple and popular language the fundamental ideas behind the units and standards on which all engineering quantities are based. The authors, after defining the terms "units" and "standards", show how the former are nominal amounts fixed by definition, while the latter are the physical embodiment of the units. Standards of time, mass, length and volume in turn are discussed. Difficulties in the way of maintaining various standard units inviolate against the effects of temperature, pressure, humidity, time, etc., are explained. Some of the precautions taken in the National Research Council Laboratories for maintaining accuracy in comparing various unit quantities with standard units are enumerated.

In presenting a scientific paper or treatise, it is important for the speaker to define his terms. While this paper is not highly scientific, most of it has such a bearing on exact knowledge and definition that we should be clear about what we mean by the terms we employ. Two of these terms are widely used in the course of the duties of officers of the Standards Division, and are worth a little study. They are the common words "units" and "standards".

Units

First of all what do we mean by a unit? When we form an estimate of the magnitude of some physical quantity we mentally try to sub-divide it into a number of equal amounts of the same quantity. For example, when we see a pile of bricks we can guess the number of bricks it contains, simply because we have an idea of the size of a single brick, which in this case is our unit of measurement. In the same way we can speak or make calculations with regard to length, weight, capacity and so on. Even in more abstract cases we can reason intelligently regarding the number of units in any given quantity. A little thought shows that in all such cases we imagine a unit of some kind and mentally endow it with just that property or properties necessary for our calculations: whether such a unit could exist in nature in a tangible form is immaterial. It is commonplace to speak of units of measurement, such as feet, pounds, seconds, volts, degrees Fahrenheit and many others. We can be quite intelligible when we discuss such units or make calculations involving them, especially when in such cases, we deal solely with a single unique property of the unit.

Let us therefore define the unit of a physical quantity as being a nominal amount fixed by definition. It is, consequently, independent of all physical conditions such as temperature, pressure, geographic location, etc. These last considerations are very important, and I would like to emphasize them. Thus when we are talking of our unit brick for our brick pile, we say that there are 300 bricks in the pile and we mean just that. We don't care whether the unit brick is at a temperature of 20 deg. C, what the barometric pressure is, or whether the gravitational attraction is that in Calgary or in Ethiopia. It is just a brick.

Basic Units

In the case of the units employed to evaluate physical magnitudes, of which there may be many hundreds, it has been found advantageous to attempt to relate them to one another, or better still to a few basic ones. We can see how desirable it is to do this. If we fixed all of our units by definition but without regard to other units, and then afterwards found out that they could all be expressed in terms of each other, we would soon have a terrific confusion wondering which was the correct definition to apply in each case. The unit of volume is especially to the point, and

I would like to say more about this later. In this way we have found that as our knowledge of the true nature of physical phenomena increased, we have been able to boil down all of our units into three basic or fundamental ones viz. those of length, mass and time, (L, M and T). There are, of course, a few units the physical nature of which we do not at present understand, and which are therefore excepted.

Thus volume is obtained by multiplying together three lengths or as we say, it has the dimension L^3. In a similar way velocity is compounded from length and time, or can be expressed as LT^{-1}, while the unit of acceleration becomes LT^{-2}. Force has the dimensions MLT^{-2}, voltage $L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}\mu^{\frac{1}{2}}$ (where μ is a so-called dimensionless constant—the permeability), current $L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}\mu^{-\frac{1}{2}}$, and so on. These last two units are actually examples of the absolute system of electro-magnetic units, which is based on length, mass and time, and in the past year has been sanctioned by the International Committee of Weights & Measures. It is now officially adopted by all of the great national standards laboratories of the world.

Standards

So far we have been talking about units, things which we can picture in our minds, but which do not necessarily have a physical existence. When we come to actual measurement, however, we find we can do nothing unless we first have some material reference measure or standard, which in some way or other embodies the unit. The situation is now different. We see we are forced to use physical matter, and however simple we may make our reference measure, we are always up against the physical properties of matter and all that this implies.

A simple illustration of our difficulties is given by geometry. We study propositions and proofs about the relations of points, lines and planes. These have very simple definitions and we might call them our units. The moment, however, that we wish to make physical examples of these concepts (i.e. our standards), we find that we can only represent a point by a dot, a line by a streak and a plane by a sheet of, say, metal or glass. So the definitions of our ideal point, line and plane now become much more difficult and complicated, and must be hedged in with all sorts of requirements and conditions.

To repeat, we have on the one hand *a unit* which is a nominal amount of a quantity, fixed by definition and independent of any physical condition such as temperature, pressure, humidity, etc., and on the other *a standard* which is the physical embodiment of the unit, and which, in general, is dependent on physical conditions. We all know, for instance that the International Metre Standard is considered to be a metre of length only at the temperature of melting ice.

Basic Standards

We speak also as in the case of units, of *fundamental* standards which, as the name implies, form the basis of our system of standards and hence our system of units. As we have seen, from these fundamental standards others can be derived, e.g. volume from length, pressure from mass, length, and time. The actual realization even of these primary standards is not simple and they are not in every case ideal, that is to say unchanging and invariable. For example, we know that it is a metre in length today, but in a million years from now, would it still be exactly the same length?

Time

In making a few observations about these standards, let us first discuss very briefly the standard of "time". We will not even attempt to discuss it from a relativistic point of view. That would truly complicate matters, because if we drag in the theory of relativity, we would soon find ourselves rushing about the Universe equipped with clocks which, although they seemed perfectly accurate to us, would appear to someone else to be running slow.

Time is something which is continually flowing by, like a river or stream. Whatever time is, it is certainly different from length and mass which are essentially attributes of physical matter. To us, time implies the length of a duration between separate events. The ancients used for their standards the duration between pulse beats, day and night, lunar months, and recurring seasons. Today, the astronomers use as their standard the sidereal day. Due to the rotation of the earth this is the time which elapses between two successive passages of the same star across a certain imaginary line, called a meridian.

Although the sidereal day is the best time standard we have, it is not altogether ideal or invariable. There is evidence that the speed of the earth's rotation is slightly erratic and moreover, it is very gradually slowing down, due in part to tidal friction. It is not, however, intended to give the impression that our fundamental standard of time is not a good standard, for it certainly is. It is merely necessary to understand that excellent though it is, it is not ideal.

We do have, however, a very curious situation in the case of some of our most precise clocks. These can actually measure an interval of a single day more accurately than the standard sidereal day can itself be measured, but over a long period of time our natural standard is infinitely more reliable than our artificial clocks. Before leaving this subject it should be pointed out that another standard which may turn out to be ideal has been suggested. It is the period of vibration of certain kinds of light.

Mass

In the case of mass, our physics text books tell us that it is measured by inertia, which is proportional to the amount of matter in a body. It is difficult to define inertia, but one definition is recalled which states that it is the "stay-as-it-is-ness" of a body, whatever that means. Anyway, it is of little help here. So, in the end we are forced to take as our standard a certain lump of matter described by law. In our case, the Dominion Standard Pound is a cylinder of platinum-iridium alloy, while the International Kilogram is a nearly similar, but larger cylinder preserved at Sèvres in France.

We all know that over a period of time physical matter may change, however imperceptibly, by chemical or other actions. It is quite possible that this can happen to our mass standard, even when it is sealed up in a vault. Then, too, from time to time, it has to be intercompared with secondary standards, and it is almost inevitable that during this procedure it must suffer some slight wear, with consequent loss of mass. So we see that despite the apparent simplicity of the quantity concerned, it is by no means a reproducible and invariable unit.

It has been suggested that a natural standard, such as the mass of the hydrogen atom (which is 1.6×10^{-24} grammes) on the one hand, or the mass of the earth

(6×10^{24} kilogrammes) on the other be adopted as ideal standards, since each is considered to be invariable. But it is difficult to believe that the precision of determining such standards can ever approach the remarkable accuracy of 1 part in several hundred million attainable in the most precise comparisons of the masses of two one-kilogramme standard weights made on the balance.

Length

Next, let us see how we fare when we deal with the fundamental standard of length. Our Dominion Standard Yard, as you know, is defined by the distance between two particular lines ruled on gold plugs inserted in a certain bronze bar, when the bar is at a temperature of 61.91 deg. F. and is supported in a certain way. We have also the Canadian Standard Metre, verified, in terms of the International Metre. While there is no evidence of any secular change in the International Metre or for that matter in the Canadian Standard Metre, some of our secondary standard bars or rules which at the time of their manufacture had been submitted to the best known methods of heat-treatment, have shown a progressive shortening since their purchase about 25 years ago. It has been brought to our attention, on the other hand, that bars made of nickel-steel alloys, similar to our own have been progressively lengthening at the National Bureau of Standards in Washington and at the National Physical Laboratory in England. With such evidence confronting us, can we positively say that the International Metre itself will remain invariable forever?

Some years ago it was strongly recommended that a natural standard, the wave-length of the red radiation from Cadmium, become the standard of length. Indeed in 1927 the International Committee of Weights and Measures adopted an alternate and provisional definition of the metre in terms of the number of cadmium wave-lengths it contained. These light-waves have the virtue of being extremely small, the average length being about 20 micro-inches, and it is possible to have at our disposal a number of different wave-lengths each of known value. They are very useful in Metrology and are universally employed for measuring such precision measures as Johansson gauges to an accuracy of about a millionth of an inch Light-waves, however, like natural standards, are affected by atmospheric temperatures, pressures, etc. As far as we know, however, they are always the same when brought to the same physical conditions which, as we have seen, is not the case with all of our metal bars. But again, where we once thought that the cadmium red radiation was a pure wave, it is now known that this is not quite true. Scientists are, therefore, now looking for new and purer radiations, such as isotopes of mercury. And so the search goes on.

Volume

Something might be said at this point about derived standards, of which volume is a good example. As we saw earlier, the unit of volume has the dimension of length cubed. Hence at first sight it would appear that the standard of volume should be linked directly to the standard of length. In actual practice, however, the measurements of volume in terms of a length standard is very difficult. Take for instance one of the simplest of solid bodies, the cube. In order to determine its volume from length measurements, we have to ascertain that all six faces are truly plane, and that adjacent faces are perpendicular to each other to a very high degree of accuracy. In this connection, an error of only a thousandth of a millimetre in the measurements of the distance between opposite faces of a cube of 10 cm. side would produce an error of about 30 cu.mm. in the volume. Hence the practical realization of such units as the United States gallon from its definition of 231 cubic inches is by no means an easy task, even for the most efficiently staffed and lavishly equipped metrological laboratory.

The Metric Standards

It is considerations of this kind which prevented the exact embodiment of the ideal of the metric system when it was first conceived back in 1792. It was intended that the litre was to be equal to a cubic decimeter or 1000 cubic centimeters, while the kilogramme was to be the weight of a litre of water under stated conditions. Actually it was found necessary to construct the kilogramme and the metre, each as a distinct unrelated standard. These were known as the "kilogramme des Archives" and the "mètre des Archives", respectively. A few years after their construction it was found by careful experiment that these standards did not fulfil the terms of the original definition, i.e. that the weight of a cubic decimetre of water did not equal the weight of the kilogramme des Archives.

Later, in 1875 when the International Metric Commission was formed and the problem was taken up of constructing new standards to form the fundamental international standards and the national prototypes (these latter for distribution throughout the world) it was decided to make them conform as closely as possible to the Archives standards. Still later, in 1901, since the exact significance of the term "litre" was still in doubt, it was defined by the International Committee of Weights and Measures as the volume occupied by an International kilogramme of water under stated conditions. But it was not until 1910 after a long and difficult series of experiments that the International Bureau of Weights & Measures found a reliable figure for the cubic contents of the litre. This turned out to be 1000.028 c.c.'s, and hence one millilitre is *not* equal to one cubic centimeter. How many of our teachers made this distinction to us when we were studying our elementary physics? It is interesting to note that the figure determined by the I.B. forms the basis of our most reliable conversion tables for other units. For example, you can use this result to calculate the number of cu.ft. in an imperial gallon or the weight of a cu.ft. of water.

Measurement of Liquids

It is also interesting to note that a flask which at room temperature contains a quantity of water weighing 1000 grammes, and which we might think of as containing 1000 cc., has an actual volume of water of approximately 1002 cc., due to its thermal expansion from its maximum density at 4 deg. C.

The thermal expansion of liquids has been known for a long time. Many a gasoline station attendant has discovered this fact for himself on a hot day; especially where the old fashioned hand pumps were concerned. With these, gasoline could be pumped from a cool tank underground, to a glass container above, which was exposed to the hot summer sun. We don't know how many gallons this type of container held, but we do know that you could pump 30 gallons up into it and sell 31 of them.

Mass, as distinct from volume, is independent of temperature and it would only be by selling liquids by weight that constant amounts could be realized. You could always pay the same price for the same potential mileage of the fuel used in your car.

Standards in the Laboratory

As we observed when discussing units, the relation between the electrical standards and those of length, mass, and time are even more complicated. Most elaborate equipment, to say nothing of laborious observations, followed by difficult calculations, are required to derive those standards. In fact much of the activity of such well-known institutions as the National Physical Laboratory in England and the National Bureau of Standards in the United States is devoted to the realization of accurate values of derived standards. The work is of such a nature that in nearly all countries it is confined to the well-equipped and well-staffed central government laboratories. In Canada these functions are undertaken by the National Research Council.

Even when we restrict ourselves to the comparatively simple fundamental standards, in comparing similar measures, say of length or mass, many complications may arise. As the need for accuracy becomes more pressing (as say in comparisons involving the fundamental standards themselves) so does the operation become complicated by numerous secondary measurements of temperature, pressure, humidity, time and so on. The control of such quantities is sometimes difficult, and in addition, due to known and accidental sources of error in himself, his instruments and in the secondary measurements, the metrologist must make his primary measurement many times before he will commit himself to the value of his result.

Let us consider just a few complications in connection with the very accurate comparison of two masses. In the first case, a high precision balance is necessary. In the National Research Laboratories we have a balance which will, under the best conditions, compare two one-kilogramme weights to an accuracy of about one part in 50 million. We keep this instrument in a temperature-controlled room, to make sure that its relevant parts preserve their correct ratios. The weights themselves are placed in the balance case several hours before the comparison is begun, so that they will come to equilibrium temperature with the balance.

The observer reads the balance indications with the aid of a telescope from the far side of the room, for here again he is dissipating heat at a rate something like that of a 100 watt lamp. Temperature, pressure and humidity are carefully measured to determine the air density when the weights are of different materials and hence of different volume; for in the case of two one-kilogramme weights, if one is steel and the other brass, the steel kilo has a greater volume, and hence the buoyant force of the air which it displaces is greater, making it lighter than the brass by about 10 milligrammes when weighed in air.

The National Physical Laboratory has built a remote controlled balance which, it is claimed, will compare two one-kilogramme weights to an accuracy of about 1 part in several hundred million. This instrument has an automatic arrangement which can interchange the weights from one pan to the other while the knife-edge is still in contact with its plane. We can see that this is necessary when we consider the tiny contact area, and consequently the very great intensity of pressure of probably several hundred tons per square inch on the knife-edge itself, and which might deform it differently every time the arrestment is released.

When such accuracies are considered, the size and shape of the weights involved become highly important, for as you know weight is proportional to the gravity acceleration, and consequently if the centre of gravity of one of the kilos is only one-tenth of an inch above that of the other, the difference in their weight due to this should be detectable by this balance.

It is believed by scientists that the ultimate attainable precision of a balance when used in air will be limited by molecular bombardment against its moving parts, which is a remarkable tribute to a measuring instrument which was one of the very first to be devised by mankind.

Universal Chinese Standards

In conclusion let me mention an ancient Chinese standard, described in a publication of the Chinese Ministry of Industries in 1934. This standard was established in 2700 B.C. and consisted of a piece of bamboo. When the distance between two knots was such that the bamboo when used as a whistle emitted a certain note, it gave the standard of length. The one-hundredth part of this length was the breadth of a grain, while the volume of the cylinder of bamboo capable of containing 1200 of these grains was the standard of capacity. The weight of 1200 grains was the standard of weight. You will observe that this was primarily based on the vibration or the frequency of the emitted note, which is linked up with the wave-length of sound, just as we are proposing to do nearly 5000 years later, in adopting a light wave-length as the basis of the metric system.

BARK REMOVAL

by the

HYDRAULIC METHOD

A paper prepared for presentation at The Annual General and Professional Meeting, The Engineering Institute of Canada, Banff, Alberta, June 4, 1948

by

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The authors outline the fundamental principles behind the hydraulic method of bark removal. The Weyerhaeuser Barker, installed in 1943, one of several types of hydraulic barkers, is described, and the results obtained over twelve months operations of a similar installation at Powell River, installed in 1946, are recorded. Savings of 10 per cent of wood per unit of newsprint, and 20 per cent per unit of chemical pulp by this method, have been effected. Less power and labor are required. The hydraulic method has gained wide acceptance among large Pacific Coast pulp and paper producers, and has proved of inestimable value to the industry and to our economy generally.

In the manufacture of wood pulp the pulpwood must be free of bark and rot. The early method of peeling the logs in the forest has been almost entirely superseded by less costly methods, removing the bark in the pulp mills by means of various debarking machines called " barkers ". In the Pacific Coast region of North America the largest and most economic machines developed in recent years remove the bark and rot by means of hydraulic jets applied in various ways.

History of Method

Prior Methods

The wood pulp industry was first established in regions where the trees were relatively small (plus or minus 8 in. diameter). The first machine to replace the woodcutter with his peeling knife consisted of apparatus for rotating several knives (by means of power), against which the operator could press a billet of wood. Such machines not only removed the bark but the wood directly beneath it. Where rot was present it was often necessary to remove a significant quantity of wood to get to the bottom of the seam in which the rot was found.

Such machines were later followed by barking drums, i.e., rotating cylinders with ribs on the inside by means of which the pulpwood sticks were tumbled, one against the other, until the bark was removed. As a matter of fact, this " friction " method of removing bark is used in a variety of successful modern machines of various types. It is, for example, the method most commonly used in Eastern Canada and in the Southern United States, where the pulpwood sticks are round, thus allowing the drum barker to be effective.

On the Pacific Coast, wood-pulp is made from logs of an average diameter of approximately 20 in., with extremes of diameter as high as 60 in. In order to be able to treat such wood in drums, it was necessary to saw the logs into billets of approximately the same size as the pulpwood sticks found in other parts of the country. In such sizes the wood billets are no longer round, and the effectiveness of the drum barker is much reduced. An alternate method, widely used before the introduction of the hydraulic method, consisted of cutting the logs into cants and then removing the outer bark by means of rapidly rotating cutter heads on machines especially designed for the purpose.

Economic Problem on Pacific Coast

No matter whether the log was first cut into billets or into cants, the waste, in the form of sawdust and edgings, was considerable. Particularly in the case of the machines with the rotating cutters, the loss of wood adhering to the bark was relatively large. The actual amount of waste often reached 20 per cent of the original volume. In cases where the wood was eventually converted into chips for the manufacture of chemical pulp, it was evident that if the complete log could first be debarked and then converted directly into chips, without the intermediate slabbing process, the savings would be of great significance. Thus, there was an obvious need for any type of barking machine

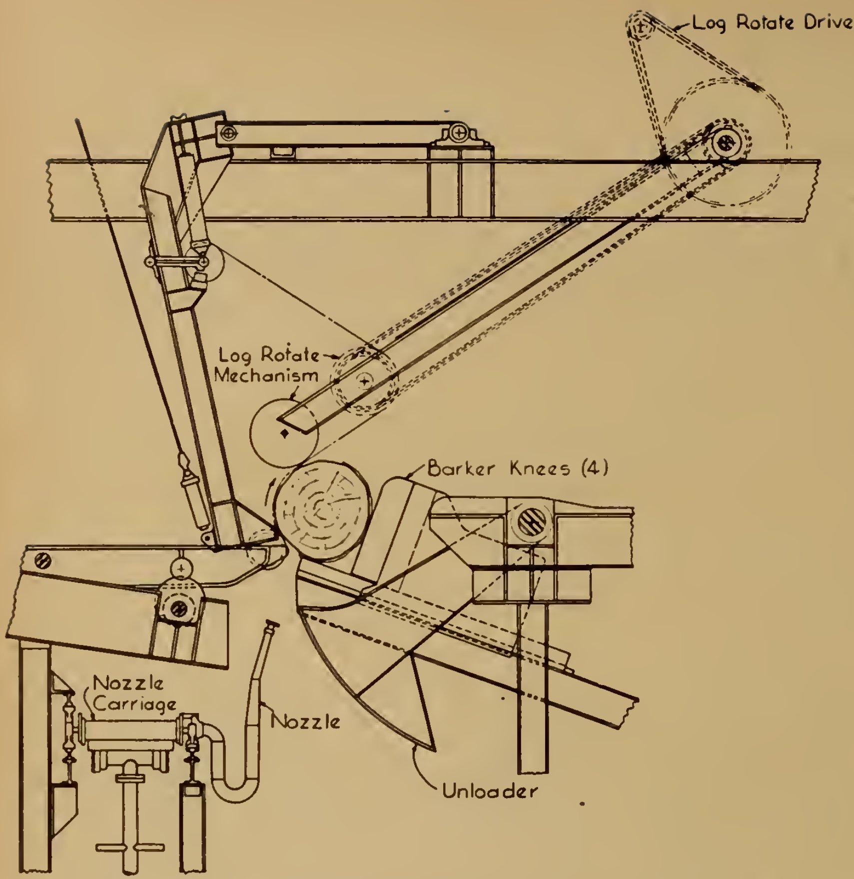


Fig. 1—Section through hydraulic barker showing log support and rotate mechanism

which would remove the bark from complete logs. It so happens that the hydraulic method, in which destructive jets are used, was the first to achieve commercial recognition.

Development of Hydraulic Method

It has been known for many years that a high velocity stream of water directed against a log would remove the bark without damaging the wood beneath it. Early experimental work was hampered by a lack of reliable pumping equipment. When this difficulty had been overcome, experimental work by different investigators resulted in various mechanical arrangements to provide motion of a jet or multiple jets relative to the log, as well as in various hydraulic circuits arranged for the delivery of a thin sheet of water either approximately tangentially or approximately perpendicularly to the log.

Apart from the fact that for the debarking of large whole logs, the hydraulic method was developed faster than the mechanical method, it soon became evident that the hydraulic method had distinct advantages, particularly with an increase in the irregularity of the surfaces to be barked. In fact, this ability of the hydraulic barker to handle irregularities has been exploited to extend the range of size and shape of wood which may be handled. Where a large range of such variations exist it now completely overshadows other barkers.

Furthermore, because the hydraulic barker is capable of expending an almost unlimited input of power, it is theoretically capable of almost unlimited capacity. Thus, on the Pacific Coast, where large variations exist in wood size, species, shape and conditions, and where high capacity is required, the hydraulic barker has offered distinctive advantages which could not be overlooked.

Nevertheless, in its present state of development, the hydraulic barker brings with it certain troubles and disadvantages. It is expensive, inefficient in the use of power, and (in its present state) is still hampered by misapplications both in principle and in mechanical and electrical details. This is to be expected in the early stages of development.

Basic Principles

Nature of Bark

In general, the substance to be destroyed by a hydraulic jet may be said to lie between two extreme types: a non-porous material on the one hand, and a porous material on the other. The first may be a semi-homogeneous substance in which the stress causing destruction is low at the outside but increases uniformly to some high value on the inside. In the case of logs with bark resembling this material, which is of such a nature by virtue of its formation or as a result of freezing or some other process, the logs are usually referred to as " hard barking ".

The porous material, at the other extreme, is an irregularly composed substance, in which the stress causing destruction is uniformly low in a definitely bounded region on the outside and is uniformly high on the inside. The stress required for separation at the boundary between the two regions will be lower than the ultimate stress on the outside region. In the case of logs with bark resembling this material, which is such by virtue of a rough and porous outside surface, and by the existence of a weak zone between the bark and the wood, the logs are called " easy barking ".

Nature of Jet Action

The function of a destructive hydraulic jet is to stress the material to be destroyed beyond its maximum resistance, and then to remove such pieces as have been sufficiently damaged and loosened. Two things are essential: 1) a created pressure or pressure gradient applied advantageously to cause damage to the material; 2) a supply of energy to do work against the resisting forces during the removal of the material.

In the case of the non-porous material (hard barking) practically nothing will be removed until the maximum specific pressure created by the jet exceeds the lowest ultimate stress in the material. At that point the material will be removed in pieces of the order of magnitude of the particles in the jet. They will be removed to a depth at which the ultimate stress again exceeds the maximum specific pressure. Increase of the relative speed of the jet past the material increases the power required by the mechanism which provides the motion. If the jet removes material, most of the power goes into energy of removal; otherwise it goes into an increase of the kinetic energy of the rebounding fluid.

In the case of the porous material (easy barking) the maximum created stress in the material is greater than the maximum pressure created by the jet by a " porosity factor ". This is the ratio of the empty areas to the solid areas on a random plane through the material to be removed. The porosity to be considered is of the order of magnitude of the particles in the jet. Again, nothing is removed until the ultimate stress in the outside portion is exceeded, at which point pieces will be taken off which may be larger than the particles in the jet. In this case the lower limit of jet pressure which removes material depends a great deal on the physical configuration of the substance in the outside layer.

Furthermore, in the case of the porous material (easy barking), because barking is accomplished by blasting it off, the jet need not be solid but may contain air. The air provides a rapid means of transferring the created pressure through and under the material. Through the presence of the compressible air, a greater proportion of the kinetic energy of the jet can be used. However, for efficient operation, the relative motion between the jet and log must be high: the jet must keep up with the rate of propagation of the blast. This leads to low requirements as to the volume and pressure of water, but also to difficulties in construction.

Design Requirements

The requirements of the two conditions of barking may be summarized as follows:

1. Non-porous material (hard barking) requires a high pressure, well formed, solid, thin sheet jet of low traverse velocity, which utilizes an increased water supply by increase of its width while maintaining its thin dimension and traverse velocity. The thin dimension of the jet is one order smaller than the thickness of the bark to be removed.
2. Porous material (easy barking) requires a low pressure jet of high traverse velocity which contains air and, therefore, is not critical as to form. Increased water supply is utilized by an increase of traverse velocity and/or jet width. The thin dimension of the jet is of the order of thickness of the bark to be removed.

As a final generalization it may be said that for the barking of wood a fluid jet is required, consisting of a substance or substances provided with kinetic energy required to destroy and remove the bark. The kinetic energy of the particles would be graded, by variation of their density, all the way from the large specific amounts necessary to damage the strongest regions to be removed to the lowest specific amounts required to remove the damaged regions.

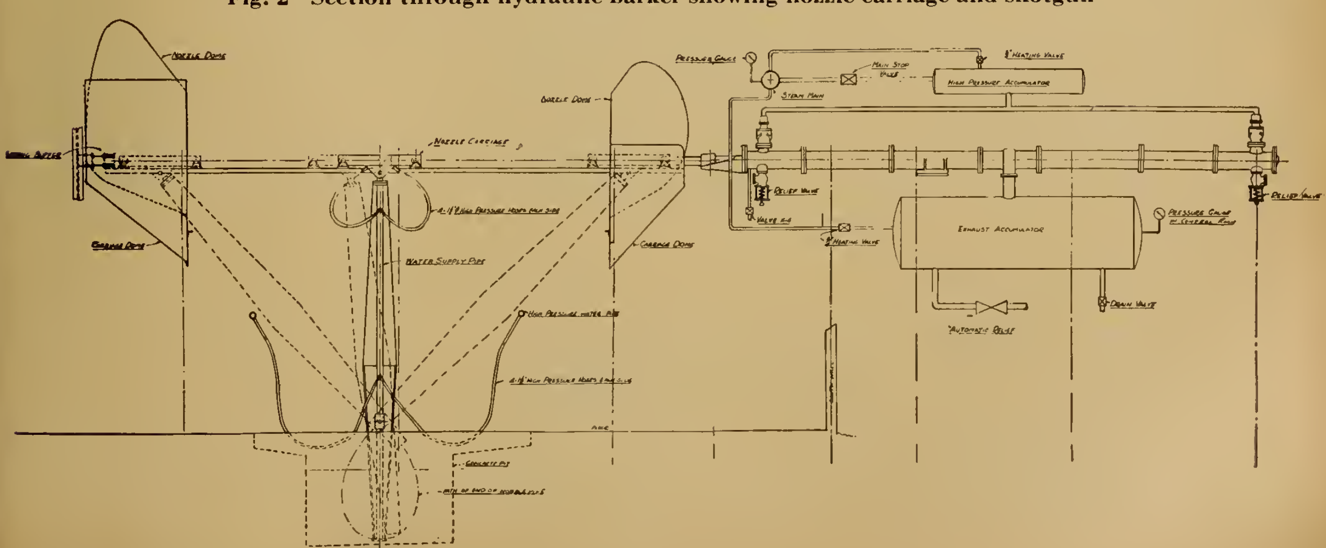
The generalized design of the hydraulic barker jet will consist of the choice of substances of suitable densities which can be conveniently obtained and handled. There is also the choice of a method which will provide particles with velocities such that the highest specific kinetic energies are slightly lower than those which would damage the wood. The actual distribution of specific kinetic energy throughout the particles of the jet or jets is governed by the nature and condition of the bark to be removed.

More specifically, the hydraulic barking process may be divided into two types:

1. Erosion barking in which the bark is crushed and worn off in relatively small pieces by a jet of water discharging from a relatively high pressure.
2. Blast barking in which, because of a weak zone between the bark and the wood and because of the porosity of the bark, the bark is blown off in relatively large pieces by a mixture of water and air discharged from a relatively low pressure.

The minimum power required is approximately proportional to the weight of bark removed per minute. It is approximately inversely proportional to the weight of the average piece of bark refuse which is formed during barking. There is almost no limit to the wastage of power during barking, because the wastage can be increased by prolonging the time that the areas already barked are washed by the barking stream. This inadvertently happens because the desirable speed of the jet relative to the wood is

Fig. 2—Section through hydraulic barker showing nozzle carriage and shotgun



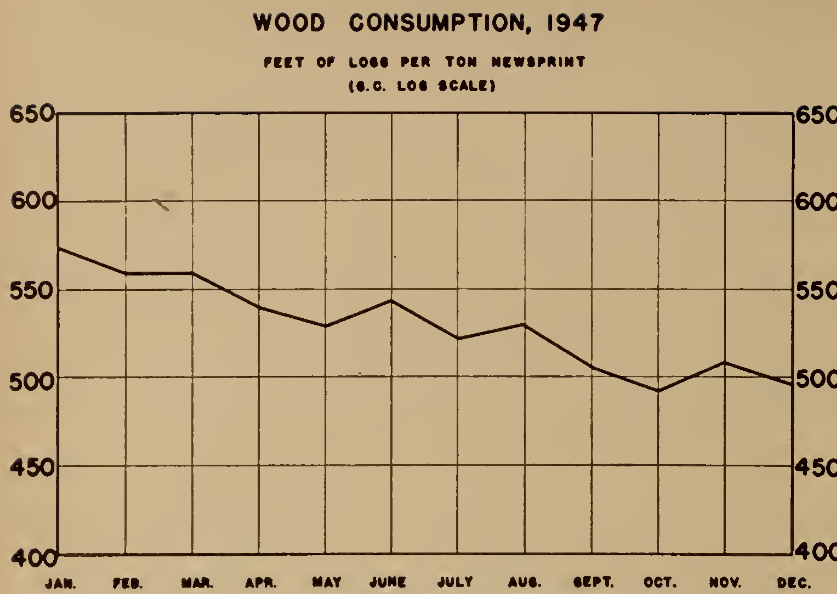


Fig. 3—Statistical record for 1947 showing effect of hydraulic barker on unit consumption of pulpwood per ton of newsprint paper produced

makes a difficult engineering problem. It can only be applied where the power supply is unlimited.

In view of all this, it is necessary to consider partial log length and partial circumference jets which are traversed relative to the log at right angles to their speed. The choice lies between jets moving past the logs circumferentially and jets moving past it longitudinally. The choice between moving the nozzle or moving the log lies with the former, because the weight of the moving parts can be much less, and can be kept constant once a design has been completed. A *rapidly* rotating nozzle with the log progressing endwise may be the best choice. However, until the problem of making a seal has been overcome to permit the rotating nozzle to be supplied with water from stationary pumps, the development of this type of machine will be hindered.

not usually obtainable. Therefore, it is desirable to remove the bark in pieces as large as possible. To that end a localized jet moving rapidly relative to the log is desirable.

The speed of motion should tend to approach that of the propagation of the blast along the log. That the jet must be localized is evident from the consideration that if the log were completely surrounded by jets there would be no place for the bark to go. Furthermore, at extremely high pressures, although the bark at the middle of the log would be crushed, very little of it would be removed. When the bark approaches the non-porous class of material, which requires erosion barking, many of the advantages of the hydraulic barking method disappear.

The Two Extremes

Carrying the basic design requirements somewhat farther, we find that the nozzle arrangement can lie between the two following extremes:

1. A nozzle to give a thin jet the whole length of the log, or part thereof.
2. A nozzle to give a thin jet completely around the log, or part thereof.

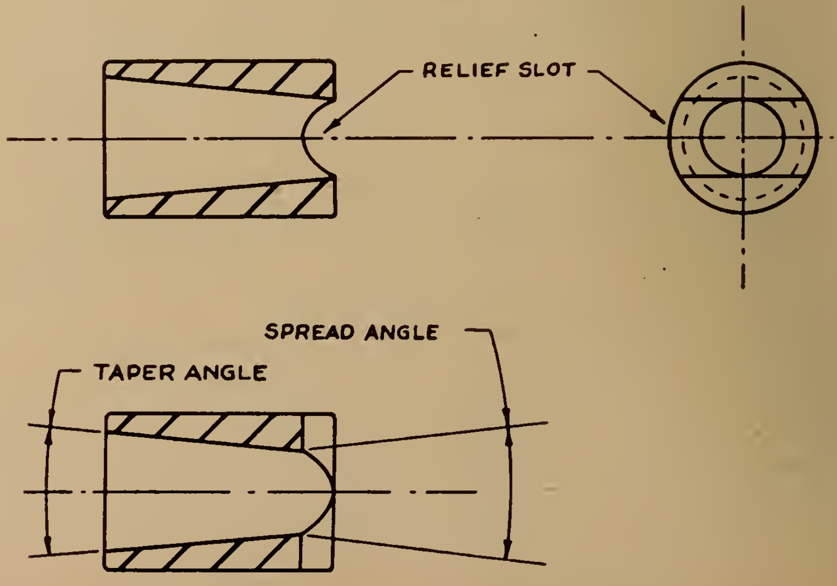
In the case of a full length jet, the log would make one turn. In the case of a full circumference jet, the log would move once through its length past the job. The full length jet, beside requiring enormous power, would certainly split the log. The full circumference jet, besides requiring enormous power, would require very high endwise velocities for its exploitation. There is some question as to the theoretical correctness of a full circumference jet. This is for the reason that bark failure would be restricted in one direction: that of greater bark strength. Also, because the nozzle should be angled against the motion of the log, desirable angles would make it difficult to move large logs through the jet. To move a full circumference jet past a stationary log

Final Choice a Compromise

The final choice seems to lie between a nozzle which spans the log circumference and moves longitudinally past an indexed or slowly rotating log, and a nozzle which spans the log longitudinally and progresses through the length of the log while the log is rotating rapidly. The first may be called the "axial" and the second the "circumferential" type.

The axial type of barker permits the attainment of a high jet velocity past the log, with a greater efficiency in the use of water and power. It has the disadvantage of mechanical and electrical complica-

Fig. 4—Typical hydraulic barker nozzle



tions, which increase both with the length of the barker and with the speed of the nozzle along the log.

Although the circumferential type of barker may have simplicity for an advantage, its performance depends almost entirely on the log characteristics. A log which is not round and straight cannot be rotated rapidly. Thus, to shorten the time of barking, the jet must be widened to cover more surface per turn of the log. If the barker is designed for maximum output on straight logs, widening the jet will split the log. Therefore, if irregular logs are encountered, the peripheral speed must be dropped to the detriment of production.

In choosing between the two types, one must compare mechanical complication on the one hand with long sensitivity on the other. Since it is economically desirable for a pulp mill to use logs which are unsuitable for the sawmill and related industries, it is desirable to avoid sensitivity and to choose therefore a slowly rotating log with a rapidly travelling nozzle. After all, the main reason for installing a hydraulic barker is to extend the range of size and irregularity of the logs that can be handled. There would be no justification in installing a type which would not perform well over a large range of size or on irregular wood.

Weyerhaeuser Barker

Support and Rotating Mechanism

A commercial barker, in which all of the above basic requirements have been met, was first installed by the Weyerhaeuser Timber Company at their Everett sulphite pulp mill in 1943. Subsequent installations with minor modifications have been made at their Longview sulphite pulp mill and at the newsprint and sulphite pulp mills of the Powell River Company in British Columbia.

The apparatus which is used to support and rotate the log is shown in Figure 1. It consists of skids and knees, which can be adjusted to suit the size and shape of the log, but which remain stationary, at will, during the rotation of the log. Rotation is accomplished by means of chains, supported by overhead arms, which wrap themselves around the log, thereby adjusting themselves to any irregularity. With this mechanism the log can be firmly gripped and its rotation can be controlled within the limits of the log irregularity experienced on the Pacific Coast. The speed of rotation can be adjusted to suit the condition of the bark. In cases where the bark is porous and loose, high rotational speeds are used. The range of surface speed is from 10 to 60 ft. per minute.

Jets, Carriage and Supply Piping

The jet mechanism is arranged to give a jet velocity of the greatest practical magnitude relative to the log in a longitudinal direction. It has been previously stated that the relative speed of the jet and the log should approach the rate of propagation of the blast. It is believed that the latter is of the order of 200 ft. per second. Wear of the hose mechanism has prevented the relative speed from exceeding approximately 25 ft. per second in operations which have been conducted to date.

The jets themselves are produced by two over-lapping nozzles which travel back and forth beneath the log while the log is rotated. Details of the nozzles are discussed in Appendix I. The nozzles are situated approximately 18 in. to 22 in. below the bottom surface of the log, and are directed at right angles to it. They are supported on a carriage of light construction which slides on micarta ways.

The carriage is driven back and forth by a " shot gun " steam cylinder of the type commonly used to propel sawmill carriages. Steam is admitted to the cylinder by means of electrically-operated automatic equipment. Once the operator has pressed a " start " button, the carriage will move back and forth continuously until he presses a " stop " button, whereupon the carriage is retracted into an end zone where the jets are discharged harmlessly. The nature of the shot gun and the carriage mechanism can be seen in Figure 2. This illustration also shows the flexible rubber lines which extend from the fixed supply pumps to the travelling carriage. It is the whipping and destruction of these lines which limits the speed of the carriage to the 25 ft. per second mentioned above.

Pumps

It has been found that, for the proper action of the jets, pressures in the range from 1200 to 1400 p.s.i. are required. Such pressures will allow the removal of the bark without destruction of the wood, provided that the jets do not remain in contact with the wood for too long a period. While the duty is not arduous, principally because the pumps operate under conditions of constant discharge and constant pressure, maintenance of high efficiency under conditions of continuous operation requires that the pumps operate practically without wear.

It is considered that the ideal arrangement of the pumps is one in which there are several units, of which one is always out of service but ready for immediate operation. Combinations of pumps can be so arranged that a low pressure can be delivered during the " easy barking " season, and a high pressure in the " hard barking " season. Actually it has been found that the high pressure is desirable at all times; the rate of production being adjusted to suit the condition of the bark.

Control Equipment

A variety of auxiliary devices such as the entry door, the indexing chain arms, the lift arms, the lift skids, the entry and exit deck chains, etc., are all operated electrically. By means of a system of relays and interlocks a sequence of operations may be started simply by pressing a button. A skillful operator can pass complete logs through the machine at the rate of 180 per hour. The operator can vary both the location of the knees which support the log, and the speed of rotation of the log. In addition to the automatic control, manual controls are provided to give the operator a means of meeting any unusual condition which may be encountered.

Related Log Transporting Equipment

The hydraulic barker itself, while somewhat complicated, is not a large piece of equipment. The barking plant as a whole, however, consists of numerous conveyors, transfer decks, trimming saws, loaders, unloaders, and kickers, and the necessary controls required to route the logs through them. All of this equipment, which has been inherited from sawmill practice, is to some extent sensitive to log irregularities. It works extremely well on round straight logs and not at all on logs with roots and limbs still attached. The investment in the auxiliary equipment exceeds the investment in the barker. The design of such equipment is quite as important for the successful operation of the plant as a whole, as is the design of the hydraulic barking unit. Provision for sorting of the logs, including the rejection and subsequent disposal of unacceptable logs, is essential to the efficient operation of the barker.

Results

Installation at Powell River

In the case of the hydraulic barker and related equipment installed at Powell River, the barker section was placed in operation in December, 1946. Several weeks were required to train crews, to overcome mechanical and electrical difficulties, and to adjust procedures to suit the new method. By July most of the wood required by the pulp and paper mills was being processed in the hydraulic barker. However, all of the wood was still being cut into billets in the sawmill before being sent to the pulpwood grinders and to the pulpwood chippers. In August, a new chipping plant of sufficient capacity to take complete logs up to 26 in. diameter was placed in operation. Approximately 40 per cent by volume of the pulpwood required by the pulp mills is converted into chips, the balance must remain in billet form for processing in the pulpwood grinders.

Statistical Records

The effect of hydraulic barking upon the consumption of wood per unit of newsprint paper is shown in Figure 3. With the method now in stable operation a unit consumption consistently under 500 ft. b. m. per ton of newsprint is being maintained. This is equivalent to a saving of at least 10 per cent of the original wood volume. In the case of chemical pulps the saving is over 20 per cent.

Costs

The total cost of a complete hydraulic barker installation, together with the alterations required to a conventional Pacific Coast wood preparation plant, may be as much as $2,000,000. In the case of the installation at Powell River. the reduction of waste alone is of the order of 1,700,000 ft. b. m. of logs each month. The annual saving in wood is worth, at current market prices, over $700,000. Moreover, the hydraulic method reduces the cost of operating labour. In some cases it actually requires less power than the aggregation of barking drums, knife barkers, chippers, conveyors, etc., to be found in the plants previously used. The hydraulic barker does away with the arduous and unpleasant work associated with the former methods.

Apart from the benefit to the owners of the plant in which the equipment is installed, the nation benefits to the extent that its resources are more effectively used than has been the case in the past. The hydraulic barker is, then, not only a means of earning money but a means of conserving our natural resources.

Conclusion

The commercial development of the hydraulic barker has taken place within the last five years. On the Pacific Coast, it has provided a means of removing bark from complete irregular logs without the necessity of cutting them into small pieces with a consequent waste of wood substance. For this reason it has gained rapid acceptance among the large producers of pulp and paper on the Pacific Coast. Several types of machines have been, and are being, developed. Only the barker described herein fully satisfies the theoretical requirements outlined in this paper. The others effect compromises whose purpose is to reduce the mechanical and electrical complication of the machines.

Disregarding the relative performances of the various types which have been installed, it can be fairly stated that the development of the hydraulic method has been of inestimable benefit to the Pacific Coast Pulp & Paper Industry, and to our economy generally.

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"The Powell River Hydraulic Barkers and New Wood Preparing Plant," by R. M. Stewart, *Pulp and Paper Magazine of Canada*, Vol. 47, No. 12, November 1946, Page 95.

Appendix I

Notes on Nozzle Design

A typical nozzle of the type used in the hydraulic barker at Powell River is illustrated in Figure 4.

In a conical nozzle, if the radial convergence and axial flow are symmetrical about the axis, the discharge will be cylindrical at the lower pressures. At the higher pressures, the discharge is an expanding cone (approximately 5 deg.) because of the explosion of the dissolved gases. If, in a conical nozzle, we remove diametrically opposite sides at the outlet, the discharge will expand into the openings so formed and will tend to form a fan. As cutting of the sides progresses, the fan increases its spread, eventually becoming stationary at an angle about a degree or two larger than the taper angle of the nozzle. The condition where the taper angle equals the spread angle is said to be at the " critical relief slot ". At a depth of slot approximately 20 per cent greater than the critical depth, it is said to be at the " full relief slot ". The critical depth equals approximately two-third the radius of the opening for the usual range of pressures and tapers. The relief slot is cut by a sprocket cutter sunk in approximately to a depth equal to the radius of the nozzle. The nozzle angles range from 9 deg. to 40 deg. The present nozzle angles are from 10 deg. to 11 deg. If the operation is in the " shallow relief slot " range the slightest wear and alteration at or near the perimeter of the opening alters the shape of the discharge. With the " critical relief slot " the dependence is not as marked, but the life of a nozzle is only about a month. The discharge is not perceptibly better at " critical depth " than at " full depth ", where the life is over eight months. (One pair of nozzles with stainless steel tips has been in operation since August, 1947). With " extra deep " relief slots the discharge is not as well formed as at " full depth ".

From Month To Month

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

The President Completes a Task

Yesterday here at Victoria another president finished another tour of the branches. This time there were thirty-one meetings—three more than there are branches—and visits to sixteen universities. A new record for distance was set up, 16,000 miles being covered. The completion of a task of these dimensions is indeed a dedication of one's self to the Institute and the profession. Within two weeks time LeRoy Fraser Grant joins that exalted group of distinguished gentlemen—The Past-Presidents—with the satisfaction of knowing he has contributed something real to the advancement of the profession, and with the warm thanks and good wishes of all who met him.

The enthusiasm with which the president has been met at every branch is alike a tribute to him and to his predecessors. It is also a sign that the Institute is alive and is an influence in the land. It is an indication of an increasing usefulness and is an inspiration to those who give leadership in Council and in branch deliberations.

It is neither fair nor simple to single out a branch or a few branches for special mention. In almost every instance the number in attendance constituted a new record. The hospitality in every case was remarkable. The devotion to the Institute was uniform across Canada and was most inspirational. It was evident that the Institute is in a thriving, healthy state and that the future holds for it great opportunities and responsibilities.

New ground was broken this year by a visit to Prince Albert, Sask. Although it seemed as if the entire area were under floods, an enthusiastic group of engineers were able to leave their work of great urgency to meet with the president. With only ten members in that area twenty-seven engineers and wives turned out for a dinner meeting. The group requested that a Section of the Saskatchewan Branch be formed there with Prince Albert as the centre.

For the second time a president visited Kamloops, and again it was an inspirational experience. There were forty-two present at the luncheon. A request was received that a new branch be created for the area with Kamloops as the centre. This would embrace all the Okanagan territory including Penticton, Kelowna and Vernon.

The experience at Trail was similar to that of previous meetings in that it afforded the largest attendance of all meetings with the exception of one—Montreal. There were 192 engineers and wives there, and yet the membership is only fifty. It is characteristic of the engineers in the Kootenay district that the members of one society turn out for the special meetings of the others. A splendid spirit that does much for the profession and for the communal good.

At Vancouver the president spoke to the Board of Trade at a luncheon. His theme was " Canadians for Canada ". He urged employers to show more confidence in Canadian engineers and Canadian industry, pointing out by logic and by example that Canadians are competent to do the work required in Canada—that it is not necessary to employ engineers from another country to take care of Canada's needs. He argued that as long as Canadian governments and Canadian industry send to the United States for the brains to do the design for Canadian expansion just so long will young Canadians feel that their best future lies in that country. It is time to stop such thinking said the president and keep " Canadians for Canada ". (The *Journal* hopes to have Dr. Grant present this address for publication. Ed.)

At the conclusion of a tour like this, and with a few spare hours in this pleasant garden which is Victoria, in which to contemplate the recent past one may well wonder how many engineers in Canada have any conception of what a president gives to the Institute. Only a person who travels the distance in his company, can even approach an understanding of the task. Dr. Grant has been absent from his home on Institute business for almost four months. Besides visiting all the branches, he has attended every council meeting but two. He has represented the Institute at innumerable meetings of other societies in Canada and has twice visited the United States on the same mission. He has gone from his home to the west coast twice in the interests of the profession.

On most of these visits he has been accompanied by Mrs. Grant, who by her charm, tact and wit has added much to the pleasure of branch functions and the pleasure of travelling with the president.

L. A. W.

A Challenging Letter

Late in February of this year, Stewart Young, M.E.I.C., was elected President of the Association of Professional Engineers of Saskatchewan and Chairman of the Saskatchewan Branch of the Institute. On taking over the duties of these important offices, Mr. Young sent a letter to the members of the Saskatchewan Professional Engineers Association and to the members of the Saskatchewan Branch of the Institute. The message in this letter is stated most clearly and is of such importance that it is reprinted in the *Journal*, with Mr. Young's permission, without further comment.

"Let me first thank you for the honor of election to the highest office in your gift. In assuming my duties as President of the Association and Chairman of the Saskatchewan Branch, E.I.C., I make no promise other than to be heedful of my responsibilities.

"Sometimes I wonder whether or not we appreciate the trust that is ours. We bear a great responsibility, greater, I believe, than the engineers of any other country, in that we have the legislative right to determine and to discipline the members of our profession. I need not outline the reasoning in support of the system other than to say that it is an outgrowth of the British Craft Guilds and that the purpose is to provide a means of assuring the public of competent engineering services.

"Not long ago there was discussion of the advisability of limiting the powers of the professional societies. Why? Because of fear that some were acting more in their own than in the public interest. We have a double duty: first to the public and then to ourselves. It is our first duty to choose men of standing and to see that they deal fairly with the public.

"There is, however, a school of thought advocating regimentation; of which Owen J. Roberts, formerly of the Supreme Court of the United States said to a group of students: 'Reject the thought that the state is your boss. Let's stop talking as if we lived in a police state. The state is your agent and you are its master. Never forget that'. This thought was recently restated by Mr. A. J. Bater, President of the Saskatchewan Association of Rural Municipalities when addressing their annual meeting.

"And yet, I am not a little concerned over the future of our profession. Not long ago the well known Hollywood actor, Joe E. Brown, said: 'One of the greatest losses the world has suffered in the past ten years is pride of achievement. We all seem to want to get as much as possible for a minimum of effort'. I am not prepared to point a finger of criticism at our membership but I suggest that if we give the other fellow a little more than the contract calls for, our public relations will not suffer.

"Last fall I attended the National Conference on Community Planning in Montreal. There were engineers in attendance from Halifax to Victoria. My general reaction was that we are not living up to our opportunities. With slide rule and log tables we are daily working out engineering problems but so intent are we on each project that too often we fail to see the effect on its surroundings. Herein lies one of our opportunities—a chance to broaden our vision—a chance to do a better job.

"From time to time mention is made of the scarcity of engineers in public life. A few years ago there were none. Some of us have done our bit; others have not even tried. There are many opportunities for public service, in clubs and societies, on municipal councils and school boards. A good place to begin is in your own organization. In any event the benefit to be derived in character building is far beyond the effort expended."

Personals

Notes of the Personal Activities of Members of the Institute

R. E. Heartz, M.E.I.C., vice-president and chief engineer of the Shawinigan Engineering Company Limited has been appointed treasurer of the Institute.

He was born at Marshfield, P.E.I., and following graduation from McGill University, Montreal, in 1917, he enlisted with the Royal Flying Corps and received his commission with the Royal Air Force the following year. Upon demobilization in 1919 he joined the Fraser Brace Engineering Company.

In 1920 he began his long association with the Shawinigan Engineering Company. As resident engineer on power developments at Shawinigan Falls, La Gabelle, St. Narcisse and Paugan Falls, he gained engineering and construction experience, 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 diversified projects of the Company. Many innovations in methods and equipment, which have led to increased economies, have been initiated by him.

In 1941, during the recent war, he was loaned by the Shawinigan Company to Wartime Merchant Shipping Limited, where he acted in the capacity of general manager until 1942. In January 1947, Mr. Heartz was appointed vice-president and chief engineer and was made a director of the Shawinigan Engineering Company.

Active in the affairs of the Institute for some years, Mr. Heartz was chairman of the Montreal Branch in 1941, member of Council in 1942-44. Other

R. E. Heartz, M.E.I.C.

professional affiliations include the Corporation of Professional Engineers of Quebec, the Canadian Electrical Association, and the American Society of Civil Engineers.

J. F. MacLaren, M.E.I.C., the newly elected chairman of the Toronto Branch of the Institute is a partner of the firm of Gore & Storrie, Toronto consulting engineers. Originally from Ingersoll, Ont,. he has been connected with that firm for twenty years. He had been at one time superintendent of construction and assistant engineer with the Water Supply Section, Department of Works, Toronto, and later was connected with John Inglis Company Limited, there. In 1912 he was draughtsman with Hazen and Whipple, Toronto, and his service with the Toronto Department of Works dated from 1913 and was interrupted for three years service overseas in World War I with the infantry. He served with the rank of major and was awarded the Military Cross and Bar.

M. Eaton, M.E.I.C.

H. W. Tye, M.E.I.C.,, engineer, maintenance of way and structures for Northern Alberta Railways Company, Edmonton, Alta., has been elected chairman of the Edmonton Branch of the Institute for the year 1948-49.

He is from Haysville, Ont., and a civil engineering graduate of the University of Toronto, class of 1908. He was with Canadian Pacific Railway in Winnipeg for a number of years in charge of various railway construction projects. In World War I he served for two years in France with the 78th Winnipeg Grenadiers, after which he returned to C.P.R. In 1922-28 he was resident engineer in charge of the Lacombe North-Western Railway, and then he assumed his present position at Edmonton.

Milton Eaton, M.E.I.C., has been elected chairman of the St. Maurice Valley Branch of the Institute.

Born at Whitewater, Man., Mr. Eaton was educated 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., and was employed on the installation of a 41,000 hp. unit and extension to the power house; he was in charge also of steel erection, and the installation of oil and water filtering and circulating systems.

From October 1922, he was electrical engineer for the Canadian Electro Products Co. Ltd., in charge of the electrical department. The company is now known as Shawinigan Chemicals.

H. J. McCann, Jr., M.E.I.C., is chairman of the Cape Breton Branch of the Institute. He is located at Sydney, N.S., branch manager for Wm. Stairs Son and Morrow Ltd. He is a native of that city, a graduate of St. Francis Xavier University, Antigonish, class of 1929. He received the degree of B.Sc. in electrical engineering from Marquette University, Milwaukee, Wisconsin, in 1933.

He joined Dominion Steel and Coal Corporation in 1934 as assistant electrical engineer, but accepted his present position in 1939. He is a member of the Nova Scotia Mining Society.

Lt. R. L. Nixon, M.E.I.C., retiring bursar and alumnus of King's College, Halifax, completed, this year, 32 years of service to the College. After winning his M.Sc. in civil engineering at Nova Scotia Technical College, he joined the staff of King's College, Windsor, in the capacity of lecturer in engineering. In 1920 he became professor of engineering, which post he held until the college was destroyed by fire and King's became associated with Dalhousie University in Halifax. At Halifax he received the appointment as college bursar. During the recent war, the College buildings were taken over by the R.C.N. as an officers training establishment. Lt. Nixon received his commission and acted as liaison officer between the Navy and the Board of Governors. He has served as secretary of the board of governors for 25 years and has been instrumental in the university's campaign for funds.

D. Hutchison, M.E.I.C., was appointed superintendent of the Power Corporation of Canada Ltd., Montreal. The past-chairman of the Edmonton Branch of the Institute, and Queen's University graduate, was formerly connected with the Hudson's Bay Company as manager of Mackenzie River Transport at Edmonton. Earlier, in 1926-1938, he was with the Power Corporation in Montreal, in the position of construction superintendent.

J. Garrett, M.E.I.C.

Steel Institute Elections

The Eighteenth Annual Meeting of the Canadian Institute of Steel Construction, Inc., was held in May at Toronto. The list of officers for the coming year include the following members of the Engineering Institute:

G. E. Trelaar, M.E.I.C., chief engineer of Sarnia Bridge Company Limited, Toronto, Ont., is re-elected as president; **F. P. Flett,** M.E.I.C., district manager of Truscon Steel Company of Canada Ltd., Toronto, is second vice-president; **H. W. Shart,** of Dominion Bridge Company Limited, Toronto, is treasurer.

Other officers are:

G. P. Wilbur, M.E.I.C., of Dominion Bridge, Toronto and **C. S. Kane,** M.E.I.C., of the same company, Montreal; **G. G. Henderson,** M.E.I.C., of the Canadian Bridge Co. Ltd., Walkerville, Ont.; **Norman Eager,** M.E.I.C., general manager of the Burlington Steel Co. Ltd., Hamilton, Ont.; **G. H. Midgley,** M.E.I.C., and **A. S. Gentles,** M.E.I.C., of the Montreal and Vancouver sections of Dominion Bridge, respectively; **J. F. F. Mackenzie,** M.E.I.C., of Robb Engineering Works Ltd., Amherst, N.S., and **G. H. Crase,** of Horton Steel Works Limited, Toronto.

R. C. Manning, M.E.I.C., was promoted to the position of general manager and chief engineer of the Canadian Institute of Steel Construction, Inc., at the same meeting. He had completed eighteen years of continuous service with that Institute.

Julian Garrett, M.E.I.C., has retired as vice-president of Northwestern Utilities Limited, and has opened an office as a natural gas consultant in Edmonton, Alta. Mr. Garrett, a past-councillor of the Institute, joined Northwestern Utilities in 1924 as its secretary-treasurer.

D. Hutchison, M.E.I.C.

Lt. Commander C. P. Edwards, M.E.I.C., Deputy Minister of Transport for Air Services, was expected back in Canada late in June from Europe, where he attended the International Telegraph Union conference in Brussels in May as head of the Canadian delegation. Early in June he went to London to attend the board meeting of the Commonwealth Communications Council as the Canadian Representative.

Canadian Westinghouse Company Limited, have announced the following appointments in Montreal and Hamilton.

K. W. Fraser, M.E.I.C., formerly district manager, Quebec District, becomes assistant to the vice-president in charge of sales at Hamilton. He 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.

E. E. Orlando, M.E.I.C., formerly manager of central station sales in Hamilton, returns to Montreal to become district manager, Quebec district, of Canadian Westinghouse. After graduating in 1927 from Nova Scotia Technical College, he joined Canadian Westinghouse in the engineering department. He transferred to the sales department in Montreal in 1934, where he ultimately became manager of the Apparatus Division, a position he held until 1946, when he was appointed manager, central station sales, at Hamilton.

J. W. Kerr, M.E.I.C. formerly assistant manager, is appointed manager, central station sales, for Canadian Westinghouse, at Hamilton. He is a graduate of the University of Toronto, receiving the degree of B.A.Sc. in electrical engineering in 1937. He took the Westinghouse Apprenticeship Training Course, and was transferred to the Sales Department, Toronto District Office, in 1940. After his service in the R.C.A.F. in World War II, finally with the rank of squadron leader, he returned to the Company in 1945 in the Central Station Sales Division in Hamilton, and was appointed assistant manager in 1947.

J. W. Kerr, M.E.I.C.

K. W. Fraser, M.E.I.C.

E. E. Orlando, M.E.I.C.

E. G. Wyckoff, M.E.I.C., is in Warsaw, N.Y., connected with the Warsaw Elevator Company in the capacity of chief engineer. A past-chairman of the Hamilton Branch of the Institute, Mr. Wyckoff was connected with the Otis Fensom Elevator Company in that city since graduating in 1930 from the University of Toronto. He was head of the engineering department of the company.

J. I. Carmichael, M.E.I.C., has been employed since last March by Fleet Manufacturing Limited, Fort Erie, Ont., in the capacity of executive assistant to the president, and plant manager. He had been employed by Canadian Car and Foundry Company as chief engineer at their Fort William plant.

O. W. Titus, M.E.I.C., is now general manager of Canada Wire and Cable Company, Toronto, Ont. He rejoins the company from which he separated early this year to become vice-president of English Electric Company of Canada Limited, St. Catharines, Ont.

Emile Lourence, M.E.I.C., who was assistant joint chief engineer in the Montreal region for the Provincial Department of Public Works, has been transferred to Quebec, Que., as assistant structural engineer.

R. C. Bryce, M.E.I.C., is at Port Colborne, Ont., plant engineer with Maple Leaf Milling Company. He completed this year a course in industrial relations at Queen's University.

H. R. M. Acheson, M.E.I.C., recently joined the Abitibi Power and Paper Company Ltd., as assistant manager of the mill at Fort William, Ontario. He was previously with Gaspesia Sulphite Company Limited, a plant engineer of their mill at Chandler, Que.

E. C. Percy, ME.I.C., who has been engineer with Coastal Asphalt Products, Saint John, N.B., is now engineer and vice-president of Fowlers Paving Ltd. Mr. Percy went to Saint John in 1946, from Moncton, where he was assistant district airways engineer for the civil aviation division of the Department of Transport.

E. K. Cumming, M.E.I.C., is the new secretary-treasurer of the Edmonton Branch of the Institute. He is lecturer in charge of mechanical engineering courses at the University of Alberta, Edmonton. He was born at Cayley, Alberta, and studied engineering at the University of Alberta, and McGill University, Montreal, receiving from the latter in 1944 the degree of B.Eng. He joined the R.C.N. after graduation and was discharged with the rank of Lieutenant (E) in 1945.

R. T. Sonsom, M.E.I.C., has been appointed signal engineer for the Atlantic Region of the Canadian National Railways. A graduate of the University of New Brunswick, Fredericton, N.B., receiving a B.Sc. degree in 1935, he worked first as engineer in the electric light department of his home town of Campbellton. He joined the Army in 1940 and returned from overseas in 1946 with the rank of Captain. He joined Canadian National Railways that year as assistant engineer in the signal department, the position he held until his present appointment.

G. R. Pritchard, M.E.I.C., has been named Alberta district sales manager for the General Engineering Division of John Inglis Co. Limited, Calgary. He is a graduate in engineering of the University of Manitoba and comes to Alberta from the mining and industrial areas of Manitoba, Ontario and Western Quebec.

G. R. Pritchard, M.E.I.C.

Ross T. Sawle, M.E.I.C., is secretary-treasurer of Blenkhorn & Sawle, Limited, St. Catharines, Ont., a newly formed industry which will provide engineering consultant, sales representation and manufacturing services in the Canadian electrical field, including electronics. He was formerly assistant engineer with English Electric Company. The possessor of a M.A.Sc. degree in electrical engineering he joined English Electric in 1935, and worked on the development of new products in addition to regular engineering duties.

J. E. Brett, M.E.I.C., has accepted a teaching position at Stevens Institute of Technology to start September 1st, and will be located at Haverford, Pa. Mr. Brett had been lecturing in civil engineering at McGill University, Montreal, during the past year, and had managed also a consulting engineering practice.

William J. Neale, Jr.E.I.C., is now with Chas. Magee & Sons Limited, steel fabricators, Port Colborne, Ont. He was formerly employed by the Maple Leaf Milling Co. Ltd., in that city. He received the degree of B.A.Sc., Mechanical, from University of Toronto in 1946.

R. T. Sawle, M.E.I.C.

G. W. Bond, Jr.E.I.C., is on the engineering staff of the Canadian International Paper Company plant at Three Rivers, Que. He was formerly with Canada Cement Company in Montreal. He graduated from University of New Brunswick with a B.Sc. degree, civil, in 1946.

H. H. Todgham, Jr., Jr.E.I.C., has gone to work with Mr. C. G. R. Armstrong, consulting engineer and land surveyor, of Windsor, Ont. He was in Toronto, Ont., employed by E. A. Cross, M.E.I.C., consulting engineer. He is a University of Toronto graduate, having received the degree of B.A.Sc., civil, in 1946.

A. B. Bamford, Jr.E.I.C., is a student apprentice with A. Reyrolle and Co. Ltd., of Durham, England, manufacturers of switchgear, etc. He went to England last year, after some work on seismic survey with Imperial Oil Ltd., Edmonton, Alta. He received the degree of B.Sc., in electrical engineering from University of Manitoba in 1945.

Charles Metherell, Jr.E.I.C., has gone to Fort William to be control engineer in the mill of the Abitibi Power and Paper Company. He was previously employed by Price Brothers and Company at Riverbend, Que. He graduated in 1946 from University of Toronto.

Robert D. Morrison, S.E.I.C., has been appointed technical representative in charge of the Montreal office of Carbide and Carbon Chemicals, Limited, of Toronto. He has been associated with the company since his graduation from the University of Toronto.

J. K. Melville, S.E.I.C., graduated with honours from Queen's University in May, with the degree of bachelor of science in civil engineering. He has entered the International Paper Company Limited as junior engineer at Hawkesbury, Ont. He is the son of Jas. L. Melville, M.E.I.C., who is chairman of the Canadian Pension Commission.

Geoffrey W. Ince, S.E.I.C., is secretary-treasurer of the St. Maurice Valley Branch of the Institute. He was born at Barbados, B.W.I., and studied at Harrison College there. He attended McGill University, Montreal, graduating with the degree of B.Eng. in electrical engineering in 1947. He is in the engineering department of Shawinigan Chemicals Limited at Shawinigan Falls, Que.

Institute Prize Winners

P. L. Pratley, M.E.I.C., Montreal consulting engineer, is one of two recipients of the Julian C. Smith Medal of the Institute for the year 1947. The citation which accompanies the award reads as follows:

"Philip Louis Pratley is a consulting engineer in the city of Montreal. He was born in Liverpool, England and has been awarded the following degrees from the University of Liverpool; B. Eng. (ordinary) 1904; B. Eng. (1st Class Honours) 1905; M. Eng. 1908; D. Eng. 1939.

"From April, 1906 when he joined the Quebec Bridge Board of Engineers, Department of Railways and Canals, Dr. Pratley accumulated a wealth of experience with the St. Lawrence Bridge Company of Montreal, the Dominion Bridge Company Limited, and the Grand Trunk Railway System and its subsidiaries. He has been engaged professionally by several Departments of the Dominion Government, by various Provincial Governments, cities and municipalities throughout the country, by railways and industrial corporations, by private companies and by general contractors, and has collaborated as Canadian consultant with different American engineering firms working on international bridges.

"Among the more important structures in this country where Dr. Pratley was responsible for the complete design and construction, are the Montreal Harbour Bridge, the Island of Orleans Bridge, the Lions' Gate Bridge, the Reconstruction of Second Narrows Lift Span, and the deep water piers of the Patullo Bridge at New Westminster. Among the International bridges where he has been engaged either for design or inspection or in collaboration with other engineers, are the Detroit Ambassador Bridge, the Blue Water Bridge at Sarnia, the Thousand Islands Bridge at Gananoque, several bridges over the Niagara River, and projects at Amherstburg and Kingston which were later abandoned in favour of alternative schemes.

Dr. P. L. Pratley, M.E.I.C.

"From 1921 to 1940 he was a member of the firm of Monsarrat and Pratley, consulting civil engineers in Montreal, and since the death of Colonel Monsarrat in 1940, he has carried on the consulting practice under his own name. He has served on the executive committee and on numerous technical committees of the Canadian Engineering Standards Association.

"Dr. Pratley joined the Institute as a Student in 1907, transferred to Associate Member in 1909, and to Member in 1917. He was a member of Council in 1927, 1928, 1929, 1932, 1933 and 1934, and a vice-president in 1935 and 1936. He was treasurer of the Institute in 1933. In 1935 Dr. Pratley was awarded the Gzowski Medal, and in 1937 was the first recipient of the Duggan Medal and Prize. In addition to serving on the Council of the Institute for many years, Dr. Pratley has also served as Canadian member of Council for the Institution of Civil Engineers in London. Dr. Pratley has long taken an active interest in Institute affairs and has delivered many papers before various branches of the Institute."

P. M. Sauder, M.E.I.C., general manager of the Western Irrigation District, Strathmore, Alta., is one of the recipients for 1947 of the Julian C. Smith medal of the Institute. The citation read upon presentation of the medal at the Annual dinner, is as follows:

"Penrose Melvin Sauder was born near Preston, Ontario. He attended the University of Toronto and in 1904, graduated with a diploma in mechanical and electrical engineering. In 1904, he joined the staff of the Irrigation Branch of the Dominion Department of the Interior and by 1909 had become chief hydrometric engineer in charge of hydrometric surveys of Alberta and Saskatchewan.

"In 1920 he joined the staff of the

P. M. Sauder, M.E.I.C.

Lethbridge Northern Irrigation District and served for three years as division engineer in charge of location. Later, he was assistant project manager in charge of maintenance and repairs of the works, and from 1924-40 he was project manager and district engineer in full charge of the operation and maintenance of the work of the project. From 1940-44 he was Director of Water Resources for Alberta, and in 1944 was appointed general manager, Western Irrigation District, Strathmore, Alberta, which position he still holds.

"Mr. Sauder joined the Institute as an Associate Member in 1908 and transferred to full membership in 1914. He was a member of Council representing the Lethbridge Branch in 1927 and was vice-president in 1939-40. He is past chairman of the Lethbridge Branch. He is past-president of the Association of Professional Engineers of Alberta, and from 1944 to date has represented the Association on the Institute Council."

E. A. Allcut, M.E.I.C., of University of Toronto, has been awarded the Gzowski Medal of the Institute for 1947 for his paper "The Smoke Problem", which

E. A. Allcut, M.E.I.C.

appeared in the April, 1947, issue of *The Engineering Journal.*

Born at Birmingham, England, he was educated at the University of Birmingham where he received the degree of B.Sc. in engineering with honours in 1908 and the degree of M.Sc. in engineering in 1909. From 1908 to 1910 he was research scholar at the University of Birmingham. From 1910 to 1913 he was assistant engineer with the Humphrey Pump Company at Westminster, England, and in 1913 he became manager of the engineering and testing machine department of W. & T. Avery Limited, Birmingham. Professor Allcut came to Canada in 1921 as associate professor of mechanical engineering at the University of Toronto and in 1931 he became professor of mechanical engineering, and was made head of the department.

In 1930 Professor Allcut was awarded the Herbert Akroyd Stuart prize of the Institution of Mechanical Engineers, London, England, for the best paper published in their Proceedings during the years 1927-28 and 1929, on the general subject of the origin and development of heavy oil engines. He was the recipient of the Plummer Medal of the Institute in 1943 for his paper "Producer Gas for Motor Transport", which was published in the April, 1942, issue of the Journal.

Professor Allcut, a fellow of the Royal Aeronautical Society since 1939, was president of the Affiliated Engineering Societies of Ontario in 1946. Other memberships and offices are as follows: member and past chairman of the Ontario Section of the American Society of Mechanical Engineers; chairman of the Canadian Advisory Committee of the Institution of Mechanical Engineers; member of the Association of Professional Engineers of Ontario; member of Committee on Substitute Fuels of the National Research Council, and chairman of the Sub-Committee on Producer Gas (War Research); joint author with R. H. Patten of the two reports of this Committee. Professor Allcut is the author of several scientific books and of many technical articles and papers. He has served on many Institute Committees, currently that of Industrial Relations.

G. S. Hume, of Ottawa, is the recipient of the Leonard Medal for 1947, for his paper "Results and Significance of Drilling Operations in the Athabaska Bituminous Sands", published in the May, 1947, issue of *The Canadian Mining and Metallurgical Bulletin.*

Dr. Hume was born in Milton, Ont., and received his early education there and at Galt, Ontario. He graduated in

Dr. G. S. Hume

1915 from the University of Toronto with the degree of B.A., majoring in geology. After a period of overseas service with the C.E.F. and the Imperial Artillery, he returned to Canada in 1919 and thence to the U.S. to continue his education at Yale University, from which he obtained his Ph.D. degree, specializing in stratigraphy. A short lectureship at McGill University preceded his appointment to the staff of the Geological Survey in May 1921. His first assignment was to make a special study of petroleum and natural gas resources of Canada. Oil geology of the Great Plains area of Western Canada has been Dr. Hume's specialization. He was made chief of the Bureau of Geology and Topography, Mines and Geology Branch, early in 1947.

Because of his comprehensive knowledge and experience with the petroleum and natural gas industry of Canada, he was loaned to the office of the Oil Controller, Department of Munitions and Supply, from 1941 to 1945. Canada was faced with a serious shortage of oil products to supply her industries under the stress of wartime conditions and Dr. Hume was called on to advise Oil Control on all possible means of developing her oil resources. In the King's Dominion Day Honours List of 1945, he was awarded an O.B.E. in recognition of his services.

Dr. Hume has been a Member, C.I.M. since 1920. He is a Fellow of the Royal Society of Canada, of the Geological Society of America, and of the American Association of Petroleum Geologists.

Photo by Cunningham, Hamilton

E. T. W. Bailey, M.E.I.C.

E. T. W. Bailey, M.E.I.C., of Hamilton, Ont., has been awarded the Plummer Medal of the Institute for 1947, for his paper entitled "Oxygen Accelerated Combustion in Open Hearth Furnaces", which was published in the February, 1947, issue of *The Engineering Journal.*

Mr. Bailey was born at Hawkesbury, Ont., and received his early education at Lakefield and Peterborough, Ont. He 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 Chem. E. from the same institution.

After graduation he joined the staff of the Aluminum Company of Canada Limited, Arvida, Quebec, where he acted as assistant chief chemist. In 1928 he transferred to the engineering department of The Steel Company of Canada Limited, in Hamilton, and some years later became head of the Combustion Engineering Department.

E. P. Muntz, M.E.I.C., of Hamilton, Ont., has been awarded the Keefer Medal of the Institute for his paper entitled "Steel Rail Piles Replace Concrete Piles", which appeared in the April, 1947, issue of *The Engineering Journal.*

Mr. Muntz was born in Toronto, Ont., and was educated at Upper Canada College, and University of Toronto. He received the degree of B.A.Sc. with honors in 1914. He began his professional career as assistant engineer, Welland Ship Canal, from 1914 to 1920, but this employment was interrupted by service overseas from 1916 to 1919, with the Canadian Railway Troops. He served with the rank of captain in France and Palestine, and was mentioned in General Allenby's despatches.

He was superintendent for E. A. Rigby, railroad contractor, at Galt, Ont., in 1920-21. From 1921 to 1923 he was construction manager for J. B. Nicholson Ltd., and J. B. Nicholson Inc., coal handling facilities in Canada and the United States, after which he was president of E. P. Muntz, Limited, of Ontario and New York State, until 1932, when engineering work executed exceeded four million dollars, including work for seven railroads and many large industries. He was vice-president of Canadian Engineering and Contracting Company (Quebec) Ltd., which company was formed in 1937 to build the plant for Abrasive Co. of Canada Ltd., Arvida, Que. Mr. Muntz was engineer on special work for The Foundation Co. of Canada, Ltd., and subsidiaries from 1940 to 1943. From 1944 he has been a consulting engineer in his own behalf with offices in Montreal until 1946, since then in Toronto and Hamilton. He has been advising the Hydro-Electric Power Commission of Ontario on various bridge and building problems in connection with the very large expansion programme now under way in Ontario. In this connection the use of surplus war stocks of Bailey Bridge equipment are of particular interest.

E. P. Muntz, M.E.I.C.

Mr. Muntz is a past vice-president of the Institute; a past-president and life member of the Association of Professional Engineers of the Province of Ontario. He was twice president of the National Construction Council. He is also a member of the Corporation of Professional Engineers of Quebec, and is licensed in the State of New York, and is a member of the American Concrete Institute.

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

J. A. Ouimet, M.E.I.C., has been awarded the Ross Medal of the Institute for 1947 for his paper entitled "Certain Aspects of Frequency Modulation and Television Broadcasting in Canada", which appeared in the March, 1947, issue of *The Engineering Journal.*

Born at Montreal, he was educated at the College Ste-Marie and obtained his B.A. degree from the Université de Montréal in 1928. He received his engineering training at McGill University where he was graduated in electrical engineering, with the highest honours, in 1932. After graduation he was employed as research engineer with the Canadian Television Limited and the Canadian Electronic Company until 1935 when he joined the staff of the Canadian Radio Broadcasting Commission, now the Canadian Broadcasting Corporation. He was employed in development work until 1937 when, as operations engineer, he was put in charge of the operation and maintenance of all CBC stations.

In 1939 he was made general supervising engineer and in 1941, he became assistant chief engineer of the CBC. As such, he is concerned with the general direction of the technical activities of the Corporation and more particularly with current developments in frequency modulation and television engineering.

Mr. Ouimet is a member of the Corporation of Professional Engineers of Quebec, a senior member of the Institute of Radio Engineers. He has served on a number of committees of the Engineering Institute and is currently serving on the Finance Committee.

N. A. Parlee, Jr.E.I.C., has been awarded the Martin Murphy Prize of the Institute for 1946-47, for his paper entitled, "Utilization of Sydney Slag for Engineering and Agriculture", which appeared in the January, 1947, issue of *The Engineering Journal.*

Born at South Farmington, N.S., he attended school at Kingston, N.S., and high school at Halifax Academy. He entered Dalhousie University in 1930 and graduated in 1935 with B.Sc. in Chemistry, winning the Hugh Graeme Fraser Memorial Prize in Chemistry. Awarded a National Research Council Bursary in 1936, he carried on research at Dalhousie University on Reaction Kinetics, this work leading to the degree of M.Sc. in Physical Chemistry from Dalhousie in 1937. He was awarded a National Research Council Bursary in 1937 and a Studentship in 1938, which were held at McGill University. There he specialized in Physical Chemistry and did research on Atomic Reactions and received a Ph.D. degree in 1939.

Dr. Parlee joined Dominion Steel and Coal Corporation, Sydney, N.S., in 1939 and held positions as analytical chemist, metallographer, research chemist and assistant chief metallurgist, before being appointed to his present position as director of research and development.

Dr. N. A. Parlee, Jr.E.I.C.

R. N. E. Haughton, Jr.E.I.C., has been awarded the John Galbraith Prize of the Institute for his paper entitled "Effects of Lightning on Buried Telephone Cable", which appeared in the May issue of the *Journal.*

Mr. Haughton was born at Toronto, Ont., but was educated in Hamilton. He graduated from Hamilton Delta Collegiate Institute in June, 1942. There his sporting activities included boxing and weight lifting; he was Ontario junior weight lifting champion in 1941. He entered McMaster University in 1942, in the Pre-Engineering course. He was McMaster University Boxing Champion, light weight class, that year. Transfer-

Photo by Ashley & Crippen

R. N. E. Haughton, Jr.E.I.C.

ring to Queen's University in 1943, he entered the electrical engineering course and graduated in 1946, with the B.Sc. degree.

At present he is engaged on electrical coordination and protection studies, Transmission Group, General Engineering Department of the Bell Telephone Company of Canada, Western Area. He is assistant secretary-treasurer of the Toronto Branch of the Institute this year.

Photo by Van Dyck

R. B. Todd, S.E.I.C.

R. B. Todd, S.E.I.C., has been awarded the Phelps Johnson Prize, which is presented to English speaking students in the Province of Quebec, for his paper "The Manufacture of .22 Calibre Long Range Rifle Cartridges".

Mr. Todd was born in Grand Falls, Que. He graduated from West Hill High School, Montreal, in 1935 and from the Montreal Technical School in 1938. He was employed by Canadian Industries Limited, Ammunition Division, from 1938 until 1943 in the positions of draughtsman and foreman in charge of tool, gauge, and cartridge design and development. He served with the R.C.A.F. from 1943 until 1945 when he was discharged with the rank of pilot officer, (flight engineer).

Mr. Todd entered McGill University in 1945 and he has now completed his third year in mechanical engineering.

Photo by LaRose

Robert Riopelle, S.E.I.C.

Robert Riopelle, S.E.I.C., a native of Montreal, has been awarded the Ernest Marceau Prize which is offered each year to French-speaking students in the Province of Quebec. His prize-winning paper is entitled "Etude, Plans et Devis d'un Generateur de Haute Frequence pour la prechauffage dielectrique d'une poudre a mouler thermostable".

He graduated from the Montreal Technical School in 1940 where he was the recipient of the Gold Medal as an outstanding student. He also attended Ecole Polytechnique, Montreal, where he was awarded the degree of bachelor of applied science in electrical engineering in 1947. Here again he was awarded a gold medal for his thesis.

He served in several capacities with various companies during the summer months, while attending the Ecole; and his post-graduate work has consisted of service as an electrical engineer and assistant superintendent of construction, and as works manager of Metropole Electric Incorporated. He has also acted as a consulting engineer.

Raymond A. Pillman, S.E.I.C.

Raymond A. Pillman, S.E.I.C., has been awarded the H. N. Ruttan Prize for his paper "The Accuracy of a One-Minute Transit".

A native of Montreal, Mr. Pillman was educated in Western Canada where he attended the University of British Columbia and graduated this spring with the degree of bachelor of applied science in civil engineering.

His prize-winning paper is the result of a series of original tests he made in order to determine the heretofore undetermined precision of repetition work with one-minute instruments. He is now employed by H. G. Acres and Company on the construction of the John Hart Development at Campbell River, B.C. He is a former secretary of the student section of the Institute's Vancouver Branch at the University of British Columbia.

Obituaries

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

G. K. McDougall, M.E.I.C., Montreal consulting engineer, died in Hospital on April 27, 1948, after a short illness.

Born at Three Rivers, Que., in 1882, Mr. McDougall was educated at Montreal High School and McGill University, receiving from the latter in 1904 the degree of bachelor of science in electrical engineering. He did engineering work in the U.S.A. for a time, but in 1908 returned to Canada and became connected with Shawinigan Water and Power Company as assistant to the treasurer. Later he was sales manager of the Canada Carbide Company, until he entered consulting engineering practice in 1914. He became associated with the late Raymond E. Pease and with Ferdinand J. Friedman. At the time of his death he was a partner in the firm of McDougall and Friedman.

Mr. McDougall joined the Institute as a Student in 1904, transferring to Associate Member in 1912 and to Member in 1919. He was awarded Life Membership in 1948.

William Walker, M.E.I.C., of Montreal, who had retired in 1946 from Canadian National Railways in Montreal, died in July 1947.

He was born at Eldorado Mine, Chile, in 1883, but was educated in Scotland, following his high school and technical school training in Glasgow. After some years of practical engineering experience in railway and dock construction in Scotland and Brazil, he entered the Grand Trunk service in 1908 as assistant in the office of the engineer of maintenance of way in Montreal. He was made assistant engineer in the chief engineer's office in 1909; was appointed assistant engineer of the Ottawa Division in 1910, and assistant land commissioner in 1916. He was acting division engineer on the eastern lines of the Grand Trunk from 1917 until 1919, when he was made division engineer of eastern lines for the System. On his retirement in 1946, Mr. Walker was district engineer for C.N.R. in Montreal. He was a Life Member of the Institute from 1945. He joined as an Associate Member in 1910, transferring to Member in 1940.

E. S. Miles, M.E.I.C., chief engineer and president of Angus Robertson Ltd., died at his home in Toronto on May 29, 1948.

Born at Maugerville, N.B., in 1883, he graduated from the University of New Brunswick in 1904. He worked as an assistant engineer on Georgian Bay canal survey for a few years. He was assistant resident engineer of St. Andrews Lock and Dam from 1907 to 1911. He also served as a supervising engineer in the Department of Public Works for three years.

He was then attracted to the Welland Canal project at the beginning of its construction in 1914. He left the project several times for other construction jobs, but always came back to it, finally as chief engineer in charge of concrete construction. His work from 1914 to 1918, was resident engineer for O'Brien, Doheny, Quinlan and Robertson on the Canal. He then became local manager for Matane Lumber Development Company at Matane, Que. He was back at the Welland project in 1921 as resident engineer for A. W. Robertson Ltd. but shortly afterward went to Belleville, Ont., for the Fuller Gravel Company. He again represented A. W. Robertson on the Canal from 1924 to 1929.

Among other engineering activities which highlighted his career, Mr. Miles served as resident manager of the tunnel division of the Rayner Construction Co., which had the contract for the construction of the intake and clear water tunnel in connection with the duplicate water supply for Toronto which was begun in 1930. He also was a consultant in the Shand Dam project, and figured in the major undertaking of resurfacing Alexandria Pier at the entrance of the Lachine Canal at Montreal in 1937.

He was appointed president of Angus Robertson Ltd., a year ago, with offices in Toronto and Montreal.

Mr. Miles joined the Institute in 1911 as an Associate Member, transferring in 1936 to Member. He attained Life Membership in 1936.

H. P. Fuller, M.E.I.C., of North Battleford, Sask., died on March 6, 1948. He had been a railroader for many years, having joined the Grand Trunk Railway in 1907.

He was born at Bury, Que., in 1887, and after his first work for Grand Trunk he went on location for the Quebec Central Railway and later worked on construction for the Montreal and Southern Counties Railway. From 1910 to 1914 he was instrumentman for Grand Trunk Pacific on construction, location and maintenance. He was then an instrumentman for Canadian National Railways for a year before being appointed assistant engineer at St. James, Man., in 1916. He went to Kamsack, Sask., as assistant engineer, and he was sent in 1927 to The Pas, Man., to be roadmaster for the Hudson Bay Railway. He remained at The Pas until 1939 when he went to North Battleford, Sask., as roadmaster for C.N.R.

Mr. Fuller joined the Institute in 1919 as an Associate Member, becoming a Member in 1940.

F. W. Groves, M.E.I.C., who played an important role in many major construction projects in Kelowna, B.C., and district, during the past 40 years, died there on Thursday, March 25, 1948.

He had led an active life as consulting civil and hydraulic engineer. He was born in Ireland in 1867 and obtained his diploma in civil engineering from the Royal College of Science, Dublin, in 1888. He came to Vancouver in 1893 and for several years was employed on laying out townsites and on other projects throughout the province. As a B.C. land surveyor, Mr. Groves moved to the Okanagan in 1907, residing first at Okanagan Centre where he set up an irrigation system for some 2,000 acres. In 1909 he moved to Kelowna and supervised, for the Southeast Kelowna Land Co., the construction of the McCulloch dam and works.

He started a practice as consulting engineer and B.C. land surveyor in 1917 and later was appointed acting district engineer for the department of water rights. He resumed private practice in 1920, acting as consulting engineer for the Southeast Kelowna, Black Mountain, Glenmore and Scotty Creek Irrigation Districts. He was in partnership with F. H. Alwood a few years ago until the time of Mr. Alwood's death in 1946.

Mr. Groves was a Life Member of the Association of Professional Engineers of British Columbia. He joined the Engineering Institute in 1913 as a Member, and attained Life Membership in 1947.

M. M. Price, M.E.I.C., who was division engineer for Canadian National Railways at Edmonton, Alta., passed away in hospital there on May 1, 1948.

Mr. Price, who was born in Boston, Mass., in 1896, and was educated in Western Canada, was in the C.N.R. service for many years, joining in 1919 as chainman on construction at Winnipeg. He was later named resident engineer at Winnipeg in charge of water supply investigations. He transferred to Port Arthur, Ont., in 1934 as instrumentman for the company, and in 1939 became assistant bridge and building master there. In 1942 he moved to Prince Rupert, B.C., as assistant division engineer, and went two years later to Edmonton to the position he held at the time of his death.

Mr. Price, who was a member of the Association of Professional engineers of Ontario, joined the Institute in 1942 as a Member.

E. W. Jeffrey, M.E.I.C., of Montreal, who died in hospital on May 21, 1948, was connected with Northern Electric, general sales division, as illuminating engineer.

Born in Montreal in 1892, and educated there, he joined Northern Electric in 1910 in Montreal, transferring to Halifax Office in 1914. In 1918 he joined Canadian General Electric Co. Ltd., but left after 3 years to establish an electrical contracting business in Truro, N.S. He rejoined Northern Electric Co. Ltd., Halifax, in 1923, as assistant district sales manager in charge of the illuminating and wiring supply divisions of the Company in the Maritimes. He was transferred to his position as illuminating engineer in Montreal in 1944.

Mr. Jeffrey joined the Institute in 1943.

W. J. English, JR.E.I.C., of Saskatoon, Sask., died March 12, 1948, in hospital, after a long illness.

Mr. English, who was born in Saskatoon, in 1915, attended high school there. He studied at Nutane Collegiate and then went to the University of Saskatchewan, Saskatoon, receiving a B.Sc. degree in mechanical engineering in 1941. He did some engineering work in British Columbia, and later came east to work for Canadian Industries Limited at McMasterville, Que. He returned to Saskatoon in 1945.

Mr. English joined the Institute as a Student in his fourth year of engineering, transferring to Junior in 1945.

NEWS of the BRANCHES

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented at their meetings

Edmonton

E. K. CUMMING, M.E.I.C.
Secretary-Treasurer

On April 16 the Young Engineers Committee sponsored an evening meeting at the University of Alberta. E. K. Cumming was in the chair. R. M. Hardy, M.E.I.C., Dean of the Faculty of Engineering at the University, presented an illustrated lecture entitled **Foundation Conditions in the Edmonton Area**. Following a brief geological history of the area, the speaker discussed local soil and foundation conditions that had been investigated by him during the past few years under the auspices of the National Research Council. Dean Hardy stated that, for the most part, the Edmonton soil consisted of a glacial clay, classified as medium, or of medium to high compressibility. The two most common methods of foundation failure, consolidation and shear failure, were not usually encountered. A third means, however, that of shrinking or swelling due to changes in moisture content, was responsible for practically all the failures in this city. The soil that presents the most difficulty is a clay that has been preshrunk to a nugget structure, sometimes to a depth of ten feet. Dean Hardy pointed out the serious effects that may result from using an allowable bearing pressure as outlined in a building code, but expressed the belief that with further investigation, to be carried out in 1948, any foundation in the Edmonton area could be economically designed on the basis of a minimum of soil tests and site investigation.

Guests at the meeting included members of the Edmonton Builders Exchange and the Alberta Association of Architects. Dean Hardy thanked these organizations for their co-operation during the soil testing programme. The meeting concluded with refreshments and a visit to the Soils Testing Laboratory in the Civil Engineering Department.

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A coloured film of unrivalled action aroused the members of the Edmonton Branch, following their Annual meeting, which began with dinner and concluded with a smoker, in the Macdonald Hotel on the evening of April 23rd.

Election of officers for the year 1948-49, resulted in the following executive: J. W. Tye, Chairman; T. W. Dalkin, vice-chairman; E. K. Cumming, secretary-treasurer; D. K. Campbell, H. Hole, Jr., J. E. Kellett, O. G. Kelly, W. I. McFarland and E. L. Smith, members of the executive.

The meeting decided that a committee be appointed to organize a competition for the best paper prepared by a member of the Branch each year

Two fine films were shown by courtesy of Mr. Dan Campbell, director of the Alberta Government Travel Bureau. They were filmed by Mr. George Eisenschiml of Banff, in the setting of the Institute's Annual meeting. The first entitled "Mount Bulyea" showed a party of mountain climbers ascend the lofty peak and return. The other was the outstanding colour film, "Ski Pro's Holiday", in which a team of Professional skiers give a unique demonstration of their skill near Sunset and Temple Lodges, Banff.

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During the week-end of May 1, Col. and Mrs. Grant and Dr. and Mrs. Wright were guests of the Edmonton Branch of the Institute. Their visit was highlighted by Colonel Grant's address at a dinner held in his honour Saturday evening at the MacDonald Hotel.

Colonel Grant expressed the belief that the engineering students of today will have a great deal to offer to Canadian industry and civic work of tomorrow. These students, he said, are to some extent unlike the students of past years; they have gained maturity in their war experience and have therefore been able to absorb more of their University training. Colonel Grant also spoke of the great accomplishments of Canadian industry and Canadian engineers during the war, accomplishments which have not been equalled by any other country of comparative size. Yet, because of our modesty few know of our achievements.

Following his address the President presented the Institute award for high standing in third year at the University of Alberta.

President Grant and Dr. Wright met with the members of the executive at a luncheon at the Edmonton Club, Saturday afternoon. At this meeting labour legislation and a tariff on plans coming into Canada were discussed in detail and all present were in agreement with the Institute's action on these matters. While this meeting was being held, the ladies were entertained at a tea given by Mrs. H. W. Tye.

Sunday afternoon a very enjoyable and educational tour of the Edmonton airport was arranged by Group Captain M. M. Hendricks of the R.C.A.F., when latest Radar and G.C.A. equipment was demonstrated. Following this tour members of the executive and their guests were entertained at the homes of F. R. Burfield and J. E. Cranswick.

Halifax

W. E. Jefferson, M.E.I.C.
Secretary-Treasurer

Max L. Baker, M.E.I.C.
Branch News Editor

One of the outstanding dinner meetings of the season was held in the Lord Nelson Hotel on Thursday, March 18. About 70 members attended to hear the guest speaker, the Hon. Harold Connolly, Minister of Industry and Publicity for Nova Scotia, discuss **Industry in Nova Scotia.** Among the guests present were: Walter Ward, superintendent of the Marine Engineering Department, Imperial Oil Ltd.; G. P. Elliott, president of the Port of Halifax Club; S. R. Balcolm, vice-president of the Halifax Board of Trade; L. E. Mitchell, M.E.I.C. Councillor, Halifax, and G. A. Smith, president of the Trades and Labor Council, Halifax. Presiding at the meeting was W. C. Risley, chairman of the Branch.

Mr. Connolly paid tribute to the many organizations contributing to the welfare of the province. He referred, in particular, to the splendid efforts that the Port of Halifax Club was making in securing increasing business for Halifax, to the good work done by the Halifax Board of Trade, and of the influence for good in Halifax by the organizations headed by Mr. G. W. Smith.

Turning to his particular department in the Nova Scotia Government, the speaker dwelt at some length upon four main divisions set up within the department. The first, the tourist industry, has developed into a really big business. Tourist bureaux with permanent staffs have been placed in three points in Nova Scotia. Offices have been established in Boston and New York and one is to be established in a central Canadian city.

The second division is fisheries. Here the speaker told of the changes in the methods of fishing, the determination of the department to establish quality products, and the need of, and opportunity for, trained technical men in the many branches of this industry.

Handicrafts was the third item discussed by Mr. Connolly. Under the expert supervision of the head of this division, organized classes for this work have been set up in many parts of the province, particularly in the smaller communities. From the skills developed by the personnel in these classes, many products are now being made that find a ready sale among tourists.

The fourth and last topic under discussion was the industrial division. During the war, Nova Scotia played an important part in war industries, but has since fallen down industrially. Nova Scotians, said the speaker, contributed to this state of affairs by failure to keep pace with the times, by not having worked hard enough, and by being a little too cautious with their money. Engineers are in a position to give invaluable aid concerning industrial expansion in Nova Scotia, and their advice would be welcomed.

A vigorous discussion on the type of industries suited to Nova Scotia followed Mr. Connolly's address, both senior and junior members entering whole-heartedly in the subject. The outcome was the unanimous approval of a motion that Halifax Branch of the Institute form a committee to assist the Department of Industry in its work. The naming of the committee was left to the executive.

A vote of thanks to the speaker moved by R. N. Fournier and seconded by L. E. Mitchell, was enthusiastically endorsed by the meeting.

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On April 20 the members of the Halifax Branch were hosts to eighty-one young men who will receive their degrees from the Nova Scotia Technical College in May of this year. The meeting was held in The Merchant Seamen's Auditorium. Chairman W. C. Risley presided.

Three senior members of the Branch and three graduates had been invited to give ten-minute talks; the former on **What does industry and the profession expect from the graduate**, and the latter on **What does the graduate expect from the profession and industry?**

The speakers for the engineers were: I. P. McNab, H. W. L. Doane, Wm. H. Chisholm.

They considered the young engineer's relation to industry, and discussed such matters as: willingness to work; loyalty to the boss, the job, and the organization; preparation for advancement; advantage of looking on the bright side; satisfaction in seeing a job well done; the value of being observant and curious; willingness to teach others; the development of self-confidence and good judgment.

The graduates' side of the topic was presented by: C. Johnstone, graduating in electrical engineering; H. McClymont, mechanical; F. Theakston, civil. From the students' point of view, it was thought desirable to place more emphasis on guidance during the first years of college training in order that the student engineer would better know the kind of work for which he was fitted.

Job particulars came in for some discussion. In referring to available jobs, particularly in summer employment, the speakers felt that giving students a full picture of what the job entailed, would enable them to give better service to prospective employers because students naturally attempt to secure the kind of work in which they are most interested.

The help given to engineering students

and to graduates in engineering by senior members of the profession was spoken of with appreciation by one of the speakers, while another suggested that all engineering students should be encouraged to join the Engineering Institute early in their college careers.

In the discussion period following the prepared talks, valuable contributions were made by J. B. Hayes, past-president of the Institute; R. M. Richardson, president of the Association of Professional Engineers of New Brunswick, and J. R. Kaye, president of Engineering Service Company. L. D. McKenna, president of the Engineering Society of the Nova Scotia Technical College thanked the Institute for the invitation extended to the graduate students.

Refreshments served by members of the Branch and a motion picture, "Railroading", shown by S. V. Grisdale through the courtesy of the Canadian General Electric Company, completed a very successful evening.

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A joint meeting of the Halifax Branch and the Association of Professional Engineers of Nova Scotia was held in the Lord Nelson Hotel on May 20.. This was the last meeting of the current season. W. C. Risley, chairman of the Branch, presided.

About sixty members were present to hear the guest speaker—D. O. Robinson, chief engineer with the Canada Cement Company Sales Department, who discussed **Developments in Cement and Concrete.**

One of the major developments in cement making was changing from the dry to the wet process. This has eliminated some of the disadvantages inherent in the dry process and made it easier to control the composition and blending of materials, with the result that a more uniform product has been obtained. Great changes are apparent also in the handling of cement, in that considerably more is handled in bulk than was the practice a few years ago. Storage facilities are provided in the larger centres, from which bulk cement is transported by trucks to the job. Two minor changes worthy of note were: increased efficiency in the cement making plants, and improved service to customers.

Twenty-five years ago, said the speaker, only one cement was made—Portland cement. Since that time, because of particular needs in different parts of the Country, special cements have been developed; for example, alkali resistant cement for some parts of Western Canada, and air entrainment cement.

Developments in the use of concrete in the structural field are the principle of continuity, and the principle of prestressing. While it is possible to extend the idea to all structural design, it is limited at the present time to beams, joists and pipes. Turning to the art of making concrete, the speaker told of the development of the water-cement ratio and how emphasis was placed on strength alone, rather than on the three factors, durability, strength, and economy. He also discussed new methods of handling concrete—the ready mix, central mix, pumping concrete and the vibrator.

Coming back to a previously mentioned topic, that of air-entrainment, the speaker said this was the outstanding development of our time in cement making. He then gave a most interesting account of how the air entrainment principle came from the research and experiments conducted in New York State in an effort to find a solution to the problem of deterioration of the surface of the concrete highways in that State caused by the salt and calcium chloride used in combatting icy surface.

Viewed both from the excellence of the address and the discussion it promoted, this meeting was an outstanding success. Not only were many questions asked Mr. Robinson, all of which were answered fully and clearly, but many of the members taking part in the discussion contributed materially to the general topic. Leading the discussion was H. C. Loring, consulting engineer. Interestingly enough, he was with a firm doing research on the problem mentioned by Mr. Robinson that led to air-entrained concrete.

A vote a thanks to the speaker was moved by A. Norman.

Lethbridge

E. A. Lawrence, M.E.I.C.
Acting Secretary-Treasurer

J. A. Haberman, M.E.I.C.,
Branch News Editor

Frank Taylor, general superintendent of the Canadian Sugar Factories Limited, addressed the Lethbridge Branch of the Engineering Institute of Canada at a dinner meeting held in the Marquis Hotel on April 24. Mr. A. G. Donaldson was in the chair, and the usual musical programme was enjoyed.

A. E. Palmer introduced Mr. Taylor. The speaker sketched the history of sugar from its discovery in India and further development in Persia and the Euphrates River Valley. A Frenchman, Oliver de Sirus in 1600 discovered beets as a source of sugar. In 1779, Ekhard, a German, made the first commercial beet sugar, and he built the first sugar mill about the same time. Napoleon Bonaparte established six schools in France for technical instruction in the manufacture of beet sugar. By 1812, there were 40 sugar factories in France.

Beet sugar manufacturing came to the United States of America about 1852, but little was done in a large commercial way until the early 1900. The first sugar mill in the West was established by the members of the Church of the Latter Day Saints, and has since spread through the States of Utah, Colorado, California and up to Southern Alberta in Canada.

The Canadian Government has undertaken to absorb its share of displaced persons in Europe, and the bulk of these people will be absorbed in the sugar growing industry.

The speaker remarked that Southern Alberta is the best agricultural district he has seen with the unlimited lands to be developed within the next century if we expand in irrigation and increase our population. Mr. Taylor forecast a steady growth for Lethbridge due to its close association with agriculture.

A hearty vote of thanks was tendered the speaker by M. S. Mitchell.

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At a dinner meeting attended by thirty-four members and guests of the Lethbridge Branch of the Institute held at the Marquis Hotel on Monday, May 3, a welcome was extended to the President, L. F. Grant, and to the General Secretary, L. Austin Wright.

In his talk to the meeting, Mr. Grant referred to the Engineering Institute's attitude toward collective bargaining. He informed the members that it appears likely that now engineers will be named with other professionals in a bill which excludes professional men from collective bargaining. He referred to Labor Bill No. 195 now before the House of Commons.

Mr. Grant particularly praised the achievements of Canadian engineers in industry. "The Canadian engineer can do the job and can do it as well as any other engineer", said Mr. Grant. He stated that in 1941, Canada produced more war materials than the United States and had, at the same time, mastered complicated mechanisms that before this time were thought to be beyond the ability of Canadian engineers. He emphasized that one need not go out of this country for men to do any type of engineering.

Dr. Wright outlined the highlights of the coming annual meeting of the Institute to be held at Banff, June 1 to 5. He also commented on the expected improvements in The *Engineering Journal* which now has a circulation of approximately eleven thousand.

W. L. Foss moved a vote of thanks to the speakers, stating that he concurred with Colonel Grant regarding the problems of the Canadian engineer and his ability to master them. He said that on a recent visit to projects of the Bureau of Reclamation, he found that their engineers were confronted with the same problems as the Canadians and that they treated them in the same manner.

The meeting concluded with a lively discussion period.

A sing-song led by R. S. Lawrence, assisted by his son, E. A. Lawrence, and accompanied by Mr. Walter Hay, together with a solo by Mr. H. C. Ritchie and a recitation by Mr. A. J. Branch, were well received.

London

N. J. W. Smith, M.E.I.C.,
Secretary-Treasurer

G. N. Scroggie, M.E.I.C.
Branch News Editor

At a meeting on April 27, of the London Branch of the Institute, the guest speaker, Eric Leaver of The Electronic Associates, Toronto, was introduced by K. J. Clowson, M.E.I.C., Middlesex County engineer. Mr. Leaver opened his address by speaking generally on the possibility of operating machines by records. He outlined briefly the history of machines and tools.

Steam was the greatest advent to the machine age. Henry Ford was the first man to introduce its many applications to industry. Ford's theory was that true security in industry rests on the ability to change.

Mr. Leaver continued by illustrating how the emphasis of production has been changed, and referred to different types of production that would be applicable to records, citing for example the simple shaft. The velocity, acceleration and positions of cutting tools, when recorded, would apply to lathes, milling machines, etc. Records may be made to record in spherical and cylindrical shapes and control such machines as lathes, rivetters, etc. This type of record would have many practical applications. Steel records—steel wire with impressions on it—would not wear out and could be used for thousands of times. Motions of machines would be controlled in three or more dimensions. In the future machines could be integrated. Substitution could be made of highly skilled craftsmen to make records, instead of unskilled labour operating many machines.

Mr. Leaver cited the possibility of certain shops manufacturing only records, for other plants and shops on a royalty basis.

Mr. Leaver spoke briefly on how these machines, controlled by records, would affect labour. He considers that the machines would produce a greater diversity of production, more cheaply, and in greater quantity, which would be highly favourable from the consumers' stand-point. He concluded by stating that "the more flexible our production situation can be the more suitable it will be to peace and security."

Mr. Leaver was thanked by Dr. J. K. Watson, President of the London Branch Canadian Institute of Chemistry.

The editor wishes to thank Robt. G. Code for reporting on this meeting.

Montreal

One of the most pleasant visits made this year by Montreal Branch took place on Saturday, May 15, when, upon the invitation of the Institute of Radio Engineers, a large number of the members of the branch visited the R.C.A.F. Station at St. Hubert. From a sun-drenched terrace on the edge of the field, the members heard a most interesting address by Dr. O. M. Solandt, O.B.E., Chairman of the Defence Research Board, and this was followed by a conducted tour of the Station and an actual demonstration in flight of a jet propelled DeHavilland Vampire Fighter. Dr. Solandt's address stressed the aspects of national defence in Canada and the part which the engineer must play, together with those engaged in pure research. He has been fully reported in the daily press but it may be as well to again mention his view that engineers are tending to devote too great a proportion of their efforts to production at the expense of research, at least in the practical field.

The tour of the Station included visits to the various hangars and to the mobile radar convoy and, of course, the highlight was the demonstration in flight of the Vampire Fighter. Before taking it aloft, the pilot Russ Bannock, formerly R.C.A.F., described exactly what he would do and then proceeded to go up and do it in a series of vertical climbs, tight turns, high speed and slow speed runs topped off by a perfect landing, all within close view of the spectators—a most impressive display.

A number of the members of the Institute attended a luncheon at the Mess prior to the afternoon programme where they were welcomed by the Station Commander, Wing Commander Baxter Richer, who outlined to them the purposes of the Station; to provide a flying base for the two local auxiliary squadrons and to maintain peace-time interest in the R.C.A.F. Squadron Leader Molloy and Flight Lieutenant Patrick also spoke briefly.

We wish to thank the I.R.E. for making such a pleasurable and instructive afternoon possible to our Membership.

Niagara Peninsula

J. J. Miller, M.E.I.C.
Secretary-Treasurer

C. A. O. Dell, M.E.I.C.
Branch News Editor

A whirlwind trip to Istanbul, Turkey, was the subject on which A. D. Smith of Foster Wheeler Ltd., spoke before the Niagara Peninsula Branch of the Engineering Institute of Canada on April 22.

The word picture supplemented by movies made by Mr. Smith, showed that Turkey is a mixture of east and west. The city of Istanbul reminded Mr. Smith of Quebec City. Most of the streets are narrow and winding and paved with stone. One street is so narrow and crooked, that there is a large mirror installed so that drivers can see around the corner.

There are 400 mosques in the city, largely unused now. Most of the people dress as Europeans, except the very old. The veil is banned, but some of the older women pull their shawls around their faces to create the same effect.

Most of the people are very poor. Mr. Smith said that there are only a few public eating places in a city of one million people, because very few can afford to take advantage of them.

Concerning the engineering aspects of his trip. Mr. Smith said, "Turkey is very alive to western progress. I was asked questions of all kinds, they have an intense desire to know. Only the younger engineers speak English, the older ones all had their training in Germany, France and even Russia."

"Much of the equipment used in the country today was made in Germany, and I must admit that it is very efficient. I had to deal with only one or two firms, but all the large businesses are government owned.

"I was surprised at the difference in technical drawings. All the details of our new installations had been received, but the engineers could not understand them, as they were different from the German type."

Mr. Smith was dealing with a paper company, A vast variety of raw material is used in Turkey to make paper, including rags, waste paper, wood and even carpets. The speaker also remarked on the tremendous amount of military activity in Turkey, where there are 800,000 men under arms.

Chairman M. F. Ker presided at the meeting and C. L. Mason introduced the speaker. He was thanked by George Griffith.

Ottawa

C. G. Biesenthal, M.E.I.C.
Secretary-Treasurer

R. C. Purser, M.E.I.C.
Branch News Editor

The story of an interesting trip to the southwestern States and to Mexico City, with emphasis on some soil problems, was told in an illustrated address at an evening meeting on Wednesday, April 28. The speaker, F. Lionel Peckover, of the Division of Building Research, National Research Council, was introduced by Major-General G. R. Turner, and thanked by W. L. Saunders. Ottawa branch chairman, J. L. Shearer, presided.

In addition to a description of points of scenic interest visited on the trip, Mr. Peckover dealt first of all with problems relating to the construction of the famous Boulder Dam and of other engineering developments of the Colorado watershed. Among these was included the Colorado-Big Thompson project, a water diversion project involving the construction of several large earth fill dams. He characterized these as an example of aggressive engineering development combined with a sensible conservation of the natural beauty of the region.

The speaker then devoted a considerable portion of his time to the problem of the settlement of buildings and other heavy structures in Mexico City due to the unusual nature of the soil. The soil here is mostly a water-deposited volcanic ash interspersed with occasional layers of water-bearing sand. The city obtains its water supply from these sand layers. Settlement of ground surface level at times is as much as five inches in a year.

Various types of foundations have been tried out, the general method being to use wooden piles driven to the first sand layer about 100 feet down. These piles are in sections connected with steel dowels and are estimated to bear a weight up to 25 tons per pile. The National Lottery building, he gave as a good example of the displacement or floating type of foundation. No damage had resulted to this building as the settlement, in accordance with the design, was uniform with relationship to the surrounding ground.

The Palace of Fine Arts, views of which he showed upon the screen, exhibited over nine feet of settlement since its construction. The foundation of this beautiful building, however, was rigid so that no damage has resulted to the structure itself. The differential settlement was about six inches, which was small by Mexico City standards.

The settlement of these heavy structures naturally causes damage to surrounding pavements, entranceways and approaches. He showed several views where this damage was most pronounced. The effects in some cases were almost unbelievable. He showed pictures, for instance, where the doorways of business buildings had to be converted into windows on account of the impossibility of using them for their original purpose.

At the conclusion of his address, the speaker remarked that it was not really necessary to go to Mexico City to view the effects of settlement on building structures. In the building in which the meeting took place, the National Museum, there was a moderate example of the same thing, with a differential settlement of about a foot or so showing up in its foundation.

The meeting then adjourned to go to the basement of the building where this settlement was very much in evidence resulting in inclined floors, walls with large cracks, and doorways that were far out of plumb.

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At the last regular noon luncheon of the spring season, held on May 6, S. A. Gitterman, Ottawa, Architectural branch, Central Mortgage and Housing Corporation, spoke on **The Engineer and Community Planning.**

"Too many people", said Mr. Gitterman, "think of community planning solely from the aspect of beautification." Proper planning takes in far more than this with considerations of utility taking a paramount place.

The grid pattern of city development, so common in Canada, can be very expensive, he said. By the use of loops, and the breaking down of areas to neighborhoods, on to "precincts" as the English call them, highways can be reduced as much as 40 per cent and other benefits can result to the population.

These nighbourhoods are bounded generally by high speed traffic arteries but internally are free of fast traffic, and may have their own local shops and educational areas. Among other benefits danger to school children on the way to and from school is greatly reduced and through traffic to other parts of the city expedited. With the grid pattern makeshifts are required that aggravate rather than relieve congestion.

The speaker stressed the necessity of planning for possible populations ahead. If you have no idea what the population of the city is going to be how can you design it adequately, he asked.

The speaker was thanked by Tom Foulkes. Chairman J. L. Shearer, who introduced the speaker, announced that the following were recently named as life members: W. F. M. Bryce, F. E. Bronson, E. G. Carty, F. Coburn, and E. B. Jost.

Saint John

J. H. C. MacLure, M.E.I.C.
Secretary-Treasurer

A. R. Bonnell, M.E.I.C.
Branch News Editor

The monthly dinner meeting of the Saint John Branch was held Thursday evening, April 22, in the Admiral Beatty Hotel, with the vice-chairman H. P. Lingley presiding.

In addition to a large turnout of members and affiliates, many guests interested in heating were present. Members from other branches included C. F. G. Bennett, Halifax, and J. F. MacKenzie, Amherst, N.S.

The guest speaker for the evening was G. Lorne Wiggs, M.E.I.C., of Wiggs, Walford, Frost and Lindsay, Montreal. His subject was **Radiant Heating and Cooling.**

Mr. Wiggs stated that radiant heating installed in the ceiling had a great advantage over other types of heating in that the circulation of dust is eliminated. Mr. Wiggs said that germs are carried in the air on dust particles, and that where radiant heating was installed, the tendency for the occupants to have colds was reduced.

Mr. Wiggs also described prefabricated floor and ceiling sections with all services installed. He illustrated his remarks by color slides.

Saguenay

J. E. Dyck, M.E.I.C.
Secretary-Treasurer

Scandinavia as seen by a Canadian Hydro-Electric Engineer was the topic of an address given by F. L. Lawton, M.E.I.C., to the Saguenay Branch of the Institute on May 27, 1948. Mr. Lawton, who is on special assignments for the Aluminum Company of Canada, Limited, Montreal, spent approximately 6 months in Europe during 1947, and visited hydro-electric installations in Norway and Sweden.

Mr. Lawton discussed the amount of water power developed and the efficiencies of installations in these two countries. He pointed out that due to limited coal and oil resources the Scandinavian people had turned to water power for a great part of their power supply. Realizing that water power would have to be their main supply, the people of these countries developed their water wheels and generators to achieve good efficiencies. Mr. Lawton used slides to illustrate statistical data such as per cent of available power developed as well as photographs and cross sections of various installations. He pointed out that Norway with a population of 3 million people had developed over 2 million kw.

Norway and Sweden, due to a sharp contrast in topography, present different problems from the power development point of view. In Norway due to the rugged terrain, power plants are generally of the high head type and power line maintenance presents a problem. In certain localities, service camps are located at 6 mile intervals along the power lines to remove ice and generally maintain the lines. In Sweden practically all plants are tied into one system and transmission distances are considerably greater than in Norway. Power houses in Sweden are being built to some extent underground, not as a safeguard against bombing but rather to reduce the cost of concrete and upkeep.

Both countries operate on a 50 cycle frequency and develop power at 10,000 volts which is considered an economical voltage at the generators. There are certain plants however which generate at 18,000 volts. Transmission lines are well advanced in these countries and a 380,000-volt line under construction has 7-ton towers with a 39-foot distance between conductors. Concrete towers have been experimented with but are used only for lower voltage lines. Mr. Lawton pointed out that due to severe winter conditions, some dams were electrically heated to prevent excessive contraction and leakages.

At the conclusion of the address a question period brought out the following interesting facts: The cost of power in Scandinavia in large blocks ran about $25.00 to $30.00 per kw. year. Lightning conditions on power lines were relatively mild. Pitting and wear on water wheels was about the same as in Canada. J. T. Madill, thanked the speaker on behalf of the Branch.

Vancouver

Alan M. Eyre, Jr.E.I.C.
Secretary-Treasurer

Stuart Lefeaux, Jr.E.I.C.
Branch News Editor

A meeting of the Vancouver Branch was held on April 21 in the Forest Products Laboratory of the University of British Columbia. The speaker of the evening was J. B. Alexander, chief of Timber Mechanics Division, Forest Products Laboratories of Canada. Roscoe Brown, director of the Laboratory introduced the speaker. The title of the address was **Wood as an Engineering Material.**

Mr. Alexander opened his remarks with some facts not generally known about the growth of trees. The moisture content of a tree varies little in the course of a year; more water passing through the tree in the spring and summer. A tree is not a product of the soil, it is a product of the air and water; approximately one per cent by weight of the tree comes from the soil. Trees extend in height from the terminal bud only; a nail driven into the trunk of a three will not change in elevation.

The speaker illustrated his talk with slides of tree growth and lumber testing. The positions of knots in structural members should be taken into account, especially in regions of high stress. Compression wood is dark and appears to be made up of all dark rings of summer wood; it shrinks longitudinally and should not be used for structural members. Spiral grain and ribbon grain lumber has little strength for stressed members. Shakes and checks are of no account unless they come in the centre quarter of a beam. The strongest wood is found at the outside stump of an old tree. Douglas Fir is as strong as any other structural wood of comparable density.

Mr. Alexander conducted machine loading tests to illustrate to those present that the l/d of columns is the determining factor in loading. With l/d greater than 25 there is no need for first quality lumber as the compressive strength does not determine failure. A test was made of a plywood beam to illustrate the weakness of horizontal glued laminations.

The speaker was thanked for his interesting presentation by W. O. Scott. The members then adjourned to the Brock Memorial Building for refreshments.

Toronto

R. A. Muller, M.E.I.C.
Secretary-Treasurer

D. D. Whitson, M.E.I.C.
Branch News Editor

Due to an error in the handling of mail at Headquarters, Toronto Branch activities have not been reported regularly in these columns. An attempt is being made in this issue to compensate for this error. The February meeting, with a summary of guest speaker N. W. McLeod's remarks, was reported in the May issue.

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On January 24, 1948, the Toronto Branch held its annual Ladies' Night. This year's event was held at the Boulevard Club where 125 members, their wives and friends met for dinner, cards and musical entertainment. Of special interest was the attendance of President Grant and Mrs. Grant and some of the out-of-town councillors. The President spoke entertainingly after dinner and touched on his earlier experiences involving many domiciles in different parts of Canada, and said how much he appreciates the friendly welcome he receives from the members of the various Branches.

The evening afforded an excellent opportunity for "get-togethers" and is a firmly established part of the Toronto activities. The Branch was fortunate in obtaining two interesting films from the Bell Telephone Company and the H.E.P.C. of Ontario which were much appreciated.

The Chairman of the entertainment committee was Professor Mark Huggins of the Faculty of Applied Sciences, University of Toronto. D. G. Geiger occupied the chair.

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On Wednesday, January 29, 1948, at Hart House, University of Toronto, the annual Students' Night was held. This has become a widely featured event encouraging and giving an opportunity to Varsity's many undergraduate engineers to deliver short technical addresses before the Branch for monetary prizes. Elimination contests were held at the University and the five best were selected to speak before the Branch. Seventy-five members heard five first class talks on a variety of subjects, illustrated with slides and diagrams. The judges were Messrs. Muntz, Bonn and Whitson who, after detailed comparison of their notes, selected A. S. Halpenny of Toronto as winner of the first place award of $50.00 donated by the T. Eaton Co. Ltd. T. L. Faul, of Czechoslovakia, was winner of the second place award of $30.00; V. L. Richards, of Bermuda and England, won the third place award of $20.00; and J. R. MacKenzie of Stettler, Alberta, and R. S. Hill of Havana, Cuba, tied for fourth place award of $5.00 each.

Mr. Halpenny's subject was **Atomic Power Engineering.** He listed informative facts about the isotopic content of uranium, the process of fission, the phenomenon of transmutation. He places the engineer in the scheme as the man who will design the power plant to minimize losses and assure a chain reaction. He described in detail a plutonium or uranium "pile".

Vincent Richards, of third year Engineering and Business, discussed the application of the **Heat Pump** as a year-round air conditioning unit. The heat pump is the term given to the use of refrigeration equipment to deliver heat in the winter and to abstract heat in the summer. Although extravagant claims had been made in the popular press, the heat pump did offer remarkable advantages over other systems. Air above 35 deg. F., water above 32 deg. F., or even groundheat from the earth below 60 feet, could all be used effectively as heat sources. The refrigeration cycle on which the heat pump operates permitted coefficients of performance of 3-5 in practice, thus enabling electricity to compete profitably for the first time with the older types of heating.

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On April 27, 1948 the Annual Meeting of the Toronto Branch was held at the Royal York Hotel, and was preceded by a dinner attended by a large number of members of the Branch, and honoured by the presence of two life-members, Mr. Wheaton and Mr. Wm. Rogers of the Halifax Branch. An added feature of the evening was the announcement that Prof. Allcut of the Faculty of Applied Science of the University of Toronto had been awarded the Gzowski Medal for his paper on Toronto's Smoke Problem, which he presented before the Toronto Branch in November, 1946.

Elections for the Branch Executive for 1948-1949 had been held previously and the scrutineers reported the following results: Chairman, J. F. MacLaren; Vice Chairman, E. R. Graydon; Executive, John Hall, W. H. Patterson, E. G. Tallman, D. C. Beam, Prof. M. W. Huggins and D. D. Whitson.

The secretary-treasurer reported the financial position of the Branch. A. Murray Lount gave a particularly good report of the activities of the Junior Section. Their Ajax (U. of T.) meeting was attended by over 800 students, and other meetings were very well attended.

At a certain point the meeting was declared to be a regular meeting of the Branch. Business was discussed, and voting was carried out with the following results. The Branch Year was changed to coincide with the calendar year and with Headquarters' year. It is expected that this will keep the Branch finances on a more readily workable basis, and will assist future vice-chairmen in lining up speakers. It is worthy of note that a majority of a group of ten past-chairman, who were contacted regarding this matter, did not approve the change.

Also approved by standing vote was a change covering the duties of the Nominating Committee. Henceforth, if insufficient nominations are obtained from the members for the various offices of the Branch, the Committee need only nominate one member for the position of Vice-Chairman, and three for Committeemen instead of two and six as formerly required.

On presentation of a petition signed by seventeen corporate members, and after a motion by Mr. Storrie, it was decided to call a special meeting of the Branch to discuss Council's stand, and the stand of the Toronto Branch Executive on the subject of collective bargaining by engineers and the proposed bill No. 195, now "in committee" at Ottawa.

The special meeting was planned for May 17, 1948, and it was expected that Mr. G. Martin would attend to explain Council's stand, and the stand of the special committee of Council on collective bargaining. Mr. Martin is chairman of that committee. The Toronto Branch Executive passed a resolution on April 16, opposing Council's stand on this important matter.

The Branch had the pleasure during the evening of hearing G. L. Long, customer relations supervisor of the Bell Telephone Company discuss the use of microwaves in the transmission of the human voice. Mr. Long had elaborate apparatus to illustrate his talk and greatly entertained and enlightened the members. The system improves on what is known in the telephone business as "carrier", which is a method of transmitting several telephone messages over the same wires at the same time. Carrier telephony operates on different wave lengths like radio, and by use of special co-axial cable, 600 messages may be transmitted simultaneously. The frequencies used in this method run to several million cycles per second. If more messages are to be transmitted, the frequencies must be raised still higher, and microwaves come into their own. At 1,000 messages on the system it becomes cheaper than present co-axial wire systems. The ultimate hope is for 4,000 simultaneous messages to be transmitted over one channel.

Even co-axial conductors cannot carry microwaves. The wire and insulators interfere with the tiny waves. Special radio tubes had to be developed. The wave lengths are 1¼" long compared with 1000 feet for home power supply. The frequency of micro-waves, as generated by a klystron tube or the newer British magnetron tube developed for use in "radar", is 10 million cycles per second. These waves come out of a transmitter by a wave guide and are picked up by a similar device, using a special silicon crystal detector, which lowers the microwave frequencies to frequencies which can be amplified.

Micro-waves are not interferred with, cut-off, or reflected by non-electrical conductors such as wood, glass, etc., but are blocked, and may be reflected by metal plates, or normal electrical conductors. The waves in many respects are similar to light-waves, and are polarized. A metal grid or "lens" is used to direct the waves at both the transmitting and receiving ends. These grids focus the waves, which cannot be transmitted beyond the visible horizon. The transmitters and receivers must therefore be on high buildings or hill tops, or towers at about 35 mile spacings, and must be relayed from one station to the next. A ten-foot square grid collects 1 part in 400,000 of the energy transmitted by a station 35 miles distant. It is expected that the system can be used eventually for the transmission of television programmes as well as telephone conversations.

LIBRARY NOTES

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEWS

CONSTRUCTION ESTIMATES AND COSTS, 2nd ed.

H. E. Pulver. N.Y., Toronto, London, McGraw-Hill, 1947. 653 pp., illus., 9½ x 6½ in., cloth, $7.20 (in Canada).

This book on the estimating of building costs is both a text book and a practical manual. It describes in detail the purposes and functions of estimating, giving the reader an adequate background knowledge of the subject before proceeding to the practical applications. In the first section on estimating in general, the author defines the various types of estimates, describes the methods used in computing the figures, and discusses the various factors that must be taken into consideration by the estimator.

The main part of the book is taken up with the problem of estimating the cost of construction. This includes not only the cost of the actual construction work, but such problems as the handling and transporting of materials, the excavation, the installation of machinery, the equipment used, the temporary buildings erected on the site, and also the overhead and profit. With regard to the actual building operations, the author includes piling and bracing, concrete, masonry, damp-proofing and waterproofing, wood construction, structural steel, roofing and flashing, lathing and plastering, heating and air conditioning, plumbing, electrical work, painting, papering, and glazing.

Not only does the author discuss the factors that must be considered, but he also provides many concrete examples and illustrations from which the estimator may work directly. Methods of computing costs are described, with illustrative tables and graphs. The revised edition bases prices and materials on 1947 standards, though they are necessarily only approximate. An appendix provides a check list that the estimator may use in approaching the problem. Also in appendices are included a schedule of average ownership expense, a table of construction equipment rental rates, a depreciation schedule for construction equipment, a list of compensation insurance rates for construction, and a considerable number of examples of graphical diagrams.

The final chapter in the book deals with construction management, and outlines in detail the steps that must be taken by the estimator from the beginning to the end of the construction job. The author has used many tables, diagrams, and examples as well as explanatory text, and the material is presented in a manner that is both straightforward and concise. N. T.

WHO'S WHO IN ENGINEERING; A BIOGRAPHICAL DICTIONARY OF THE ENGINEERING PROFESSION, 6th ed:

Winfield Scott Downs, ed. N.Y., Lewis Historical Publishing Company, 1948. 2357 pp., 9½ x 6½ in., cloth, $15.00.

The qualifications for inclusion in Who's Who in Engineering were established by the Engineers' Joint Council, and include engineers of outstanding and acknowledged professional eminence, who have had ten years of active practice, five years of which has been in responsible charge of important engineering work (including teachers in colleges and schools of accepted standards in engineering). Almost 18,000 engineers are listed, an increase of twelve per cent over the fifth edition, which was published in 1941.

The biographical material is listed alphabetically and comprises 2260 two-column pages of text. The information given includes full name; position held; business and home address; type of engineer; place and date of birth; parents' names; universities attended and degrees received; date of marriage and names of wife and children; positions held throughout career; books written; and society and club memberships. There is a geographical index to the biographies, by state and city for the United States, and by city for other countries.

Besides this there are lists of American and some Canadian engineering organizations, with their address, officers, membership, and in some cases, purpose, arranged alphabetically in one section, and geographically in another. There is a subject list of professional fraternities and honour societies. The engineers included in this dictionary are mainly American, but Canada is well represented. L. S.

ABSTRACTS

FUEL ECONOMY CONFERENCE OF THE WORLD POWER CONFERENCE, THE HAGUE, SEPTEMBER 1947

The following are official summaries of papers presented at the Fuel Economy Conference. The complete text of these papers, together with reports of the discussions on the Section in which they were included, will be published in the "Transactions of the Fuel Economy Conference". Enquiries may be addressed to Mr. Norman Marr, Canadian Committee, World Power Conference, Laurentian Building, 54 Albert Street, Ottawa, Ontario.

DISTRICT HEATING

Ir. M. C. Hoenkamp. The Hague, Fuel Economy Conference of the World Power Conference, 1947. (Fuel Economy Conference Section C5 Paper No. 3).

A district heating system can meet the demands which the human organism may make. In the Netherlands the consideration of district heating is urgent, because extensive quarters of several towns have been destroyed. With a view to the reconstruction of the destroyed heart of Rotterdam schemes for district heating in this city have been studied. (1) Supply of the heat from the Schiehaven power station, which is situated at some distance from the area of consumption. The supply of heat would be combined with the generation of electric energy. Considerable savings of fuel would be secured, but very large capital investment would be entailed. (2) Supply of the heat from ten small boiler houses, to be established in the area of heat demand, these being heating plants only without power generation. In this case the saving of fuel will be considerably smaller but less capital would be needed. (3) Combination of methods (1) and (2), the Schiehaven power station to supply the base heat load, this being combined with the generation of electrical energy. In the area of heat demand the peak load would be supplied by a small number of boiler stations supplying heat only.

This third scheme is to be adopted. A large quantity of fuel will be saved thereby. The capital required is not soo great. The price of a thermal unit will be lower for the adopted scheme than for either scheme (1) or (2).

A general description is given of the Schiehaven power station, and of the hot water mains, the connections to the houses, and other factors.

DEVELOPMENTS IN THE HEATING OF BUILDINGS IN SWEDEN

Erik O. Jonsson and E. Lagerstedt. The Hague, Fuel Economy Conference of the World Power Conference, 1947. (Fuel Economy Conference Section C5 Paper No. 6).

During and after the second world war, imported coke, which had been the principal fuel employed in central heating boilers in Sweden, was replaced by home-produced wood fuel. The use of wood in boilers designed for coke firing is facilitated by various special devices and methods of firing. Efficient wood-fired boilers of large heating capacity are now available. The efficiencies of these boilers are high also when fired with coal. No satisfactory commercial wood-fired heating boilers have so far been produced for small houses, but a new type of boiler has been found to have a high test-bench efficiency. Special systems of boiler connections have come into use for preventing corrosion due to condensation of steam, etc., from flue gases in wood-fired boilers feeding hot water heating systems. It seems, however, that the most reliable method for preventing corrosion is to use low-pressure steam boilers equipped with heat exchangers built into the steam domes. As a rule, modern coke-fired heating boilers are now so designed that they can be alternatively fired with fuel oil. Large boilers of this type can also be fired with coal by means of work feed stakers. New materials are being used for heat insulation of buildings. Regulations applicable to the whole of Sweden have been issued for the heat insulation and ventilation of dwelling houses. Research is being conducted into the heating of buildings.

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Annual Report on the Progress of Rubber Technology, Volume X, 1946:
T. J. Drakeley, ed. Cambridge, Heffer, for the Institution of the Rubber Industry, 1947. 128 pp., illus., paper.

Automatic Regulation, Volume I: Discussion of Fundamentals:
William R. Ahrendt and John F. Taplin. Washington, the authors, 1948. 205 pp., illus., cloth.

Basic Engineering Drawing:
H. D. Orth, R. R. Worsencroft, and H. B. Doke. Chicago, Irwin-Farnham, 1946. 346 pp., illus., cloth.

Cellulose Plastics:
D. N. Buttrey. London, Cleaver-Hume, 1947. 127 pp., illus., cloth.

Chamber's Mineralogical Dictionary:
Chemical Publishing Co., Brooklyn, 1948. 47 pp., illus., cloth.

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Rex W. Wadman, ed. N.Y., Diesel Engines, Inc., 1947. 519 pp., illus., Fabrikoid.

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Thirty-sixth Annual Report, 1947.

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No. B-1479—Test Sets and Methods for Cable Carrier Systems, W. H. Tidd, S. Rosen, H. A. Wenk.—1480—Telephony by Pulse Code Modulation, W. M. Goodall. — 1481 — Photoelectric Lens Bench, W. Herriott.—1483—Dielectric Properties of Some Steatite Bodies, M. D. Rigterink.—1484—Calibrating Method for Microwave Wavemeters, L. E. Hunt. 1485—Scattering of Sound Waves in Materials, W. P. Mason and H. J. McSkimin — 1486 — Improved Cable Carrier System, H. S. Black, F. A. Brooks, etc.—1487—Rating Microphones and Loudspeakers for Systems Use, F. F. Romanow and M. S. Hawley.—1488 — New Low-Coefficient Synthetic Crystals, W. P. Mason.—1489—Radio Propagation at Frequencies above 30 Megacycles, Kenneth Bullington.—1491 —Pulse Code Modulation, H. S. Black and J. O. Edson.—1493—Linearization of Solutions in Supersonic Flow, J. W. Tukey.—1494—Physical Significance of Birkhoff's Gravitional Equations, H. E. Ives.

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Carrier-Frequency-Shift Telegraphy, R. Ruddlesden, E. Forster, Z. Jelonek.—Convention on Scientific Radio, April 7 and 8, 1948.—Economic Utilization of Electricity in Great Britain, R. B. Giles.—Electrical Measurement of Pressure and Strain, with Particular Reference to the Testing of Circuit Breakers, R. W. Wild.—Flash Tube and its Applications, J. N. Aldington and A. J. Meadowcroft. Some Developments in Commercial Point-to-Point Radiotelegraphy, J. A. Smale.

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Calculation of Roll Force and Torque in Cold Strip Rolling with Tensions, D. R. Bland and Hugh Ford.—District Heating, A. Stubbs.—Factors Influencing the Weldability of High Tensile Alloy Steels, and a New Weld Cracking Test, P. L. J. Leder.—Mobile Locomotive Testing Plant of the London, Midland and Scottish Railway, H. I. Andrews.—Piston Ring Movement during Blow-by in High-Speed Petrol Engines, P. de K. Dykes.—Researches into the Deformation of Metals by Cold Rolling, Hugh Ford.

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Machinery of the Cunard White Star Liner "Asia", W. E. Loveridge.—Work of an Engineering Department in a University, A. F. Burstall.

Princeton University. Industrial Relations Section. Publications:

Management Procedures in the Determination of Industrial Relations Policies, Helen Baker.—Selected References on Measuring Employee Attitudes.

U.S. Bureau of Standards. Applied Mathematics Series:

No. 1—Tables of the Bessel Functions $Yo\ (x)$, $Y_1\ (x)$, $Ko\ (x)$, $K_1(x)$. $0 \leq x \leq 1$.

University of Illinois. Engineering Experiment Station. Bulletin Series:

No. 374—Free Surface around, and Interference between, Gravity Wells, H. E. Babbitt and D. H. Caldwell.—375—Studies of Slab and Beam Highway Bridges, Part II: Tests of Simple-Span Skew I-Beam Bridges, N. M. Newmark, C. P. Siess, W. M. Peckham.—376—Highspeed Freight Train Resistance—its Relation to Average Car Weight, John K. Tuthill.—377—Flexural Fatigue Strength of Steel Beams, Wilbur M. Wilson.

...Circular Series:

No. 52—Railroad Dynamometer Car of the University of Illinois and the Illinois Central Railroad, John K. Tuthill.

...Reprint Series:

No. 37—Progress Reports of Investigation of Railroad Rails and Joint Bars, R. E. Cramer, N. J. Alleman, R. S. Jensen.—38—Second Progress Report of the Investigation of Methods of Roadbed Stabilization, Rockwell Smith, R. B. Peck, T. H. Thornburn.

STANDARDS, SPECIFICATIONS, ETC.

British Standards Institution. Codes of Practice:

CP(B) 725—Provision of Domestic Electric Water-Heating Installations.—CP(B) 726—Bitumen Felt Roof Coverings.

...Standards:

381C:1948—Colours for Ready Mixed Paints.—951:1948—Earthing Clamps.—1000A:1948—Universal Decimal Classification, Abridged English Edition.—1170:1947—Treatment of Water for Marine Boilers.—1400:1948—Copper Alloy Ingots and Castings.—1432:1948—Copper for Electrical Purposes, Sheet and Strip.—1433:1948—Copper for Electrical Purposes, Bar and Rod.—1434:1948—Copper for Electrical Purposes, Commutator Bars. — 1395:1948 — 30-Amp. Flameproof Plugs-and-Sockets and Cable-Couplers.

Great Britian. Ministry of Works. Codes of Practice Committee. Reports:

No. 3—Codes of Practice for Civil Engineering, Public Works, Building and Constructional Work.

PAMPHLETS, ETC.

Beneficiation of Over-Spray Porcelain Enamel:

D. W. Scott, L. A. Roe, and B. J. Sweo. N.Y., American Institute of Mining and Metallurgical Engineers, 1947. (AIMME Technical Publication No. 2253).

Canadian Export Timbers; their Properties and Uses:

Department of Trade and Commerce and Forest Products Laboratories, Ottawa, 1948.

Distruzioni e Ricostruzioni in Italia; Attivita Attuali e Programmi di Lavor del Ministero dei Lavori Pubblici:

Ministry of Public Works, Rome, 1948.

Effects of Radiant Heat on Reinforced-Concrete Rigid Frames:

Milan A. Johnston. N.Y., American Society of Civil Engineers, 1946. (ASCE. Paper No. 2289).

Electrets:

Thomas A. Dickinson. Alhambra, Calif., Plastics Research Co., 1948.

Patterns of Power:

L. K. Sillcox. Cambridge, Massachusetts Institute of Technology, 1948.

Regulation to Amend Manitoba Regulation 54/55, being a Regulation under "The Mines Act", R.S.M. 1940, CAP. 136 Governing the Disposal of Mineral Locations in the Province of Manitoba:

Manitoba Parliament, Winnipeg, 1948. (Manitoba Regulation 11/48).

Rubber and the Chemical Engineer:

H. C. Young. London, British Rubber Development Board, 1948.

Steam Turbine Locomotive:

Charles Kerr. Montreal, Engineering Institute of Canada, 1948.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

HERITAGE OF THE ENGLISH-SPEAKING PEOPLES AND THEIR RESPONSIBILITY; ADDRESSES AT THE SECOND CONFERENCE, September 1947:

Kenyon College, Gambier, Ohio, 1948. 268 pp., 9 x 6 in., paper, $2.50.

The second conference was intended as a study of the ideas by which we live. Discussion included such topics as "Responsibility for World Peace and Justice", "Our Liberal Heritage: What it is and how to keep it", "Some Philosophical Facets of Anglo-American Culture", "The English Turn of Mind in Philosophy", Education and the Literary Heritage", "The Meaning of Fairness", "Labor Relations and Freedom", "Freedom and Community in an Industrial Society", "The Spirit of the Age", and "The Past and the Future".

INTERNATIONAL CIVIL AVIATION ORGANIZATION. PUBLICATIONS: SUPPLEMENTARY PROCEDURES FOR THE SOUTH AMERICAN REGION (Doc 4976):

These supplementary Procedures detail the specific arrangements applicable to the South American Region, and in conjunction with the general *"Procedures for Air Navigation Services"* provide complete information for International Civil Aviation within the region.

SUPPLEMENTARY PROCEDURES FOR THE SOUTH ATLANTIC REGION (Doc 4977):

These are the same for the South Atlantic Region as the above.

METEOROLOGICAL DIVISION. SPECIAL SESSION. FINAL REPORT, September 1947 (Doc 4820-MET/509):

This includes definitions, classification of meteorological information, meteorological observing stations and observations, aeronautical climatology, telecommunications for aeronautical meteorology, and procedures for meteorological service on international air routes, with several appendices.

PROCEDURES FOR AIR NAVIGATION SERVICES. AERODROMES AND GROUND AIDS (Doc 4810-AGA/559):

These procedures are recommended for implementation, as far as practicable and appropriate, at all regular, alternate and supplementary aerodromes in the Caribbean, South American and South Atlantic Regions.

SPECIAL COMMITTEE ON TEMPERATURE ACCOUNTABILITY. FINAL REPORT ON THE PARIS MEETING (Doc 4643-AIR/510 and OPS/510):

The purpose of the committee was to clarify the issues raised by temperature accountability, and to state the principles involved in the clearest possible terms.

STATISTICAL SUMMARY (Doc 4900-AT/634).

The predecessor to an official series of statistical publications soon to be published.

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.

ALLEN'S DICTIONARY OF ABBREVIATIONS AND SYMBOLS.

E. F. Allen. Coward-McCann, Inc., New York, 1946. 189 pp., 7¾ x 5 in., cloth, $3.50.

The major part of the book consists of some 6000 abbreviations alphabetically arranged. The abbreviations are ones commonly used in a wide variety of fields such as: literature, science, engineering, business, politics, religion, etc., and where more than one word or phrase is represented all are given. At the back of the book several pages are devoted to classified groups of symbols used in typography, mathematics, astronomy, and a few other fields.

COLLEGE PHYSICS, Complete Edition. Electricity, Magnetism, Optics.

F. W. Sears and M. W. Zemansky. Addison-Wesley Press, Inc., Cambridge 42, Mass., 1948. 848 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $3.50.

An adaptation of the Sears' "Principles of Physics" series, this text puts the emphasis on physical principles. Those parts of the original text that come within the scope of intermediate physics and needed the aid of calculus have been removed or rewritten in simpler form. In addition to the standard material on electricity, magnetism and optics, this volume briefly discusses radioactivity, atomic and nuclear physics. Problems are presented at the end of each chapter and answers are provided for the odd-numbered problems. A companion first volume covers mechanics, heat and sound.

ENAMELER'S DICTIONARY.

Ferro Enamel Corporation, Cleveland, Ohio, 1947. 84 pp., illus., 9 x 6 in., paper, gratis to persons interested in porcelain enameling.

Of interest to those who wish to have a thorough working knowledge of the language of porcelain enameling, this volume contains definitions of words and terms adopted for use by the industry. In addition to the definitions, there is an Appendix containing useful charts and tables.

ENGINEERING LAMINATES, Fundamentals Underlying the Problems of Their Inhomogeneity (Edgar Marburg Lecture 1947).

W. C. Voss. American Society for Testing Materials, Philadelphia 3, Pa. 34 pp., illus., diagrs., tables, 9¼ x 6 in., paper, $1.00.

Following a brief introduction noting the steps through which the present knowledge of materials has developed, this booklet presents a review of some of the fundamentals involved, including: atomic structure, crystal lattices, and plastics. This is followed by a section on adhesion. Some of the common laminates are described along with methods of evaluating their properties.

HOT-DIP GALVANIZING PRACTICE.

W. H. Spowers, Jr. 2 ed. Penton Publishing Co., Cleveland, Ohio, 1947. 188 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.00.

In this second edition much of the subject matter of the first has been rearranged to conform more nearly with the sequence of operations. New material on the control of oxidation and radiation in galvanizing kettles has been added as well as on plant construction and procedure. New references have been added to the extensive bibliography.

HOW TO ORGANIZE AND MANAGE A SMALL BUSINESS:

N. Black. University of Oklahoma Press, Norman, Okla., 1946. 367 pp., charts, tables, 8¼ x 5½ in., cloth, $3.00.

The reader is taken point by point through the problems, planning, decision and action of small-business organization and management. Modern management methods are described, and techniques are explained for forecasting and preventing mistakes by the use of business ratio and percentage guides. Important features of the book are the emphasis on effective study of business fundamentals, and the discussion of methods necessary for adequate price-setting. Illustrative examples of particular types of small businesses are freely used.

MANUAL OF DESIGN FOR ARC WELDED STEEL STRUCTURES.

Compiled by L. Grover. Air Reduction Sales Co., New York, March 1946. 281 pp., illus., diagrs., charts, tables, 9¼ x 6 in., fabrikoid, $2.00.

The material in this manual is divided broadly into three sections. The first covers fundamentals of design, typical details, data and diagrams for design calculations, the estimation of cost, and inspection methods. Part II presents standardized welded connections for simple framing and tables of allowable loads on beams and piece marks for welded connections. Part III contains welding terms, definitions and symbols, acceptable and unacceptable weld profiles and joints, and condensed information on electrodes for structural welding.

PHOTOELASTICITY, Vol 2.

M. M. Frocht. John Wiley & Sons, New York; Chapman & Hall, London, 1948. 505 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $10.00.

This treatise on advanced principles and methods includes the following: essential elements of the theory of elasticity; a critical examination of the influence of the physical constants on the state of stress in two dimensions; a broad survey of the methods for the determination of the sums of the principal stresses with special emphasis on the numerical solution of Laplace's Equations. It also presents the theory and technique of three-dimensional photoelasticity with applications to stress concentrations.

REPORT ON GERMAN BLAST FURNACE PRACTICE AND PLANT.

British Iron and Steel Federation and British Iron and Steel Research Association, London, 1946. 57 pp., diagrs., Charts, tables, 9¼ x 6¼ in., paper, 10s.6d.

Prepared under the auspices of a British Intelligence Sub-Committee, this volume deals with the development of German blast furnace practice and design during the war. Among the changes in processes and equipment, the progress made in the installation of plants for ore crushing and sintering is particularly noted. The changes in furnace design are discussed as well as the progress made in the development of blower equipment, gas cleaning practice, and vortex dust catchers.

TABLES OF PROPERTIES OF GASES WITH DISSOCIATION THEORY AND ITS APPLICATIONS.

E. W. Geyer and E. A. Bruges. Longmans, Green and Co., London, New York and Toronto. 1948. 102 pp., charts, tables 9¼ x 6 in., cloth, $3.50 (in Canada).

This book contains ables on the thermal properties of oxygen, nitrogen, hydrogen, water vapor, carbon monoxide and dioxide, ethylene, octane and benzene. The tables run from 400° to 5400° F. abs. for the most part, with a few going higher. Linear interpolation for intermediate temperatures is possible. The derivation of the tables, a modern approach to the theory of dissociation, and directions for the use of the tables are included.

UNIT HEATERS, Types, Application, Installation and Maintenance. (Mechanical World Monographs No. 40.)

S. E. Nelson. Emmott & Co., Ltd., 31 King Street West, Manchester, England, and 21 Bedford Street, Strand, London, W.C.2., 1947. 23 pp., diagrs., 7¼ x 5 in., paper, 1s.6d.

A concise survey of the types of unit heaters with suggestions as to methods of applying them to general warming and ventilating problems. Comparisons are made with other systems regarding installation and running costs and accessories required. Setting systems in operation, testing, supervision and maintenance are dealt with briefly.

VACUUM-TUBE CIRCUITS.

L. B. Arguimbau. John Wiley & Sons, Inc., New York; Chapman & Hall, Limited, London, 1948. 668 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $6.00.

Emphasizing physical concepts and ideas rather than detailed discussion of actual circuits, this book includes the fundamental material needed by the reader who is unacquainted with electronics. It deals at some length with frequency modulation, transient response and the generation of microwaves, with special treatments of inverse feedback, video-amplifier transients, pulses and television. A knowledge of alternating-current circuits, calculus, and Fourier Series is assumed.

WELDING ENCYCLOPEDIA, Completely Revised:

Re-edited by T. B. Jefferson, Originally compiled and edited by L. B. Mackenzie. 12th ed. Welding Engineer Publishing Co., New York 18, 1947. 1024 pp., illus., diagrs., tables, 9 x 5½ in., fabrikoid, $6.50.

From abrasion to zirconium this standard reference work covers all terms relating to the broad field of metal joining and cutting by the application of heat, including heat treating processes and other allied subjects. Photographs, line drawings, graphs, data tables, and equilibrium diagrams are extensively used to illustrate or amplify the text. Various pertinent codes, standards, and specifications are appended, and there is a 90-page list of trade names with descriptive information. The volume has been revised throughout in accordance with current practice.

Although not available in the Institute Library, inquiries concerning the following new books will be welcomed there or may be sent direct to the publishers.

ANALYSIS AND SYNTHESIS OF LINEAR SERVOMECHANISMS.

A. C. Hall. Technology Press, Massachusetts Institute of Technology, Cambridge, Mass., 1947. 193 pp., diagrs., charts, tables, 11 x 8½ in., paper, $2.50.

This publication is a formulation of a servomechanism design procedure based primarily upon an analysis of the system response to sinusoidal inputs of various frequencies. The methods developed are based upon the characteristics of the servomechanism transfer function. Following the discussion of compensating functions, their physical realization is considered using several different types of circuits. Advantages and short-comings of the various compensating devices are discussed.

CHEMICAL AND TECHNICAL STENOGRAPHY.

J. Kanegis. James Kanegis, 619 Eye St., S.W., Washington 4, D.C., 1947. 387 pp., diagrs., 8¾ x 5½in., cloth, $5.00.

Using the Gregg system, this volume presents forms of technical stenography used particularly in the chemical and metallurgical fields. Introductory matter is given to provide the idiom of each field. No previous science training is necessary, although a basic understanding of Gregg shorthand is assumed. Extensive word and phrase vocabularies are included, following the detailed classified sections and the explanations of formula and equation representation.

COMBAT SCIENTISTS.

L. R. Thiesmeyer and J. E. Burchard; volume editor, A. T. Waterman, foreword by E. T. Compton. Little, Brown and Company, Boston, 1947. 412 pp., illus., tables, 8¾ x 5½ in., cloth, $5.00.

This book tells the story of the field activities of the Office of Scientific Research and Development as instituted and carried out for the purpose of providing the armed forces with scientific advice on new weapons, devices and techniques. The many forms of this assistance, its scope, and a glimpse of the manner in which this activity was organized and operated are presented. Two illustrations of the work are given in the studies dealing with the navigational and demolition aspects of landing operations. Subject and personnel indexes and a glossary of organization and operation abbreviations are included.

ECONOMICS OF TRANSPORTATION.

D. P. Locklin. 3 ed. Richard D. Irwin, Inc., Chicago, Ill., 1947. 885 pp., diagrs., charts, maps, tables, 9¼ x 6 in., cloth, $5.50.

This well-documented volume provides comprehensive coverage of the fields of water, highway, air, railroad and pipeline transportation. The new edition has been revised to include discussion of new legislation, and some of the issues which arose from the administration of the laws are treated. Other important changes are the expansion of the chapter on transport coordination and the omission of the one on common-carrier liability.

ELECTRIC POWER TRANSMISSION.

M. P. Weinbach. Macmillan Company, New York, Toronto, 1948. 364 pp., diagrs., charts, tables, 9½ x 6 in., cloth, $5.50.

Emphasizing the electrical problems of power transmission, this book provides a knowledge of the physical phenomena involved and the mathematical processes needed for their solution. The three-phase system, circuit properties of transmission lines, voltage control, steady state power limits and other problems are considered. Some items omitted from the book are generating equipment, schemes of mechanical suspension of lines, insulation structures, switching apparatus, current-limiting reactors, relay installations, and lightning protection. Lists of references at the ends of the chapters provide sources for additional information on special phases of the subject.

ELEMENTARY ENGINEERING MECHANICS.

C. O. Harris. Irwin-Farnham Publishing Co., Chicago, Ill., 1947. 445 pp., diagrs., tables, 9¼ x 6 in., cloth, $5.00.

Covering both statics and dynamics, the material in this text is so organized as to give first the general theory and methods of the several topics dealt with, then continuing with special cases and practical applications. The object is to develop the analytical and reasoning ability of the student as well as to present the principles of mechanics and show how to apply them. A great many illustrative diagrams and problems are provided.

ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY, Vol. 1, A to Anthrimides.

Edited by R. E. Kirk, D. F. Othmer and others. Interscience Encyclopedia, Inc., New York, 1947. 982 pp., illus., diagrs., charts, maps, tables, 10½ x 7½ in., cloth, $20.00 per volume.

Primarily designed for chemists and chemical engineers, the set of which this is the first volume, will present a comprehensive summary of industrial knowledge on materials, methods, processes and equipment. The theoretical and mathematical treatment is restricted, except where it is necessary to bring out established principles and provide a background for applications. The bibliographies serve as selected reading lists. Diagrams, flow sheets, formulas and equations have been used freely. All articles have been written by authorities in the respective fields. The wide range of topics includes metallurgy, industrial hazards, fuels, fibers and polymeric substances, coatings, foods, pharmaceuticals, and all other industries served by chemical processes.

FRACTIONAL HORSEPOWER ELECTRIC MOTORS.

C. G. Veinott. 2 ed. McGraw-Hill Book Co., New York, Toronto, London, 1948. 554 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.00.

This practical book is written for those engaged in the design, manufacture, installation, maintenance, or repair of fractional horsepower motors. It discusses what types are available, what makes them run, and what they will do, together with a detailed analysis of testing methods. This thoroughly revised and rewritten edition conforms to the standards of the American Standards Association, the National Electrical Manufacturers Association, and the American Institute of Electrical Engineers. Special attention is given to electrolytic capacitors, regeneration, commutator refinishing, and fractional-slot winding layouts.

SOUND, A PHYSICAL TEXT-BOOK.

E. G. Richardson. Longmans, Green & Co., New York, Toronto; Edward Arnold & Co., London, 1947. 344 pp., illus., diagrs., 8½ x 5½ in., cloth, $5.00.

This volume deals with the physics of sound and its applications. The results of experimental research are included as well as a selective survey of the periodical literature from 1907 to date. A knowledge of basic physics and calculus is assumed. In this fourth edition, the material is brought up to date and re-arranged to provide a logical progression from the simple characteristics of sound to the modern technological aspects.

STARTING A SMALL MACHINE SHOP.

F. H. Colvin. McGraw-Hill Book Co., New York, Toronto, London, 1948. 212 pp., illus., diagrs., charts, tables, 7¾ x 4¾ in., cloth, $2.50.

This book is written to help the machinist who wants to start his own business. It sets forth the problems that must be considered and shows how they have been solved by others. The location of the shop, the selection of machine equipment with regard to both cost and efficiency, the shop layout, work and employee management, and the handling of special work with limited equipment are discussed.

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 St., Montreal—Telephone BElair 3019—may be arranged *by appointment.*

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER for work in the Development Department of a large chemical manufacturing company involving chemical engineering design, preparation of mass and descriptive flow sheets, specification of equipment, comparison of processes, pilot plant liaison work. Must have had from three to five years in chemical plant engineering, maintenance or operation, in order of decreasing preference. Must be able to co-operate well with other departments in the Company. Work would be in Montreal. Salary open. Apply to File No. 4119-V.

CIVIL

CIVIL ENGINEER required for consulting engineer and surveyors' office in Montreal. Work includes surveying, topographical draughting, preparation of designs and plans of engineering work, etc. Must be bilingual. Salary according to experience with future depending on ability. Apply to File No. 4105-V.

CIVIL ENGINEER, thoroughly experienced and competent in structural design required by an established firm of consulting engineers in Toronto. Applications are invited from engineers with high qualifications and references. Salary open. Apply to File No. 4112-V.

CIVIL ENGINEER age 25 to 35 with experience in structural design required by an established firm of consulting engineers in Toronto. Opportunity for progressing in this work under proper supervision. Salary will be relative to experience and ability. Apply to File No. 4112-V.

CIVIL ENGINEER with considerable experience in structural steel and reinforced concrete design. Preferably bilingual. Required in Montreal. Must be veteran with overseas service. Applicant should state age, experience and salary expected. Apply to File No. 4137-V.

ELECTRICAL

ELECTRICAL ENGINEER required by company in Shawinigan Falls, Quebec. Vacancies exist for first class electrical engineer capable of taking entire charge of electrical department also electrical engineer for work as assistant plant engineer. Salary open. Apply to File No. 4106-V.

EXPERIENCED ELECTRICAL ENGINEERS required by consulting engineering office in Montreal as Assistant Engineers, Designers, Checkers, Draughtsmen and Quantity Estimator. Salaries open. Apply to File No. 4110-V.

ELECTRICAL ENGINEER, age 30-40, required as Sales Engineer for Electrical Power Apparatus Company, manufacturing motors, transformers, rectifiers, switchgear, etc. Test course graduate specializing in switchgear preferred. Sales experience desirable but not essential. Location Toronto. Salary open. Apply to File No. 4128-V.

MECHANICAL

EXPERIENCED MECHANICAL ENGINEERS required by consulting engineering office in Montreal as Assistant Engineers, Designers, Checkers, Draughtsmen and Quantity Estimator. Salaries open. Apply to File No 4110-V.

JUNIOR MECHANICAL ENGINEER, age 25 to 27 years, preferably with three to four years experience required for general duties by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 4114-V.

MECHANICAL ENGINEER with two or more years experience in machine shop practice required in Montreal as sales engineer handling cutting oils and other chemicals and oils used in machine shops. Salary open. Apply to File No. 4116-V.

MECHANICAL ENGINEER with at least ten years experience including plant maintenance and preferably in the pulp and paper industry required in New Brunswick. Salary open. Apply to File No. 4117-V.

MECHANICAL ENGINEER for work in the Development Department of a large chemical manufacturing company involving chemical engineering design, preparation of mass and descriptive flow sheets, specification of equipment, comparison of processes, pilot plant liaison work. Must have had three to five years in chemical plant engineering, maintenance or operation, in order of decreasing preference. Must be able to cooperate well with other departments in the Company. Work would be in Montreal. Salary open. Apply to File No. 4119-V.

MECHANICAL ENGINEER preferably with two or three years general plant experience required as production engineer by National Beverage Company in Eastern Canada. Salary open. Apply to File No. 4122-V.

MECHANICAL ENGINEER, recent graduate, required by a chemical plant in Central Ontario. Salary open. Apply to File No. 4123-V.

MECHANICAL ENGINEER or other engineer with equivalent draughting training, for position of assistant plant manager of a granite plant 25 miles south of Montreal. Applicant should be 28 to 34 years old with one or two years business experience. Position offers prompt promotion for a capable man as present manager must take over new duties in two to five years. Starting salary about $275.00 per month with regular annual increases. Apply to File No. 4126-V.

MECHANICAL ENGINEER required for a Western industry engaged in the manufacture of truck bodies and trailers, overhaul and repair of industrial engines and construction equipment, repair and maintenance of R.C.A.F. and civilian aircraft. Service as an Engineering Officer in the R.C.A.F. during the war will be an advantage. An excellent opportunity is offered to the right man. Apply to File No. 4129-V.

MECHANICAL ENGINEER with knowledge of design and considerable experience with steam and diesel engines and refrigeration equipment. Required in Montreal. Preferably bilingual. Must be veteran with overseas service. Applicants should state age, experience and salary expected. Apply to File No. 4137-V.

MECHANICAL ENGINEER OR DRAUGHTSMAN with minimum of four or five years experience. Knowledge of paper mill engineering desirable but not essential. Required by large Pulp and Paper Mill for general engineering design and draughting. Salary up to $400 depending on qualifications. Apply to File No. 4138-V.

MISCELLANEOUS

CONSTRUCTION ENGINEER, recent graduate, required in Montreal for general duties. Salary around $275. Apply to File No. 4107-V.

SALES ENGINEER required by Canadian manufacturer of industrial instruments. Territory: Montreal and Quebec. Sales and process experience very helpful. Salary open. Apply to File No. 4109-V.

MECHANICAL OR ELECTRICAL GRADUATE, age about 35 years with experience in building construction machinery maintenance and repair capable of taking over the engineering and maintenance services in a large textile mill in Province of Quebec. Salary open. Apply to File No. 4114-V.

DRAUGHTSMEN with some experience in building design or architectural work required by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 4114-V.

MECHANICAL ENGINEERS required for manufacturing and related duties with well established reputable paper company. Four to six years general industrial experience required. Salary open. Apply to File No. 4115-V.

SALES ENGINEERS, one experienced man also two juniors willing to learn required by an electrical and power house equipment manufacturer in Montreal. Salary open. Apply to File No. 4121-V.

RECENT GRADUATE preferably mechanical or civil background required by Maritime branch of large industrial Canadian firm. Duties of general engineering nature. Salary open. Apply to File No. 4125-V.

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

CHEMICAL

CHEMICAL ENGINEER OR CHEMIST, preferably with Ph.D., required by a pulp and paper company with plants in Eastern Canada, for research work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER required by a pulp and paper company with plants in Eastern Canada, for mill control and pilot plant work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER with considerable mechanic and hydraulic experience or mechanical engineer with good chemical knowledge and experience in hydraulics, required by a manufacturer in Ontario. Salary open. Apply to File No. 3928-V.

CHEMICAL ENGINEER, recent graduate is needed by a chemical manufacturing firm situated in the Province of Quebec. Some experience in oil refinery, pulp and paper, or synthetic resin manufacture would be useful. Salary open. Apply to File No. 3978-V.

CHEMICAL ENGINEER OR CHEMIST wanted by large manufacturers of bleached sulphate pulp for their Technical and Development Department. Several years experience preferably in the pulp and paper industry. Mill located in Northern Ontario. Salary open. Apply to File No. 3991-V.

SENIOR CHEMICAL ENGINEER OR CHEMIST, required by leading Paper Manufacturer in Eastern Canada. Applicant should have some experience in Paper Mill Control work. This position offers plenty of scope for advancement. Salary open. Apply to File No. 4013-V.

CHEMICAL ENGINEER required by a major Canadian Company located in Toronto as Technical Service Man. 25 to 35 years old. Definite sales personality. Position will include 6 to 12 months' training. It will carry the responsibility for servicing all types of adhesives to industries throughout Canada. Salary open. Apply to File No. 4044-V.

GRADUATE CHEMICAL ENGINEERS OR CHEMISTS required by an industrial chemical plant in the Montreal area. Preferably with experience in production and the operation of chemical equipment such as filters, presses etc. Must be able to organize work and direct workmen. Salary open. Apply to File No. 4071-V.

CHEMICAL ENGINEER age 25 to 35 years, experience in the Pulp and Paper industry, preferably Kraft, required by paper manufacturer in Eastern Ontario for position of Control Superintendent. Salary according to qualifications. Apply to File No. 4099-V.

CIVIL

CIVIL ENGINEER to take charge of work in a drainage district in Quebec. Must be bilingual. May be recent graduate. Salary $2,400 per annum for the first three months, $2,700 after 3 months and $3,000 after 12 months. Apply to File No. 3479-V.

CIVIL ENGINEERS with experience in detailing and designing structural steel and reinforced concrete for manufacturers are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

CIVIL ENGINEERS recent graduate up, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

GRADUATE CIVIL ENGINEER, required by a public utility in the Montreal area with three or four years experience in design of reinforced concrete and structural steel. Salary $250-$300. Apply to File No. 3766-V.

CIVIL ENGINEERS with some experience on design and field work required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

CIVIL ENGINEERS required as draughtsman in bridge department of large transport company. Preferably with experience in steel, concrete and timber construction. Salary open. Apply to File No. 3884-V.

CIVIL ENGINEER required as Town Engineer of a town in the Maritimes. Required to supervise and layout work for Water and Sewerage Dept. Works Dept. also construction of a general nature for the Electric Light Dept. Salary open. Apply to File No. 3930-V.

JUNIOR ENGINEER, preferably with civil background required for sales and service by a Montreal manufacturer of water-proofing compounds. Salary open. Apply to File No. 3968-V.

CIVIL ENGINEERS required by a Montreal firm for field inspection in Ontario and North Shore St. Lawrence. Salary open. Apply to File No. 4084-V.

CIVIL ENGINEER with at least two years experience required in a Pulp and Paper Mill in the Province of Quebec for surveying and general paper mill engineering and draughting. Salary $250 to $300. Apply to File No. 4094-V.

ELECTRICAL

ELECTRICAL ENGINEER, recent graduate up required by a manufacturer in Montreal for sales engineering. Must be bilingual and familiar with rotating electrical equipment. Salary $200 up. Apply to File No. 3761-V.

GRADUATE ELECTRICAL ENGINEERS, with 3 to 10 years experience in design, operation, layout of substations, switching stations, and electrical machinery, together with engineering studies, including draughting for a large hydro electric power house in Quebec. Salary $225 up according to experience. Apply to File No. 3787-V.

ELECTRICAL ENGINEER required for power sales by an electrical utility in Province of Quebec. Preferably experienced, bilingual. Salary open. Apply to File No. 3802-V.

ELECTRICAL ENGINEERS with experience in layout and design of generating and transformer stations, required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

SEVERAL EXPERIENCED ELECTRICAL DRAUGHTSMEN for the design and layout of industrial power and control systems required by consulting engineering office in Montreal. Salary open. Good chance for advancement. Apply to File No. 3890-V.

ELECTRICAL ENGINEERS required for sales engineering work in Western Canada. Graduates with some selling experience preferred. Salary open, plus expenses. Apply to File No. 3915-V.

ELECTRICAL ENGINEER, age about 30 required as assistant to Supt. of Light Dept. in Montreal area. Practical experience in Hydro Distribution and Steam Turbines. General office routine of administrative nature. Salary open. Apply to File No. 3950-V.

ELECTRICAL DRAUGHTSMAN required by a firm of Engineer Contractors in Alberta for layout and plotting with a minimum of supervision. Should be accustomed to working with power lines to 2,300 volts and must be able to do lighting circuits, both overhead and underground. Salary $250 to $300. Apply to File No. 3972-V.

PROFESSOR IN ELECTRICAL ENGINEERING required by a Canadian University in the Province of Quebec for fall 1948 semester. Preferably with teaching and practical experience in power, electrical machinery design, lab. etc. Bilingual preferred. Attractive salary available for right man. Apply to File No. 3982-V.

ELECTRICAL ENGINEERS, age 30 to 40 required for the Commercial and Distribution Department of large Hydro Electric Utility. Must have experience in electrical distribution. Salary open. Apply to File No. 4002-V.

ELECTRICAL ENGINEER, experienced in Power Station Transmission and Distribution design and installation. Permanence and advancement depending upon performance. Salary open. Apply to File No. 4024-V.

JUNIOR ELECTRICAL ENGINEER required by a mining company in Northern Ontario. Salary open. Apply to File No. 4028-V.

GRADUATE ELECTRICAL ENGINEER with a minimum of 2 years practical experience to assist in electrical engineering design work, field work on construction and maintenance of structures, service and installation of equipment required by Manitoba City. Salary $226 to $257. Apply to File No. 4069-V.

MECHANICAL

MECHANICAL ENGINEERS, preferably with design experience are required for armament research and development in the Quebec area in a government establishment. Salary from $190.00. Apply to File No. 3401-V.

MECHANICAL ENGINEERS required by a Pulp and Paper Company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

JUNIOR MECHANICAL ENGINEER with knowledge of precision machine shop practice and aptitude for research work in metals and plastics required for an organization in Toronto for the production of artificial limbs. Must be veteran. Salary from $225. Apply to File No. 3675-V.

RECENT GRADUATES OR JUNIOR ENGINEERS with mechanical background required by a Montreal Engineering, fabricating and contracting firm, for training purposes leading to sales and service. Montreal area. Salary $175 up. Apply to File No. 3810-V.

MECHANICAL ENGINEERS with experience in plant layout and design or ventilation problems or general mechanical design required by a firm in Quebec. Salary from $250. Apply to File No. 3818-V.

MECHANICAL ENGINEER required by a manufacturer in Ontario for the plant operation staff. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER with six to ten years experience in maintenance and engineering work required by alkali manufacturers in Ontario. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER with knowledge of physical metallurgy heat treatment, ability in stress analysis and design required for research work in B.C. Maximum salary $4,000. Apply to File No. 3865-V.

MECHANICAL ENGINEER age 30-38 required for Northern Ontario Paper Mill, preferably with paper mill experience or experience in general layout and design. Knowledge of pumps capacities, piping conveyors, estimating and structural design essential. Salary open. Apply to File No. 3891-V.

RECENT GRADUATES in Mechanical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 3981-V.

MECHANICAL DESIGN DRAUGHTSMAN with experience in re-inforced concrete and structural steel required by a mining company in Northern Ontario. Housing available. Salary open. Apply to File No. 3994-V.

MECHANICAL ENGINEER required as assistant in Chief Engineers Department by large paper company. Paper experience essential, some knowledge of the French language would be helpful. Age 28-40. Salary $350-$450. Apply to File No. 4022-V.

MECHANICAL ENGINEER required in Ontario by a firm specializing in machine tools. Applicant must be experienced in production control. Salary open. Apply to File No. 4026-V.

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for colliery plant, screening equipment, hoists, simple steel structures etc. Salary $240 up depending upon ability. Apply to File No. 4030-V.

CHIEF ENGINEER, mechanical background required by a specialized industrial plant in the Montreal area. Work covers mechanical design, preparation of work drawings, bills of materials, specifications and the ordering of all materials for contracts, also design of necessary tooling. Minimum salary $450. Apply to File No. 4066-V.

MECHANICAL ENGINEERS with experience in estimating or design required by well known general engineering firm in Montreal. Good future for those with right qualifications. Salary commensurate with ability. Apply to File No. 4074-V.

MECHANICAL ENGINEER with experience in the design of hydraulic turbines, valves, penstocks, surge tanks and associated equipment required by large manufacturer in Montreal to participate in expanding program of hydro electric development. Salary open. Apply to File No. 4074-V.

MECHANICAL ENGINEER with minimum of eight years experience in the design of heavy mechanical equipment required by well established firm in Montreal for general supervision and checking. Must be alert and aggressive. Salary open. Apply to File No. 4074-V.

MECHANICAL ENGINEER required in Montreal with considerable experience in machine shop practice and some administrative experience in shop work. Applicant should be around 35 years of age and bilingual. Salary depending on qualifications. Apply to File No. 4100-V.

METALLURGICAL

RECENT GRADUATES in Metallurgical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 3981-V.

METALLURGICAL ENGINEER required by a farm implement manufacturer in Ontario to take over the necessary duties in new mechanized foundry. Salary open. Apply to File No. 4086-V.

MINING

MINING ENGINEERS with varied experience required by a firm in Quebec for general mine operation, exploitation and development work. Salary from $250. Apply to File No. 3818-V.

MINING ENGINEER with several years experience required by a Company engaged in large scale asbestos production in Quebec. Salary open. Apply to File No. 3935-V.

MISCELLANEOUS

STRUCTURAL STEEL DRAUGHTSMAN AND CHECKERS, preferably graduate engineers but any experienced man acceptable, are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

GRADUATE ENGINEERS required by an industrial and chemical organization with headquarters in Montreal for all phases of research, design, operation, development, production and maintenance. Salaries open. Apply to File No. 3588-V.

SALES ENGINEER with wide engineering experience, wanted by a company in Toronto for the sale of textile machinery and construction equipment. Salary open. Apply to File No. 3639-V.

STRUCTURAL STEEL DETAILER AND CHECKER with considerable experience required for checking shop details by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

DETAILER AND DESIGNER for reinforcing steel with considerable experience required by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

SALES ENGINEER, preferably bilingual required by a Montreal firm dealing in building materials. Salary from $200. Apply to File No. 3745-V.

GRADUATE ENGINEER required by an electrical firm in Montreal to organize publicity department and edit trade journal. Salary open. Apply to File No. 3751-V.

STRUCTURAL STEEL DRAUGHTSMAN, qualified to detail and check all classes of structural steel and to supervise draughtmen in a large drawing office on the West Coast. Salary open. Apply to File No. 3777-V.

BRIDGE ENGINEER, qualified to be in charge of the design and supervision of the construction of highway bridges. Apply stating qualifications, experience, age and salary wanted. Apply to File No. 3780-V.

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open. Apply to File No. 3811-V.

STRUCTURAL STEEL CHECKER AND ONE DETAILER CHECKER wanted for large fabricating plant in Vancouver, B.C. Age between 30 to 40 years preferred. Must be experienced. Give full information and references. Salary open. Apply to File No. 3862-V.

MECHANICAL, CHEMICAL OR CIVIL ENGINEER, recent graduate up required for sales and service in Montreal. Must be bilingual. Salary open. Apply to File No. 3867-V.

STRUCTURAL ENGINEER required by a Steel Company in Montreal for the design of reinforced concrete frame. Salary open. Apply to File No. 3931-V.

TWO METALLURGICAL ENGINEERS AND ONE CHEMICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No. 3942-V.

SALES ENGINEER required by well known manufacturer of mechanical equipment to solicit industrial accounts throughout the Province of Quebec. Applicants must reply giving full details, age, training, etc. Salary open. Apply to File No. 3951-V.

STRUCTURAL ENGINEER DRAUGHTSMAN required by a firm of engineer contractors in Alberta. Duties include structural detailer and requires knowledge of major concrete foundations: to detail structural steel buildings, access tower platforms and miscellaneous small steel structures. Salary $300.00. Apply to File No. 3972-V.

DRAUGHTSMAN required by a firm of engineer contractors in Alberta for layout of pipelines and details in refinery construction. Preferably background of refinery experience or alternately power-house piping or heavy industrial draughting. Salary $300. Apply to File No. 3972-V.

CIVIL OR MECHANICAL ENGINEER wanted with 5 to 8 years experience for key position in moderate size plant in Manitoba, doing fabrication of Plate Work and Light Steel Work, also Grey Iron Foundry and Machine Shop. This will lead to a key position in a growing organization. Salary open. Apply to File No. 4003-V.

MECHANICAL AND CHEMICAL ENGINEERS, interested in entering the Pulp and Paper industry required in Nfld. Vacancies in Technical Department and studying process work and improved methods of operation. Pulp and Paper experience is not necessary. Salary open. Apply to File No. 4009-V.

POWER PLANT SUPERVISOR required for South America. Age 30-40, single preferred to supervise steam power plant including operating, boiler cleaning and minor repairs. Salary $375 U.S. currency. Apply to File No. 4011-V.

ELECTRICAL OR MECHANICAL ENGINEERS required by large Montreal firm to prepare and analyze specifications for telephone equipment manufacturing and installation. Other types of engineering work also available. Salary open. Please send photo together with particulars of education and experience. Apply to File No. 4018-V.

GRADUATE ENGINEER required as Assistant to Manager of Sawmill and Woodlands operations. Position located in Ontario. Good commercial sense essential also some sales ability. Salary around $400. Apply to File No. 4021-V.

ARCHITECTURAL DRAUGHTSMAN experienced in industrial building construction, with natural aptitude for design work, wanted by large industry in Eastern Townships. Good salary, permanent position to the right man. Apply to File No. 4031-V.

SENIOR INDUSTRIAL ENGINEER required by Management Consultants in Montreal. Experienced in installations of production and cost control, wage incentives, etc. Free to travel, preferably bilingual. Salary open. Apply to File No. 4052-V.

SALES ENGINEER for popular line of Diesel Engines. Applicants must be specialists on Power Units and Generator Sets, required for permanent employment with well established organization. Apply to File No. 4055-V.

GRADUATE ENGINEER, preferably mechanical or electrical background required for drop forging plant operation and production in Province of Ontario by a steel company with headquarters in Ontario. Good commercial sense essential. Salary open. Apply to File No. 4062-V.

INDUSTRIAL ENGINEER with considerable manufacturing experience between 30 and 40 years of age required for plant surveys in Province of Quebec. Must be fluently bilingual. Permanent position. Salary according to qualifications. Apply to File No. 4064-V.

DRAUGHTSMAN preferably with mechanical and structural experience required by engineering firm in Toronto for design of material handling equipment such as belt conveyors also crushing plants and gold mills. Salary $200 to $350. Apply to File No. 4072-V.

POWER STATION OPERATOR with about five years' experience principally in operation and maintenance of turbines and mechanical equipment of hydro-electric plants required by public utility in Brazil. Preferably not over 30 and single but will consider married man without minor dependents. Replies held in strictest confidence. Salary open. Apply to File No. 4073-V.

MECHANICAL OR CIVIL ENGINEER with at least four years experience in stress analysis and vibration required by one of Canada's leading manufacturers of heavy mechanical equipment. Considerable scope for man of proper qualifications. Salary open. Apply to File No. 4074-V.

SALES ENGINEER required by well known engineering supply company doing business with Mining and Pulp and Paper companies. Excellent opportunity for advancement. Travelling not extensive. No experience necessary but desirable. Salary open. Apply to File No. 4079-V.

TOWN ENGINEER required by town in Ontario. Duties include the supervision of Board of Works and Sanitation Departments as well as acting in an advisory capacity to the telephone, electric and water utilities. Salary from $250 to $300. Apply to File No. 4087-V.

RECENT GRADUATE, MECHANICAL OR ELECTRICAL background required by engineering firm in Montreal. Duties include training in Public Utility in Administration Department. Eventually for South America. Salary to start $225. Apply to File No. 4089-V.

SALES ENGINEER preferably mechanical graduate, required for sales engineering work on blowers and vacuum pumps. Compressed air experience would be advantageous. Location Montreal. Salary and commission. Apply to File No. 4090-V.

JUNIOR ENGINEER preferably with a few years experience in production control and some knowledge of the textile industry required for Montreal area. Salary $250 to $275. Apply to File No. 4092-V.

SENIOR INDUSTRIAL ENGINEER with business administration and mechanical background, bilingual, with at least five years experience in production control, wage incentives and cost control required by an industrial engineering consultant in Montreal. Salary open. Apply to File No. 4092-V.

SENIOR DESIGNER with from five to ten years experience and a general knowledge of structural design in relation to buildings and bridges required by a steel company in Southern Ontario. Salary open. Apply to File No. 4093-V.

JUNIOR ENGINEER with from one to five years experience and at least a working knowledge of structural design of buildings required by a steel company in Southern Ontario. Salary open. Apply to File No. 4093-V.

SALES ENGINEER required by large manufacturer of Air Handling equipment in Toronto area. Applicant should have either industrial or Public Building application and sales experience. Salary open. Apply to File No. 4101-V.

SALES ENGINEER required by Canadian Company in Ontario. Must have thorough knowledge of the preparation of tenders, propositions on Transformers, Motors and Switchgear equipment also experience in the commercial side of the heavy electrical industry. Salary open. Apply to File No. 4102-V.

MAINTENANCE ENGINEER required in Quebec City to do installation work in heating, ventilating, refrigeration and air-conditioning, gas and diesel motors. Must be bilingual. Salary open. Apply to File No. 4104-V.

JUNIOR ENGINEER required in Quebec City. Preferably with three to five years experience in heating, ventilating and air-conditioning. Salary open. Apply to File No. 4104-V.

Situations Wanted

CIVIL OR MECHANICAL ENGINEER, M.E.I.C., age 42, B.Sc. Civil Graduate Work in Industrial Engineering at McGill University. Seventeen years experience in following field: Manufacture of incentive bonus systems in two of Canada's largest aircraft plants. Production planning on the manufacture of shells and shell parts. Design and construction of explosive proving equipment. Superintendent during construction of one of Canada's largest shell filling plants. Other experience covering oil refining, contracting, and installation of pulp and paper mill equipment. Interested in position with responsible firm or partnership with consultant. Home in Montreal area. Apply to File No. 981-W.

MECHANICAL ENGINEER, B.Sc., Queen's '33, M.E.I.C., M.I.A.S., P.Eng., Quebec; married, age 37. Over twelve years experience including design, stress analysis, maintenance, inspection, administration and 5½ years as an R.C.A.F., Engineer Officer. Presently employed. Desires permanent position with good future prospects preferably in a English speaking locality. Apply to File No. 1042-W.

GRADUATE CIVIL ENGINEER, B.Sc., Queen's, S.E.I.C., P.Eng., Que., would accept part time work during evenings or weekends at home preferably on steel construction and reinforced concrete design, estimating and detailing. Residing in Montreal. Apply to File No. 1487-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., Quebec, with more than 20 years experience in design and construction of dams and Power Plants in U.S.A. and Canada. Desire change in position preferably in the construction field. Apply to File No. 1527-W.

MINING ENGINEER-GEOLOGIST, M.E.I.C., R.P.E. (Man.) 39. Experience includes: supervision of mine operation and mine plant layout and construction, general mine engineering, field and underground geological mapping, mine examination and appraisal. At present employed as field scout for mining company. Available in two months. Apply to File No. 1922-W.

PART TIME WORK: CIVIL ENGINEER, age 34, R.P.E., M.E.I.C., perfectly bilingual, with post-graduate work at University of Toronto in Public Health Engineering and at Harvard University in Industrial Hygiene also experienced in structural and plate work and in municipal engineering, would take work evenings and week-ends, specially in consulting form to industry in problems related to Industrial Hygiene and local exhaust ventilation. Apply to File No. 2272-W.

GRADUATE MECHANICAL ENGINEER, M.E.I.C., P.Eng. (N.S.), age 39, married, desires position in industrial part of Canada. Eight years experience in Mechanical Department shops and in the mills of large steel company. Five and one-half years Engineer Officer R.C.A.F., rank Wing Commander. Five years Sales Engineering, conveyors, drives, pumps, heavy construction equipment. Particularly interested in Sales, Executive or Personnel work carrying responsibility and having a future. Employed at present, but desire to get out of the Maritimes to where there is greater opportunity. One month's notice. Correspondence invited. References. Apply to File No. 2711-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C. Desires part time work during evenings and week-ends. Experience in plant layout, design, estimating, etc. Apply to File No. 2715-W.

CHEMICAL PROCESS ENGINEER, McGill. Veteran, over 4 years overseas as Engineer Officer (construction). Two years design, correlation and economic evaluation work on Petroleum Refining Processes with Major U.S. Oil Company. Present salary $4,600. Age 27, married. Desire responsible position in Canada. Apply to File No. 2778-W.

CIVIL ENGINEER, S.E.I.C., P.Eng. Interested in part time work. Structural steel, reinforced concrete, or earthwork, estimating, designing and draughting. Apply to File No. 2817-W.

MECHANICAL ENGINEER, S.E.I.C., two years experience in consulting and general engineering work desires position in consulting or industrial work, Montreal or Ottawa preferred. Available on short notice. Apply to File No. 2829-W.

GRADUATE ELECTRICAL ENGINEER, McGill '24. M.E.I.C., Prof. Eng., Que.; over 20 years experience in high voltage transmission lines, design and construction. Interested in part time or temporary position in general engineering or transmission line work. Location preferably Montreal or in B.C. At present residing in Montreal area, due to certain physical defects the type of work that can be undertaken is limited. Available at once. Apply to File No. 2918-W.

CIVIL ENGINEER, Jr.E.I.C., P.Eng. (Que.) McGill graduate desires spare time work evenings and week-ends on design and detail of reinforced concrete and steel structures. Also qualified to make stress analysis of rigid frames and most statically indeterminate structures. Location Montreal. Apply to File No. 2947-W.

2 STUDENTS, S.E.I.C. both on executive of Junior Section, desire summer employment in Ottawa area. Have 2 years Engineering at Carleton College, specializing in Eng. Physics or Electrical Engineering. Jobs need not be together. Available April 30, 1948. Both experienced draughtsmen but prefer work at which they can gain fundamental knowledge in Physics. Apply to File No. 2948-W.

ENGINEER, B.Sc., M.E.I.C., P.Eng., Ont. Married, veteran R.C.E.M.E. officer. Two years in plant chemical and physical control laboratory. Two years as construction engineer, fieldwork and supervisory experience, reinforced concrete, masonry and steel structures. Chiefly interested in position as construction supervisor or concrete research. Apply to File No. 2949-W.

INDUSTRIAL AND PRODUCTION ENGINEER, Jr.E.I.C., Eng. (Mechanical), Ont. 5 years experience in cost reduction and analysis, production planning and scheduling, systems and administration. Background of experience covers both industrial and mechanical engineering. Presently employed available on six weeks notice. Age 28. Apply to File No. 2955-W.

CIVIL ENGINEER, P.Eng., Ont., M.E.I.C., would like spare time work at design of reinforced concrete or structural steel on a fee basis or otherwise. At present employed in the Hamilton area. Apply to File No. 2964-W.

STRUCTURAL ENGINEER, Jr.E.I.C., B.E., '46, N.S.T.C., S.M., '48, M.I.T. interested in Structural planning, design or construction or working with consultants. Available June 15. Apply to File No. 2965-W.

MECHANICAL ENGINEER, M.E.I.C., B.Sc., Queen's, 1936. Position wanted leading to design and installation of automatic controls and allied equipment; eleven years diversified experience including supervision of plant engineering and maintenance, with four years work on many types of control problems involving measurement and control of such factors as temperature, atmosphere, and flow. Available at one month's notice. Toronto area preferred. Apply to File No. 2966-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng. Twelve years experience in the following fields: Automotive, Aircraft and Airhandling Equipment on product design, development and testing, improvement of production. Also on design of special machinery; Maintenance in Paper Converting Mill and six years executive in Sales and Service. Desires position with responsible firm, or partnership with Consultant. Apply to File No. 2967-W.

ELECTRICAL ENGINEER, M.E.I.C., P.E.Q., B.Sc., 1931. Age 40, married. Requires employment with opportunity for advancement. Have extensive experience in power generation, conversion, plant power distribution, plant design and construction. Also experienced in management and the setting up of new organizations. Available on one month's notice, additional information upon request. Apply to File No. 2976-W.

CIVIL ENGINEER, M.E.I.C., B.A.Sc., P.Eng. (Ont.) Age 44, single. Past experience includes administrative, executive and sales engineering in metal products, building materials and sub contract work in construction industry. Also held responsible position in Personnel Administration. Desires permanent position requiring initiative with good future prospects. Apply to File No. 2983-W.

MECHANICAL ENGINEER (27), B.Sc., A.M.I. Mech. E., in responsible position with world-famous engineering concern in England is willing to emigrate to Canada if suitable opening is found there. Experienced in production development work, production planning and manufacturing methods of wide range of power station plant. With initiative and adaptability for most positions on the production side. Further particulars on request. Apply to File No. 2984-W.

GRADUATE ELECTRICAL ENGINEER, Manitoba, age 36, M.E.I.C., 12 years experience in industrial manufacturing. Married with family. Well grounded training in costs and estimating of machinery, structural, miscellaneous ironwork and platework. Some experience in sales development and promotion work. Now employed but desires position with progressive firm where opportunity for advancement not restricted either in a similar capacity or position under superintendent. Apply to File No. 2986-W.

ENGLISH ENGINEER, A.M.I.E.E., 33 years of age, married. Wishing to emigrate requires post where his experience will be of most use. 17 years experience comprising workshop, test, development research on public address and television E.M.I. Co. Field and development engineering, radio navigation aids and radio teleprinter equipment. At present Technical Officer, Air Ministry. Could possibly arrange to visit Canada for interviews if required. Apply to File No. 2994-W.

MECHANICAL ENGINEER, M.A., M.I., Mech. E. wide experience in Vibrations and Balancing presently residing in England interested in emigrating to Canada if suitable contacts could be arranged. For details of past experience apply to File No. 2995-W.

Graduate Electrical Engineer

Required for position with large Northern Ontario Paper Mill. Preferably man with some paper mill or other industrial experience. Salary commensurate with qualifications and experience. Apply stating experience and qualifications to File No. 4032-V.

THE UNIVERSITY OF MANITOBA REQUIRES ENGINEERING INSTRUCTORS

The Faculty of Engineering and Architecture of the University of Manitoba will require additional instructors for teaching duties beginning September 1, 1948.

Applicants should be Engineering Graduates from recognized Universities. The grades required will be assistant professors, lecturers and demonstrators in Civil, Electrical, and Mechanical Engineering. Salaries dependent on experience and general qualifications. Apply as soon as possible to Dean of Engineering and Architecture, or Head of Department Concerned, The University of Manitoba, Winnipeg.

ALUMINUM COMPANY OF CANADA, LIMITED
AND ASSOCIATED COMPANIES

Have opportunities for

QUALIFIED GRADUATE ENGINEERS

Information regarding current requirements may be obtained from Employment Department, 1700 Sun Life Building, Montreal, Quebec

BUSINESS & INDUSTRIAL BRIEFS

A Digest of Information received by The Editor

Appointments and Transfers

The English Electric Co. of Canada Ltd., St. Catharines, Ont., have announced the following staff changes.

I. S. Patterson, M.E.I.C. has been promoted to the post of Manager Central Station Sales; P. J. Farmer, M.E.I.C., is now acting Manager of Industrial Sales and D. C. Brooking, M.E.I.C., is District Manager of the Winnipeg area.

Mr. Patterson, who for the past two years has been District Manager in Winnipeg, will be located at the Head Office of the Company at St. Catharines, Ont. Mr. Farmer, a graduate of the University of British Columbia in Electrical Engineering, has been with the Company for the past ten years. Mr. Brooking is a graduate in Electrical Engineering of the University of Manitoba. He has been with the English Electric Sales Staff since 1946.

●

James Irwin Robinson, has been elected President of Crane Limited. He was formerly Vice-President and General Manager of the Company.

Mr. Robinson has had forty-one years of service with the Crane organization. He is a native of Ontario and was educated at Prescott High School and the Ottawa Business College.

He joined the Crane Company in San Francisco, in 1907, and returned to Canada during the first World War to serve with Canadian Engineers. Following his demobilization he was named Sales Manager with Crane Limited. Shortly after this appointment he became General Manager of Sales for Canada and in 1927 was elected a director of the Company. Mr. Robinson was named Vice-President and General Manager in 1937.

The Arborite Company Ltd., have announced that Dr. Alexander Szwarc, F.C.I.C., has been appointed Technical Director of the Company. A native of Poland, but now a Canadian citizen, Dr. Szwarc served as a consulting chemist with Allied War Supplies Corporation, while on leave from the Polish Army, during the war. He has had very wide experience in the field of resins, waxes, coatings and laminates.

●

The Technical Advertisers' Association of Montreal has elected B. McK. Davey as its President for the forthcoming year. He succeeds H. Putnam of Canadian Marconi Co.

Mr. Davey is General Manager of the Rudel Machinery Co. Ltd. and President of Rudel Exports Ltd. He has had long association with technical advertising affairs in Canada.

●

H. John Racey, M.E.I.C., of Montreal has been appointed President and Managing Director of Cresswell Roll Forming Company Limited and its subsidiary Cresswell Pomeroy Limited.

Charles M. Kinghorn of Montreal has been appointed Director and Vice-President in charge of Engineering and Research of the two companies named above.

●

A new firm of engineers and contractors, Blenkhorn & Sawle Limited has been formed in St. Catharines, Ontario.

H. C. Blenkhorn is the President and Ross T. Sawle, M.E.I.C., the Secretary-Treasurer.

The new company will serve industry as engineering consultants and sales representatives and by providing manufacturing services in the electrical field, including electronics.

Mr. Blenkhorn was formerly vice-president and general manager of the English Electric Company of Canada Limited and Mr. Sawle was assistant engineer of that company. Both are graduate electrical engineers.

●

J. R. Menzies, M.E.I.C., of Montreal has been promoted by the Civil Service Commission to head the public health engineering division of the Department of National Health and Welfare.

●

B. T. Tinling has been appointed General Manager and a Director of the International Varnish Company. For the past five years Mr. Tinling has served his Company in the capacity of Sales Manager. He is also a Director of the Tait Plate Glass Company of Kitchener and the Scott Paint-Varnish Company of London.

●

Ulric S. Annett has been appointed Winnipeg District Sales Manager for the Explosives Division of Canadian Industries Ltd. He succeeds J. S. Morrey who has retired after 35 years of service with the Company.

Mr. Annett is a native of Montreal and he has been associated with the Explosives Division of C.I.L. for the past 28 years. Prior to his present appointment he was technical representative in Vancouver.

●

A. P. Craig formerly assistant to the President has been appointed Vice-President of the Canadian Westinghouse Co. Ltd. Mr. Craig joined the Westinghouse Electric Corporation, after graduation from

Cornell University in Electrical Engineering, in 1928. He has held many important posts with the Company including 12 years in commercial activities in the New York office. He spent 4 years building and assisting in the operation of war plants for Westinghouse and 2 years as manager of the X-Ray Division of the Company in Baltimore.

In his new position, Mr. Craig will be responsible for the operation of the Company's Appliance, Lamp, Tube and Lighting Divisions and he will work in co-operation with the Vice-Presidents of Sales, Manufacturing and Engineering for the Purchasing and Service activities of the Company.

●

Allan T. Loucks of the Railway & Power Engineering Corporation Ltd., has been elected chairman of the Montreal Chapter of the American Society of Metals.

●

At a recent meeting of the directors of the Burlington Steel Company Ltd., Harold H. Leather, M.B.E., was elected a member of the Board.

●

Spielman Agencies of Montreal well known to the construction industry, have recently incorporated as a Limited Company under Dominion Charter.

The firm is the Canadian distributor of 'Pudlo' Brand waterproofer and of the 'Duro-Kote' line of hardeners, paints and protective coatings.

●

Norman A. Hesler of Sackville, N.B., has been elected president of the Canadian Manufacturers' Association. M. A. East of Saskatoon was elected first vice-president, H. G. Hilton, Hamilton, Ont., second vice-president and J. C. MacFarlane, K.C., of Toronto, treasurer. Mr. Hesler is president and managing director of the Enamel & Heating Products, Ltd. of Sackville, N.B. He succeeds R. C. Berkinshaw of Toronto, in his post as president of the Association.

Chairman of Standing Committees of the Association are as follows:

S. G. Bennett, Toronto, Tariff Committee; W. Ferguson, Toronto, Transportation Committee; O. H. Barrett, New Toronto, Legislation Committee; C. B. C. Scott, Toronto, Industrial Relations Committee; F. G. Rolph, Toronto, Membership Committee; L. L. Lang, Kitchener, Insurance Committee; J. A. Terrace, Toronto, Commercial Intelligence Committee; W. C. Laidlaw, Toronto, Publishing Committee; Hugh Crombie, Montreal, Education Committee.

Publications

The Automatic Clutch Corporation of Canada, 388 Yonge Street, Toronto, have available an excellent brochure entitled "B.L.M. Automatic Clutch". The booklet is well prepared and most informative. It contains important technical data and general specifications. Also available from the same source are wall charts giving fractional and decimal equivalents.

●

R. G. LeTourneau Inc. of Peoria, Illinois, have available a new four-page folder which explains how non-productive dozer time can be cut, etc. For copies apply to the company and ask for Bulletin No. TD-118.

●

Hobbs Glass Limited, London, Ontario, have published a new booklet "Glass That Tames the Sun". The booklet describes the advantages of "Coolite" a product of the Company.

Copies may be obtained by applying to the Company.

●

For more than twenty years red-stain and pocket-rot in standing jack pine has been under study at the Forest Products Laboratory, Department of Mines & Resources, Ottawa. These studies have been concerned with the strength of affected wood and with the progress of the red-stain disease in timber in service. A compilation of the results of all the work carried on to date has now been made and has been published in Circular No. 63, "Red-Stain and Pocket-Rot in Jack Pine". Copies of this circular are now available and will be sent to readers of the *Journal* on request. Requests for copies should be addressed to: Superintendent, Forest Products Laboratory, Department of Mines and Resources, Ottawa.

Brown, Boveri (Canada) Limited, 1111 Beaver Hall Hill, Montreal 1, have received from Switzerland a well illustrated brochure on the Brown Boveri On-load Disconnecting Switch. For copies ask for bulletin No. 1492-E.

●

Darling Brothers Limited, 140 Prince Street, Montreal, have just completed a new "Yeomans-Darling Manual".

The publication has been produced to inform architects. and engineers of the latest Yeomans-Darling features in heavy-duty automatic electric vertical centrifugal pumps. The manual embraces a "Selection Guide" which covers all important points.

To quote the publisher, "the purpose of this manual is to present in concise form essential data on Yeomans-Darling Bilge and Sewage Pumps, and to indicate their field of application".

Copies of the manual are available on request from any Darling Brothers representative, or the Head Office of the Company at the address given above.

●

The Atlas Asbestos Company Limited, 110 McGill Street, Montreal, have available literature describing "Chemiseal," the trademark name for chemically inert gaskets. The plastic protective covering used in "CHEMISEAL" Gaskets is "TEFLON" the du Pont designation for polymerized tetrafluoroethylene. Many important advantages are claimed for "CHEMISEAL" products.

●

Ferranti Electric Limited, Mount Dennis, Toronto 15, Ontario, offer a "long span" calendar. It is pocket size and can be used to determine any date from 1865 to the year 2000. For a copy apply to the address given above. The supply is limited.

New Equipment and Developments

On Thursday, May 27th, a preview of the New Canadian Johns-Manville Company Limited plant at Port Union, Scarborough Township, was held. The new plant cost several million dollars to construct. It is located on a 212-acre site adjacent to Lake Ontario and it is claimed as " Canada's most modern production centre for Rock Wool and ' Transite ' Asbestos-Cement Pipe ". The Company's statement said, " It is part of our programme to develop greater domestic use of Canada's native raw materials, of which Asbestos has the highest value of all our non-metallic minerals ".

•

According to a statement released by the Dominion Oxygen Company Limited clean-up operations were reduced to a minimum by a manufacturer who used the Heliarc inert-gas shielded arc welding process in fabricating alloy tanks for the storage of chemicals. High purity argon gas shielded the electrode and weld area and thus eliminated the use of flux.

The tanks on which the work was carried out are 8 feet in diameter and have an overall length of 18 ft. with a 3 ft. steel skirt. Plate thicknesses were 3/16 in. for the shell and ¼ in. for the head.

•

A new Photoelectric Recording Wattmeter designed for such applications as analyzing welding circuits and measuring industrial heating load, motor-starting load, and power surge is available from the Meter and Instrument Section of Canadian General Electric Company. Consisting of a high-speed photoelectric recorder and a newly designed wattmeter measuring unit, the new instrument can be used to measure d-c power or a-c power up to 10.000 cycles per second. For complete details communicate with the manufacturer.

•

Crawford Gordon, Jr., President of the English Electric Company of Canada, Limited, announces that an important contract has been awarded by the Hydro Electric Power Commission of Ontario, to the English Electric Company Limited, represented exclusively in Canada by English Electric Company of Canada Limited and John Inglis Co. Limited. The $3,000,000 contract covers the manufacture of two Steam Turbo-Generator units, to be installed in the first large steam-electric generating plant on the Hydro Electric Power Commission's system, in the Windsor district.

The first two units will be steam turbine driven generators, each of 80,000 hp. at a speed of 3,600 r.p.m., for high pressure, high temperature steam, supplying 60 cycle power. The Electric Generators will be hydrogen cooled. An idea of the size of each unit is indicated by its overall length of 75 feet and shipping weight of 300 tons.

These units will form a most important part of the power plant, which is designed throughout for the highest degree of efficiency in generation of electric power from fuel.

It is anticipated that certain items of auxiliary equipment for this order will be built in Canada.

•

Bepco Canada Limited, 4018 St. Catherine St. W., Montreal, manufacturing electrical engineers, have announced that Messrs. Cooke & Ferguson of Manchester, England, have now joined their group of British companies. As a result of this new affiliation the switchgear range of Bepco Canada Limited has greatly increased. They now have circuit breakers of the oil-break type and the minimum oil type, both indoor and outdoor—built in all sizes up to 3000 amperes and for voltages up to 132 kv and rupturing capacities up to 2,500,000 kva.

Bepco's oil circuit breakers are built in one or another of their British works, making full use of their approved Short-Circuit Testing Station.

Most of their other switchgear components are made in Canada in line with Canadian requirements.

•

A new self-propelled rock drilling plant designed for large diameter blast holes in quarries, open pit mines and coal stripping operations has been announced by Ingersoll-Rand Company.

Known as the " Quarrymaster ", this machine is a completely self-contained unit consisting of a drill, compressor plant, propulsion equipment, and accessories. The "Quarrymaster" is claimed to be capable of drilling at a faster rate than conventional machines such as are generally used in pit and quarry work. It is easily manoeuverable, collars a hole with ease, and drills up to 6 inches in diameter and up to 70 feet in depth.

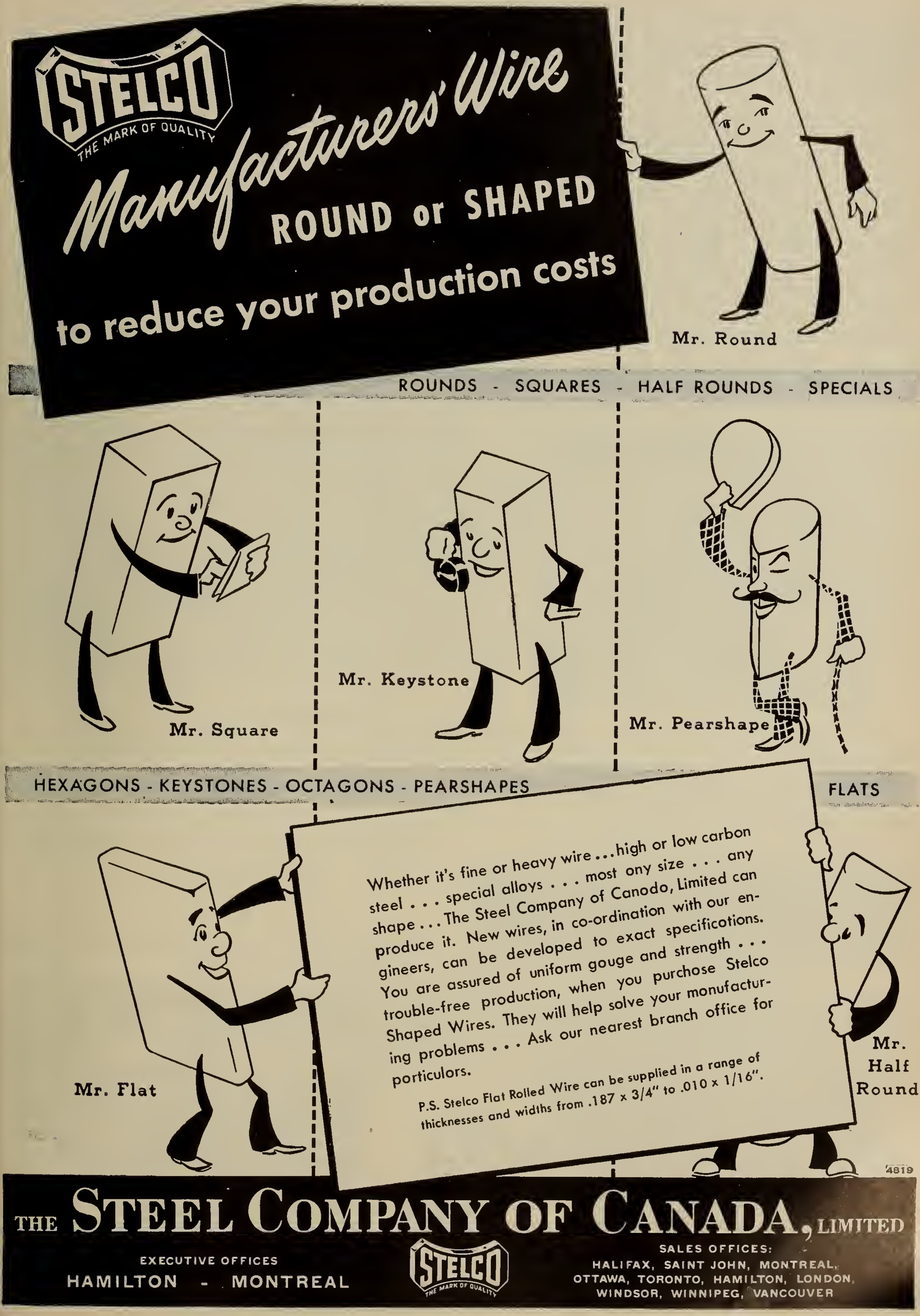
Mounting an air-operated, piston-type rock drill that strikes more than 200 blows per minute, the " Quarrymaster " has an unusually high rate of rock penetration. A patented valve action and power cycle insures maximum efficiency and drilling speed, while maintenance is reduced to a minimum by utilizing a cushion of air to bring the piston to rest before it can strike the front head. Feeding of the drill is accomplished by an air motor which drives the feed chain. An illustrated folder describing the " Quarrymaster Drill, No. 4077 " may be obtained from the Canadian Ingersoll - Rand Company Limited, 620 Cathcart Street Montreal or from any branch office of the Company.

"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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All boilers and other heated equipment, designed to make use of SPUN ROCK BLANKETS, find their way to satisfied customers. There is nothing quite so efficient in topping waste of heat units, and thus conserving valuable fuel. All blankets are custom made to specifications. Write for blanket sample and heat loss data.

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HORTON WELDED STEEL BINS

The two bins in the above view were erected at a refinery in Ontario. They have cone-bottoms and are elevated 4 ft. 8 in. above the ground on six structure posts. The overall height is 42½ ft.

If you require steel bins for handling solids or liquids, our nearest office will be glad to furnish you additional information or tenders.

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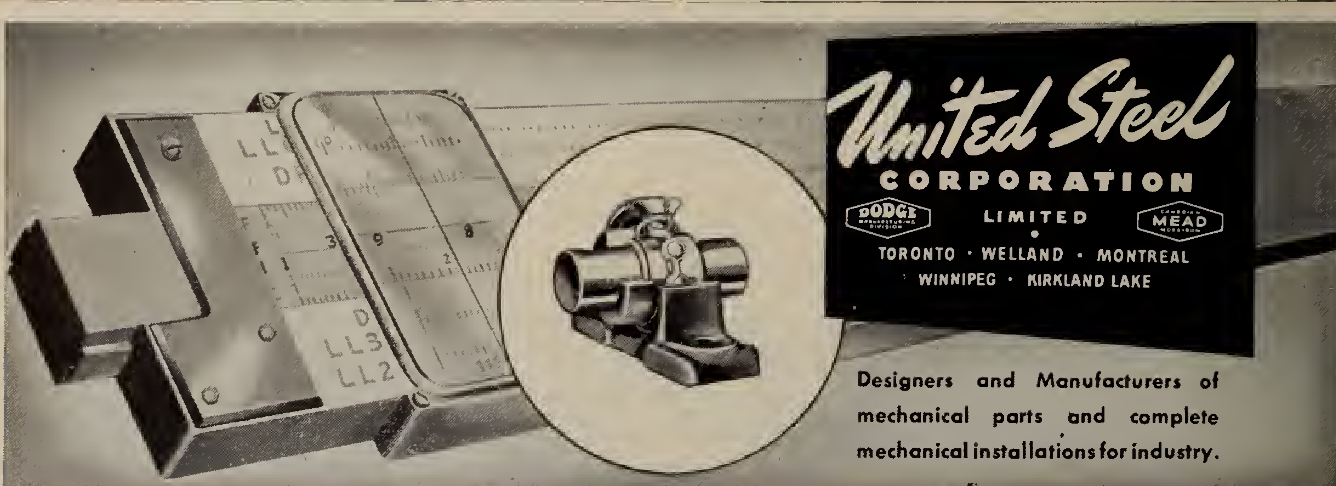

THERE is no mystery, no legerdemain, about the way special machines to do special jobs for various industries are produced by Canadian Vickers. It is all a matter of having the men, materials, machinery and know-how . . . all working together in one harmonious unit. It's as simple as that.

A large dairy company wants some special apparatus? It is designed, plans drawn, stainless steel specified and Canadian Vickers craftsmen go to work. The illustration shows the finishing being done.

Brewers want copper kettles; hospitals want mechano-therapy machines; distillers want distilling columns; candy manufacturers want kettles; food companies want tables, etc. We are told the need . . . Canadian Vickers designs and builds the answer.

If you have need of a special machine or industrial equipment of any kind, remember . . . *if industry needs it . . . Canadian Vickers builds it.*

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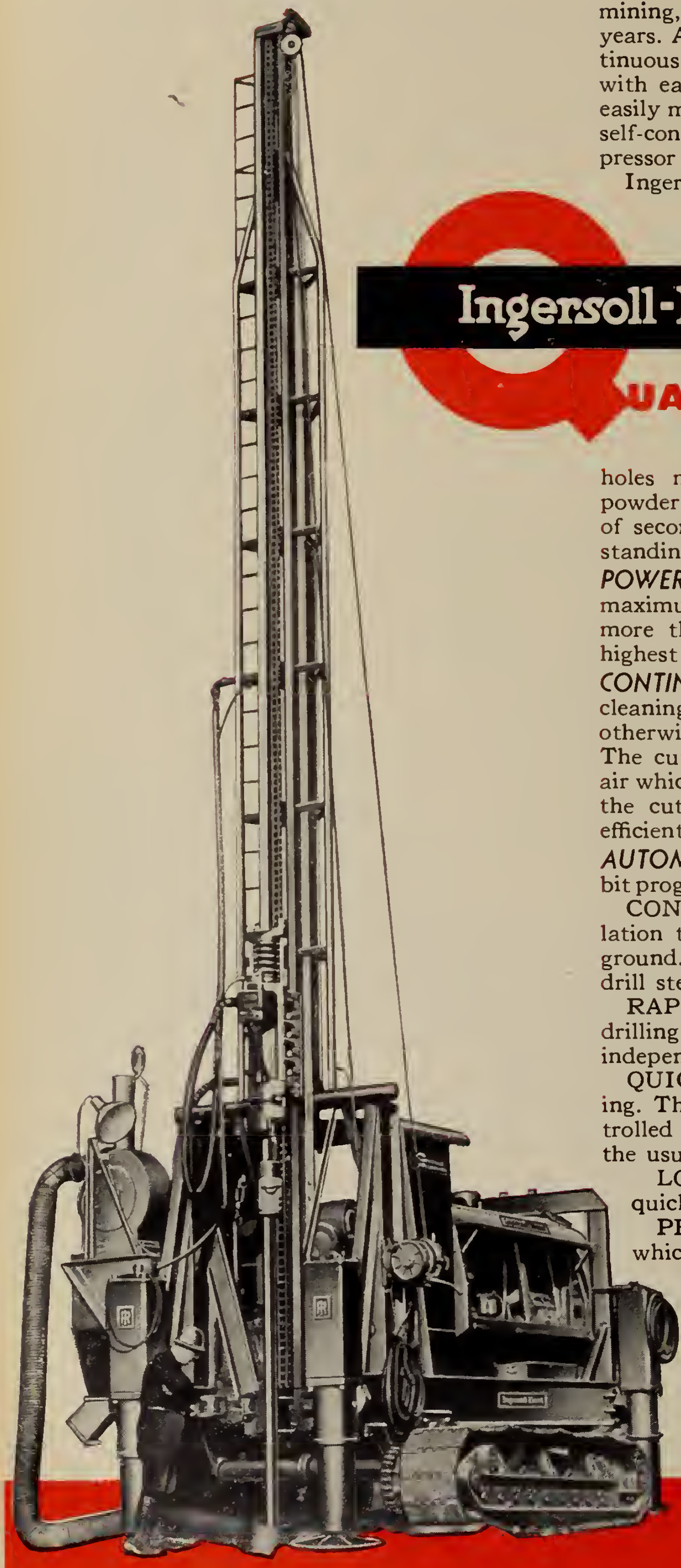
Index to Advertisers

The revenue derived from the sale of advertising space enables the *Institute* to publish the *Journal* on a regular monthly basis. Listed below are the names of the Companies and Individuals whose advertisements appear in this issue.

JUNE 1948

The DRILL you asked for



Here's the drill for open cut work that mining, quarrying and construction men have wanted for years. A drill with vastly superior drilling speed and continuous hole cleaning ability. A drill that collars a hole with ease, requires no water, has automatic rotation, is easily maneuverable and quickly set up. It is a completely self-contained unit, including an air-powered drill, a compressor plant, propulsion equipment and auxiliaries.

Ingersoll-Rand presents the **QUARRYMASTER** as the greatest advance in rock drilling for open pit mining, quarrying and general large scale excavation work since the days of hand drilling.

Ingersoll-Rand

QUARRYMASTER

The overall efficiency of the **QUARRYMASTER** results in a new low in drilling costs. Now operators can afford to space holes more closely, permitting proper distribution of powder. The result is better fragmentation and a minimum of secondary blasting. Here are but a few of the outstanding features found in this revolutionary machine.

POWERED DRILLING . . . Powered drilling guarantees maximum efficiency. The air-operated piston drill striking more than 200 powerful blows per minute insures the highest rate of rock penetration.

CONTINUOUS HOLE CLEANING . . . Continuous hole cleaning eliminates bailing. It also saves power that is otherwise wasted in drilling through previous cuttings. The cuttings are removed from the hole by compressed air which passes down through the hollow drill steel. When the cuttings reach the surface they are caught by an efficient dust collector.

AUTOMATIC ROTATION . . . Automatic rotation turns the bit progressively to a fresh cutting position with each blow.

CONTROLLED FEED permits a fine degree of regulation that is necessary in drilling gravelly and fitchery ground. EASY COLLARING is assured by a time-saving drill steel centralizer.

RAPID SPOTTING will save many hours of valuable drilling time. The quick acting crawlers are powered by independent Ingersoll-Rand Air Motors.

QUICK SET-UPS allow more time to be spent in drilling. This unit is equipped with four independently controlled hydraulic leveling jacks that save up to 20% of the usual set-up time.

LONG WEARING BITS that are light-weight and quickly changed is another important cost-saving feature.

PROVEN POWER PLANT . . . The power plant which is an integral part of this unit is the Ingersoll-Rand MOBIL-AIR KA500 Portable Compressor.

Ingersoll-Rand **QUARRYMASTERS** are now operating in quarries, strip and open pit operations. They are drilling in many kinds of rock and under various operating conditions.

Arrange with us to see a **QUARRYMASTER** in operation. Our nearest branch office has full information.

branches at

Sydney Sherbrooke Montreal Toronto Kirkland Lake Timmins Winnipeg Calgary Nelson Vancouver

Canadian Ingersoll-Rand Company *limited*

THE ENGINEERING JOURNAL

VOLUME 31 NUMBER 7
JULY 1948

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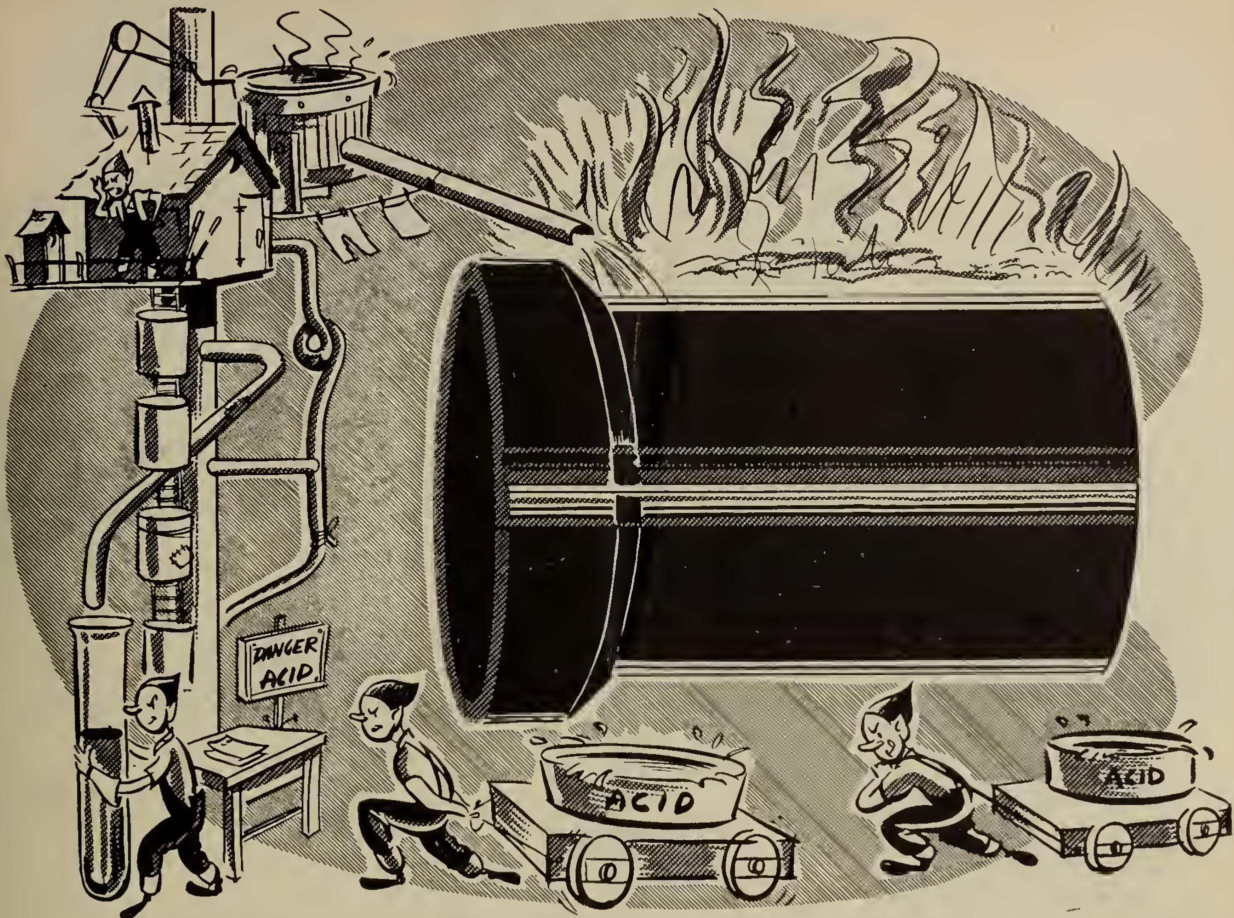

THE SKIN NO ACID CAN TOUCH!

VITRIFIED CLAY SEWER PIPE....

In the laboratory—in hundreds of municipalities across Canada—Vitrified Clay Pipe has proven itself immune to the actions of sulphuric, nitric, hydrochloric and acetic acids (concentrated or dilute), hot or cold.

Development of specific types of Vitrified Clay Pipe for specific uses keeps our engineers constantly busy in the field. This study results in time-saving, money-saving new Vitrified Clay Pipe products.

Reigning supreme is the test of time. In this regard Vitrified Clay Pipe stands pre-eminent. Its resistance to scour—alkalis—gases—crushing makes it "Permanent as the Pyramids".

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PERMANENT AS THE PYRAMIDS

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JOBS LIKE THIS...

prove the value of the lubricant that Seals out Dirt and Moisture

GOODBYE bearings if that mud ever works its way into them! Put Texaco Marfak into a bearing and here's what happens —

Marfak stays where you put it. It doesn't squeeze out when the load is heavy, doesn't jar out when the going is rough. Marfak holds together. It clings to the bearing — guards it with a persistent lubricating barrier against dirt and moisture. It protects parts better, longer, with fewer applications.

In wheel bearings, use Texaco Marfak Heavy Duty. Here the secret of long-lasting protection is Marfak Heavy Duty's ability to form a fluid lubricating film inside the bearing while retaining its original consistency at the outer edges — thus sealing itself in, sealing out dirt and moisture.

Best testimonial to Marfak effectiveness is this fact: *More than 275 million pounds of Marfak have been used to date!*

McColl-Frontenac Lubrication Engineering Service is available to you; just call the nearest of the more than 200 McColl-Frontenac Distributing Bulk Stations across Canada, or write McColl-Frontenac Oil Company Limited, Executive Offices, Royal Bank Bldg., Montreal, Que.

GET FULL ENGINE POWER

Your heavy-duty gasoline and high-speed Diesel engines will run more efficiently and deliver more power when lubricated with oil that keeps them clean — *Texaco Ursa Oil X***. Made especially for this service, *Ursa Oil X*** is fully detergent, dispersive, and has high resistance to oxidation. It keeps rings free, assuring better compression and combustion — great power and fuel economy. It protects bearings from corrosion, greatly reduces engine wear and maintenance costs.

2-3-A1-48

TEXACO MARFAK

The Super-Tough All-Weather Chassis Lubricant

TEXACO REG. T. M.

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Silver Hard Duck plies, securely bonded by layers of tough, resilient rubber, assure extreme flexibility plus highest tensile strength.
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DOMINION RUBBER COMPANY LIMITED
MADE IN CANADA
No Splice...
Special round and round construction of Dominion Royal Endless Transmission Belts eliminates splices — a major source of belt failures. Uniform thickness of Royal Endless Belting assures smoother, quieter running. Exceptional flexibility allows belts to hug pulleys. Factory pre-stretching minimizes on-the-job stretch. You get less slippage — and maximum power transfer! For longer, harder wear . . . for shock loads . . . specify Dominion Royal Endless Transmission Belts. They're ENGINEERED for the job!
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ENGINEERED RUBBER PRODUCTS FOR EVERY INDUSTRY
HALIFAX-SAINT JOHN-MONTREAL-TORONTO-WINNIPEG-CALGARY-EDMONTON-VANCOUVER

Engineering Facts about

Johns-Manville TRANSITE PRESSURE PIPE

*Winnipeg: A case history**

In 1932 the city of Winnipeg, Manitoba, made its initial installation of Transite Pressure Pipe. A portion of the installation consisted of an 18″ line. Recently this pipe was subjected to a series of field and laboratory tests to determine its condition after 14 years of service, which had included exposure to an extremely corrosive soil.

Pitometer Flow Test

Before the pipe was removed from the line for the laboratory tests which were to follow, its flow capacity was checked. The Pitometer Company, Inc., New York, was selected to conduct these field tests. Velocities ranged from 1.1 to 1.9 feet per second and readings were made at 30-second intervals. During each test, the velocity was held constant. Results were summarized by the Pitometer Company as follows:

Assembly of pipe and coupling being removed from the line for laboratory tests.

"*The high value of C=140, which we believe is a reliable index of the present capacity of the pipe tested, shows that there has been little if any loss in capacity since 1932 when the pipe was laid.*"

Readings being recorded during Pitometer flow tests on the line.

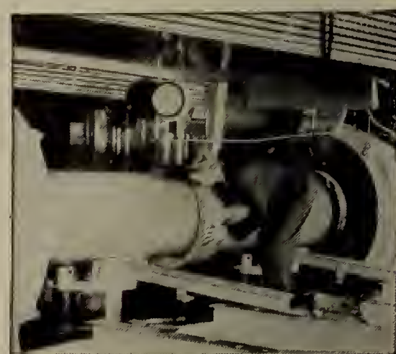
Soil Conditions

The soil in which this Transite installation was made was known to be destructive to water pipe. Analysis showed the presence of certain soluble salts, which, when dissolved by ground water, became highly corrosive.

It was desired, therefore, to determine how well the Transite line had withstood these severely corrosive conditions and thereby to provide a basis for gauging its life expectancy. To do this, a series of physical tests were made, using the sections of pipe which had been removed from the line for the purpose: The most significant of the tests conducted on the pipe were the hydrostatic pressure tests.

Hydrostatic Pressure Tests

In order to simulate field conditions as closely as possible, an assembly consisting of portions of two lengths of pipe joined by a Simplex Coupling with rubber rings and sleeve intact was tested. The complete assembly was placed in a hydrostatic testing machine and the water pressure was raised to 260 pounds per square inch. This was the original test pressure to which this pipe had been subjected at the factory and 4 times the normal working pressure of the line.



Assembly of pipe and coupling undergoing hydrostatic pressure test.

Pressure was held at 260 pounds while observers closely examined the coupling for leakage. No leakage occurred. The rubber rings, undisturbed and in their original position, functioned as well as when the pipe had been placed in service 14 years previously. Subsequent careful inspection and tests confirmed that the rubber rings removed from this Transite line were free from any signs of deterioration.

Specimens of the Winnipeg pipe were also subjected to other laboratory tests. Crushing tests showed that its strength compared favorably with that of Transite Pressure Pipe as manufactured today. A corporation stop pull-out test provided further verification that the strength of this pipe was in no way impaired.

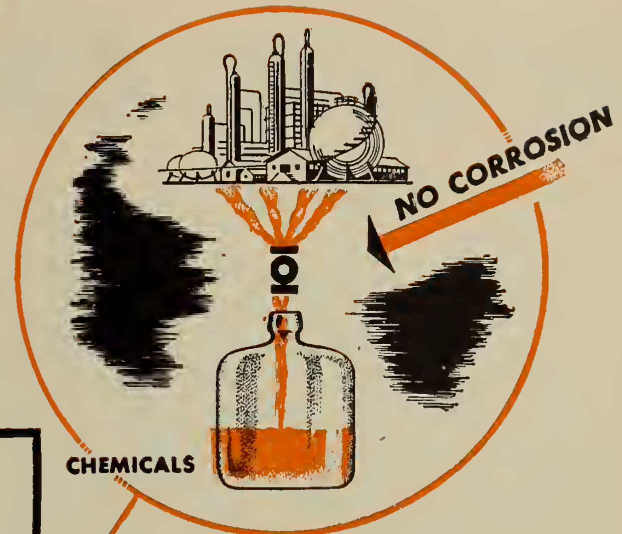
Summary

The above series of tests provided conclusive evidence that the strength, flow capacity and other physical characteristics of the Winnipeg pipe were unimpaired after 14 years' service under severe conditions. Further, as summarized in the original report, they demonstrated that "on the basis of the performance rendered to date, it is reasonable to anticipate a life-expectancy of many times that already obtained."

* *A copy of the detailed performance report on this Transite Pipe installation is available on request. Address Canadian Johns-Manville, Co., Limited. Toronto, Montreal, Winnipeg, Vancouver.*

JOHNS-MANVILLE JM PRODUCTS

I-730



A Valve with . . .

★ **ISOLATED WORKING PARTS**
★ **CORROSION-PROOF LININGS**
★ **STREAMLINED FLOW**

GRINNELL-SAUNDERS DIAPHRAGM VALVES

● The flexible diaphragm isolates the working parts of the valve from the fluid, preventing contamination, and permits streamlined flow plus positive closure even with suspended solids.

A selection of diaphragm materials and also body linings of glass, porcelain, lead, rubber or synthetics protects against corrosion.

- No packing glonds to demond constant ottention. Non-rising stem eliminates breakage . . . seoled for protection from dust, weather and corrosion.
- Working parts completely isolated from the fluid. No sticking, corroding or clogging to interfere with easy operation and tight closure. No contamination from valve lubricants.
- Compressor and finger plate combine to support the diaphragm in all positions.
- The large area of contact of the diaphragm on the seat, plus the resilience of the diaphragm, permits positive closure even when foreign matter is trapped.
- No metal-to-metal seats to become damaged or wire-drawn.
- No refacing or reseating is required.
- Streamlined passage without pockets reduces friction to a minimum and prevents accumulation of sludge and foreign solids.
- The valve body—the only metal that could contact the fluid—can be completely lined with glass, porcelain, lead, rubber or synthetic compounds (flange type only) to suit service requirements.

Write for catalog describing Grinnell-Saunders Diaphragm Valves—standard and special types.

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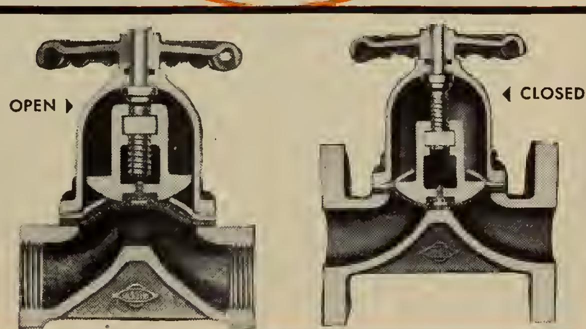

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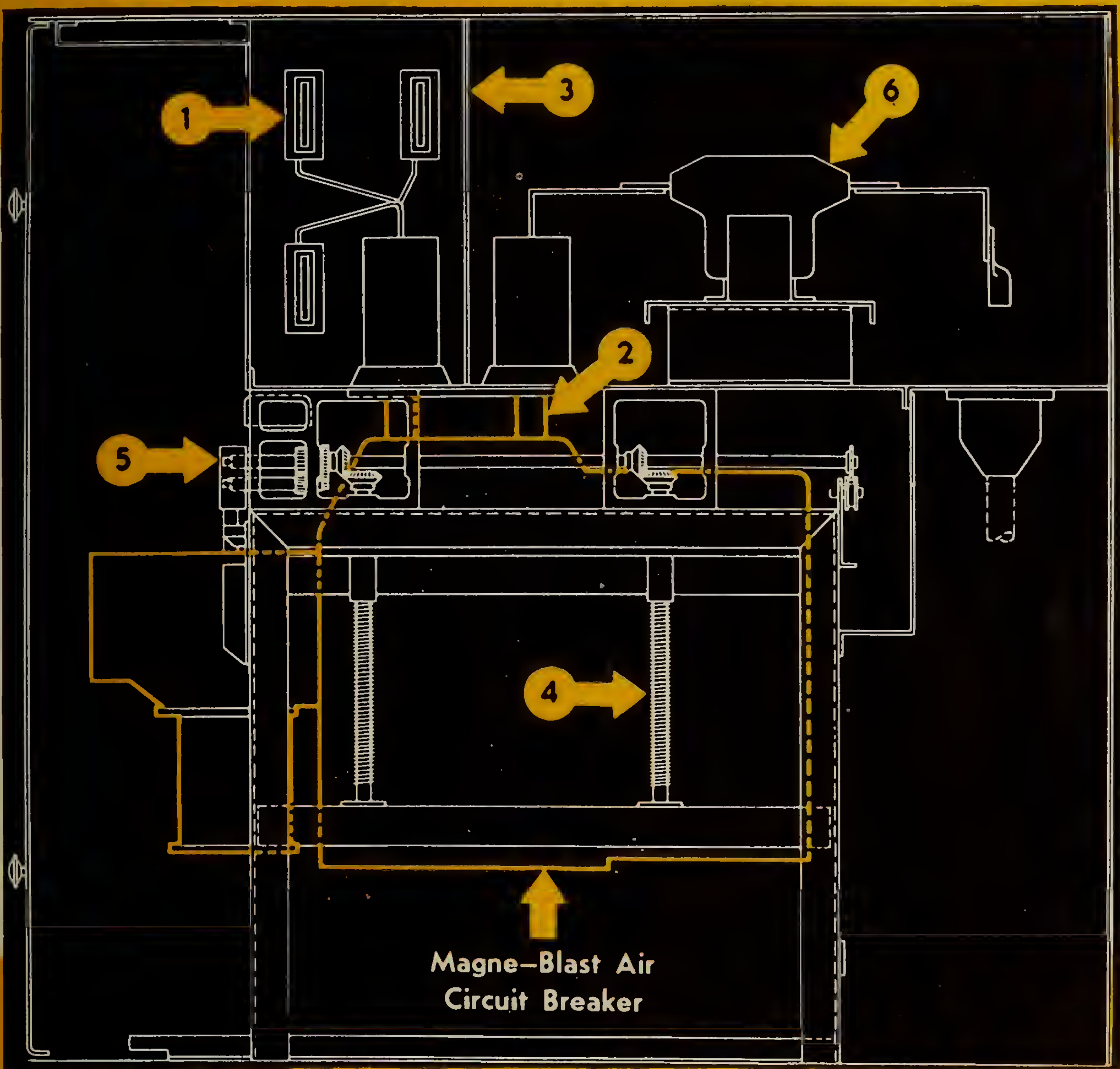
with MAGNE-BLAST BREAKERS

including all vertical-lift master metal clad features and the time-tested arrangement of circuit components



Not one of these features is sacrificed:

1) High-dielectric, molded bus insulation and insulated interconnectors.
2) Standard high-pressure disconnecting devices.
3) Complete circuit isolation.
4) The time-proved breaker-elevating mechanism.
5) The dependable, direct-acting mechanical interlocks.
6) Current transformers that are properly co-ordinated.
7) Silver-to-silver contacts throughout.
8) Semiflush mounting of instruments and relays.

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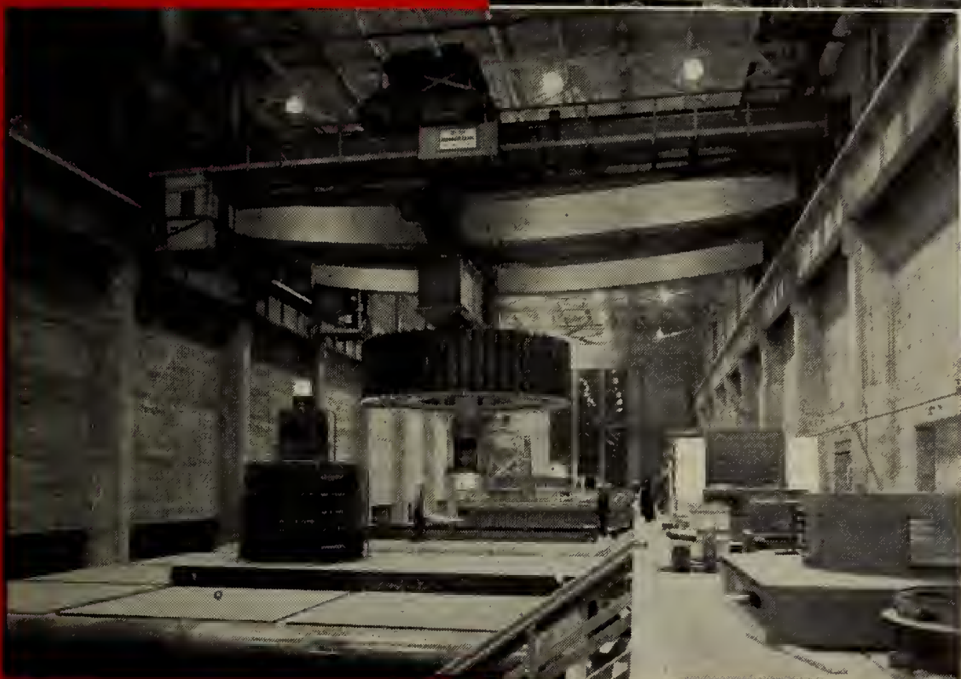

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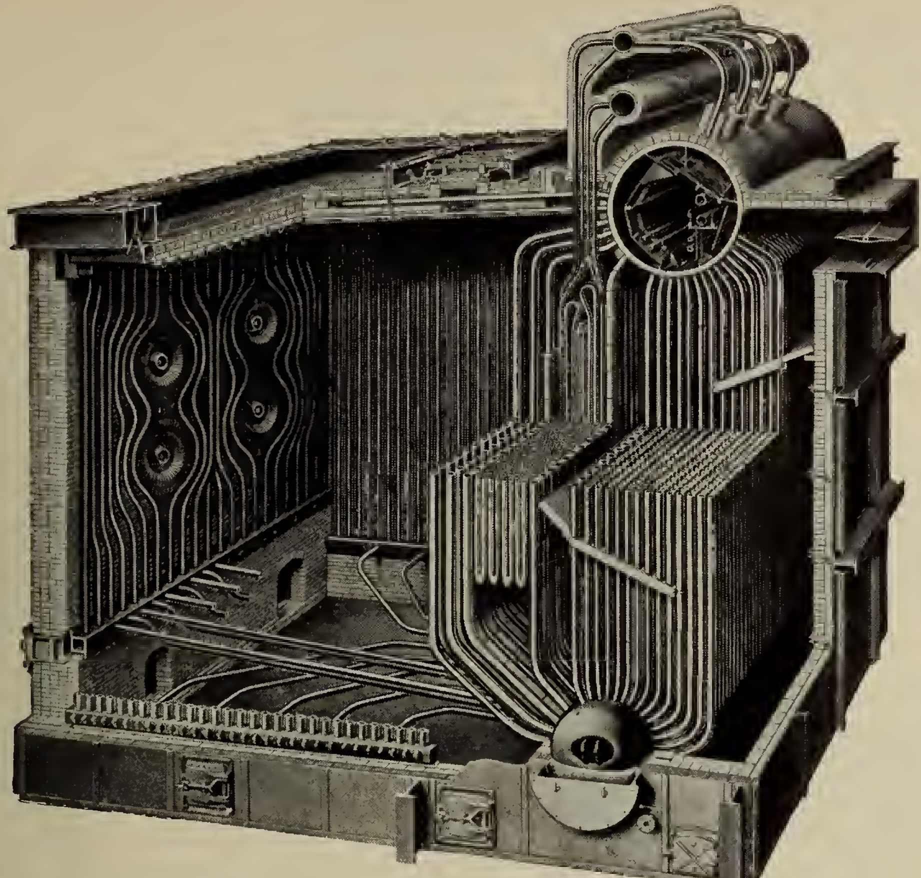
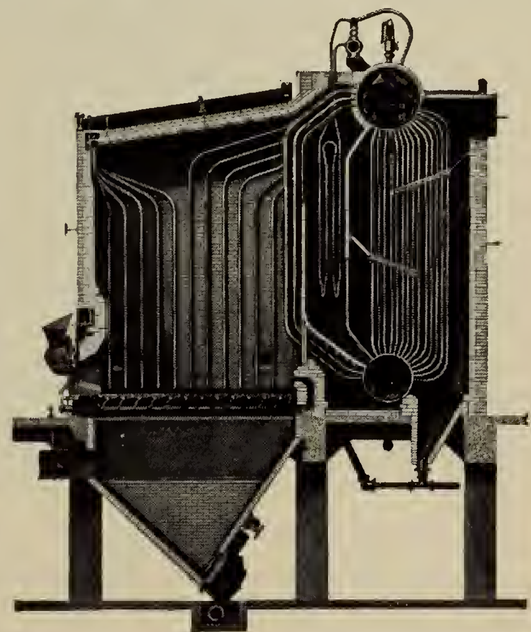


Typical C-E Steam Generator, Type VU as arranged for pulverized coal, oil or gas firing.



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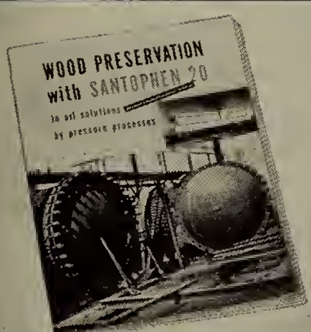

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75	0.019
100	0.12
110	0.24
120	0.45
130	0.82
140	1.45

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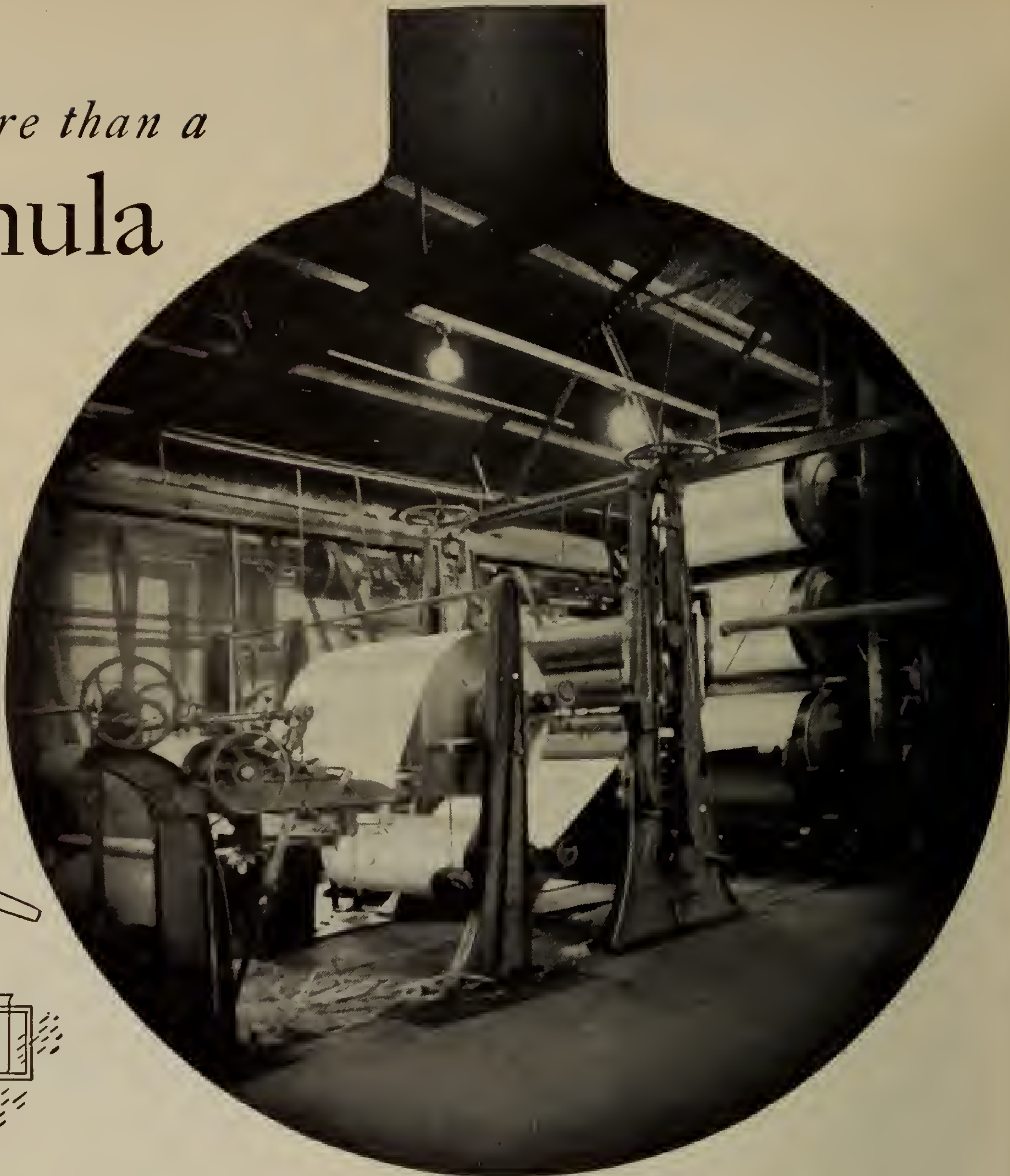

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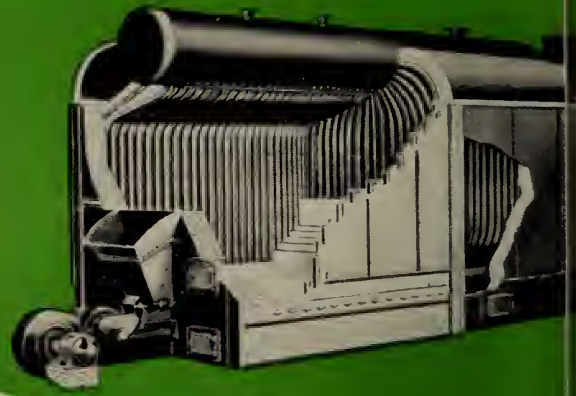

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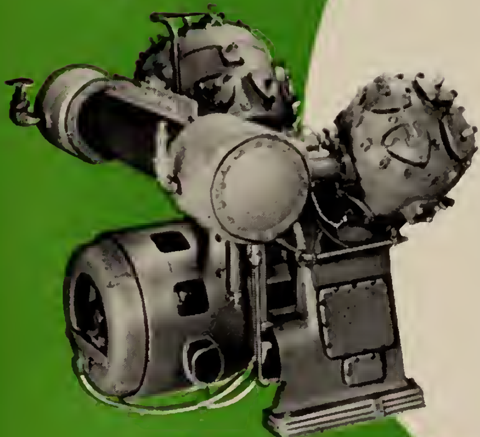

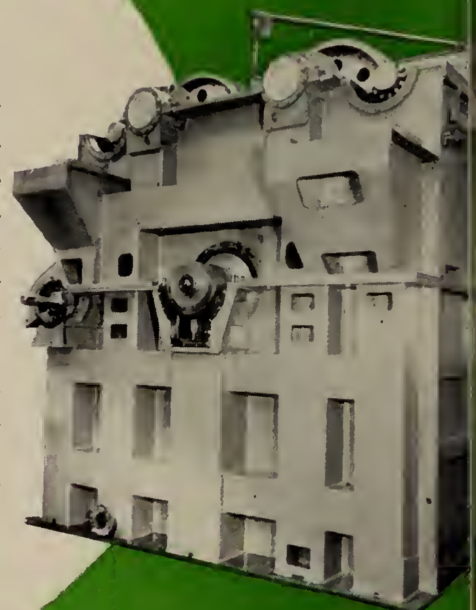

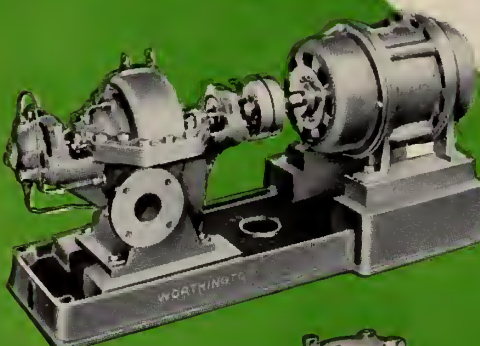

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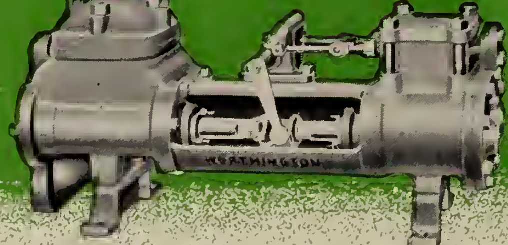

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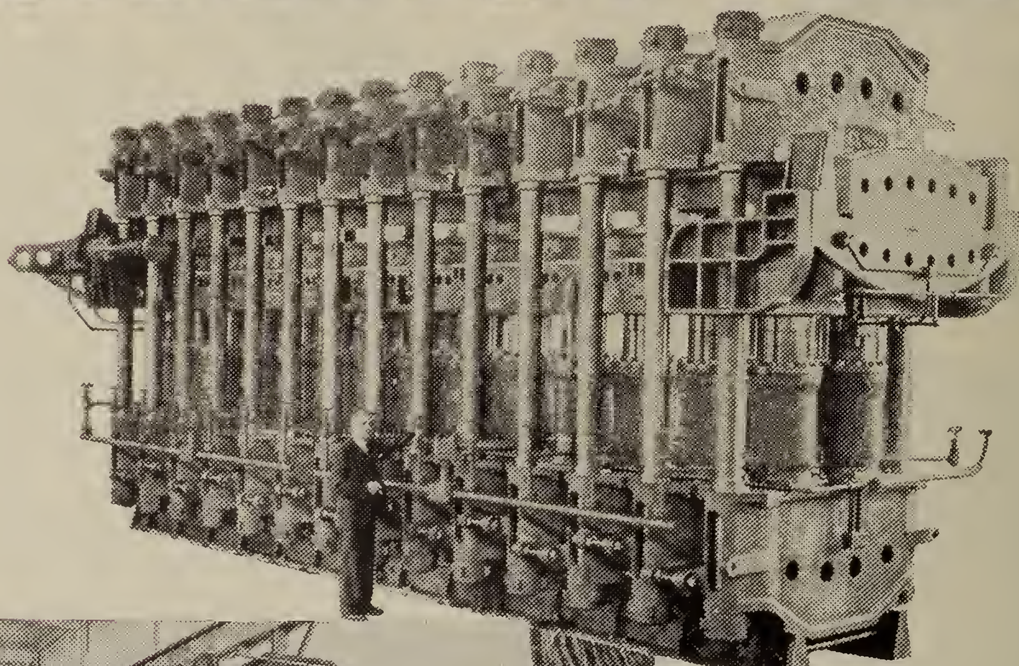

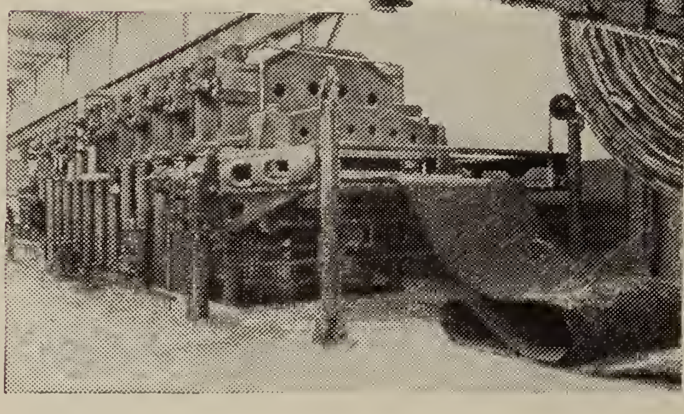

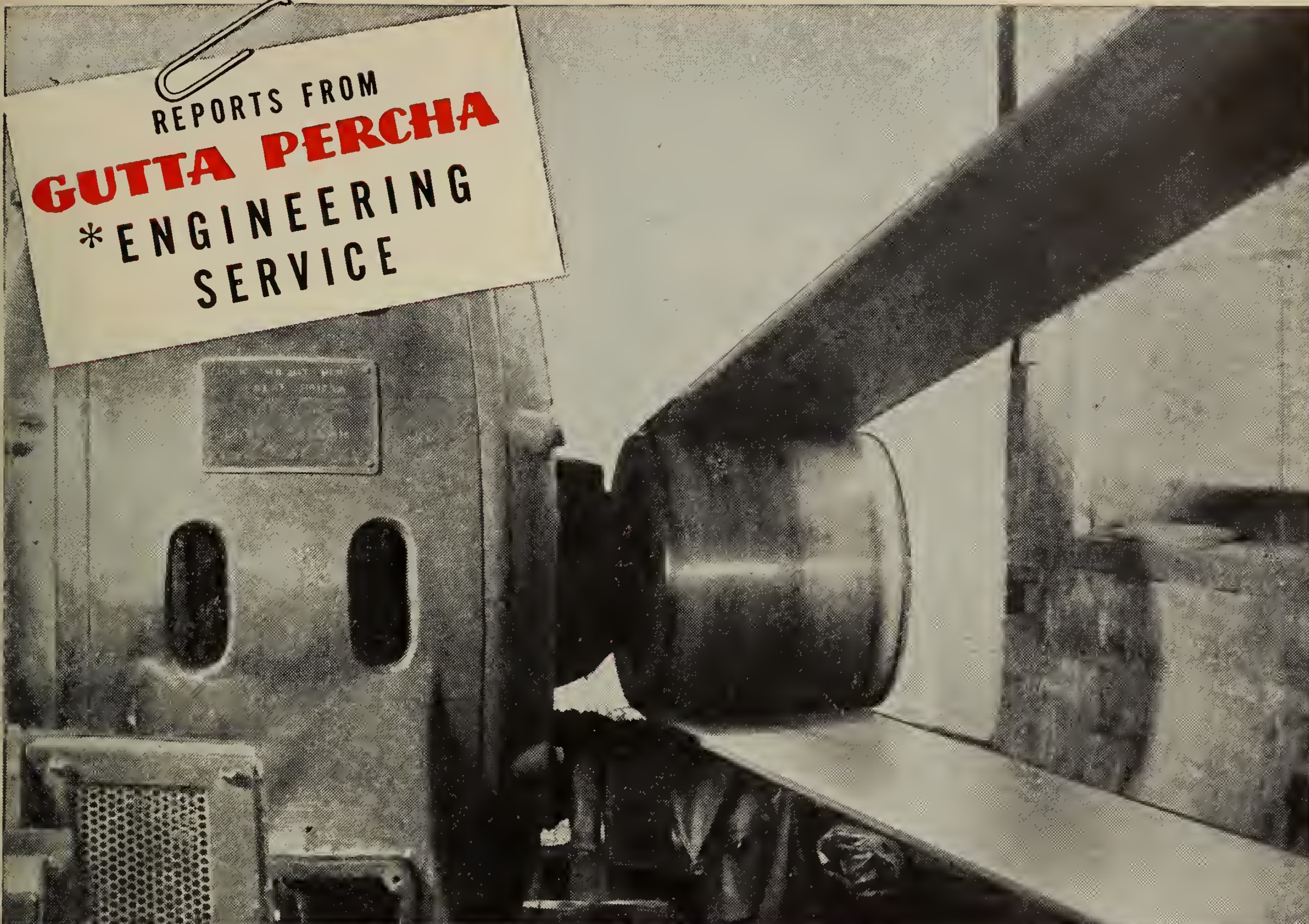

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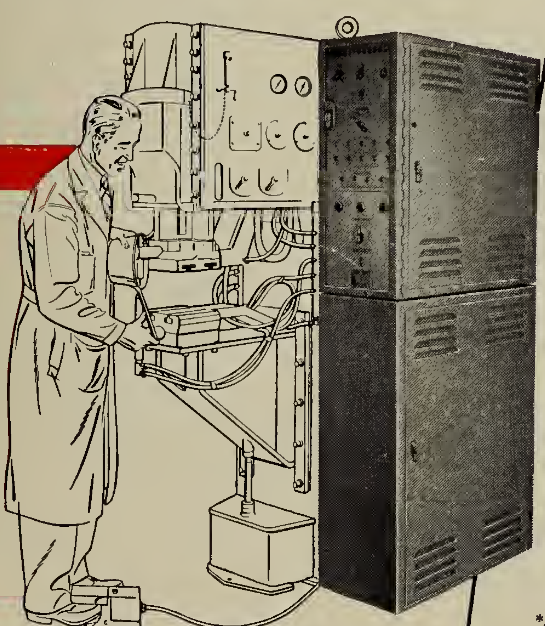

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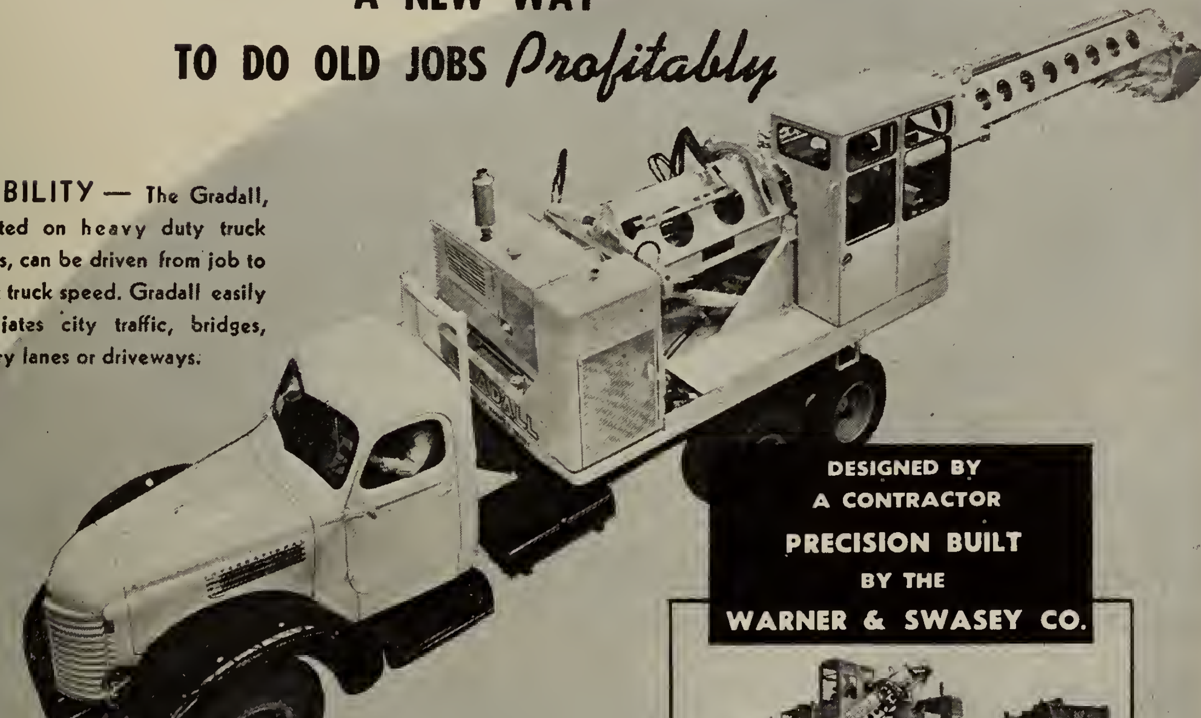

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOLUME 31 | MONTREAL, JULY 1948 | NUMBER 7

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★ ★ ★

CONTENTS

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COVER PICTURE

The cover illustration depicts a component of the equipment described in Mr. Ballard's paper, "Recent Canadian Radar", page 373 of this issue. It is the modern antenna developed by the National Research Council for the 3-cm. Harbour Control Radar equipment at Camperdown, N.S.

Photo courtesy National Research Council and National Film Board

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Recent Canadian Radar

by

B. G. Ballard, M.E.I.C.

Director, Radio and Electrical Engineering Division,
National Research Council, Ottawa, Ontario

A paper presented at the Annual General and Professional Meeting of The Engineering Institute of Canada, Banff, Alberta, June 4th, 1948

This paper deals with the more common uses of Radar, of general interest to engineers. Cautioning that there is still much to be learned, the author tells how various universities and the National Research Defence Board are co-operating with the National Research Council in further studies and experiments. Other sciences, he contends, will find Radar a useful tool. Three examples are given of problems that can be solved with its help, namely accelerators, solar noise, and meteor studies.

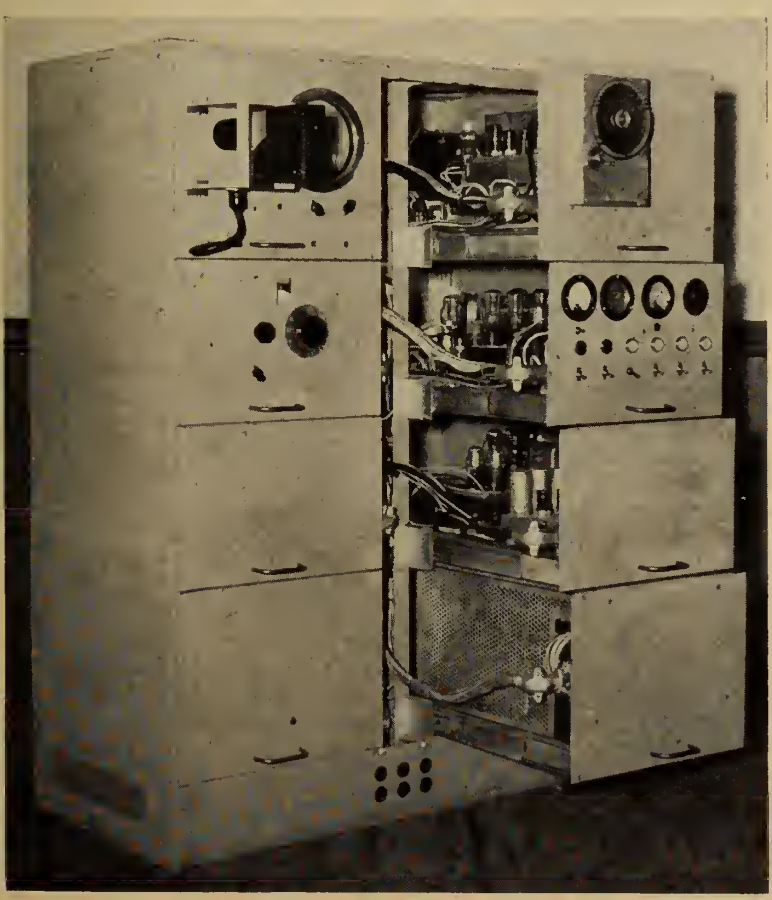
Application of Radar to marine work and harbour controls are discussed, as well as marine mapping. Its use in aerial mapping is also described. Research currently being undertaken by National Research to develop a suitable altimeter is outlined.

As late as 1933, R. N. Vyvyan, Chief Engineer of Marconi's Wireless Telegraph Company Limited, cautioned young men about selecting wireless engineering as a profession because, as he said, "Wireless is getting to be a crowded profession, and with the tendency to rationalization, and possible merging of campanies into one monopolistic organization, the number of vacancies for engineers will become less and less. . . ."

It is unfair, perhaps, to confront the memory of Vyvyan with this statement, but no reflection on a great engineer is intended. The statement merely emphasizes the phenomenal progress which has been made beyond the wildest dreams of the early pioneers, who were themselves men of vision. Certainly Vyvyan was one of the leading wireless engineers of his day.

Out of the humble beginnings of Marconi's work, aided by the brilliant contributions of Clerk Maxwell and Hertz, and the long line of later scientists, has grown the present expansion of electron science in modern communication systems. These embrace broadcasting, facsimile transmission, telephone repeaters, television, sound pictures and radar, to say nothing of a host of scientific and industrial applications, which are in no way connected with communication.

Fig. 1. Panoramic ionosphere recorder.



Radar is certainly the most recent offspring of electronics in the communication field. It is one to which Canada has made notable contributions, both in the advance of fundamental knowledge and in practical application. It is encouraging to note that this work is continuing in industry, in the universities and in government laboratories. True, since the war, the emphasis has shifted to different phases of the work. There is no longer the

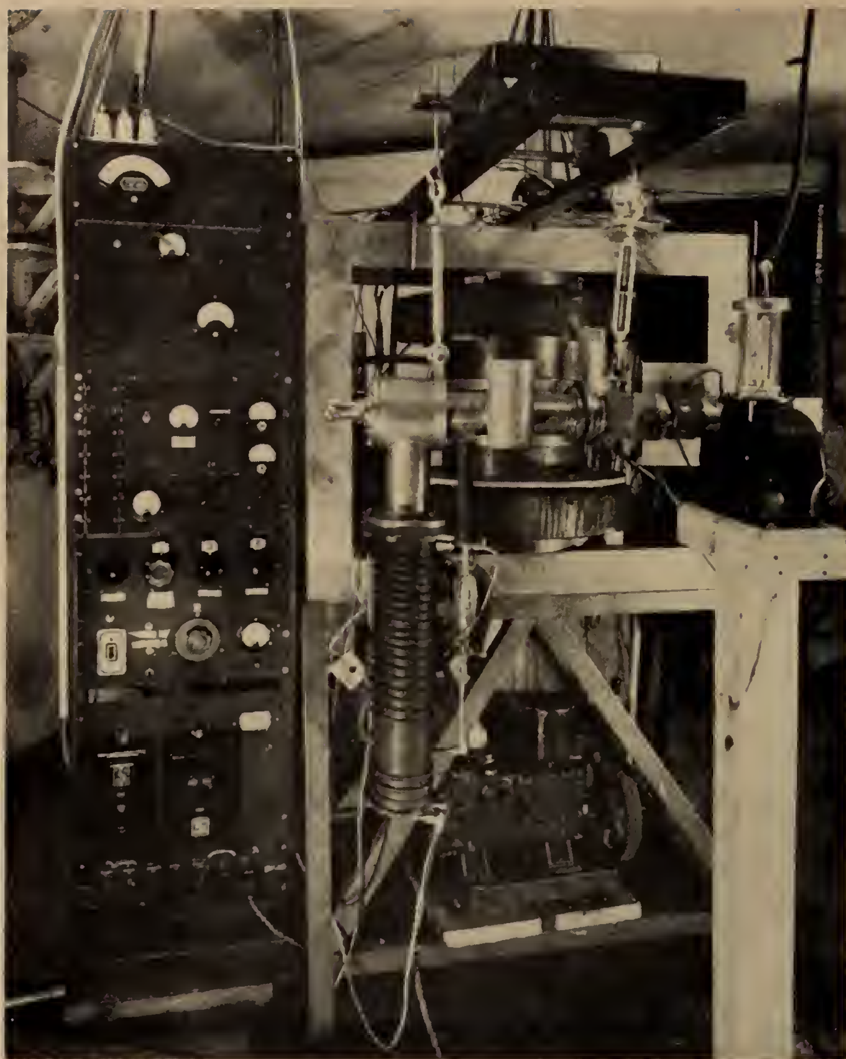


Fig. 2. National Research Council cavity accelerator.

terrible urgency which dominated during the war, but satisfactory progress is being made nevertheless.

Fundamental Work

Despite the many successful accomplishments in the field of radar, and despite the very intense effort which has been devoted to it, there is still much to be learned. We must pursue our investigations into the absorption effects at very high frequencies, and we must know more about the performance of materials under their influence. It might be expected that most materials would display quite unusual properties when exposed to frequencies of the same order as the natural frequencies of the molecules themselves, but unexpected phenomena occur long before these natural frequencies are reached. Ice, for example, has a dielectric constant of approximately 75 at commercial frequencies, but this value drops to approximately 4 at 300 kc.

Nor is dielectric constant the only factor about which we must concern ourselves. Conductivity and losses demand critical study. Propagation in a wave guide involves surface phenomena, and the condition of the surface has a profound influence on the efficiency. Paradoxically, a conductor may be a better insulator than the best known insulating materials available. Yet it should be emphasized that these new phenomena are not discrediting established theory. Rather, many factors which are insignificant at commercial power frequencies become prominent at microwave frequencies.

Since radar frequencies approach those of light, it is quite natural that radar waves display many of the properties of light. It is not surprising, therefore, that the application of optical theory to radar work is receiving attention. The University of Western Ontario has been engaged on these studies for the past two years, and from their laboratories we are learning new facts which will lead to better radar in the future.

Workers at McGill University are studying the performance of various materials under microwave frequencies, and from this work we can expect a better understanding of conductivity, dielectric constant and dielectric losses. Other Canadian universities are pursuing similar studies.

It is, of course, essential to understand fully the limitations and characteristics of propagation under various conditions. As our knowledge in this field grows, so will the application and usefulness of radar grow. The Propagation Laboratory of the Defence Research Board includes a large and capable establishment at Suffield, Alberta for the study of the ionosphere, which plays such an important part in much of our radar and radio work.

The National Research Council is assisting this work by developing measuring instruments. There is now in the course of development a panoramic ionosphere recorder, the purpose of which is to determine the characteristics of the ionosphere by transmitting a vertical pulsed signal at frequencies ranging from 1 to 20 mc. and recording the return echo.

An illustration of this equipment is shown in Figure 1. It is probable that the development will continue, to embrace oblique ionosphere recorders.

It would be surprising if other sciences had not found radar to be an exceedingly useful tool for their own purposes and radar does offer a technique for solving many problems. Only three that are being pursued in Canada will be mentioned here.

Accelerators

Much has been written regarding the development of various types of accelerators, such as the Van de Graaf generator, the cyclotron, betatron, synchrotron, etc. But radar technique offers still another possibility, known as the cavity accelerator. Essentially it consists of an evacuated chamber, containing a cavity which is excited by a 10 cm. magnetron. Electrons are accelerated through the cavity electrostatically, and then under the influence of a magnetic field are directed through a circular orbit to re-enter the same cavity. A single electron may be re-accelerated as many as eight times, following

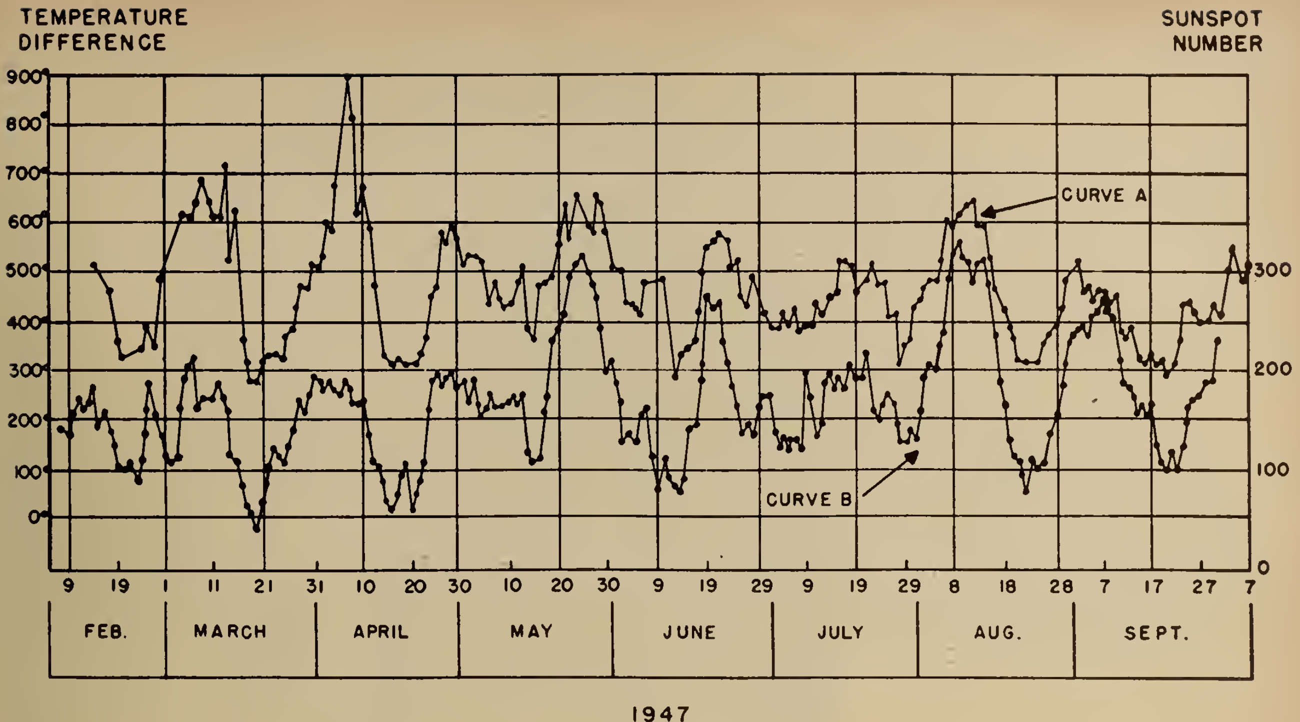


Fig. 3. Comparison of solar noise variation with sun spot numbers. Curve A—daily variations of solar noise. Curve B—American relative sunspot numbers.

eight distinct orbits for the return paths because of its increasing velocity.

An illustration of the National Research Council's cavity accelerator is shown in Figure 2. It should be emphasized that this is not a full-scale machine. It has been set up to study the soundness of the principle involved. Not more than four or five million electron volts can be realized from a machine of this size. The results of this investigation may lead to the development of a full-scale unit, generating 100 or more million electron volts.

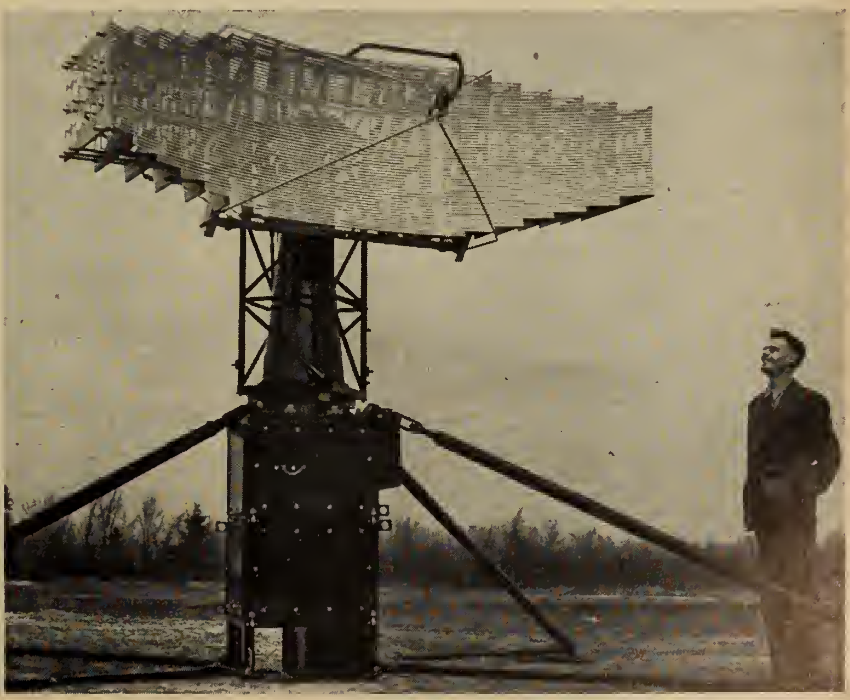
Solar Noise

Since the sun is the source of terrestrial energy, and since aberrations of the sun have been held responsible for many of our terrestrial disturbances, it has been the object of intensive study from many quarters. At the National Research Council interest was aroused in the sun's radiation through the 10 cm. portion of the spectrum. These studies have shown that radiation in the 10 cm. band is correlated very closely with sun spot number. This correlation is shown in Figure 3. Studies on longer wave lengths do not reveal this close correlation, but it is possible that some other frequency will give an even better correspondence.

During the eclipse in 1946 the radiation was studied very carefully, as the sun's disk was obscured and exposed. Fortunately, a very large sun spot was in evidence at that time, and the reduction and increase in radiation as the spot was obscured and exposed was very notable.

It is well-known that high temperatures are measured by means of pyrometry. Pyrometers, of course, utilize a very limited range of the spectrum and their operation is based on the fact that the law of black body radiation at elevated temperatures is very consistent. It is obvious, however, that some

Fig. 4. A recently developed radar antenna. ***National Film Board photo.***



other part of the spectrum might be selected for measuring temperature, and when the 10 cm. band is selected, it leads to very interesting results. The 10 cm. radiation, for example, suggests a sun's temperature well in excess of that revealed by radiation in the optical range. The scientists are busily seeking the explanation. The solution may add to our knowledge of nuclear physics, particularly in view of the fact that much of the sun's energy is attributed to atomic fission.

But these solar studies may lead to more immediate practical results. It is now possible to determine the position of the sun through its electromagnetic radiation in the radar frequency band. Such determination may be made regardless of an overcast sky, so that mariners are provided with a more reliable means of solar navigation.

Meteor Studies

For many years the astronomers have studied the performance of meteors, have charted their orbits, and have predicted their arrival in the earth's atmosphere with uncanny accuracy. The meteors themselves are usually present in clouds or showers, and consist of many fine particles of matter rarely exceeding the size of a pin head. To observe these particles either visually or by radar would be a hopeless task were it not for the fact that in entering the earth's atmosphere they leave an ionized trail which is visible, and which will reflect radar echoes.

By coordinating radar and visual observations, our knowledge of meteors and meteorites (those meteors large anough to survive the passage through the earth's atmosphere until they reach the earth's surface) can be accelerated very substantially. The radar set can see many more meteors than the visual observer during the hours of darkness, and it may continue observations throughout the day. The increased knowledge of meteors serves also to increase our knowledge of the upper atmosphere. Already the results of our trials at Ottawa in cooperation with the Dominion Observatory have lead to the postulation of a new layer in the upper atmosphere.

Part of the fundamental work in progress is directly applicable to the design of radar antennae, upon which depends so largely the performance of any radar set. The National Research Council is investigating intensively the design and performance of the various kinds of radar antennae and reflectors, paying particular attention to the antenna pattern and the sharpness of the beam. One of the recently developed radar antennae is shown in Figure 4.

In addition to the antenna work, investigations are under way on the effect of rain and snow on radar propagation, the absorption of radar waves over snow layers, and the most suitable design of radar targets for navigational markers. Also, the development of special electronic tubes, particularly in the millimeter range wavelength, is being pursued intensively.


Fig. 6. Type 268 marine radar set developed for naval service.


Fig. 5. Marine radar set.

Marine Radar Application

During the war, the National Research Council developed what was known as the Type 268 Radar Set, which was ultimately put into production at Research Enterprises Limited. This was a very successful set, and many of the war surplus units are now serving merchant ships effectively. Nevertheless, the Type 268 set was designed for naval use, and it was to be expected that it would not be ideally adapted for merchant service. The National Research Council undertook, therefore, to develop a new marine set based very largely on the wartime set, but eliminating many of the naval features which were unnecessary for merchant service. The performance in general was improved, and the inherent cost reduced to a point which would enable the set to be employed by even the smaller vessels. The performance was improved mainly by reducing the minimum range at which it will operate, since for coastal and harbour navigation the ship's master is interested in obstacles and targets at very short range.

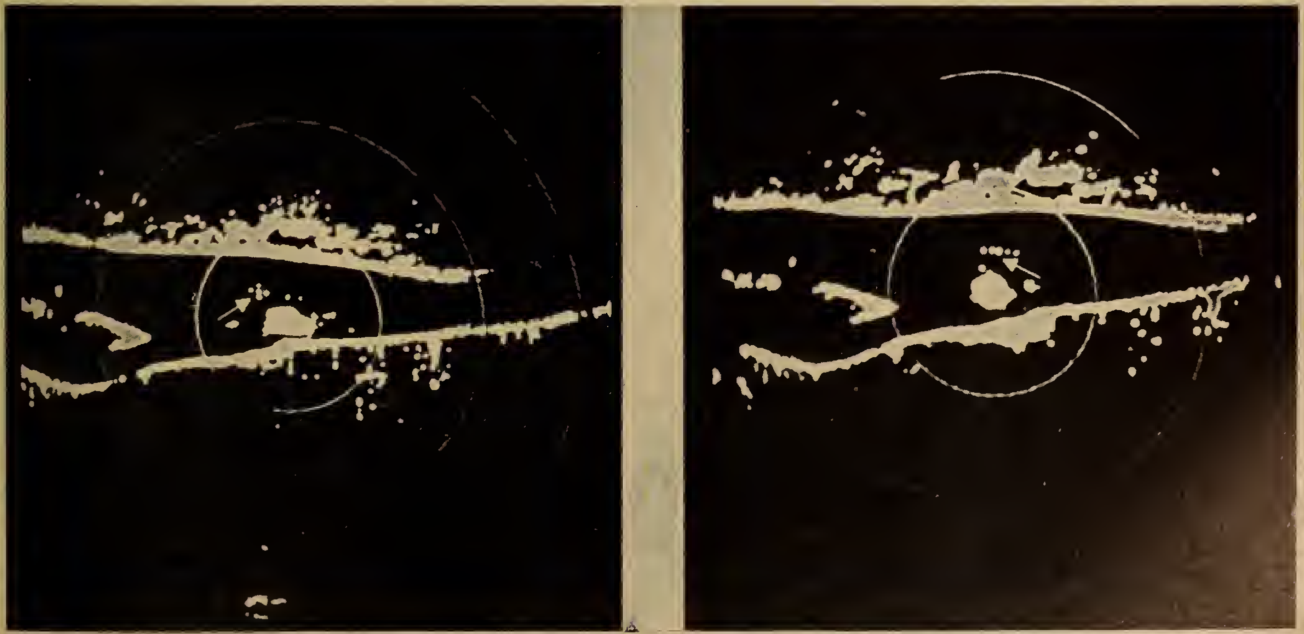
It is obvious that the echo from any target returns to the radar set after extremely short intervals. When the target is at close range, and unless the initial pulse transmitted is of exceedingly short duration, the echo from the pulse front may return before the transmission of the pulse itself has been completed. Therefore, the first objective was to reduce the pulse length of the set. This reduces the total energy of the pulse, assuming a given pulse power, and range is a function of pulse energy rather than power. However, some reduction from the possible range of the Type 268 set can be tolerated, since the latter was required to detect targets at some distance from the set itself, whereas the merchant set is more concerned with targets close at hand. Furthermore, the range over water varies approximately as the 6th root of the energy and it is obvious that a substantial reduction in energy has a relatively small effect on total range. For example, if the energy were reduced in the ratio of 40 to 7, the range would be reduced by about 25 per cent.

It must be remembered that at short range the target image appearing on the display is very close to the ship's image. Unless the images are sharp and the discrimination good, it will be difficult or impossible to separate the target and the ship on the display. Discrimination, therefore, is an important factor in reducing the minimum range of the set. This has been improved by providing a sharper beam, which in turn has been accomplished by modifying the antenna system. The necessity for a sharp beam becomes obvious when it is realized that any beam sweeping across a single point of infinitesimal dimensions on a target will return an echo during the interval that the beam illuminates the point and if that beam were 5° wide, the point's image would subtend an angle of 5° on the screen.

The marine set, as developed by the National Research Council, has a beam width in the horizontal plane of 3°, a range under normal conditions of 20 miles, and it will enable targets to be identified at ranges as close as 50 yards from the ship. As a matter of fact, the writer has been able repeatedly to follow targets up to within eight yards.

Fig. 8. M.V. "Radel".

Fig. 7. Preliminary buoy pattern trials conducted with merchant marine radar (MMR-B) equipment in the Ottawa River. 8-inch buoy reflectors, only 2 feet above water, with 50-yard separation. Arrows indicate 5-point cross and straight-line patterns used to identify shoal.



The set is exceedingly simple, and contains no controls or features which are unnecessary. The pulse power is only 10 kw, and the average power requirements are so small that the unit may be fed from the regular ship's electrical supply. The simplicity of the set will be apparent by comparing the illustration in Figure 5 with that in Figure 6. Figure 6 represents the Type 268 set, as developed for naval service.

A prominent Canadian manufacturer is now putting into production the new Merchant Marine Radar.

Harbour Control

Only a small percentage of ships are equipped with radar, and indeed many vessels, particularly in the smaller tonnages, cannot justify economically the installation of radar equipment. Moreover, the master of a radar-equipped ship, not knowing if his neighbour is similarly equipped, cannot predict the course the latter is likely to pursue under conditions of poor visibility. The congestion of traffic in harbours accentuates the problem. If however the harbour master is able to see all vessels within the harbour, whether they be equipped with radar or not, it is possible to direct harbour traffic.

With this end in view, the National Research Council has developed a harbour control unit which again employs as a basis the original Type 268 Radar Set. In the case of harbour control, however it is practicable to employ a more elaborate and complex set. It will be under the control of a fully qualified radar expert, so that the demand for simplicity is not as compelling as in the case of a ship. In order to obtain maximum discrimination, the harbour control set is equipped with a special antenna, an antenna which would be much too expensive for the majority of smaller radar-equipped vessels.

The set has been installed as an experiment at Camperdown, Nova Scotia, to control traffic in Halifax Harbour. The Department of Transport very properly is unwilling to announce the use of the set until they are fully satisfied that it is completely reliable. There is some doubt as to whether or not the harbour control unit will detect reliably the presence of smaller wooden craft, which do not give as powerful an echo as the larger metal vessels. Moreover, there is the danger that one vessel may screen from radar view the existence of a second one. These possibilities are now being studied carefully. The equipment has been in operation for a period of about one year, and the results have been most gratifying. Many of the ships' masters have spoken in glowing terms of the service which the harbour control equipment renders. A similar unit in a mobile form is now under construction, to permit a study of the most suitable harbour control for the city of Vancouver.

In general, the procedure is to follow the ship's progress on the radar chart and communicate directly with the ship's pilot by radio so as to give him suitable guidance. At one time it was proposed to achieve this communication by modulating the radar beam, that is to say, by modulating the pulse recurrence frequency. While the normal pulse recurrence rate is too low to permit a normal voice frequency range, it was possible to communicate successfully on experimental trials. However, during rough weather it was very difficult to keep the beam trained on the ship, and the proposal was finally abandoned. Other methods of communication appear to be more economical, and the use of the radar beam is restricted to its primary purpose.

One of the radar's inherent weaknesses is the fact that it is colour blind, and it will not distinguish between a red and a black navigational buoy. Nor is the discrimination sufficiently accurate for it to identify reliably different shapes of navigational aids. For this reason, ship's masters are reluctant to rely on radar to navigate through confined channels. Considerable study has been devoted to the possibility of providing navigational buoys which radar will identify.

Most of this effort has been devoted to the arrangement of distinctive patterns of buoys, and there is no attempt to rely on any single identifiable buoy. Five buoys arranged in various configurations enable a ship's master to identify them readily. The five buoys may be arranged in line, in a triangle, a star, a five spot on the die of a pair of dice, and in other combinations employing fewer units. It must be recongized that at best radar does not, as yet, give the same discrimination as a good optical system. If the buoys in the pattern are too close together, the radar will not identify that particular configuration. Hence, it is preferable to space the buoys at a distance of 50 yards. Figure 7 shows a radar display of a number of buoy patterns.

As a matter of interest, much of this work is carried out by the National Research Council's radar vessel, "Radel", which is shown in Figure 8. It operates for a large part of the year on Lake Ontario in conjunction with the National Research Council's Scarboro station.

Marine Radar Mapping

The "Radel" has been engaged in the development of the merchant marine radar, the buoy patterns, some studies on radar clutter due to snow and ice, and also some studies of mapping by radar. In this connection a radar map of a portion of the Ottawa River together with the corresponding chart of the Hydrographic Service is shown in Figure 9. The radar map was made as the vessel proceeded on its normal course. The chart differs from most charts in that it is plotted from a point at relatively low elevation, whereas most charts assume an observer's position well above the area charted. High precision cannot be claimed for this sort of chart, but it may become more popular as the use of radar increases, since it shows exactly what the radar set sees, rather than what the hydrographic surveyor puts on his charts. Already radar is being considered for charting certain areas although it is unlikely that the system will be used extensively.

Aerial Surveying

Perhaps one of the most interesting applications of radar is that of mapping those great unexplored areas of Canada. In undertaking conventional aerial surveys it is necessary to "locate" each photograph by having within it some fixed and known spot, usually determined by land survey. If very large areas are to be surveyed, both geodetic and topographic techniques must be employed, and the operation becomes one of considerable magnitude. By employing radar, the time and effort required can be reduced substantially.

Everyone is familiar with the conventional method of radar location,—that is, a transmitter sends out a signal which is reflected from a target. By timing the interval between transmission of signal and reception of the echo, and by noting the direction in which the signal was transmitted at the time an echo is received, the range and bearing of the target is determined. However, it is apparent if one attempts to represent a range of, say, 200 miles, on a radar display about four inches long, the degree of accuracy possible is completely inadequate for survey purposes. Nor does the measurement of bearing offer any more promise. The precise measurement of angles by radar has yet to be realized, although these measurements can be undertaken with a sufficiently high order of accuracy to be suitable for many applications. Surveying, however, is not one of these.

Fortunately, despite the remarks made earlier, radar can measure range with an exceedingly high precision. There are several methods of realizing this precision, but the one proposed for the mapping of the northern part of the country is one employing "Shoran" equipment.

The high precision with which radar ranges may be determined arises from two factors. First, the ability to measure frequency very accurately (actually to within one part in ten million) and secondly, because of the precise knowledge of the velocity of electromagnetic propagation in the atmosphere. Through knowledge of the frequency, the period of a single oscillation can be derived with corresponding precision, and knowing the velocity of propagation, the distance traversed in space by a signal during an oscillator period, is known.

It should be emphasized that the timing oscillator frequency is not necessarily the frequency of the propagated wave. The progress of the signal during an oscillator period corresponds to a wave length of the oscillator, and this term will be used in the following description. The timing oscillator wavelength, therefore, provides a very precise standard of measurement, and any system which measures an unknown distance in these oscillator wavelengths will yield an accurate result.

"Shoran"

One of the most successful systems employing this principle is the "Shoran". Briefly, an oscillator provides a standard frequency, which serves as a timing device for the initiation of a radar pulse once during each cycle. It also controls the angular velocity of a circular sweep on a cathode-ray tube display. The sweep completes exactly one revolution for each cycle of the oscillator. At a predetermined point on the sweep a signal is transmitted to the target. A pip on the circular trace indicates the return of the echo. If the frequency were selected so as to have one complete revolution correspond to a distance of one mile, then any target within the one-mile range of the radar set would register on the screen with conventional radar accuracy. A second pip appears on the display, the position of which is controlled manually, and it is the operator's duty to keep the two pips in alignment. A dial connected mechanically to the pip aligning control indicates the target's distance within the one-mile range.

Let us assume now that the radar set moves away from the target. As the distance increases, the operator adjusts the position of the second pip to coincide with that of the return echo, and the dial indicates the separation distance at any instant. As the radar set moves beyond the one-mile range, the revolving echo pip begins its second revolution, but a counter device records the fact that one complete revolution has been made by the manual follow-up. This mechanical counting continues for each succeeding mile as the radar set continues to recede. Of course, a decreasing range can be followed with equal facility. It is apparent therefore that, at any instant, the radar set indicates its distance from the target in oscillator wavelengths plus some fraction of a wavelength.

As mentioned previously, the fractional wavelength can be determined to conventional radar accuracy only. However, if the total distance embraces a large number of wavelengths, the error in the fractional wavelength will have no significant influence on the final accuracy of measurement.

The above describes a very simple but very precise ranging device. Two modifications, and we have a Shoran radar similar to that employed for precision bombing during World War II. The first modification is to employ a responder beacon instead of a dead target. The use of a responder beacon permits a substantial reduction in the power of the initial radar signal, and permits a corresponding reduction in the weight of the set, rendering it more suitable for aircraft use. Moreover, it eliminates the problem of identifying a particular target against a non-contrasting background from the aircraft. The second modification is the introduction of a second responder, with a corresponding radar receiver and a second manually operated dial. By following the pip positions of the two returning echoes the operator maintains a range indication of his radar set with respect to two separate stations.

Ranging

Undoubtedly the question will arise in the minds of many as to what occurs if the operator happens to "lose" the echo pip. He can, of course, re-align the pips, but he cannot be certain that the counter then indicates the proper number of wavelengths. With the system described above, it would be necessary to return the radar set to some known point and begin the ranging operation all over again. In actual practice, however, such a procedure is unnecessary, because the oscillator frequency can be adjusted to make one pip revolution correspond to almost any required distance. By so doing, the operator may, by a series of reductions, relocate himself regardless of where he may happen to be with respect to the responder stations, assuming of course that he is within radar range. Once he has relocated his position, the oscillator can be reset to its normal frequency.

If, instead of flying directly away from a target or responder station, the pilot flies a course across a line joining two responder stations, it is obvious that the sum of the two distances to the responder stations will gradually decrease until he reaches the joining line, and then increase. Continuous photographic records are maintained of the dial and counter readings, and from the minimum sum of the two ranges, the true range between the two stations can be computed. The computation involves a knowledge of the plane's elevation. This may be determined either by barometric or radar means, and the measurements are automatically recorded by the same camera as is used for the radar ranges.

Thus, by locating responder beacons at strategic points throughout the area to be surveyed, their positions can be determined very accurately. Subsequently, aerial topographic surveys may be undertaken, locating the plane's position with respect to these responder stations by radar. The radar used for the topographic surveys is the same as that used for the locating of the responder stations. After locating the survey plane's position with respect to the responder stations, the pilot will fly a course indicated to him by the plane's radar. It so happens that for normal photographic survey purposes it is very desirable to fly the plane in a straight line over the area to be

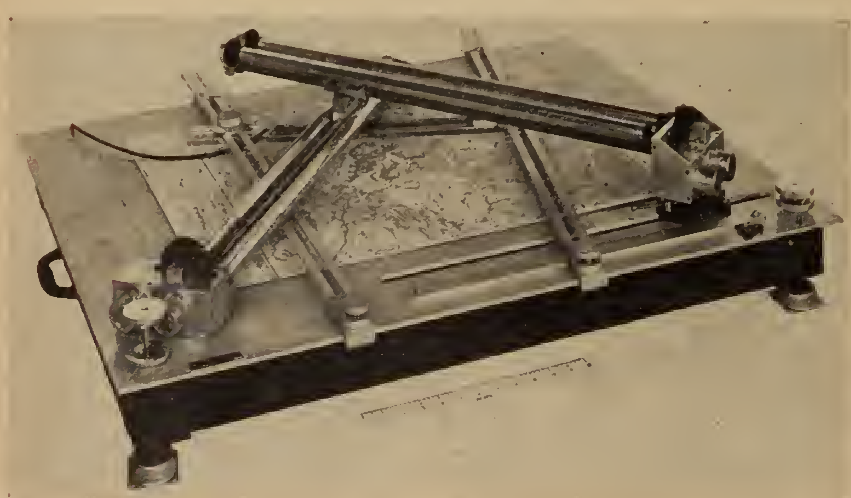
Fig. 9. Radar mosaic of Ottawa River, (composed from MMR display) with map of corresponding area.

charted. Yet shoran, as will be obvious, lends itself more readily to circular courses than to straight courses.

To overcome this difficulty the Council devised a so-called straight-line computer, which provides the pilot with the required information to follow a straight course. The computer is illustrated in Figure 10. The length of two radius arms is adjusted automatically by a servo-mechanism from the control dials of the radar, to correspond to the distances between the radar and the responder stations. A stylus is mounted at the intersection of these two radius arms, and obviously the position of the stylus on the chart corresponds with the position of the plane.

A straight-line course is laid out on the chart, and over this is placed a relatively wide strip of high resistance conducting material, each edge of which is bounded by a metallic conductor. The stylus and the outer boundaries of the strip are connected in the arms of a wheatstone bridge, and as long as the stylus is in the central part of the strip, the bridge is balanced, and an indicator on the pilot's instrument board reads zero. If the pilot deviates from the course plotted, the radar immediately detects the deviation. The servo follow-up from the straight-line computer shifts the stylus accordingly, thereby upsetting the bridge balance and indicating to the pilot that he should adjust the course. A shoran installation in a survey craft is shown in Figure 11.

Fig. 10. Straight-line computer.



This undertaking is a joint effort on the part of the Department of National Defence, the Department of Mines and Resources and the National Research Council.

The Altimeter

So far we have considered only the question of planimetric surveys, but for many purposes information on topographic elevation is exceedingly valuable. Only about 12 percent of Canada's area has been reasonably well contoured. Another 28 per cent has contouring of a "conjectural" kind, while in the remaining 60 per cent very few elevations are available. There exists, therefore, a real need for a method of rapidly and economically running elevation traverses. This problem prompted the National Research Council to undertake the development of a suitable radar altimeter.

Obviously, if the radar beam is too wide, the information gives an average elevation over a relatively large area, and is not suitable for contouring purposes. It is essential, therefore, to devise a radar set with a relatively narrow beam. This is difficult with airborne equipment, because the radar reflector or antenna must have a diameter of many times the wavelength if a narrow beam is to be realized.

At the time this development was undertaken the only equipment immediately available for the prototype models had a wavelength of

3.2 cm., which requires a parabolic reflector of about four feet in diameter to realize a beam width to half intensity of 1.6°. The problem of mounting such a reflector on an aircraft, without interfering seriously with the streamlining, was overcome as shown in Figure 12. Admittedly it is not an ideal solution. If the craft were specially designed for this type of altimeter, better streamlining could be achieved. Still better results would be possible with a smaller reflector which the adoption of 1.25 cm. equipment would permit. Altimeters of this wavelength are now under consideration.

It is of interest to note that even with a beam width of 1.6°, the area illuminated per thousand feet of altitude is 28 feet in diameter. At an altitude of 30,000 feet, the diameter of the area illuminated is 840 feet.

In ordinary contour surveying the plane will be flown at relatively low altitudes, permitting small illuminated spots, and demanding a short maximum range on the radar set. However, the possibility was borne in mind that the altimeter might be employed for shoran geodetic fixes as mentioned previously. In such a case altitudes up to 30,000 feet might be anticipated. For this reason the instrument was designed for that maximum altitude. It employs the conventional pulse with echo return. As in the case of shoran radar, however, greater accuracy was required than could be realized by contracting the whole 30,000 foot range into a single scale in the aircraft. Accordingly, a scheme similar to, although not identical with that of shoran was adopted. Instead of counting wavelengths, a manually controlled delay circuit was inserted. Thus the recorder does not commence timing the return of the echo until a predetermined interval after the transmission of the pulse.

By this means the scale of the radar instrument represents only a small part of the total range. The latter is determined by adding to the scale reading the elevation corresponding to the distance the radar signal travels during the artificial delay interval. The delay, incidentally, is inserted in blocks equivalent to 1,000 feet of elevation, each block corresponding to a delay of approximately two microseconds. The exact value of the delay must of course be determined very accurately, and is derived from an oscillator which, like the shoran oscillator, provides the ultimate standard of reference. To simplify operation, the reading is registered on the chart of a recording milliameter, and a continuous record of elevation is thus provided.

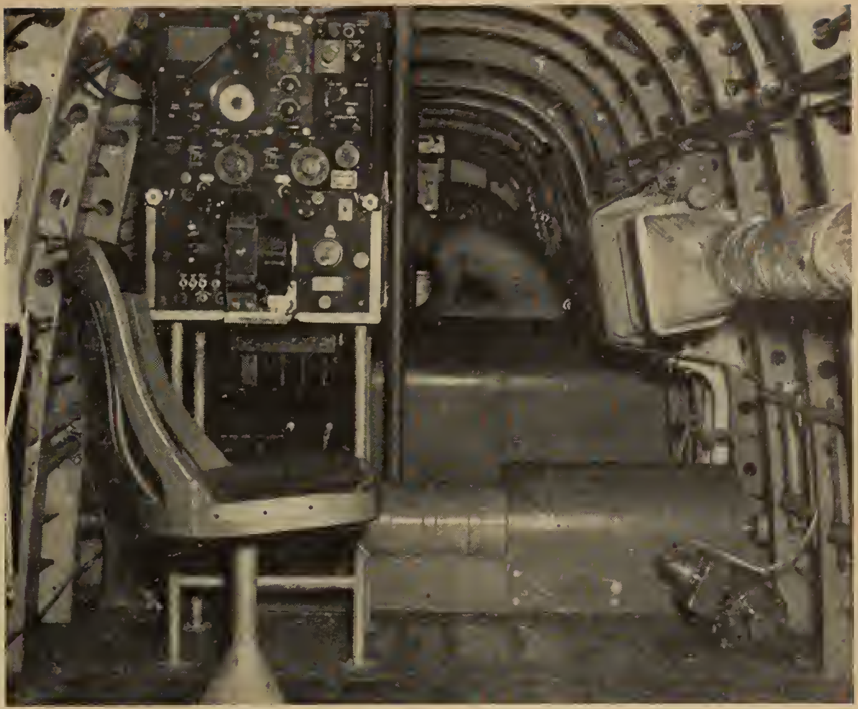


Fig. 11. Shoran installation in a survey craft. ***R.C.A.F. photo.***

Fig. 12. Altimeter antenna mounted on aircraft.

The use of radar altimeters immediately suggests the possibility of a warning device to notify a pilot when he is approaching an obstruction. The device just described is not well adapted for applications of this type. It is much too cumbersome and heavy. The total weight is approximately 350 pounds. Every pound of pay load displaced by equipment of this kind results in a loss of revenue from one hundred to two hundred dollars annually. Moreover, it is designed primarily for recording elevations directly underneath the plane. That information is of no value for an anti-collision warning; the pilot must know the elevation of obstacles some distance ahead of his plane, so that suitable corrective action may be taken. To provide this service it would be necessary to devise a

(Continued on page 391)

Localized Overheating

in the Wall of a High Pressure Vessel and its

Effect on Rupture Strength

by

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A paper presented at the Annual General and Professional Meeting of the Engineering Institute of Canada, Banff, Alta., June 4, 1948.

When a pressure vessel weighing some 90 tons, and having walls over 6 in. thick, ruptures while undergoing routine hydrostatic pressure tests, this type of failure in high pressure equipment is a serious matter. The unusual nature of such a break has resulted in a detailed investigation to determine the cause of failure and the condition of the steel in the vessel. This paper presents some of the more important aspects of the investigation. The conclusions reached should serve as a guide to other users of high pressure vessels.

This paper records a detailed investigation into the causes of failure in a heavy pressure vessel containing the catalyst used in the synthesis of ammonia. The vessel and the operating conditions are described in detail as well as the nature of the failure and the physical and metallographic examinations carried out to determine its cause. An examination of the steel indicated the formation of martensite, which caused cracking. Stresses are analysed, causes of the failure are discussed, and conclusions are arrived at. Finally some precautions necessary in the care and operation of high pressure vessels are listed.

Description of the Vessel

The vessel which failed contained the catalyst used in the synthesis of ammonia from nitrogen and hydrogen and is generally referred to as a converter column. This is designed for a maximum working pressure of 4400 psi., and consists of two almost identical halves, bolted together at the centre. Each half is a steel forging weighing about 45 tons, flanged top and bottom, and having the following principal dimensions:—(see Fig. 1.)

Total length	23	feet
Inside diameter of middle section	33.5	inches
Outside diameter of middle section	46	,,
Thickness of wall in middle section	6.25	,,
Outside diameter of flange	51.85	,,
Inside diameter of flange	29.53	,,
Thickness of wall at flange	11.16	,,

The column contains the catalyst necessary for the reaction, a heat exchanger, and an electric heating element. In order to supply the latter with current, one lead consisting of a copper rod, insulated with porcelain sleeves and asbestos, is taken through a hole 1.42 in. in diameter in the top flange. The other lead is grounded to the body of the column. The power for the heater is supplied from a 250 kva. transformer with secondary taps of 50 to 220 volts. The insert in Fig. 1 shows the manner in which the lead-in conductor is installed in the column.

Operating Conditions

Figure 2 is a flow diagram of an ammonia synthesis unit, of which the converter column is a part. The unit consists of compressor *A*, converter column *B*, cooler *C*, condenser column *D* and circulating pump *F*. Since the failure occurred in the converter column, only its operation will be considered in any detail.

A mixture of hydrogen and nitrogen in the proportions of 3:1 by volume enters the top of converter *B* at a temperature of 20°C. The mixture passes down between the basket containing the catalyst and the column walls, in order to keep the latter cool. It then proceeds up through a heat exchanger and through the tubes embedded in the catalyst. From here it passes down through the catalyst, where the heat of reaction raises the temperature of the gas to around 550°C. Finally it passes around the outside of the heat exchanger, leaving the column at about 160°C.

The gases, now containing about 13 per cent ammonia, pass through cooler *C*, at which point fresh gas, raised to a pressure of 3700 psi. by means of compressor *A*, is added. The gases then pass to condenser

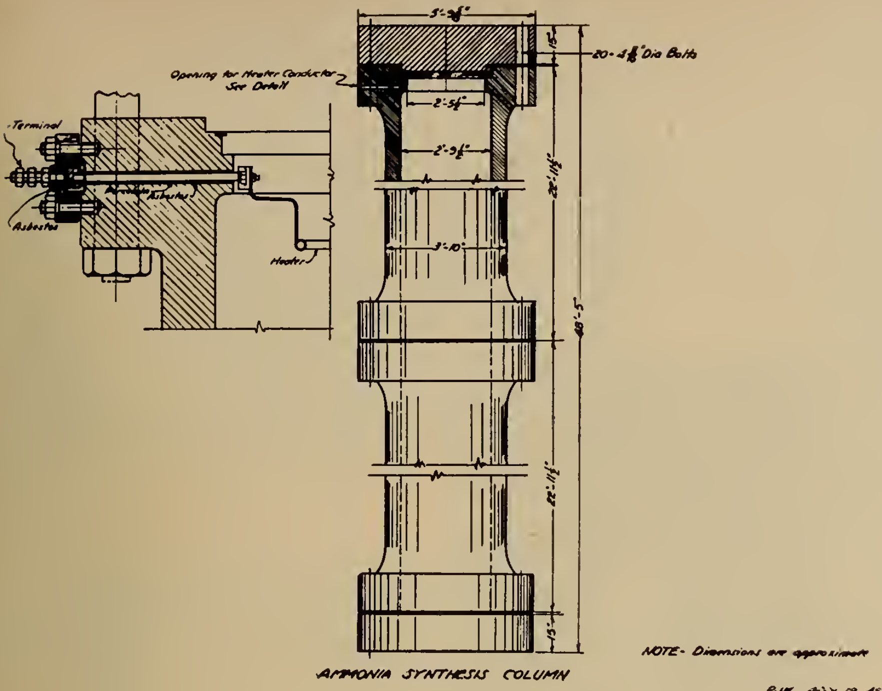


Fig. 1. Dimensioned diagram of the vessel that failed—a converter column used in the synthesis of ammonia from nitrogen.

D and evaporator *E*, where they are cooled to –20°C. Here the ammonia is removed, while the remaining hydrogen and nitrogen mixture then proceeds to pump *F* for re-circulation. While the reaction in the catalyst is normally exothermic, so that the process is self-sustaining, an electric heater is necessary for starting-up the process, and for maintaining heat when operating at low production rates.

Hydrostatic Test

As a safety measure, all high pressure equipment in the plant is periodically subjected to routine hydrostatic tests. In accordance with Provincial regulations the pressure at which the columns are tested is 1½ times the maximum working pressure, (in this case 6600 psi.) It was during one of these routine tests that the column failed at a pressure of 5500 psi. A few of the pertinent details of the test under discussion are as follows.

The maximum temperature on on the walls of the column before being taken out of service to carry out the test, was 218°C near the lower flange of the top half. The last recorded temperature in the same location after shut down was 64°C, and was taken 22½ hours before the column was filled with water. By this time the walls of the column should have cooled to room temperature.

The failure occurred during the winter months. The temperature of the water with which the column was filled prior to test was about 3°C. While temperature readings were not taken on the walls of the column before applying the hydrostatic pressure, it is fairly certain that equilibrium conditions had been reached between the water and the walls. In such case the temperature of the latter would have been somewhere between 5° and 10°C.

The hydrostatic pressure was raised over a period of 1½ hours to 5200 psi., and was then dropped to 2100 psi. in order to repair a leaking flange. The pressure was again increased slowly, and the column was suddenly ruptured at a pressure of 5500 psi.

Description of Failure

Examination of the remains of the column immediately after the failure showed a considerable amount of fragmentation had taken place. The whole appearance of the failure gave the impression of cracks having developed in a material, which was in a brittle condition. This is illustrated in Figs. 3 and 4, which are photographs taken shortly after the accident occurred, and in Fig. 5 which is a drawing showing as nearly as possible how the cracks developed in the column steel at the instant of rupture.

Further examination revealed that the fracture was trans-crystalline, (see Fig. 6) and immediately suggested that the failure was due

Fig. 2. Flow sheet for the ammonia synthesis unit.

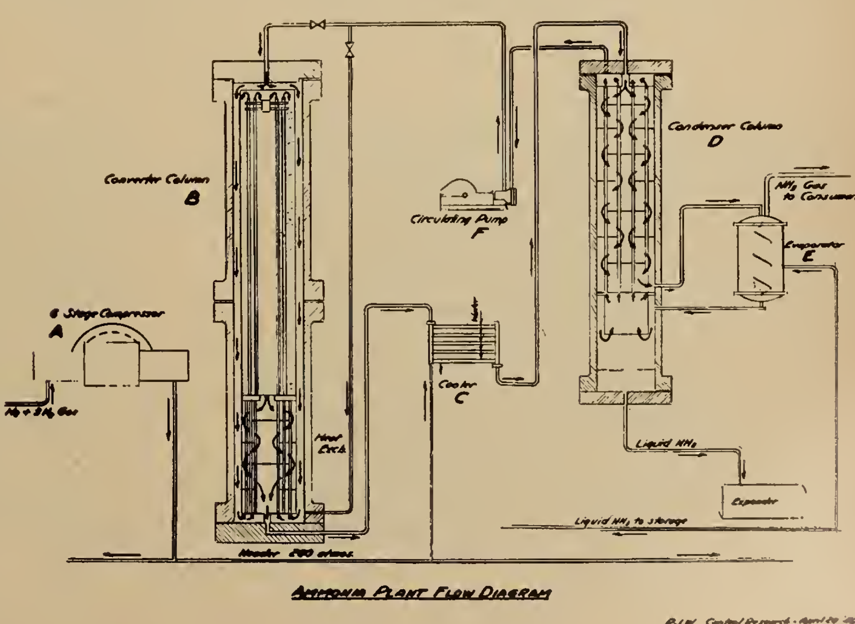


Fig. 3. Photograph of fractured portion of the column.

to almost instantaneous propagation of a small crack, such as a fatigue crack. Now it is well known that cracks in most materials are notorious stress raisers. Such cracks can, given the necessary conditions, produce stresses at their roots far in excess of the breaking strength of the material. The result is that a crack will propagate with destructive rapidity through material that is otherwise perfectly normal. The required conditions for crack propagation can be due to a number of causes, such as subjecting the material containing the crack to stresses in excess of those to which it is normally accustomed, to a sudden shock, or to a rapid reversal of stresses. The propagation of a crack in steel is invariably transcrystalline. Evidence that this was so in the case of the column is shown in Fig. 7, which is a photomicrograph of the edge of one of the main cracks.

In searching for evidence which would lead to the location of the originating crack, it was observed that one of the main cracks passed directly through the centre of the electrical lead-in port, (Fig. 8.) Further inspection of the port revealed that at some period prior to the failure it had been fused throughout its whole length, due to a short circuit between the copper lead-in conductor and the sides of the port. Several cracks had developed in the fused area. It seemed logical to assume from the results of the preliminary examination that the failure had originated in the electrical lead-in port. Yet the manner in which the crack had propagated through the main body of the column, appeared to indicate that possibly some condition in the steel itself may have been at least partially responsible for the failure.

This brought up the question as to whether the type of steel originally used in the fabrication of the column when it was purchased some twenty years before was unsatisfactory, or whether the steel had deteriorated in service. This thought was rather disturbing, as there were in operation three other columns which had been made at the same time from similar material. For this reason it was decided to carry out a complete investigation of all the factors which might have contributed to the failure. The investigations included:

(A) Complete physical and metallographical examination of the steel in the column, both in the main body of the forging and in the fused area.

(B) Analysis of mechanical and thermal stresses in the column which would be present during normal operation, and while undergoing hydrostatic tests.

Fig. 4. Photograph of the fracture.

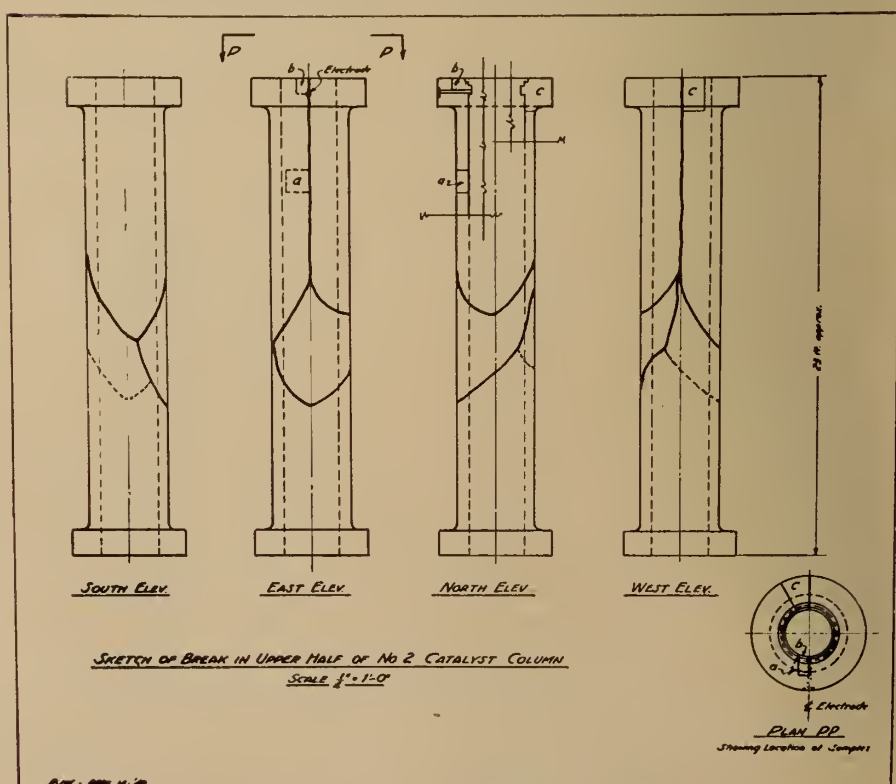
Chemical, Physical and Metallographical Examinations

A chemical analysis of the steel in main body of the forging was as follows:

C—0.31%, Si—0.21%, Mn—0.65%, Ni—1.5%, Cr—0.80%, Mo—0.08%, S—0.03%, P—0.04%.

This analysis corresponds to the familiar AISI Type 3130 nickel-chromium medium carbon forging steel. The presence of molybdenum was probably fortuitous. According

Fig. 5. Diagram of cracks in the upper half of the column.



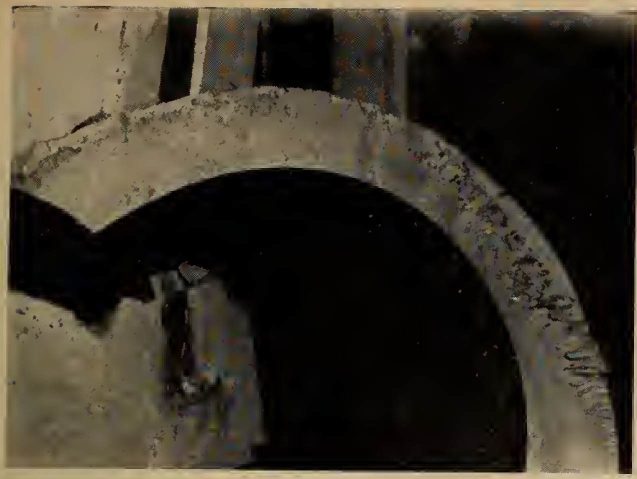


Fig. 6.

Fig. 7.

Fig. 8.

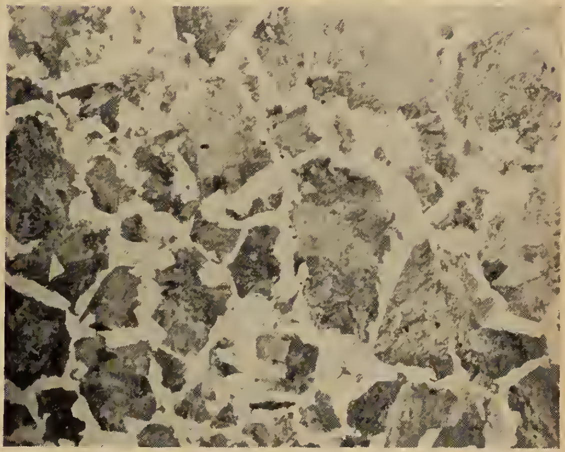


Fig. 9.

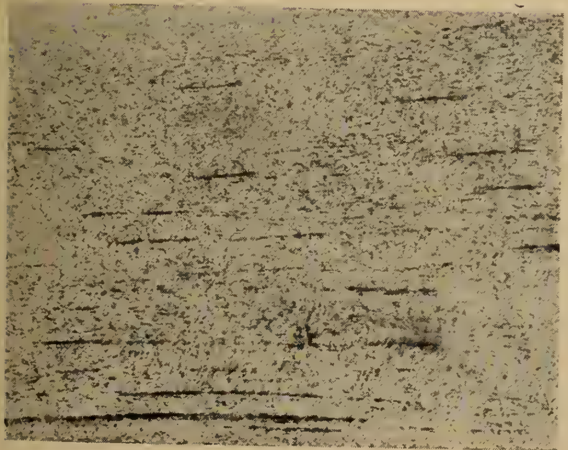


Fig. 10.

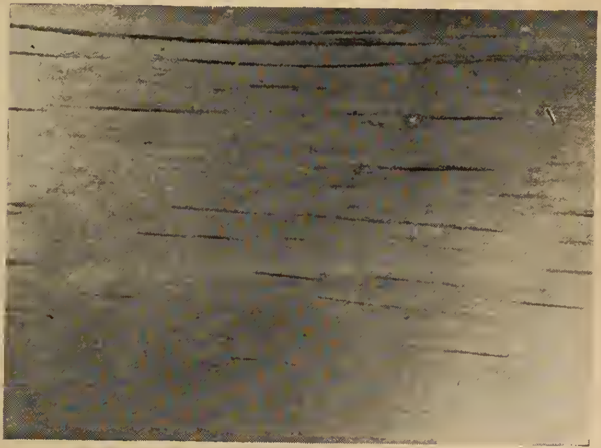


Fig. 11.

Figs. 6-11. Photographs of various aspects of the failure as detailed in the text.

to the manufacturer's specifications, the heat treatment given the column after fabrication consisted of heating to 840°C (1544°F), soaking until uniform, and allowing to cool completely in furnace.

To obtain representative samples for the physical tests, a block was cut from the column wall about four feet from the top flange, and adjacent to one of the fractures. Test specimens were cut from this block in such a manner that both longitudinal and transverse samples were obtained across the wall. While tests were carried out on samples from both orientations, it is obvious that with a vessel of this construction, only the results obtained from the transverse specimens are of real importance, and only these will be considered here. (By transverse is meant normal to the long axis of the column).

The following were the average values obtained for the physical properties of the steel:

yield strength, 46,000 psi.; tensile strength, 93,850 psi.; breaking stress, 146,230 psi.; reduction in area, 46%; elongation in 2", 23%.

Hardness—195 to 200 VPN.

Impact Strength—6 to 15 ft. lbs. (Charpy "V" notch 220 ft. lbs. at room temperature)

Metallographic

Microscopic examination of the steel (Fig. 9) showed it to be very coarse grained, being almost ASTM-3; essentially pearlitic in structure with much free ferrite, which had been rejected in heavy masses to the grain boundaries, presumably during the pre-austenitic phase. It is probable that the steel was silicon-deoxidized without regard to grain size control.

The terms austenite and martensite will be used several times during the following discussion, and a brief definition of their meaning might be in order; *Austenite* is the solid solution of iron carbide in iron, and in an ordinary carbon steel is the first phase formed as the steel solidifies from the molten state. This takes place at about 1100°C. (2012°F). *Martensite* is an extremely hard brittle phase. It is produced when a medium-carbon steel and certain alloy steels are rapidly quenched from the austenitic phase. The volume changes occurring during the formation of martensite are restrained by the rigidity of the steel, and thus result in tremendous internal stresses. Martensite is the essential constituent of hardened tool steel.

Sulphur prints (Fig. 10) showed that there had been marked sulphur segregation in the core of the original ingot, with the result that sulphur inclusions are more numerous in the wall of the column near the inside surface. The sulphur is possibly rather higher than would be considered normal in a steel of this type, but cannot be considered deleterious.

Deep etching indicated that other non-metallic impurities were low and that there were no hair cracks or flaws present. (Fig. 11.) With a vessel operating in an atmosphere of nitrogen and hydrogen, consideration had to be given to the possibility of nitriding or hydrogen embrittlement having contributed to the failure. Microscopic examination showed, however, that neither phenomenon had occurred.

Discussion of Physical and Microscopic Examination

In examining the results of the preceding series of tests, it will be seen that the steel can be considered normal for its type in the fully annealed condition, with the exception of two very important properties; viz. impact strength, which is low, and grain size, which is large. As these features, which are to a certain extent dependent on each other, have an important bearing on the type of fracture produced when the vessel failed, they will be considered in some detail.

In order to study the impact properties of a steel it is necessary to secure information regarding the variation of impact strength with temperature. If the necessary tests are made and a curve is drawn of the results obtained, it will be seen that there is a point on the curve where the impact value falls off steeply with decrease in temperature. This is known as the transition zone. (Fig. 12.) If the impact specimens are examined after breaking, it will be noticed that over this range in temperature the nature of the fracture will change from one that is tough and ductile at the upper part of the transition zone, where the temperature is high, to one that is brittle with a crystalline appearance at the lower part of the transition zone, where the temperature is low. Steels which have their transition zones at high temperatures have low impact values at room temperature, and vice versa.

One of the chief factors affecting transition temperature of a steel is the austenite grain size. This is largely controlled by the degree and manner in which deoxidization of the steel was carried out during manufacture. In general, completely deoxidized steels have a very small grain size with little free ferrite at the grain boundaries. They also have their transition zone at low temperatures. Such steels will retain these characteristics even when annealed or normalized. On the other hand, steels which have *not* been deoxidized, or only partly deoxidized, have relatively large grain size with large masses of free ferrite at the grain boundaries. The effect of this is to shift the transition zone towards the high temperature region, that is, to the right of the curve. The steel from which the column was fabricated is of this latter type. Fig. 12 shows comparative transition curves for steels that have been completely deoxidized *A*, semi-deoxidized *B*, and not deoxidized *C*.

In considering the impact properties it should be kept in mind that, irrespective of the degree of deoxidization, steels which have been quenched and tempered have characteristically lower transition zones than those which have not been so treated. Figure 13 gives the temperature-impact curve for the steel in the failed column. The values plotted are the averages for a large number of determinations made in two independent laboratories, and may be taken as fairly characteristic of the steel.

Examination of the curve shows that at room temperature (25°C) the impact value is about 12 ft.-lbs., while in the region of 5°C-10°C, which is approximately the temperature at which the hydrostatic test was carried out, the impact value is only 6 to 8 ft.-lbs. It is generally conceded that a steel for use in the fabrication of forged pressure vessels should have a grain size of about ASTM 6-8 and an impact value of at least 20 ft.-lbs. at room temperature. That the impact properties of the steel can be considerably improved by heat treatment is shown by the top curve in Fig. 13. Here the steel was heated to a temperature of 900°C (1650°F), drawn for two hours at 650°C (1200°F), and then water-quenched.

It might be asked why a grain size controlled steel, or one that had been heat treated, was not used in the original fabrication of the columns. It should be pointed out, however, that at the time the vessel was purchased, some 20 years ago, the amount of technical information available, both relating to the metallurgy of alloy steels and the design of high pressure vessels, was considerably less than it is today. At the time of manufacture the steel was considered to be entirely suitable for the purpose.

Examination of Steel Surrounding Lead-in Port

When the lead-in port was opened up it was evident that the short circuit had caused fusion to occur along the whole length of the bore. This resulted in a heat affected area penetrating the steel surrounding the hole to a depth of about 1 in., (Fig. 14). It is clear from the photograph that the heat-affected area consisted of two zones. Examination of the zone nearest the surface of the bore showed it to consist of a hard brittle copper-iron alloy, having the following approximate chemical analysis; — *Cu*—22.8%; *Fe*—74.0%; *Ni*—1.4%; and *Cr*—Trace. This zone, which had a hardness of 470 VPN, penetrated from ⅛ in. to ¼ in. and contained many small cracks.

Microscopic examination of the succeeding zone showed that it consisted chiefly of untempered martensite, into which the copper-iron alloy had penetrated along the grain boundaries. The hardness of this zone varied from 435 VPN adjacent to the copper-iron alloy, to 290 VPN near the unaffected steel of the column. This zone also contained a number of cracks, some of which had continued from the preceding zone. Fig. 15 is a photomicrograph of the heat-affected zone, showing the copper-iron alloy (dark portion). Fig. 16 shows the martensitic zone, with the penetration of the copper-iron alloy into the grain boundaries.

Evidently, the arcing which resulted from the short circuit fused the copper conductor. It also raised the steel in the walls of the port to a very high temperature. This resulted in the formation of a copper-iron alloy and also caused the steel in the vicinity to be rendered austenitic. It was while the steel was in this condition that some of the copper-iron alloy penetrated the austenite grain boundaries.

When the arc was finally interrupted, the severely heated copper-iron alloy and adjacent steel cooled with extreme rapidity. This was due to the rapid heat flow to the great mass of contiguous steel. This series of events created several conditions conducive to crack formation and propagation. In the first place the copper-iron alloy formed during the fusion is extremely hard and brittle. It would readily crack when subjected either to the very large thermal stresses set up during cooling, or to the normal repeated elastic stresses in the column during operations.

Secondly, the rapid cooling of the fused zone changed the austenite to martensite with large grain size near the surface of the bore, where the temperature was highest, decreasing to a smaller grain size at the lower temperature zone adjacent to the main body of the steel. In this connection it should be noted that the large grain size of the martensite in the heat affected zone was to some extent determined by the coarse grain size of the original steel.

During the formation of martensite it is known that large volume changes tend to occur, which in this case would be restricted by the large mass of metal surrounding the port. Tremendous stresses therefore would be set up in the fused area. These stresses could readily cause crack formation and propagation in the hard coarse grained untempered martensite.

Thirdly, the penetration of the copper-iron alloy into the martensite grain boundaries provides further stress raisers, where under proper conditions of stress, cracks could form and propagate. Fig. 17 shows a crack in the copper-iron alloy zone and Fig. 18 shows the continuation of a crack in the martensite zone. It will be observed that in a vessel of the type under review, the formation of martensite alone without the copper-iron alloy, can cause cracking. That this condition can be caused by welding is shown in Fig. 19, where a weld bead has been laid on a piece of the column steel. The martensitic zone in the heat affected area of the weld, in which cracks have developed, will be noted.

Stress Analysis

To obtain information regarding the distribution of stresses in the column under various conditions of operation and testing, the following calculations were made.

1. *Radial Stress* (S_r) which is equal to the internal pressure in the inner wall of column and since compressive, will have negative value $S_r = -P$.

2. *Tangential or Hoop Stress* (S_t) in both inner walls and outer walls of centre section and flange of column, using Lamé formula.

3. *Longitudinal Stress* (S_l) which is equal to the total pressure on end cap divided by wall area.

4. *Maximum Shear Stress* (S_o) on both inner walls and outer walls of centre sections and flange of column, using maximum shear strain energy equations of von Mises, H. Hencky and M. T. Huber. This stress is important, because if the value of the maximum shear stress becomes greater than the yield stress of the steel in the column, then the steel would start to yield.

5. *Thermal Stresses* which occur in operation, using the equations and nomographs of L. H. Baker (*Engineering* 1927, pp. 443). These stresses can be either additive to or subtractive from the stresses due to internal pressure.

6. *Combined Pressure and Thermal Stresses.* The stresses due to internal pressure which have been calculated for operating, design and hydrostatic test conditions are given in Table I. It will be seen that during operation the maximum tangential stress appears at the inner wall of the centre section of the column, and for a pressure of 3700 psi. amounts to approximately 12,000 psi., while for the same location the maximum shear stress is approximately 13,600 psi. If a yield stress for the steel of 46,000 psi. at room temperature is taken, then the factor of safety is 3.4.

When under maximum hydrostatic test pressure of 6600 psi., the tangential and shear stresses in the centre section are 21,300 psi. and 24,200 psi. respectively, and the factor of safety is 1.9. For the flange section under operating conditions the factor of safety if 4.85, and at maximum hydrostatic test pressure the factor of safety is 2.7.

In calculating the thermal stresses, the results of which are given in Table 2, a normal operating temperature difference of 20°C between the inside and outside wall of the column has been taken. It should be noted that for the inside wall of the centre section and of the flange, these stresses are compressive, and will reduce the tangential stresses due to internal pressure. On the outside walls of the centre section and the flange they are in tension, and will increase the tangential stress due to internal pressure.

The combined effect of stress due to temperature and pressure are

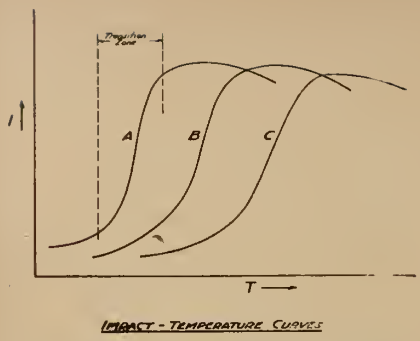


Fig. 12. Impact-temperature curves for completely deoxidized steel (A); for semi-deoxidized steel (B); and for non-deoxidized steel (C).

shown in Table 3. From these results it will be seen that, due to the inclusion of the thermal stresess, the relationship of the stresses as shown in Table 1 has reversed. The tangential and shear stresses are now greater on the outer wall of both the centre section and the flange.

That the effect of thermal stresses can be very important was demonstrated a number of years ago, when a catalyst column similar to the one under discussion developed a crack while under operating pressure, due to the temperature gradient across the wall becoming excessive. Where pressure vessels are used at elevated temperatures it is important that they be allowed to cool down sufficiently before being filled with water for hydrostatic testing. After filling, the temperature of the walls and the water should be allowed to reach equilibrium before applying the hydrostatic pressure.

In the present instance, it is interesting to note that, had a temperature gradient of 20°C existed across the walls of the vessel during hydrostatic testing, then at 6600 psi. the tangential stress on the inside wall would have amounted to around 28,000 psi., and the shear stress to about 29,000 psi. thus reducing the factor of safety in the centre section to 1.58.

The thermal stresses at the lead-in port at the time of fusion can only be guessed because actual temperature conditions are not known. For the formation of austenite however, the temperature of the heat affected zone at the surface of the bore must have been in the region of 1000°C (1832°F). If this figure is used and the heat affected zone considered as a cylinder with walls 1 in. thick, and if a logarithmic distribution of temperature is assumed, then by applying Baker's equation, the stress on the internal size of the lead-in port would be about 300,000 psi. in compression, for a temperature difference of 1000°C between the inner surface and outer surface of the heat affected zone.

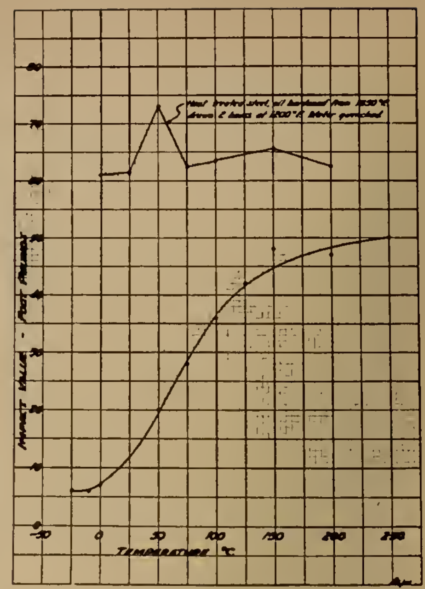


Fig. 13. Impact-temperature curve for the steel in the failed column.

Discussion

Metallographical and physical examination of the steel in the column shows that it is satisfactory

STRESSES IN WALLS OF COLUMN DUE TO PRESSURE AND TEMPERATURE

TABLE 1 - Pressure Stresses Only

	Centre Section of Column			Flange Section of Column		
	psi	psi	psi	psi	psi	psi
Internal Pressure	3700	4400	6600	3700	4400	6600
S_r(Max)	-3700	-4400	-6600	-3700	-4400	-6600
S_t(Max) Inner Wall	11,970	14,230	21,350	7,250	8,620	12,930
S_t(Max) Outer Wall	8,270	9,830	14,750	3,550	4,220	6,340
S_l(Max)	4,140	4,920	7,390	1,780	2,110	3,170
S_o(Max) Inner Wall	13,570	16,130	24,200	9,480	11,270	16,910
S_o(Max) Outer Wall	7,160	8,530	12,790	3,070	3,660	5,480

TABLE 2 - Thermal Stresses Only

Temperature Gradient Across Wall = 20°C

	Centre Section	Flange Section
	psi	psi
S_r(Max)	-464 (negligible)	-760 (negligible)
* S_t(Max)=S_l(Max) Inner Wall	-6500	-7000
S_t(Max)=S_l(Max) Outer Wall	+5500	+4900

* It should be noted that the maximum tangential stress equals the maximum longitudinal stress.

TABLE 3 - Combined Pressure and Thermal Stresses

	Centre Section of Column		Flange Section of Column	
	psi	psi	psi	psi
Internal Pressure	3700	4400	3700	4400
S_r(Max)	-3700	-4400	-3700	-4400
S_t(Max) Inner Wall	5,470	7,730	250	1,620
S_t(Max) Outer Wall	13,770	15,330	8,450	9,120
S_l(Max) Inner Wall	-2,360	-1,580	-5,220	-4,890
S_l(Max) Outer Wall	9,640	10,420	6,680	7,010
S_o(Max) Inner Wall	8,570	11,000	4,890	6,280
S_o(Max) Outer Wall	12,240	13,560	7,720	8,270

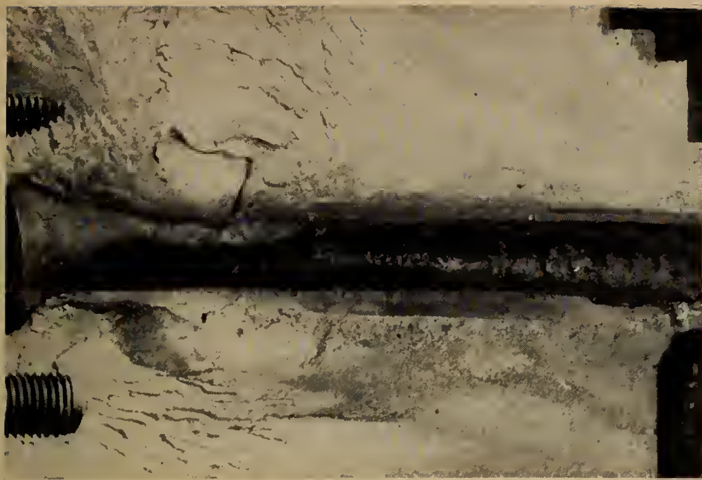


Fig. 14.

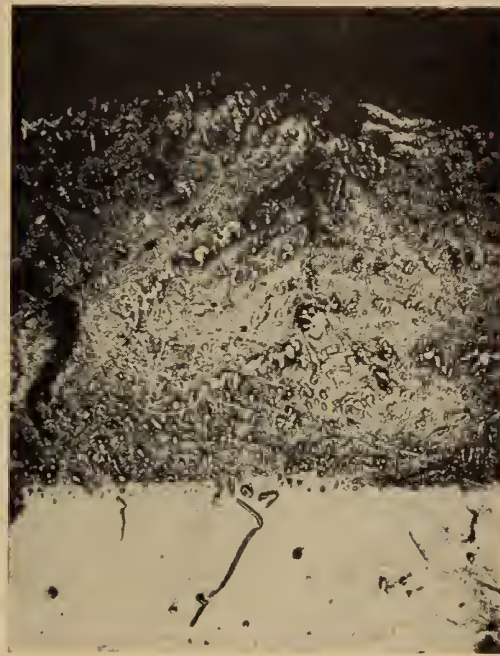


Fig. 15.

Fig. 16.

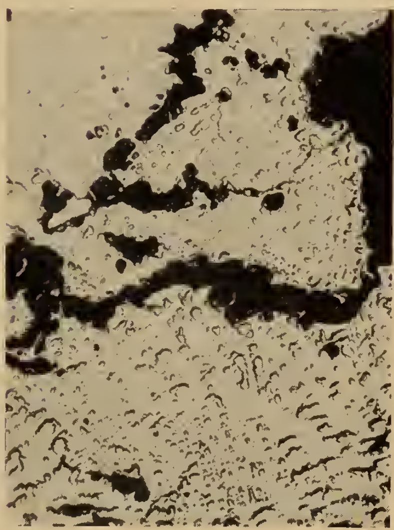


Fig. 17.

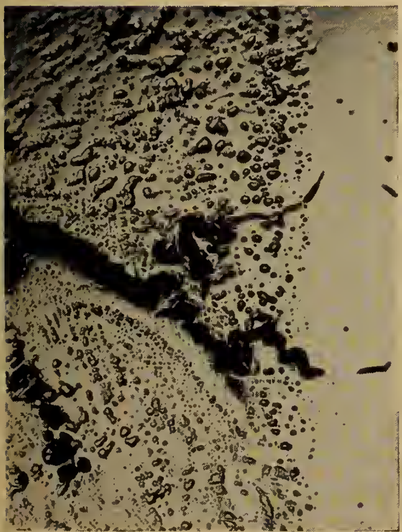


Fig. 18.

Fig. 19.

Figs. 14-19 (above) are photographs and photomicrographs relating to investigation of the steel in the region of the electrical lead-in port.

for normal operating conditions. Yet its high transition zone, together with coarse grain structure, does not make it the most desirable type of steel for the fabrication of high pressure vessels. The actual failure of the vessel, however, cannot be directly attributed to any condition existing in the steel.

A more suitable steel for the purpose would have been one with a much lower transition zone and smaller grain size. Both of these characteristics could have been obtained during manufacture of the steel by proper deoxidization, preferably by the addition of vanadium. A higher molybdenum content would also have been desirable in order to still further refine the grain size. The transition zone of the steel in the column could also have been lowered by suitable heat treatment of the vessel after fabrication, as indicated earlier in the paper. It is doubtful, however, whether a forging of this size could be quenched without serious warping taking place.

Examination of the fused area around the electrical lead-in port revealed that the high temperature to which this part had been subjected had resulted in the formation around the inside of the bore of a hard brittle copper-iron alloy zone. This was followed in depth by an untempered martensitic zone, into the grain boundaries of which the copper-iron alloy had penetrated. All these conditions resulted in an area that was highly susceptible to crack formation and propagation.

From the analysis of the normal stresses existing during operation, and while undergoing hydrostatic tests, it is evident that the yield point of the steel in the column was not exceeded under these conditions. Thus the original failure cannot be attributed to this cause.

From the foregoing considerations and the fact that one of the main cracks passed directly through the lead-in port, it may be concluded that the failure of the column was due to the almost instantaneous propagation of a crack. This crack originated in the fused area of the port, and continued through the main body of the steel in the column, which at the temperature of the test had low impact strength, and was therefore very notch-sensitive.

The original crack in the fused area of the lead-in port was probably formed by the tremendous stresses developed at the time of fusion. What "trigger" caused the crack to propagate, however, it is hard to say. The trigger may have been the increased stresses resulting from the hydrostatic pressure. It may have been a sudden shock produced by the pulsations of the hydraulic pump, or a combination of both.

It is probably extremely fortunate that the hydrostatic test was so severe in this case. There is little doubt that the cracks in the lead-in port developed when the short circuit occurred, some two years before. Although at the normal temperature of operation of the column, the steel is above the transition zone, and therefore ductile with high impact strength, once a crack had been formed it could, under certain stress conditions, have propagated with extreme rapidity through the steel. Had this occurred while the vessel was under gas pressure, as could easily have happened, the results might have been extremely serious.

Conclusions

That the column should have been allowed to continue in service after the lead-in port had been damaged might appear to be surprising. However, the massive proportions of the equipment undoubtedly gave a false sense of security, so that the serious consequences that could result from what was considered to be an apparently minor accident to the lead-in port were not fully realized. Had the column not failed under hydrostatic pressure the defect in the port might still have passed unnoticed. The inspection procedure existing at that time did not include examination for minor cracks. As a result of the failure, the remaining columns were thoroughly tested and inspected. In consequence two additional half columns, which showed evidence of fusion at the lead-in port, were immediately removed from service.

While the hydrostatic test is necessary and desirable, it is felt that in the past too much reliance has been placed on it. The need for proper and regular inspection for cracks cannot be too strongly emphasized, and the aid of such testing methods as magnaflux, radiograph, strain gauge, etc. is strongly recommended. It is also recommended that when damage has been found in high pressure equipment, the advice of a competent physical metallurgist be obtained before carrying out any repairs or placing the equipment back in service.

The result of the investigation was very reassuring insofar as the remainder of the columns was concerned, indicating as it did, that the failure, per se, was not due to any defect in the steel or the operating conditions. The investigation did point out, however, the necessity of avoiding conditions which could cause the formation of cracks of any kind in pressure vessels, particularly those having thick walls. It also showed that in vessels of this type, (apart from the effects of overheating due to local fusion) even moderate temperature differences in the walls of the vessel can cause the development of dangerous thermal stresses, which may result in the rupture of the vessel.

The following are some of the precautions which should be taken in the care and operation of high pressure vessels:

1. If the vessel has been fabricated from an alloy steel or a steel containing over 0.2 per cent carbon, do not allow any welding operations to be carried out, unless the vessel can be suitably preheated. Otherwise, welding will cause the formation of martensite with subsequent danger of crack formation. While vessels fabricated from low carbon, low manganese steels can of course be welded without danger of formation of martensite, it is preferable that they also should be preheated prior to welding. In any case, all vessels should be stress-relieved after welding.

2. Avoid heavy grinding operations on thick walled vessels, because the heat generated can cause the formation of martensite.

3. Avoid all scoring or marking of the vessel, such as rough machining, chisel marks, stamping of numbers, etc. These can cause stress concentrations with the subsequent development of fatigue cracks.

4. Do not allow large temperature gradients to exist between the inside and outside walls of the vessel during operation or hydrostatic testing.

5. If the vessel is at elevated temperatures during operation, allow it to cool to approximately room temperature before filling with water for hydrostatic tests. Before applying the pressure allow the temperature of the water and walls of the column to come to equilibrium.

6. Following hydrostatic testing, examine the vessel carefully, prefer-

ably by the magnaflux method, for any cracks or defects.

7. Avoid subjecting the vessel to a heavy blow while under pressure. The shock may be sufficient to act as a "trigger" for the propagation of a small crack.

Acknowledgments

In preparing this paper the author is indebted to the following; Dr. Robert F. Mehl, director, Metals Research Laboratories, Carnegie Institute of Technology, who was retained as consultant in the investigation; Metallurgical Laboratories, Bureau of Mines, Ottawa, who conducted an independent investigation into the physical properties of the steel in the vessel; members of the staff of the Materials Testing Laboratory, C.M. & S. Co., who carried out the majority of the investigation work and prepared the photographs; Mr. E. M. Stiles, chief engineer and Mr. E. Mason, chief designing engineer, C.M. & S. Co. for their advice during the investigation; and The Consolidated Mining and Smelting Company for permission to publish this paper. To all the foregoing, and to many others who assisted in the investigation, the author offers his most sincere thanks.

RECENT CANADIAN RADAR

(*Continued from page 381*)

scanning device, to explore the region ahead of the plane.

In surveying service, however, the problem is quite different. The survey craft can afford to carry relatively cumbersome and heavy equipment to obtain the data required. Moreover, the pilot is no longer interested in the elevation between his craft and the ground. He is interested in the ground contours. This information is given accurately only if the aircraft flies at a constant elevation above sea level. Such a requirement is impossible of realization, even with the best of pilots, because air pockets and vertical currents are encountered frequently. If accurate contours are to be charted, the level of the plane with respect to some fixed horizontal surface must be known at all times, or some other compensation must be provided.

To overcome this difficulty, the Research Council has developed a device which inserts a correction in the radar circuit. It consists primarily of a variable condenser controlled automatically by a barometric device. Any change in barometric pressure associated with a change in elevation reacts immediately on the variable condenser, and suitable compensation is made. It should be noted that as in the case of the shoran equipment, the velocity of electro-magnetic propagation varies slightly with altitude, and suitable corrections are introduced in the calculations.

The Armed Services are engaged also on the development of special equipment, and the National Research Council is cooperating in some of this work. However, it is of a secret nature and cannot be disclosed here.

It is, of course, impossible in a broad survey of this kind to discuss in great detail the individual applications. More time has been devoted to those which it is felt would be of general interest to engineers. The emphasis placed on these items does not reflect the effort devoted nor the degree of importance attached to them.

The author has emphasized particularly the work which is in progress at the National Research Council. This is due, of course, to his closer contact with that work. It is not intended to minimize the importance of work in progress in other institutions in Canada.

Two of the Prize Awards at Banff

Left—J. A. Ouimet, M.E.I.C., assistant chief engineer of the Canadian Broadcasting Corporation, receives the Ross Medal and the congratulations of the president.

Right—N. A. D. Parlee, Jr.E.I.C., is awarded the Martin Murphy Prize for his paper entitled, "Utilization of Sydney Slag for Engineering and Agriculture".

Sixty-Second Annual General Meeting

Convened at Headquarters, Montreal, on January 22nd, 1948, and adjourned to the Banff Springs Hotel, Banff, Alberta, June 1st, 1948

THE BUSINESS MEETING

The Sixty-Second Annual General Meeting of The Engineering Institute of Canada was convened at Headquarters on Thursday, January 22nd, 1948, at eight o'clock p.m., with Vice-President R. S. Eadie in the chair.

The general secretary having read the notice convening the meeting, the minutes of the Sixty-First Annual General Meeting were submitted, and on the motion of E. M. Van Koughnet, seconded by R. H. Findlay, were taken as read and confirmed.

Appointment of Scrutineers

On the motion of Huet Massue, seconded by J. M. Crawford, Messrs. J. A. Beauchemin, Leonard Cartier and E. R. Smallhorn were appointed scrutineers to canvass the officers' ballot and report the results.

There being no other formal business, on the motion of F. L. Lawton, seconded by R. H. Hobner, it was resolved that the meeting do adjourn to reconvene at the Banff Springs Hotel, Banff, Alberta, at eight o'clock p.m., on the first day of June, nineteen hundred and forty-eight.

The adjourned meeting convened at eight thirty p.m. on Tuesday, June 1st, 1948, with President L. F. Grant in the chair.

Nominating Committee — 1948

The general secretary announced the membership of the Nominating Committee of the Institute for the year 1948 as follows:

Chairman: W. F. M. Bryce, Ottawa, Ont.

Branch	*Representative*
Border Cities	T. H. Jenkins
Calgary	H. R. Younger
Cape Breton	W. E. Clarke
Cornwall	D. Ross-Ross
Edmonton	C. W. Carry
Halifax	A. E. Flynn
Hamilton	A. R. Hannaford
Kingston	D. S. Ellis
Kootenay	C. E. Marlatt
Lakehead	J. I. Carmichael
Lethbridge	A. L. H. Somerville
London	H. A. McKay
Moncton	B. E. Bayne
Montreal	Andre Benoit
Niagara Peninsula	C. G. Cline
Ottawa	E. G. Cameron
Peterborough	C. R. Whittemore
Quebec	A. E. Pare
Saguenay	K. A. Booth
Sarnia	C. F. Davison
Saskatchewan	J. McD. Patton
Sault Ste. Marie	R. A. Campbell
Saint John	G. M. Gray
St. Maurice Valley	J. F. Wickenden
Toronto	A. E. Berry
Vancouver	R. C. Pybus
Victoria	A. S. G. Musgrave
Winnipeg	G. Fansett.

Award of Medals and Prizes

The general secretary announced the awards of the various medals and prizes of the Institute as follows, stating that the formal presentation of these distinctions would be made at the annual dinner of the Institute on the evening of June 4th:

Julian C. Smith Medals—" For Achievement in the Development of Canada "—to P. L. Pratley, M.E.I.C., consulting engineer, Montreal, Que., and P. M. Sauder, M.E.I.C., general manager, Western Irrigation District, Strathmore, Alta.

Gzowski Medal—to E. A. Allcut, M.E.I.C., professor and head of the Department of Mechanical Engineering, University of Toronto, for his paper " The Smoke Problem ".

Leonard Medal—to G. S. Hume, C.I.M.M., chief, Geological Survey, Ottawa, Ont., for his paper " Results and Significance of Drilling Operations in the Athabaska Bituminous Sands ".

Plummer Medal—to E. T. W. Bailey, M.E.I.C., Steel Company of Canada, Hamilton, Ont., for his paper " Oxygen Accelerated Combustion in Open Hearth Furnaces ".

Keefer Medal—to E. P. Muntz, M.E.I.C., consulting engineer, Hamilton, Ont., for his paper " Steel Rail Piles Replace Concrete Piles ".

Ross Medal—to J. A. Ouimet, M.E.I.C., assistant chief engineer, Canadian Broadcasting Corporation, Montreal, Que., for his paper " Certain Aspects of Frequency Modulation and Television Broadcasting in Canada ".

Students and Juniors Prizes

H. N. Ruttan Prize—(Western Provinces)—to Raymond Pillman, S.E.I.C., for his paper " The Accuracy of a One-Minute Transit ".

John Galbraith Prize—(Province of Ontario)—to R. N. E. Haughton, JR.E.I.C., for his paper " Effects of Lightning on Buried Telephone Cables ".

Martin Murphy Prize — to N. A. D. Parlee, JR.E.I.C., for his paper "Utilization of Sydney Slag for Engineering and Agriculture ".

Phelps Johnson Prize—(Province of Quebec, English) — to R. B. Todd, S.E.I.C., for his paper " The Manufacture of .22 Calibre Long Rifle Cartridges ".

Ernest Marceau Prize—(Province of Quebec, French)—to R. Riopelle, S.E.I.C., for his paper "Etude, Plans et Devis d'un Generateur de Haute Frequence pour le prechauffage dielectrique d'une poudre a mouler thermostable ".

Report of Council, Report of Finance Committee, Financial Statement and Treasurer's Report

On the motion of D. M. Stephens, seconded by J. R. Dunbar, it was resolved that the report of Council,

Candid Shots at Banff

Above: Results of some fine Maritime humour by Past-President McKiel at the President's Dinner. President-Elect Finlayson, Mrs. G. F. Layne, Quebec, Vice-Presidents C. M. Anson and W. R. Manock.

Below: The President-Elect accepts a crested cigarette lighter, presented by I. P. Macnab on behalf of the City of Halifax.

Above: Some of the President's head table guests: Vice-President G. F. Layne (behind flowers), Mrs. C. M. Anson, Past-President deGaspé Beaubien, Mrs. J. N. Finlayson, Past-President H. W. McKiel, Mrs. Grant, Past-President F. P. Shearwood and Mrs. E. P. Fetherstonhaugh.

Left: Vice-President R. S. Eadie took the chair at dinner on Wednesday.

Above: Vice-President C. M. Anson introduces head table guests at luncheon on Friday. The speaker, the Honourable N. E. Tanner is seated on his right, and on the left, in the shadow of the microphone is Mrs. J. S. Neil, president of the Engineers' Wives Club of Calgary.

Right: Norman Simmons, student delegate from Queen's and chairman of the student conference.

Right: Mrs. E. S. Carpenter and Mrs. P. G. McAra, Regina, with Mrs. H. Nolan Macpherson, Vancouver.

Annual Banquet Pictures

Left: Allan C. Ross, president, Canadian Construction Association; Mrs. V. A. Newhall, Calgary; Dean J. N. Finlayson and Mrs. E. V. Buchanan, London, Ont.

Right: Mrs. L. F. Grant; Dr. Norman A. M. Mackenzie, president of the University of British Columbia, and dinner speaker; the Honourable J. C. Bowen, Lieutenant-Governor of Alberta and Dr. Grant who was chairman of the banquet.

Left: Mrs. J. B. Stirling, Montreal; Stewart Young, president of the Saskatchewan Association and chairman of the Saskatchewan Branch; Mrs. J. N. Finlayson and J. B. Stirling, president of the Corporation of Professional Engineers of Quebec, and also representing the Canadian Chamber of Commerce.

Left: R. T. Hollies, chairman of the Calgary Branch; E. V. Buchanan, vice-president of the Ontario Association; Mrs. C. S. Clendening, Lethbridge; V. A. Newhall, city commissioner of Calgary.

Right: Mrs. H. R. Banks, Trail, B.C.; Colonel H. W. Love, director of works and construction, N.D.H.Q., Ottawa; Mrs. R. T. Hollies, Calgary.

the report of the Finance Committee, the financial statement and the Treasurer's report be accepted and approved.

Reports of Committees

On the motion of R. F. Legget, seconded by J. K. Partridge, it was resolved that the reports of the following committees be taken as read and accepted: Legislation, Board of Examiners, Publication, Membership, Industrial Relations, Community Planning, Papers, Library and House, Admissions, The Young Engineer, Employment Conditions, Professional Interests, Prairie Water Problems, Canadian Standards Association, National Construction Council, Canadian Radio Technical Planning Board.

Branch Reports

On the motion of E. V. Buchanan, seconded by J. M. Fleming, it was resolved that the reports of the various branches be taken as read and approved.

Ontario Division

On the motion of W. R. Manock, seconded by G. R. Turner, it was resolved that the report of the Ontario Division be taken as read and approved.

Election of Officers

The general secretary read the report of the scrutineers appointed to canvass the officers' ballot for the year 1948 as follows:

President:

J. N. Finlayson, Vancouver, B.C.

Vice-Presidents:

Province of Ontario — J. A. Vance, Woodstock, Ont.
Province of Quebec—Alex Lariviere, Quebec, Que.
Maritime Provinces—I. P. Macnab, Halifax, N.S.

Councillors:

Victoria Branch—S. H. Frame.
Lethbridge Branch—R. S. Lawrance.
Calgary Branch—K. W. Mitchell.
Winnipeg Branch—D. M. Stephens.
Sault Ste. Marie Branch—L. R. Brown.
Sarnia Branch—R. W. Dunlop.
Niagara Peninsula Branch—P. E. Buss.
Hamilton Branch—W. A. T. Gilmour.
Toronto Branch—E. A. Cross.
Peterborough Branch—A. L. Malby.
Ottawa Branch—G. R. Turner.
Cornwall Branch—Drummond Giles.
Montreal Branch—J. M. Crawford. H. F. Finnemore.
Quebec Branch—E. D. Gray-Donald.
Moncton Branch—W. C. MacDonald.
Cape Breton Br.—W. A. MacDonald.
Halifax Branch—C. D. Martin.

On the motion of Norman Marr, seconded by C. S. Clendening, 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.

The president announced that the newly elected officers would be inducted at the annual dinner of the Institute on Friday evening, June 4th.

Retiring President's Address

In accordance with established custom, the president delivered his retiring address, which appears in full on page 399 of this issue of the *Journal.*

Vote of Thanks to the Calgary Branch

On the motion of J. A. Vance, seconded by C. M. Anson, it was unanimously resolved that a hearty vote of thanks be extended to the officers and members of the Calgary Branch in recognition of their hospitality and activity in connection with the holding of the Sixty-Second Annual General Meeting.

Vote of Thanks to Retiring Officers

On the motion of N. F. McCaghey, seconded by R. N. Coke, it was unanimously resolved that a hearty vote of thanks be accorded to the retiring president, vice-presidents and members of Council in appreciation of the work they have done for the Institute during the past year.

The meeting adjourned at nine-thirty p.m.

The Professional Meeting

The Canadian Rockies and the Banff Springs Hotel combined to provide the background for the 1948 meeting and a very acceptable background too. Six hundred and forty members and guests registered to enjoy a programme providing for consideration of technical subjects and enjoyment of social contacts, superb hotel facilities and majestic scenery. It was unfortunate that many persons who had made reservations were forced to cancel because flood conditions in British Columbia required their attention "on the job" or rendered transportation too difficult.

This is not the first time the Institute has met at Banff, but it is the first time for an Annual Meeting. Many persons expressed the opinion that this was the best meeting of all time and it was agreed generally that the annual meeting should return there at the earliest opportunity. Certainly conditions combined to make possible an outstanding event in Institute history. Even the weather, not noted for being good at that time of year, was kind and provided excellent facilities for "extra circricular" activities every day. True, it did rain a bit Thursday afternoon but not enough to stop the golfers from finishing their competition.

History

The earlier meetings in Banff were Western Professional Sessions in August 1920 and July 1925. They took the form of camps with most of the delegates and their families living in tents pitched near the junction of the Bow and Spray Rivers—a point which this year's delegates will recall as being in front of and below the front terrace of the Banff Springs Hotel.

It is interesting to note among the registration list for the 1925 meeting the names of C. E. Sisson, Toronto; G. A. Gaherty, Montreal; Dr. J. A. Allan, Edmonton, and J. M. Wardle, Banff. These names may be found also in this year's list. In contrast to the peak registration of 640 this year, the registration in 1920 was 150 and in 1925 it was just under 100.

The technical programme was longer than any offered for many years. In all there were eighteen sessions. In addition there were the customary two meetings of council, the old and the new, the conference of branch officers, the conference of students, four committee meetings and the social events such as the Banquet, the Ball and the President's Dinner. These events made up three very full days.

Prairie Water Problems

Perhaps the outstanding feature of the programme was the symposium on Prairie Water Problems. This subject has been a continuing

At the Technical Sessions

Above left: Chester B. Hamilton, Jr., Toronto, discusses "Research for National Defence" with the author, Dr. H. M. Barrett of the Defence Research Station, Suffield, Alta.

Above right: Dr. J. A. Allan addresses the opening luncheon on the subject of conservation of natural resources.

Left: J. Alex. Walker, executive engineer of the Vancouver Town Planning Commission outlines "Some Standards and Procedures for Modern Community Planning".

Left: A. H. Wilson Busby presented a paper of outstanding practical value. It concerned the failure of a high pressure vessel at the Ammonia Plant of Consolidated Mining and Smelting Co. Ltd., Trail, B.C.

Below: Major General Howard Kennedy described the work of the Eastern Rockies Forest Conservation Board at dinner on Wednesday.

Below: F. T. Gale of Calgary Power Limited, presented interesting economic facts and figures concerning "Rural Electrification".

interest of the Institute for many years under the chairmanship of G. A. Gaherty of Calgary and Montreal. The committee presented five extremely valuable papers as can be seen from the programme following these general remarks. Judging from the notice taken by the Press throughout Canada the work of the Institute is considered of great value. Certainly a group could not be found more competent to discuss these perplexing problems.

Conservation

So closely related to the water problems that it is hard to decide where one leaves off and the other begins, is the subject of Conservation of Natural Resources. The Institute committee under the chairmanship of Dr. Alan E. Cameron of Halifax contributed three papers to the programme, all of which fitted perfectly into the picture as drawn up by the programme planners. When it is remembered that the committee was authorized only a short time ago this contribution becomes more than ever noteworthy.

Oil and Gas

So closely allied were the subjects that the programme of the second day seemed almost a continuation of that of the first day. There were three papers on oil and gas with particular reference to the Alberta situation. Surely this comes under the heading of natural resources. The papers together presented an excellent account of what has been done, and what can be expected in the future.

Variety

On the third day there were seven papers of a diversified nature, covering subjects of equal interest to all parts of Canada, as can be seen from the following list. They tend to show the wide interest of the membership of the Institute for they included electrical, mechanical, metallurgical, civil and military subjects. A very successful session on the engineer's part in, and relation to, management was held also, although not shown on the official programme.

Conferences

A Conference of Branch Officers was held for the second time in two years, under the chairmanship of Mr. J. F. MacLaren, of Toronto, and Mr. G. R. Henderson, of Sarnia. A great deal of ground was covered, and a report will appear in the *Journal* as soon as the minutes are prepared and studied. It is apparent that this should be a feature of the annual meeting each year.

For the third year, a Students' Conference was held. Every university granting engineering degrees was represented and the discussions were both lively and lengthy. Dr. G. R. Langley, of Peterborough, chairman of the Institute's Committee on the Training and Welfare of the Young Engineer presided over the first two sessions after which, following the established custom, the conference was turned over to a student chairman of the delegates' own selection. This conference too, will be reported in detail in the *Journal* after the minutes and resolutions have been prepared and studied.

Speakers

The special speakers for the non-technical subjects were The Honourable N. E. Tanner, Minister of Lands & Mines for the Province of Alberta, who spoke at luncheon on Tuesday, and Dr. N. A. M. Mackenzie, president of the University of British Columbia, who spoke at the Annual Banquet. Mr. Tanner tied in the engineer to the work of his department and spoke of the great resources of his province which he believed presaged great things for Alberta. Dr. Mackenzie gave his listeners food for deep thought in expanding his subject " Some Principles for Modern Living ".

The officers and members were delighted to receive as their guests The Honourable J. C. Bowen, Lieutenant-Governor of the Province of Alberta, and Mrs. Bowen. Their presence at the banquet and in the reception line after the banquet was indeed an added pleasure for all. The opportunity to know them was appreciated, particularly by the members from the east and their wives. They were accompanied by their Aide-de-Camp, Major Sutherland, and Mrs. Sutherland.

The Kindess of Friends

Once again the Institute's many friends in the commercial world gave great aid in the conduct of the meeting. Movie films were loaned by Imperial Oil Limited (Search Unending), the Canadian Ingersoll Rand Co. (Alva B. Adams Tunnel), The Powell River Co. (River of Paper), and the Government of British Columbia (Snow Harvest).

" Muriel's Room " again was a feature made possible by industrial and commercial organizations. With the day of arrival and the day of departure added to a three day technical programme, Muriel became more than ever important, and in her generosity welcomed the entire assembly to her spacious quarters in the River View Lounge on eleven different occasions. The many friends who sponsor this feature year after year are indeed contributing much to the pleasure and success of our annual meeting. They may be assured that their interest is recognized and appreciated.

A New President

No account of an annual meeting would be complete without reference to the transfer of authority from one set of officers to another—particularly in the case of the presidency. Throughout its long history, the Institute has been most fortunate in its selection of presidents, and yet there are always feelings of regret upon the retirement of a president. This year was no exception. Dr. Grant was widely known even before he assumed office, but now numbers many more among his host of admiring friends. He was excellently suited to this honourable position—this " labour of love "—and by his interest, his intelligence, and his industry he has raised the Institute to new heights.

To offset the feeling of regret that he must leave his position of leadership, there is the rejoicing that so excellent a successor has been selected. Dean J. N. Finlayson of the University of British Columbia comes to this high office with unusual qualifications of personality and experience. His, too, will be a great year, and the applause that greeted him upon " taking over " at the banquet is but the promise of support and encouragement from the membership everywhere.

1949

The termination of one Annual Meeting is but the beginning of another. While Banff is still pleasantly fresh in the minds of so many, Quebec becomes the urgent objective of those who are charged with the planning of the meetings. The 63rd Annual Meeting of the Institute will take place at The Chateau Frontenac in Quebec City on May 11th, 12th and 13th, 1949.

Annual Meeting Technical Programme

WEDNESDAY, JUNE 2nd

The day's papers comprised a symposium on Prairie Water Problems under the chairmanship of P. M. Sauder, M.E.I.C., with an introduction by G. A. Gaherty, M.E.I.C., Chairman of the Institute's Committee on the subject.

9:30 a.m. *"Water Resources of Alberta—Their Present and Ultimate Uses."* Ben Russell, M.E.I.C., Director of Water Resources, Province of Alberta.

10:10 a.m. *"The Saskatchewan River and Manitoba's Water Problem."* D. M. Stephens, M.E.I.C., Deputy Minister of Mines and Resources, Province of Manitoba.

10:50 a.m. *"The St. Mary-Milk River Irrigation Project."* G. L. Mackenzie, M.E.I.C., Chief Engineer, P.F.R.A., Regina.

11:30 a.m. *"Irrigation in Western Canada — Its possible Effect on Industry and Population."* A. E. Palmer, M.Sc., Superintendent, Dominion Experimental Station, Lethbridge, Alberta.

12:30 p.m. Luncheon

Chairman: S. G. Coultis, M.E.I.C., President and Gen. Manager, Valley Pipe Line Co., Ltd., Calgary and Vice-President of the Institute for the western region.

"The work of the Institute's Committee on Conservation of Natural Resources." Dr. Alan E. Cameron, M.E.I.C., President, Nova Scotia Technical College, Halifax.

"The place of the Engineer in the Conservation and Development of the Natural Resources of Alberta." Dr. John A. Allan, M.E.I.C., Professor of Geology, University of Alberta, Edmonton.

2:15 p.m. *"Hydro Power Development on the Eastern Slopes of the Canadian Rockies."* T. D. Stanley, M.E.I.C., Production Superintendent, Calgary Power Limited, Calgary, Alta.

3:00 p.m. Discussion of all papers.

6.30 p.m. Dinner

Chairman: R. S. Eadie, M.E.I.C., Chief Engineer, Dominion Bridge Co., Ltd., Montreal, and Vice-President of the Institute for Quebec.

"Forest Management on the Eastern Slopes." Major General Howard Kennedy, M.E.I.C., Chairman, Eastern Rockies Forest Conservation Board, Ottawa.

THURSDAY, JUNE 3rd

Canada's Petroleum Resources

9:30 a.m. *"Gas and Oil Resources of Western Canada."* Dr. G. S. Hume, O.B.E., Chief, Geological Survey of Canada, Ottawa.

Chairman: J. S. Irwin, M.E.I.C., Consulting Geologist, Calgary, Alta.

10:30 a.m. *"Gas Synthesis."* T. B. Doherty, M.E.I.C. Process Design Engineer, Imperial Oil Ltd., Sarnia.

Chairman: H. Stevens-Guille, Coordinating Engineer, Imperial Oil Ltd., Calgary, Alta.

11:30 a.m. *"Engineering Aspects of Petroleum Production."* E. D. Wilson, Imperial Oil Ltd., Calgary, Alta.

Chairman: J. F. Langston, M.E.I.C., Denton-Spencer Co. Ltd., Consulting Engineers, Calgary, Alta.

FRIDAY, JUNE 4th

General Professional Sessions

9:30 a.m. *"Research in Canada for National Defense."* Dr. H. M. Barrett, Chief Superintendent Defence Research Board, Experimental Station, Suffield, Alta.

Chairman: R. M. Hardy, M.E.I.C., Dean of Engineering, University of Alberta, Edmonton.

10:30 a.m. *"Rural Electrification."* F. T. Gale, M.E.I.C., Superintendent of Rural Electrification, Calgary Power Limited.

Chairman: J. C. Dale, M.E.I.C., Canadian Utilities Ltd., Calgary.

10:30 a.m. *"Localized Overheating in the Wall of a High Pressure Vessel and its Effect on Rupture Strength."* A. H. W. Busby, M.E.I.C. Superintendent, Engineering Research Development, Consolidated Mining and Smelting Co. Ltd., Trail, B.C.

Chairman: D. D. Morris, M.E.I.C., General Superintendent, Alberta Nitrogen Products, Ltd., Calgary.

11:30 a.m. *"Removal of Bark from Pulp Logs by the Hydraulic Method."* P. R. Sandwell, M.E.I.C., Chief Engineer, Powell River Co. Ltd., Vancouver, B.C.

Chairman: G. F. Layne, M.E.I.C., Vice-President, Price Bros. & Co., Quebec, P.Q.

12:45 p.m. Luncheon

Chairman: C. M. Anson, M.E.I.C., General Manager, Dominion Steel and Coal Corp., Ltd., Sydney, N.S. and Vice-President of the Institute for the Maritime Region.

"Engineering Enterprise." The Honorable N. E. Tanner, Minister of Lands and Mines, Province of Alberta.

2:30 p.m. *"Recent Canadian Radar."* B. G. Ballard, M.E.I.C. Director, Radio and Electrical Engineering Division, National Research Council, Ottawa.

Chairman: H. Randle, M.E.I.C., Equipment and Waterworks Engineer, Calgary Power Ltd., Calgary, Alta.

3:30 p.m. *"Kootenay River Power Below Nelson, B.C."* W. J. Tindale, M.E.I.C., Chief Engineer, West Kootenay Light and Power Co. Ltd., Trail, B.C.

Chairman: J. A. McCrory, M.E.I.C., President, Shawinigan Engineering Co., Ltd., Montreal.

4:30 p.m. *"Physical Standards and Procedures in Modern Community Planning."* J. Alexander Walker, M.E.I.C. Executive Engineer, Town Planning Commission, City of Vancouver.

Chairman: E. Mason, M.E.I.C., Chief Designing Engineer, Consolidated Mining and Smelting Co., Trail, B.C.

7:00 p.m. Annual Banquet

Chairman: Lieut.-Colonel L. F. Grant, D.Sc., President of the Institute, Kingston, Ont.

Speaker: N. A. M. Mackenzie, C.M.G., K.C., President, University of British Columbia, Vancouver, B.C.

Address of the Retiring President

Lieut.-Col. L. F. Grant, D.Sc., M.E.I.C.

Delivered before the Sixty-first Annual General and Professional Meeting of The Engineering Institute of Canada, Banff, Alberta, June 4, 1948

The time has come for me to give an account of my stewardship and to report to this meeting on the activities of the Institute for the year.

Our membership shows an encouraging growth — the present numbers being well over 10,000—and it is interesting to note that nearly half of these are in the junior and student classes, which indicates a very healthy prospect for the future.

There are further tangible signs of growth. A third section of the Saskatchewan Branch is being set up in Prince Albert, and the first steps have been taken towards the formation of a new branch at Kamloops to include the Okanagan and Thompson Valleys.

The Engineers' Council for Professional Development held its 15th annual meeting in October last in Montreal under our auspices. This was the first time that such a meeting had been held outside the United States. There was a large attendance from the eight constituent bodies, and the Institute received many compliments on the manner in which the arrangements for the meeting were carried out.

A joint meeting with the Community Planning Association of Canada was held in Montreal in October and some excellent papers by Canadian, English and United States authorities were presented. This was the Institute's first venture on this scale in the planning field, and the results indicated a real need for the Institute to continue its interest and its activity. We are indebted to His Worship the Mayor and the Corporation of Montreal for providing entertainment for the ladies at both of the above meetings.

Five meetings of Council have been held away from Montreal,—two in Toronto, and one each in Banff, Halifax and Quebec. It is the policy of Council to have as many meetings as possible away from Headquarters for the benefit of those councillors who do not live in Montreal.

In response to the appeal of many life members, some thought was given to work which this group might do for the Institute and for the profession. Professor C. M. McKergow, has undertaken the work of circulating a questionnaire among them outlining several proposals and asking them to comment thereon. This work is continuing.

President L. F. Grant.

The work of the Committee on the Training and Welfare of the Young Engineer has continued under the chairmanship of Dr. G. R. Langley, of Peterborough. As in the past two years, under the auspices of this committee, representatives of all the degree-granting Universities in Canada have been brought together at Banff to confer on matters of interest to students, and,—more important,—to meet the older members of the Institute.

Our relationship with sister organizations has claimed the attention of the officers on several occasions during the year, and I am glad to say that certain points of difference and of misunderstanding have been cleared up. In my opinion corporate union of engineering bodies is not possible at the present time, nor do I consider that it is necessarily desirable. I do think, however, that unity of effort in major matters of policy is essential for the welfare of the profession, and I feel that with the co-operation and goodwill of other engineering organizations, good progress is being made.

The question of labour legislation affecting engineers came before Council again this year. It will be recalled that the membership of the Institute was opposed to the inclusion of engineers in collective bargaining legislation, unless such legislation provided bargaining by engineers for engineers. It having been made clear to the officers of the Institute that there was no hope of securing such special legislation, Council recommended to the Minister of Labour that engineers should be excluded from the provisions of the proposed Industrial Disputes Act.

When, in early April, 1948, the draft of the Act was presented for first reading as House of Commons Bill 195, it excluded engineers, using the following words: "Employee . . . does not include a member of the medical, dental, architectural, engineering or legal professions qualified to practise under the laws of a province and employed in that capacity." It is to be noted that the Dominion Government thus definitely places engineering among the learned professions, something that we have sought for many years. This appeared very satisfactory to Council, and the Minister of Labour was so informed, with our recommendation that the Bill be adopted as drafted.

This action of Council has since been approved by all the Western branches and by several of the Eastern ones, and the only contrary opinions that have been expressed are those of the Toronto, Peterborough and Moncton branches, and some individual members in Toronto and in Ottawa.

Council believes, therefore, that its action is approved by the vast majority of the membership of the Institute.

It is also very striking and very gratifying to note that the eight provincial engineers' associations have also expressed approval of the Bill, as well as the Canadian Institute of Mining and Metallurgy and the Chemical Institute of Canada.

It appears, therefore, that the engineering profession is very strongly in favour of being treated as a profession rather than as a trade or craft.

While this result is satisfactory to Council and to most of the membership, I believe that it lays a heavy responsibility on the older engineers, and especially on those in managerial positions. There is no doubt that certain of the younger men, notably in the more highly industrialized parts of the country, believe that collective bargaining is, or can be of benefit to them, and it is for those who are in positions of authority to show that the rights and reasonable aspirations of their younger brothers in the profession will be as well protected without collective bargaining as with it.

Unless this is done the question may lead to a cleavage in the future between the younger and the older engineers which will be very detrimental to our profession.

The Institute has continued its efforts to have the customs tariff replaced on plans entering this country from outside. The removal of the tariff has not only taken employment from Canadian consulting engineers, but because of the natural tendency of engineers from other countries to specify equipment from those countries, it has resulted in a loss of business to Canadian manufacturers.

During my term as president, I have visited all of the 28 branches of the Institute, and three other centres of engineering activity, and I have addressed the science students in sixteen Canadian universities. This task has been a most inspiring one and has given me a great deal of pride in this country, in its achievements, and the people who are in it. I have seen the greatest hydro-electric development in the world, the most up-to-date short-wave transmitting station in North America, and many other outstanding works planned and built by Canadian engineering knowledge and skill. I have seen products which have been developed and made by Canadian engineers and scientists for use in all parts of the world. I have learned something of the marvellous record of Canadian industry in the Second World War, a record in which our profession played a great and vital part.

I have seen much of what Canadian engineers in the public service are doing to make Canada a better place in which to live, and I feel very strongly that the competence of Canadians, their ability to adapt themselves to difficult and rapidly changing circumstances, their ingenuity in overcoming obstacles, warrants a far higher degree of confidence in our country, in our people, and in our profession than we have hitherto displayed. There is still a tendency on the part of too many Canadian governments and Canadian employers to disregard Canadians when engineering services are required, and I am of the opinion that a campaign across the country addressed to municipalities and to industrial organizations might well be undertaken to enlighten them as to what Canadians are capable of doing. Let us have done with this feeling of inferiority and this too-prevalent opinion that Canadians are capable of doing only the lesser work. There is nothing in the record to justify such an opinion, nor is it held by people outside of Canada.

As most of you know, Dr. Wright, our general secretary, suffered a serious illness which began in August, and from which he has not fully recovered, although his progress is now satisfactory. During his absence from the office most of his duties were performed most acceptably by our new assistant general secretary, Mr. W. D. Laird, by Miss McLaren, and the other members of the Headquarters staff. We are very glad to have again the benefit of Dr. Wright's services.

The list of persons whom I desire to thank for help and for hospitality during the past year is an impressive one. It includes the officers and many individual members of all the branches, the vice-presidents, the treasurer, councillors, and chairmen of committees, and the Headquarters staff. Finally, I owe a great deal of gratitude to the deans of Science and Engineering at the various universities who have given me the opportunity of addressing the students.

To my successor, I extend my sincere congratulations, assuring him that he is entering upon a year of great interest, and of great inspiration, and to the membership at large I wish to proffer my thanks for having given me the greatest honour of my professional life in electing me to the presidency.

I hope that my efforts during the past year have been of service to the Institute.

Presidents confer; retiring President Grant and incoming President Finlayson in an informal moment on the terrace at Banff.

From Month To Month

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

In the Years of Peace

"Probably the only guarantee of peace today is that these newer weapons are so mutually destructive to the population as a whole that any nation might well hesitate attacking another which was fully prepared. Let us remember that such preparation will only be possible in the years of peace. After war has started it will be too late".

Although they appreciated that limitations were necessarily placed on the author of the annual meeting paper "Research in Canada for National Defence" (Dr. H. M. Barrett, chief superintendent, Defence Research Board, Suffield, Alta.), many listeners regretted that he could not expand his subject to tell about the more spectacular phases of the research effort. He confined himself largely to the development and use of toxic agents for the destruction of mankind. New weapons, explosives, and the behaviour of machines, materials and men in the Arctic would have been much more exciting, but though hoping for it no one really expected to hear it.

The really significant portion of the address is quoted above. These are the last lines of the paper appearing in the May *Journal*. Not many people appreciate that only the discoveries and developments that take place in peace time can be used in war. Either we have it when the war begins or we don't have it at all. There are a few minor exceptions to this but in general the statement is true.

For instance, not a single plane was used in the last war that was not at least in the design stage before the war began. Even jet propulsion was a pre-war discovery as everyone will appreciate who heard Air Commodore Frank Whittle (now Sir Frank) at the 1947 Annual Meeting of the Institute.

It is difficult to grasp this truth, but it is frightfully important that it be grasped—particularly by those whose responsibility it is to control our war department and our research activities. Without adequate encouragement, support and leadership from these sources the danger of war will be increased greatly and the results, if war should follow will be more disastrous.

"After war has started it will be too late".

Correspondence

Dear Mr. Laird,

Enclosed is a copy of a letter received by air mail from the General Secretary of the Institution of Engineers (India) referring to the article by me published in the March, 1948 issue of the *Journal.*

On account of the indication of the widespread distribution and interest in the *Journal* you might like to publish it.

Over fifty requests for the additional nomographs were received, coming from every province of Canada as well as several from the States.

Yours sincerely,

J. Morrow Oxley, M.E.I.C.

THE INSTITUTION OF ENGINEERS (INDIA)

May 20, 1948.

J. Morrow Oxley Esq., M.E.I.C.,
Toronto, Canada.

Dear Sir,

I have seen your excellent nomograph detailed on pages 172 and 173 of *The Engineering Journal* for March, 1948, published by The Engineering Institute of Canada, and shall be grateful if you will very kindly send me separate copies of all the three nomographs for 2000-lb., 2500-lb. and 3000-lb. concretes. If you could possibly spare about 15 copies of each, I shall be very grateful to have them on payment if necessary; otherwise kindly send as many copies as you can conveniently spare.

Thanking you,

Yours faithfully,

R. D. Ratnagar,
General Secretary.

Please Note

The new telephone number of Headquarters is

PLateau 5078

Personals

Notes of the Personal Activities of Members of the Institute

A. L. H. Somerville, M.E.I.C.

Dr. Charles Camsell, M.E.I.C., was present on June 14 in London, England, to receive from the Royal Geographical Society the founders medal which was awarded to him two years ago. The award was for his contribution to the geology and geography of Canada and his work in advancing geographical science in the Dominion.

G. H. Ferguson, M.E.I.C., who retired early this year as chief of the public health engineering division of the Department of National Health and Welfare, is chairman of the board of technical advisers to the Canadian Section of the International Joint Commission re pollution of the international boundary waters of the St. Mary River, the St. Clair River and Lake St. Clair, and the Detroit River. He is also a consultant to the International Joint Commission, and to the Federal Department of National Health and Welfare, Ottawa.

During World War II he was actively engaged on public health engineering projects for the armed forces, prisoner of war camps and industrial developments. In 1938 he was an associate member of the engineering board of review re sewage disposal for the city of Toronto.

From 1923 until his retirement he was engineer in charge of developing public health engineering policies for the Federal Department of Health, now the Department of National Health and Welfare. There he worked on the national building code with special attention to the work of the committee on health and sanitation of which he was chairman. In 1919-20 Mr. Ferguson was assistant to the housing and town planning adviser of the Commission of Conservation, and in 1920-21 he was principal assistant to the chief traffic adviser of the Grand Trunk Arbitration Board, in Montreal. He served subsequently as chief inspecting engineer on the rehabilitation of lines of the Toronto Transportation Commission.

Mr. Ferguson had been with the Commission of Conservation prior to service in the first World War. Previously, he had served with the H.E.P.C. of Ontario and on surveys for the Metabetchouan River power development. He had completed post-graduate work at University of Toronto in 1907, having received the degree of B.A.Sc. in 1906.

F. L. Lawton, M.E.I.C., formerly assistant chief engineer with Aluminum Company of Canada, Limited, was recently appointed head of the newly-formed Power Department of Aluminum Laboratories Limited. Mr. Lawton is well known in North American engineering circles,

F. L. Lawton, M.E.I.C.

having been closely associated with the wartime expansion of power and other plant facilities of the Aluminum Company, especially Shipshaw. He is a former Canadian vice-president of the American Institute of Electrical Engineers and has taken a leading part in Canadian engineering activities, in the hydro-electric power field.

As head of the Power Department of Aluminium Laboratories Limited he will continue his close connection with investigation, design and constructon of water-power facilities.

C. B. R. Macdonald, M.E.I.C., returned to England recently, and has rejoined Humphreys Limited, engineers and building contractors, at Knightsbridge, London, as a director. He had been in Canada for a short time this year, after spending several years in Barbados, B.W.I., and Venezuela, S.A. Most recently he was civil engineer for Raymond Pile Company.

J. S. Bryant, M.E.I.C., has returned to the Provincial Electricity Board in Montreal. He resumes his position as an electrical engineer, which he relinquished in October last to go to the Carborundum Company at Shawinigan Falls, Que.

A. L. H. Somerville, M.E.I.C., is no longer with the Department of Transport, Civil Aviation Branch, as district airway engineer at Lethbridge, Alta. He has accepted the post of assistant city manager at Lethbridge. A graduate of University of British Columbia, Mr. Somerville joined the Department of Transport in 1936 at Coleman, Alta.

C. Garrett, M.E.I.C., is employed at the Low Temperature Laboratory of the National Research Council in Ottawa. He received a master's degree from University of Saskatchewan in September, 1947.

P. V. Palmer, JR.E.I.C., is now employed by Arborite Company Limited at Ville LaSalle, Que., as plant engineer. A graduate of Ecole Polytechnique, Montreal, 1945, he was employed by the Manitoba Paper Company Limited, Pine Falls, Man., returning to Montreal during 1947 where for a time he was with Howard Smith Paper Mills.

D. M. Venton, JR.E.I.C., is in Owen Sound, Ont., working as assistant city engineer He had been with R. V. Anderson, consulting engineer, Toronto, from 1946, but spent a short time at H. G. Acres, Niagara Falls, Ont.

L. C. Fleet, S.E.I.C., is with Canadian Westinghouse Company, Hamilton. He graduated this year from McGill University, Montreal, with the degree of B.Eng., electrical.

G. I. Hector, JR.E.I.C., recently resigned from the Bell Telephone Company of Canada, Toronto, and has accepted a position with the Lake St. John Power and Paper Company at Dolbeau, Que. He is assistant electrical superintendent.

D. F. Messervey, JR.E.I.C., recently accepted a position with Canadian Allis-Chalmers Company Limited, Toronto, in the capacity of sales engineer. He was formerly plant engineer at the Minas Basin Pulp and Power Company, Hantsport, N.S.

Obituaries

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

J. M. Anderson, M.E.I.C., who was district engineer for the Department of Public Works of Alberta at Medecine Hat, died early in June this year.

Born in Aberdeen, Scotland, in 1890, he studied civil engineering for a time at the Royal Technical College, Glasgow, Scotland. Coming to Canada, he was employed on construction work with the Canadian Pacific Railway until 1921 except for a period of service during the first world war with the Canadian Overseas Railway Construction Corps. From 1921 to 1923 he was draughtsman and office engineer for the Edmonton, Dunvegan and British Columbia Railway. In 1923-24 he was draughtsman with the Alberta and Great Waterways Railway. He then entered on his long association with the Main Highways Branch of the Department of Public Works of Alberta. He was at first resident engineer at Edmonton and later district engineer at Hanna, at Drumheller, and at Medicine Hat.

He was a member of the Association of Professional Engineers of Alberta from 1927. He had been admitted to the Institute in 1919 as an Associate Member. He transferred to Member in 1940.

N. E. D. Sheppard, M.E.I.C., well known in engineering and publishing circles as president of Canadian Engineering Publications Limited, Montreal and Toronto, died in his sleep while returning from a business trip to Toronto, on Friday morning, June 11. Mr. Sheppard was connected with the Engineering Institute staff and that of *The Engineering Journal* for many years.

He was born in Ottawa in 1891, received his primary education there and then proceeded to the University of Toronto, where he graduated in 1914 with the degree of B.A.Sc. In 1914 he became assistant engineer in the Dominion Water Power Branch, Department of the Interior, Ottawa, Ont. In 1922 he was appointed assistant to the secretary of The Engineering Institute of Canada. He was office manager for Headquarters Staff, Montreal, and assistant editor of *The Engineering Journal*. In 1932 he was appointed manager of the Publications Division of the Institute, and was responsible for the founding of The Engineering Catalogue.

It was apparent from Mr. Sheppard's work with the Institute's publications, that his future lay in the field of technical and industrial publishing and in 1938 he founded the Canadian Engineering Publications Limited. Starting with The Engineering Catalogue, which was purchased from the Institute, the company developed under Mr. Sheppard's guidance into one of the largest publishers of exclusively technical and industrial periodicals and annuals in Canada, issuing *The Engineering and Industrial Catalogue; The Architectural and Building Catalogue; New Equipment News; Building Materials News,* and *Canadian Diesel Power and Traction.* Mr. Sheppard also continued to produce the advertising section of *The Engineering Journal* until this year.

Mr. Sheppard was admitted to the Institute as a Student in 1914, transferring to Associate Member in 1916 and to Member in 1940. He was affiliated also with The Technical Advertisers Association of Montreal, the Advertising and Sales Executive Club, the Montreal Board of Trade, and other business organizations.

N. E. D. Sheppard, M.E.I.C.

R. A. Brown, M.E.I.C., the discoverer of crude oil in Western Canada in 1936, and former superintendent of the Calgary electric light and street railway departments, died May 16, 1948, at his residence in Calgary. He had been in poor health for some time.

He was one of the pioneers in the search for crude oil in Alberta and when he brought in the Turner Valley Royalties discovery well in 1936 it gave the oil industry the necessary impetus to develop Alberta as one of the leading oil fields of the British Empire.

He started his electrical career at the turn of the century when he joined the staff of the Westinghouse Electric Co., and he learned his profession by practical experience, investigation and experimentation. He kept abreast of the latest developments in the electrical field and his opinion was sought on many problems.

Mr. Brown was born at Point Pevis, Que., in 1886, and started his electrical career at the age of 15 with the Westinghouse Electric Co., at Pittsburgh and St. Louis. He came to Calgary in 1906 as superintendent of the North West Electric Co. In 1907 he was appointed city electrical superintendent at Nelson, B.C., and designed and supervised the construction of the Bonnington Falls dam and power plant during the four years he was at Nelson.

He came to Calgary in 1911 as superintendent of the electric light department and added the supervision of the street railway department to his duties in 1921. Mr. Brown retired from the city's staff in 1937 after serving for 25 years. During that period he installed electrical plants at Bassano, Gleichen, Strathmore, Cluny, Rockyford, Standard, Olds and Okotoks through the United Electrical and Engineering Co. Mr. Brown designed and installed the first fully automatic mercury arc rectifier portable substation in Calgary in 1929.

It was when he became keenly interested in the search for crude oil in Turner Valley that he relinquished his interest in electrical expansion. When the first crude oil well was brought in in Turner Valley in 1936 Mr. Brown was president of Brown, Moyer and Brown Ltd., Federated Petroleums Limited, Coastal Oils Limited and their associated companies. A total of 23 wells were drilled in the Turner Valley crude oil field under his direction.

At the age of 18, Mr. Brown was chairman of the board of examiners of Local No. 1, Electrical Union (America) and was one of the assistants of the famous scientist Charles P. Steinmetz. He was a charter member and one of the founders of the Association of Professional Engineers of Alberta of which he was president in 1921. He was a member of the American Institute of Electrical Engineers, the Western Canadian Petroleum Association, and recently received his 25-year membership plaque from the Calgary Board of Trade.

Mr. Brown was a member of the senate and board of governors of the University of Alberta and was a member of the engineering examining board, University of Alberta from 1926-1946. He became a Member of the Engineering Institute in 1941.

LIBRARY NOTES

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEWS

CENTRIFUGAL AND AXIAL FLOW PUMPS, THEORY, DESIGN AND APPLICATION:

A. J. Stepanoff. N.Y., Wiley, 1948. 428 pp., illus., 9¼ x 5¾ in., cloth, $7.50.

Reviewed by Robert W. Angus*

This book attacks the subject treated in a somewhat different way to other recent works on the pump. After a brief discussion on general flow problems specific speed and its bearing on the proportion and action of pumps is introduced, and is not lost sight of throughout the book. Practically all coefficients used are referred to this and other affinity values.

Naturally the fundamental theory is based on Euler's equation and by systematic analysis the author deduces the modifications necessary to make it fit the actual performance of the machine. The effect of whirl at impeller entrance and the pressure and velocity in it and in the casing are noticed, and the theory is given in such general form as to make it apply to axial flow impellers as well as those of low specific speed. A chapter has been devoted to "Specific Speed and Design Constants" in which the terms "unit speed" and "unit capacity" appear as in the turbine. This chapter contains a number of useful practical diagrams which relate the efficiency and the impeller dimensions to the specific speed. It is assumed that the author's twenty years experience with one of the best Pacific Coast pump builders, as well as that in his present connection, establishes the reliability of the curves and coefficients given. A brief discussion on the effect of turning down the impeller is helpful.

There is a complete chapter on the detailed method of laying out impeller vanes, a complicated matter with low specific speed pumps, and requiring much experience. Considerable attention has been given to the casing and the diffusion ring and to the radial thrust, and pressures produced in the former. In the discussion on axial flow pumps the aerofoil method of attack has been described.

In Chapter IX hydraulic losses and pump efficiency are treated in some detail but one of the most interesting features of the chapter, and indeed of the whole book, is a diagram devised by the author for determining the principal dimensions of a single suction water pump to fulfil given specified conditions of speed, head and discharge and for a selected exit vane angle. Since the diagram is the result of experience it should be reliable. Axial and radial thrust have been discussed in some detail and individual chapters have been given to Cavitation and to Shaft Design and Critical Speeds and there are many illustrations and considerable material on the selection and application of pumps.

Professor Emeritus of Mechanical Engineering, University of Toronto, Toronto, Ontario.

Pumping of oils and fluids other than water, have, in the writer's opinion been dealt with rather briefly.

While many of the practical parts of the book can be easily read other parts require careful study. The author has shown a familiarity with his subject that gives one confidence in his treatment and the lists of references at the ends of the chapters are much more complete than is usual, a feature to be especially commended. The book contains much information that will be valuable to designers, operators and purchasers of pumps and at the same time it will be stimulating to those interested in the finer points of the theory of the pump.

BRITISH INTERNATIONAL PLASTICS ANNUAL, 1947:

Croome Hill International Ltd., London, 1947. 459 pp., illus., 10¼ x 8 in., cloth, $15.00.

This book was written to provide engineers with technical data on the grades of materials available to them commercially; on where and how to contact the practical authorities on each type of material; and on the machinery and practice of application of these materials to industry. Its purpose is to furnish a central source of information on every aspect of the plastics industry.

The authors divide plastics into six types: ceramics, bitumens, vitreous materials, resins, botanical (non-resinous) plastics, and synthetic materials. The last is given special consideration in this, the first issue, and each of the others will be singled out in turn in subsequent issues.

The book opens with a short introduction to plastics and goes on to a study of the chemistry of synthetic plastics in its many aspects. In the next section on properties of synthetic plastics, accepted methods of test and their limitations are discussed and analyzed. Other sections give detailed information on fabrication processes, applications of plastics, and notes on physical tests.

In addition to the technical and practical matter contained in the work there are complete indices, not only of the common forms of plastic materials and their properties, but also a list of trade names and generic terms, the mechanical properties of synthetic plastics, the effect of chemicals upon them, and their optical and electrical properties. L.S.

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Bibliography of Cement and Concrete; List of Books and Papers in London Libraries arranged in Chronological Order:

Cement and Concrete Association, London, 1947. 79 pp., paper.

Boiler House and Power Station Chemistry, 2nd ed:

Wilfrid Francis. Toronto, Longmans, Green, 1947. 274 pp., illus., cloth.

Cours de Mécanique; Tome Second: Dynamique des Corps Solides Rigides:

Henry Favre. Paris, Dunod, 1947. 434 pp., illus., paper.

Electron Microscope; its Development, Present Performance and Future Possibilities:

D. Gabor. Brooklyn, Chemical Publishing Co., 1948. 164 pp., illus., cloth.

Fluorescent and other Gaseous Discharge Lamps:

W. E. Forsythe and Elliot Q. Adams. Toronto, Murray Hill Books, Inc., 1948. 292 pp., illus., cloth.

Inventor and his World:

H. Stafford Hatfield. West Drayton, Middlesex, England, Penguin Books, 1948. 256 pp., paper.

Progress of Paper; with Particular Emphasis on the Remarkable Industrial Development in the Past 75 Years and the Part the Paper Trade Journal has been Privileged to Share in that Development:

Lockwood Trade Journal Co., N.Y., 1947. 352 pp., illus., paper.

Rotary Valve Engines:

Marcus C. Inman Hunter. N.Y., Wiley, 1946. 216 pp., illus., cloth.

LIBRARY REGULATIONS

Hours

	Oct-May	June-Sept
Mon-Fri	9–6	9–5
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Sat (closed Jy-Aug)	9–12	9–12

Bibliographies and Extensive Literary Searches

Short subject bibliographies will be compiled on request.

Extensive searches will be made at a charge per hour of $1.50 to members, and $2.50 to non-members.

Indicate which required
Be specific

Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

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

Steam, Air, and Gas Power, 4th ed:
W. H. Severns and H. E. Degler. N.Y., Wiley, 1948. 509 pp., illus., cloth.

Surveying Instruments; their History and Classroom Use:
Edmond R. Kiely. N.Y., Columbia University Teachers College, 1947. 411 pp., illus., cloth.

Symposium on Metallurgy of Steel Welding:
D. S. Watt, ed. London, British Welding Research Association, 1948. 104 pp., illus., cloth.

Television; How it Works:
John F. Rider Publisher, Inc., N.Y., 1948. 203 pp., illus., paper.

Timestudy for Cost Control, 2nd ed:
Phil Carroll, Jr. N.Y., McGraw-Hill, 1943. 301 pp., illus., cloth.

Timestudy Fundamentals for Foremen:
Phil Carroll, Jr. N.Y., McGraw-Hill, 1944. 172 pp., illus., cloth.

Workshop Yearbook and Production Engineering Manual (II):
H. C. Town, ed. London, Elek, 1947. 567 pp., illus., cloth.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

American Society for Testing Materials:
1947 Supplements to Book of ASTM Standards including Tentatives, 1948.

Society for Experimental Stress Analysis:
Proceedings, Volume V, Number 2, 1948.

Society of Naval Architects and Marine Engineers:
Transactions, Volume 55, 1947.

TECHNICAL BULLETINS, ETC.

Cornell University. Engineering Experiment Station. Bulletin:
No. 36—Buckling of Trusses and Rigid Frames, George Winter and others.

Institute of Metals. Reprints:
Cracking during and after Solidification in some Aluminium-Copper-Magnesium Alloys of High Purity, W. I. Pumphrey and D. C. Moore.—Cracking during the Casting and Welding of the More Common Binary Aluminium Alloys, W. I. Pumphrey and J. V. Lyons.

Institution of Electrical Engineers. Publications:
Transformer Economic Efficiency, B. Calvert.

International Civil Aviation Organization. Publications:
Air Mail Study (Doc 5348-AT/654).—Final Report of the Personnel Licensing Division, Third Session, 30 March to 23 April, 1948 (Doc 5408 PEL/535).—ICAO Regional Manual—North Atlantic Amendments No. 11, May 1, 1948, 12, May 15, 1948, and 13, June 1, 1948.

Ohio State University. Engineering Experiment Station. Bulletin:
No. 131—Research on Flow Nozzles by the ASME Special Research Committee on Fluid Meters, S. R. Beitler and H. S. Bean.

Society of Naval Architects and Marine Engineers. Preprints:
No. 1—Hydrodynamic Design of the 48-Inch Water Tunnel at the Pennsylvania State College, Donald Ross and others.—No. 2—Method for the Determination of a Ship's Stability at Sea, James E. Kiernan. — No. 3 — Equipment and Methods Used in Operating the Newport News Hydraulic Laboratory.

U.S. Geological Survey. Bulletin:
No. 957-D—Geophysical Abstracts 131, October-December 1947.

...Water Supply Paper:
No. 968-B—Floods of the Puyallup and Chehalis River Basins, Washington.—999—Ground-Water Resources of the Cincinnati Area, Butler and Hamilton Counties, Ohio.—1021—Water Levels and Artesian Pressure in Observation Wells in the United States in 1944; Part 6—Southwestern States and Territory of Hawaii. — 1022 — Quality of Surface Waters of the United States, 1944.—1043—Surface Water Supply of the United States, 1945 Part 13—Snake; River Basin.—1046—Texas Floods of 1940—1047—Public Water Supplies in Eastern Texas.—1048—Discharge and Sediment Loads in the Boise River Drainage Basin, Idaho, 1939-40.—1049—Summary of Records of Surface Waters at Stations on Tributaries in Lower Colorado River Basin, 1888-1938.

U.S. Highway Research Board. Research Report:
No. 5-B—Skid Resistance Measurements of Virginia Pavements, T. E. Shelburne and R. L. Sheppe.

United Steel Companies. Statistical Section. Publications:
Report on Scrap Preparation for Melting Operations, Dorothy M. Knowles.

STANDARDS, SPECIFICATIONS, ETC.

British Standards Institution. Code of Practice:
CP(B)733—Bell and Call Systems.—CP(B)740—Drainage Below Ground.

Canadian Standards Association:
List of Electrical Equipment Approved, 2nd ed., January 1948.

Edison Electric Institute. Standards:
No. Q-3—EEI-NEMA Recommended Standards for Distribution Transformers, Overhead Type.—TD-17—Specifications for Bolt Type Steel Insulator Pins with 1-Inch Diameter Lead Threads.

PAMPHLETS, ETC.

British Engineering Societies:
L. St.L. Pendred. Toronto, Longmans, Green, 1947.

Democracy in Action:
American Standards Association, N.Y., 1948.

Eighty-four Inch Prestressed Concrete Pressure Pipe for City of Montreal:
R. M. Doull. Montreal, Engineering Institute of Canada, 1948.

Few Remarks on the Limitations of Linearized Theory in Supersonic Flow:
Zdenek Kopal. Cambridte, Mass., Massachusetts Institute of Technology, 1947.

Humanistic-Social Stem of Engineering Education; an Annotated Bibliography Compiled by the Cooper Union Library:
Cooper Union, N.Y., 1948.

Notes Introductory to the Theory and Design of Gas Turbines:
James Small. Glasgow, Hay, Nisbet and Co., 1947.

Results of the Examination of Seven Ground-Line Treatments and One Butt Treatment on Eastern White Cedar Pole Stubs after Six Years' Service:
J. F. Harkom and others. N.Y., American Wood-Preservers' Association, 1948.

Standards and Top Management:
American Standards Association, N.Y., 1948.

Thrashers:
National Institute of Agricultural Engineering, Silsoc, Bedfordshire, England, 1948.

Utilization of Wood in the Gatineau Industries:
G. D. Davidson. Montreal, Engineering Institute of Canada, 1948.

BOOK NOTES

The Institute does not assume responsibility for any statements male; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

BENTLEY'S MACHINE SHOP COMPANION, 11th ed:
Wallace Bentley. London, Bentley, 1947. 181 pp., illus., 6½ x 4¼ in., cloth, 2/6.

This little book is a guide to practical shop work. It treats of turning, capstan lathe work, machine drilling and tapping, milling, planing, shaping and slotting, broaches and broaching, templates, jigs and fixtures, press work, grinding, toothed gearing, gear cutting, rope driving, driving belts, electrical terms, electric driving, screw threads and screwed fittings, keys and shafting, die-casting practice, materials, forging and welding, hardening and tempering, workshop arithmetic, trigonometry, and logarithms.

BRITISH STANDARD FOR ANNEALED STEEL WIRE FOR OIL-HARDENED AND TEMPERED SPRINGS. BS 1429-1948:
London, British Standards Institution, 1948. 2/-.

This British Standard provides for a range of qualities of plain carbon steel and two types of alloy steels, silicon manganese and chromium vanadium, as specified in B.S.970. Included are details of manufacture, details of a test on the rod from which the wire is to be produced, methods of test on the wire, and tolerances. For each steel the chemical composition and acceptance tests are specified.

BRITISH STANDARDS INSTITUTION YEARBOOK, 1947:
London, British Standards Institution, 1947. 3/6.

The yearbook gives a subject index and a synopsis of each of the 1400 British Standards now current. These standards have been prepared by representative committees of fifty different industries. The yearbook includes lists of members of the General Council, the Divisional Councils and the Industry Committee of the Institution as well as other useful information about its work.

GROWTH OF PHYSICAL SCIENCE:

Sir James Jeans. Cambridge, the University Press, Toronto, Macmillan, 1947. 364 pp., illus., 7¾ x 5½ in., cloth, $3.50.

This is a history describing the main lines of advance of physical science, including astronomy and mathematics, in language non-technical enough to be understood by readers who have no scientific attainments or knowledge. The author covers the history of science in its beginnings in Babylonia, Egypt, Phoenicia, and Greece; he treats of science in Alexandria and science in the Middle Ages in Islam; he describes the dawn of western science; and he traces the growth of science to the present day of modern physics. In this latter part he discusses the theory of relativity, the electrical structure of matter, the quantum theory, and astrophysics and observational astronomy.

INDUSTRIAL ELECTRICAL INSTRUMENTS:

G. W. Stubbings. Manchester, Emmott, 1947. 22 pp., illus., 7¼ x 4¾ in., paper, 1/6. (Mechanical World Monographs No. 13).

This pamphlet is a guide to the different types of industrial electrical instruments. The author divides these into two main classes: indicating and graphic instruments, and integrating instruments or meters. Included are ammeters and voltmeters, current transformers, insulation test sets, meters, sub-meters for works costing, and field tests of three-phase consumption.

INTERNATIONAL CIVIL AVIATION ORGANIZATION. SURVEY ON OWNERSHIP OF AIRLINES, as at November 30th, 1947:

International Civil Aviation Organization, Montreal, 1948. illus., 10½ x 8 in., paper, 75c. (Doc 4954-AT/633).

This is a survey of the ownership of international airlines, and covers practically all scheduled airlines of the world as of November 30th, 1947. The first part contains information on ownership of airlines, country by country, in alphabetical order, and the second part presents in summarized form information on the main airline systems of the world.

ISOMETRIC DRAWING EXPLAINED:

G. H. Pearson. London, Bentley, 1947. 38 pp., illus., 7½ x 5 in., paper, 2/-.

An isometric drawing enables us to have more than one plane presented to our vision at a time. It is an aid to the clearer visualization of a complete assembly or component, and it offers a more easily assimilated alternative to orthographic illustration. Its greatest sphere of usefulness lies in drawings destined for illustrating technical articles, and in catalogue work, since it brings better understanding and interpretation to those hitherto unaccustomed to reading drawings.

APRIL JOURNALS NEEDED

A previous request for the return to Headquarters of used copies of the April, 1948, issue of the Journal, did not result in an adequate supply.

If you do not file your April copy, will you please send it to:—

The Library,
The Engineering Institute of Canada,
2050 Mansfield Street,
Montreal.

Additional copies will then be available at Headquarters for future reference.

STRUCTURAL ANALYSIS; THE SOLUTION OF STATICALLY INDETERMINATE STRUCTURES:

W. Fisher Cassie. London, Toronto, Longmans Green, 1947. 260 pp., illus., 9 x 5¾ in., cloth, $4.48.

In this text book on the principle of least work and its application to determining the stresses in a structure containing superfluous bars, the author has brought together applications of the general principles of statically indeterminate structures and their illustration by worked solutions. He has worked out numerous examples showing the practical application of theory to problem in logical sequence and with ample detail.

TABLES OF PHYSICAL AND CHEMICAL CONSTANTS AND SOME MATHEMATICAL FUNCTIONS, 9th ed:

G. W. C. Kaye and T. H. Laby. London, Toronto, Longmans Green, 1941. 181 pp., illus., 9¾ x 6½ in., cloth, $5.50.

This is an up-to-date edition of a book first published in 1911 of English physical and chemical tables, definitions and explanations. The subjects dealt with are atomic weights, units, general physics and astronomy, heat, sound, light, including spectroscopy, electricity and magnetism, x-rays, atoms, and ions, chemistry and geology, mathematical tables, and isotopes. There are bibliographies in many of the sections.

UNIVERSAL DECIMAL CLASSIFICATION, ABRIDGED ENGLISH EDITION. BS 1000A:1948:

London, British Standards Institution, 1948. 25/-.

This is the first abridgement of the full Universal Decimal Classification to be published in English, and is intended for use in libraries or private collections where detailed sub-divisions of subjects is not required, or in special libraries using the full classification in a given subject but requiring an abridged classification for other fields. The complete fourth edition in English is being published section by section.

VERTICAL BOILER DEFECTS AND REPAIRS:

Sydney D. Scorer. London, John D. Troup, 1947. 40 pp., illus., 9 x 6 in., paper, 5/6.

This pamphlet, reprinted from the Steam Engineer (London), January-July 1947, contains a series of articles dealing with vertical boiler maintenance. It treats of such subjects as the strength of shells, furnaces and endplates; vertical cross-tube boilers; firebox crown-plate corrosion; uptake connection defects and repairs; ashpit corrosion in crane boilers; corrosion of upper tube-plates in multitubular boilers; repairing tube-plates on horizontal multitubular boilers; and furnace tables for easy calculation of safe working pressure.

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.

ANNUAL REPORT ON THE PROGRESS OF RUBBER TECHNOLOGY, Vol. X, 1946.

Edited by T. J. Drakeley; published by W. Heffer & Sons Ltd., Cambridge, England, for the Institution of the Rubber Industry, 12 Whitehall, London, S.W.1, England. 129 pp., tables, 9½ x 7 in., paper, 12s.6d. to non-members; 4s.6d. to members.

Following a historical and statistical review are papers on natural and synthetic rubber. Testing equipment and processing are next discussed, followed by papers on the applications of rubber. An extensive reference list accompanies each paper. Officers and members of the Council of the Institution of the Rubber Industry are listed. There is a complete name index to both papers and references.

AUTOMATIC REGULATION, Vol. I.

W. R. Ahrendt and J. F. Taplin; preliminary edition, published and distributed by Ahrendt and Taplin, Post Office Box 4673, Washington 20, D.C., 1947. 171 pp. plus Appendices A-D, illus., diagrs., charts, tables, 8¾ x 5¾ in., cloth, $3.50.

Following a brief introductory chapter, the mathematical background is established. Differential equations and the Laplace transformation are discussed in their application to properties of closed causal loops. There is an adaptation of the methods of Fourier through frequency spectrum analysis, and the analysis of multi-loop systems is undertaken. Mechanical and electrical details of regulator design are not considered, because the practical aspects are to be covered in another volume. A bibliography, problems and a glossary complete the book.

BASIC ENGINEERING DRAWING.

H. D. Orth, R. R. Worsencroft and H. B. Doke. Irwin-Farnham Publishing Company, Chicago, Ill., 1946. 346 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $3.50.

PROBLEMS IN BASIC ENGINEERING DRAWING.

H. D. Orth, R. R. Worsencroft and H. B. Doke. Same publisher, 1946. no pagination, diagrs., tables, 11 x 9¼ in., stiff paper, spiral binding, $2.50.

The object of this text is to present the fundamentals of the subject in a logical sequence that will properly develop both the theory and the necessary manual skill. The early chapters cover instruments and materials, the basic methods of representation, lettering, and technical sketching. Succeeding chapters deal with instrumental drawing methods, tracing, geometrical constructions, dimensioning, graphs and charts, and the detailed representation of machine parts and instructions as for working drawings. A large group of drafting problems together with complemental problems in theory is contained in a separate work book.

CHAMBERS'S MINERALOGICAL DICTIONARY WITH FORTY PLATES OF COLOURED ILLUSTRATIONS.

Chemical Publishing Co., Inc., Brooklyn, New York, 1948. 47 pp., 8¼ x 5¼ in., cloth, $4.75.

Over 1400 mineralogical terms are given in this dictionary, listing briefly the chemical composition, cyrstal form and occurrences of the minerals included. Chemical and physical properties are given for the elements and certain other items. Some two hundred minerals are shown in their original colours.

ELECTRETS.

T. A. Dickinson. Plastics Research Co., Box 346, Alhambra, California, 1948. 32 pp., diagrs., charts, tables, 5½ x 4 in., fabrikoid, $2.50.

Written for engineers and technicians, this little book is devoted to methods of rearranging atoms in non-metallic materials so as to produce electrical equivalents of permanent magnets. History and theory are presented as well as potential applications. There is a bibliography of periodical articles on the subject, and pertinent books and magazines are listed.

F-M TRANSMISSION AND RECEPTION.

J. F. Rider and S. D. Uslan. John F. Rider Publisher, Inc., 404 Fourth Ave., New York, 1948. 409 pp., illus., diagrs., charts, tables, 8¼ x 5½ in., paper, $2.70.

The first half of this comprehensive work presents the underlying theory of f-m and indirect f-m (p-m), discusses the propagation of f-m signals and the basic characteristics of f-m transmitters, and presents an analysis of transmitters in use today. The second part deals with f-m receiving antennas and the f-m receivers. Four currently used types of f-m detector are covered in detail. The last two chapters describe the alignment and servicing of receivers. There is a bibliography.

FREQUENCY MODULATION, Vol. I.

Edited by A. N. Goldsmith and others, January, 1948. RCA Review, Radio Corporation of America, RCA Laboratories Division, Princeton, New Jersey, 1948. 515 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $2.50 plus $0.20 postage.

In this volume are brought together papers from various technical periodicals for the years 1936-1947. It is divided into four parts dealing with general information, transmission, reception, and miscellaneous subjects. Some papers are reprinted in full, others in summary form. Appendixes contain a frequency modulation bibliography and a list of papers dealing with F-M station placement and field survey techniques.

INFLUENCE LINES, THEIR PRACTICAL USE IN BRIDGE CALCULATION.

D. S. Stewart. 2nd ed. Constable & Company, London, W.C.2, Longmans Green, Toronto, 1947. 209 pp., diagrs., charts, tobles, 8¾ x 5½ in., cloth, 12s.6d.

Beginning with reaction and shear influence lines in simple beams, the author proceeds to deal with the analysis of various trusses and other bridge members, ending with material on bridge loadings and impact. Selected practical applications have been worked out in full for several types of structures. Although all necessary calculations are included, the mathematics has been kept as simple as possible. The use of graphical integration is demonstrated in the last chapter.

INVENTIONS, PATENTS AND MONOPOLY.

P. Meinhardt, with a foreword by J. Mould. Stevens & Sons, Ltd., London, 1946. 352 pp., tables, 8¾ x 5½ in., cloth, 25s.

Containing concise information concerning British patent law practice and procedure, this volume is divided into four parts. Part I is concerned with the characteristics of inventors and inventions; Part II, the major portion of the volume, with a concise description of the law and practice. Characteristics of a patentable invention, patent application procedure, grant of patents, maintenance of patents, and other topics are discussed. Part III is concerned with abuse of patent monopoly; and Part IV with suggestions for reform.

LAW FOR ENGINEERS AND ARCHITECTS.

L. P. Simpson and E. R. Dillavou. 3 ed. by L. P. Simpson. West Publishing Co., St. Paul, Minn., 1946. 855 pp., 9¼ x 5¾ in., cloth, $6.00 (in Conoda).

The method of presentation used in this text is to state the fundamental principles of law in those branches which bear most directly upon the engineering profession and to illustrate these principles, where space permits, with cases in which an engineer, builder, architect, or owner are involved as parties. In the new edition some 70 cases have been added, most of which were decided after 1941. Particular emphasis has been given to the law of contracts with separate chapters devoted to its various elements. Standard forms of contracts and agreements are appended.

LOCOMOTIVE CYCLOPEDIA OF AMERICAN PRACTICE 1947, 13th ed.

Edited by R. V. Wright and R. C. Augur. Simmons-Boardman Publishing Corporation, 1947. 1418 pp., illus., diagrs., charts, tables, 11¾ x 8 in., cloth, $8.00.

This standard reference book presents the latest practices in American locomotive building. It contains a dictionary of terms and data on steam, electric and Diesel-electric locomotives for industrial and export purposes. Different parts and accessories are described in detail, locomotive maintenance and operation are thoroughly covered, and an index to trade names is provided. New features are a bibliography of the literature on locomotive shop and engine terminal layout, operation and practices, and material on recent applications of Diesel engines. Over 4000 photographs and dimensional sketches illustrate the text.

NATIONAL PAINT DICTIONARY.

J. R. Stewart, E. F. Hickson and R. B. Seymour. 3rd ed. Stewart Research Laboratory, P.O. Box No. 173, Benjamin Franklin Station, Washington, D.C., 1948. 704 pp., illus., diagrs., charts, maps, tables, 9¼ x 6 in., cloth, $7.50.

This book provides practical information of interest to manufacturers, distributors, and industrial consumers of protective and decorative coatings. Old terms omitted from previous editions have been added as well as the new terms developed during the war. Errors have been corrected and the style and format altered. The definitions are direct quotations from men in the industry. The terms cover industrial raw materials, trade names, processes and methods, scientific testing instruments, and various properties of paints, such as colours, textures, etc.

PRINCIPLES OF TILE ENGINEERING, HANDBOOK OF DESIGN.

H. C. Plummer and E. F. Wanner. Structural Clay Products Institute, Washington 6, D.C., 1947. 453 pp., illus., diagrs., charts, tables, fabrikoid, $4.50.

Chapter 1 of this manual covers the manufacture, classification and properties of structural clay tile. Succeeding chapters deal with the design, construction and properties of structural tile walls, floors and roofs. Information is also given on tile masonry details, mortar, foundations, fireproofing and furring. Estimating tables and standard specifications are appended.

TORQUE CONVERTERS OR TRANSMISSIONS.

P. M. Heldt, 3 ed. P. M. Heldt, Nyack, New York, 1947. 438 pp., illus., diagrs., charts, tables, 8½ x 5¼ in., cloth, $6.00.

Of interest to designing engineers and those whose duties include the inspection, testing, servicing and repairing of automotive transmissions, this book covers the various types in use today. New developments are discussed in the chapters on hydro-kinetic torque converters, and automatic stepped transmission. Additional material explains more fully the operating principle of inertia-type transmissions. Errors of earlier editions are corrected and new illustrations added.

Although not available in the Institute Library, inquiries concerning the following new books will be welcomed there or may be sent direct to the publishers.

INDUSTRIAL ELECTRIC CONTROL.

E. S. Lincoln. Essential Books, Duell, Sloan and Pearce, New York, 1945. 374 pp., illus., diagrs., charts, tables 8¼ x 5¼ in., cloth, $3.00.

This book provides a manual for the study of the control equipment by means of which the basic voltage of all electrical apparatus is regulated. The fundamentals of control by resistance, reactance, switching and electronic means are described in a simple, straightforward manner. Following the description of equipment available, examples are given for the use of each device in different processes. Over 200 diagrams and photographs are used to illustrate the text material.

INTRODUCTORY PHYSICAL METALLURGY.

C. W. Mason. American Society for Metals, 7301 Euclid Ave., Cleveland, 3 Ohio, 1947. 134 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $3.00.

Composed of lectures given at the 1947 National Metal Congress, this volume discusses the following phases of physical metallurgy: metal crystals; alloys as solid solutions; the working and annealing of metals; the unmixing of solid and liquid solutions; solid solution in brasses and bronzes; transformations and heat treatments of iron and steel; and corrosion. All discussions are principally in general terms for the encouragement of the student.

MEASUREMENT OF COLOUR.

W. D. Wright. Adam Hilger Ltd., London, N.W.1, 1944. 223 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, 30s. (obtainable from Jarrell-Ash Co., 165 Newbury St., Boston, Mass., $9.75 plus postage).

Giving a comprehensive but concise account of the principles and methods of colour measurement and specification, this volume also describes visual and photo-electric instruments, as well as the relation of colour physics to many technical processes. The principles, methods and applications of the fundamental trichromatic system of colour measurement are described.

Mechanical World Monographs No. 26, ENGINEERING RADIOGRAPHY. 57 pp.
Mechanical World Monographs, No. 29, COSTING IN THE ENGINEERING INDUSTRY, by F. R. Coody, 62 pp.

Emmott & Co., Ltd., Manchester, England, 1946. illus., diagrs., charts, tables, 7¼ x 5 in., paper, 2s.6d. each.

No. 26. Discusses fundamental principles of radiography and the requirements of X-ray equipment. Describes the operation of X-ray plant and explains the apparatus, characteristics and technique of gamma-ray radiography and crystal analysis. The last chapter covers various applications, both of simple penetration for the detection of flaws and of diffraction methods.

No. 29. Covers cost systems generally, with additional information such as coding of materials and equipment, wage incentives, and mechanical accounting.

STRENGTH OF MATERIALS.

J. Marin. The Macmillan Company, New York, Toronto, 1948. 464 pp., diagrs., charts, tables, 9½ x 6 in., cloth, $4.75.

Written as a text for a beginning college course, this book coordinates mechanical properties under various types of static stress, analysis of stresses, and design of simple machine and structural members. Arranged in four parts, Part I deals with simple stresses, Part II with combined stresses, and Part III with statically indeterminate stresses. Special topics are considered in Part IV, and an appendix treats centroids and moments of inertia of plane areas. Tables of physical properties and design stresses for common engineering materials are included.

STORY OF THE ENGINEERS, 1800-1945.

J. D. Jefferys. Lawrence & Wishart Ltd., 81 Chancery Lane, London, W.C.2, 1946. 301 pp., illus., tables, 8¾ x 5½ in., cloth, 10s.6d.

This book, essentially a history of the Amalgamated Engineering Union in Great Britain, describes the development of the engineering trades from the beginnings of the Industrial Revolution to the present time and the efforts of the skilled workmen to better their wages and conditions of work by the trade union system. The industrial relations aspects are emphasized, and the activities of the Union, of smaller groups, and of individuals are discussed in considerable detail.

TELECASTING AND COLOUR.

K. S. Tyler. Harcourt, Brace & Co., New York, 1946. 213 pp., illus., diagrs., 8½ x 5½ in., cloth, $2.75.

Each step of a program from its inception in the studio to its appearance on the television receivers is explained in simple language. Information is given on black and white television, color television, and a new system of transmission called pulse time modulation, a method of transmitting sound and picture together. The necessary equipment is described in detail, and there is a discussion of the duties of the operating personnel in studios and control room. A short bibliography is appended.

NEWS of the BRANCHES

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented at their meetings

Hamilton

I. M. Macdonald, jr.e.i.c.
Secretary-Treasurer

L. C. Galloway, jr.e.i.c.
Branch News Editor

The Hamilton branch of the Institute held its last meeting of the 1947-48 winter season on Thursday, April 22 in the Westinghouse Auditorium in conjunction with the Toronto branch of the American Institute of Electrical Engineers. One hundred and seventy-five guests and members of the two associations attended the joint meeting.

Chairman T. C. D. Churchill of the A.I.E.E. opened the meeting and turned the chair over to A. E. Tuck of the E.I.C. The chief engineer of the Canadian Westinghouse Company, A. A. Moline, then introduced the speaker of the evening, A. W. Hill, manager of circuit-breaker engineering at the Westinghouse Electric Corporation, Pittsburgh, Pa. Mr. Hill spoke on **Ten Million KVA Circuit Breaker Engineering.**

Mr. Hill described the development of the modern circuit-breaker, illustrating his description with slides. He pointed out that 20 years ago, circuit-breakers were tested with laboratory generators which developed momentary short-circuit currents comparable to those met in the field. At the present time, however, it is not practical to carry out such tests with laboratory equipment. For example, it is possible, by switching arrangement for the 18 generators at the Grand Coulee power project to develop as much as 10 million k.v.a.

Circuit-breakers capable of interrupting short-circuits of this order have recently been built and Mr. Hill described the method of testing them and the results obtained.

At the conclusion of his address Mr. Hill responded to a brisk question period sponsored by his appreciative audience.

Montreal
Junior Section

Though the activities of the Section are at a standstill during the summer months, the Executive Council is busy preparing the programme for the 1948-49 season. Already subjects and speakers have been agreed upon. These will be announced in a later issue of the *Journal* but below are presented the main features of the Fall Session Programme.

October 4th—Opening meeting. Presentation of the programme of the year of the Group Study on "Public Speaking". At that meeting members of the Council will elaborate on "Effective Speaking", and on its value to junior engineers.

November 15th—Students Night and Film Night. Last year's success of the students Night has led the Executive Council to repeat this meeting devoted especially to student members. All students interested in participating in the evening's programme are asked to forward their names and essays to John D. McPherson, 2050 Mansfield St., Montreal.

November 19th—Annual Dance. This will be the Junior Section Fourth Annual Dance. This dance promises to be a great event again this year. Be sure to reserve your tickets well in advance, otherwise you may be disappointed as some people were last year.

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 St., Montreal—Telephone BElair 3019—may be arranged *by appointment*.

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER for technical department of pulp and paper firm in the St. Maurice Valley. Applicant must have supervisory capacity and also be able to undertake investigational work involving the coordination of laboratory experiments and mill operations. Salary open. Apply to File No. 4130-V.

CIVIL

CIVIL ENGINEER required by a Montreal firm for field inspection in Ontario and North Shore St. Lawrence. Salary open. Apply to File No. 4084-V.

CIVIL ENGINEER around 30 years of age required as Assistant City Engineer of small city in Province of Quebec. General duties eventually to replace City Manager. Salary $3,000 to $3,600 according to qualifications. Apply to File No. 4144-V.

CIVIL ENGINEER, qualified to take charge of all town services including water and electric (distribution system) utilities required by a Town in Nova Scotia. Population 4,000. Salary open. Apply to File No. 4147-V.

CIVIL ENGINEERS required in Eastern Ontario for employment as designers of service systems for housing and other building projects. Preferably men with at least 10 years' experience in that line. Salary according to qualifications. Apply to File No. 4156-V.

CIVIL ENGINEER recent graduate with up to one year's experience since graduation. Preferably single man. Required by Northern Ontario Paper Mill. Salary around $250. Apply to File No 4158-V.

ELECTRICAL

GRADUATE ELECTRICAL ENGINEER required for position with large Northern Ontario Paper Mill. Preferably man with some paper mill or other industrial experience. Salary commensurate with qualifications and experience Apply stating experience and qualifications. Apply to File No. 4032-V.

ELECTRICAL DESIGNING DRAUGHTSMEN for work with a firm of consulting engineers in Southern Ontario. Must be experienced. Salary up to $300 Apply to File No. 4133-V.

ELECTRICAL ENGINEER required for Toronto area for engineering and design of power transformers. Salary will be commensurate with ability and experience. Apply to File No. 4141-V.

ELECTRICAL ENGINEER required as Senior Transformer Draughtsman by Canadian Company in Ontario. Must be experienced in layout and design of high voltage power transformers also capable of assuming responsibility. Salary open. Apply to File No. 4146-V.

MECHANICAL

MECHANICAL ENGINEER required as Plant Engineer by large Pulp and Paper Mill. Must have paper mill engineering experience. Permanent position. Salary between $475 to $550 depending on experience. Apply to File No. 4132-V.

MECHANICAL ENGINEER required for work in Alberta by a consulting engineer in Montreal. Duties include supervision of mining machinery. Salary up to $5,000. Apply to File No. 4134-V.

MECHANICAL ENGINEER with at least 5 years experience in heavy industry preferably rolling mill required in Montreal for design, preparation of estimates, etc. Salary $300 to $350. Apply to File No. 4139-V.

MECHANICAL ENGINEER, around 35 years of age required as Assistant to Project Engineer on construction of large pulp plant. Experience in design and piping essential. Duties in Montreal and British Columbia. Salary $5,000 to $6,000. Apply to File No. 4149-V.

MECHANICAL ENGINEER recent graduate required in Engineering and Servicing Department of Canadian Firm with Headquarters in Montreal. Duties include service work in connection with Railway, Pulp Mill and other Industrial Products. Salary open. Apply to File No. 4150-V.

MECHANICAL ENGINEER with 1 to 3 years experience in production required as Industrial Engineer by industrial and chemical organization with headquarters in Montreal. Duties include responsibility for conducting methods engineering studies using techniques of process charts, time and motion study. Salary open. Apply to File No. 4152-V.

MECHANICAL ENGINEER with 2 or 3 years experience, preferably bilingual, required as Mechanical Development Engineer by industrial and chemical organization with headquarters in Montreal. Duties will be conducting investigations on existing equipment and a certain amount of plant layout work and draughting. Salary open. Apply to File No. 4155-V.

MISCELLANEOUS

GRADUATE ENGINEERS required as Assistant Professors, Lecturers and Demonstrators in Civil, Electrical and Mechanical Engineering by a Canadian University. Salaries dependent on experience and general qualifications. Apply to File No. 4127-V.

JUNIOR ENGINEERS required as assistant engineers on construction work at Saint John Harbour. Salary $200 to $250 depending on training and experience. Apply to File No. 4131-V.

MECHANICAL OR CIVIL ENGINEER with shop experience required in Montreal. Duties include design on railway equipment. Salary open. Apply to File No. 4135-V.

SALES ENGINEER required by prominent distributor of heavy equipment for forestry, road building and construction industries. Head office in Montreal. Working knowledge of French and executive ability necessary. Salary open. Apply to File No. 4140-V.

GRADUATE ENGINEER with engineering and sales experience required as a Street Lighting Specialist in Toronto area. Position involves direct sales engineering with municipalities and utilities also engineering and production problems directly concerned with the manufacture of street lighting equipment. Age under 35 years. Salary open. Apply to File No. 4141-V.

HEATING AND VENTILATING ENGINEER with considerable experience in mechanical equipment for buildings is wanted for office work on heating, ventilating and air conditioning by a firm of consulting engineers in Montreal. Salary open. Apply to File No. 4142-V.

MAINTENANCE ENGINEER, under 30 years of age, required by Public Institution for Montreal area. Duties include maintenance of buildings, heating plants, electric services, etc. Salary open. Apply to File No. 4143-V.

TOWN ENGINEER required for town in Nova Scotia. Applicant must be qualified to take charge of all town services including electric (distribution system) and water utilities. Salary open. Apply to File No. 4145-V.

MECHANICAL OR CHEMICAL ENGINEER with Masters' or Doctors' degree and several years' experience in industrial or University research work required to head the Engineering Development Section of the National Research Council, Atomic Energy Project. Salary open. Apply to File No. 4148-V.

GRADUATE ENGINEER age 32 up, preferably bilingual and with 10 years experience in industrial design required by chemical organization with headquarters in Montreal. Duties include supervision of works design department supply draughting and design service for plant, prepare appropriation requests, maintain cost estimating units etc. Salary open. Apply to File 4153-V.

MECHANICAL ELECTRICAL OR CIVIL ENGINEER, age 23-30, preferably single and bilingual with some experience in maintenance required by an industrial and chemical organization with headquarters in Montreal. Duties include construction project and design studies. Salary open. Apply to File No. 4154-V.

ENGINEER required in Montreal. Applicant should have railroad construction experience and a knowledge of welding technique also the ability to organize and carry out special track construction jobs. Salary open. Apply to File No. 4157-V.

CIVIL OR STRUCTURAL ENGINEER, 24 to 35 years, required for Northern Ontario Paper Mill. At least four years experience, 2 of which should be on construction and 2 on design. Opportunity to train junior personnel. Salary not less than $400.00. Apply to File No. 4158-V.

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

CHEMICAL

CHEMIAL ENGINEER OR CHEMIST, preferably with Ph. D., required by a pulp and paper company with plants in Eastern Canada, for research work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER required by a pulp and paper company with plants in Eastern Canada, for mill control and pilot plant work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER with considerable mechanic and hydraulic experience or mechanical engineer with good chemical knowledge and experience in hydraulics, required by a manufacturer in Ontario. Salary open. Apply to File No. 3928-V.

CHEMICAL ENGINEER, recent graduate is needed by a chemical manufacturing firm situated in the Province of Quebec. Some experience in oil refinery, pulp and paper, or synthetic resin manufacture would be useful. Salary open. Apply to File No. 3978-V.

CHEMICAL ENGINEER OR CHEMIST wanted by large manufacturers of bleached sulphate pulp for their Tecnical and Development Department. Several years experience preferably in the pulp and paper industry. Mill located in Northern Ontario. Salary open. Apply to File No. 3991-V.

SENIOR CHEMICAL ENGINEER OR CHEMIST, required by leading Paper Manufacturer in Eastern Canada. Applicant should have some experience in Paper Mill Control work. This position offers plenty of scope for advancement. Salary open. Apply to File No. 4013-V.

CHEMICAL ENGINEER required by a major Canadian Company located in Toronto as Technical Service Man. 25 to 35 years old. Definite sales personality. Position will include 6 to 12 months' training. It will carry the responsibility for servicing all types of adhesives to industries throughout Canada. Salary open. Apply to File No. 4044-V.

GRADUATE CHEMICAL ENGINEERS OR CHEMISTS required by an industrial chemical plant in the Montreal area. Preferably with experience in production and the operation of chemical equipment such as filters, presses, etc. Must be able to organize work and direct workmen. Salary $200. up. Apply to File No. 4071-V.

CHEMICAL ENGINEER age 25 to 35 years, experience in the Pulp and Paper industry, preferably Kraft, required by paper manufacturer in Eastern Ontario for position of Control Superintendent. Salary according to qualifications. Apply to File No. 4099-V.

CHEMICAL ENGINEER for work in the Development Department of a large chemical manufacturing company involving chemical engineering design, preparation of mass and descriptive flow sheets, specification of equipment, comparison of processes, pilot plant liaison work. Must have had from three to five years in chemical plant engineering, maintenance or operation, in order of decreasing preference. Must be able to co-operate well with other departments in the Company. Work would be in Montreal. Salary open. Apply to File No. 4119-V.

CIVIL

CIVIL ENGINEER to take charge of work in a drainage district in Quebec. Must be bilingual. May be recent graduate. Salary $2,400 per annum for the first three months, $2,700 after 3 months and $3,000 after 12 months. Apply to File No. 3479-V.

CIVIL ENGINEERS with experience in detailing and designing structural steel and reinforced concrete for manufacturers are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

CIVIL ENGINEERS recent graduate up, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

GRADUATE CIVIL ENGINEER, required by a public utility in the Montreal area with three or four years experience in design of reinforced concrete and structural steel. Salary $250-300. Apply to File No. 3766-V.

CIVIL ENGINEERS with some experience on design and field work required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

CIVIL ENGINEERS required as draughtsman in bridge department of large transport company. Preferably with experience in steel, concrete and timber construction. Salary open. Apply to File No. 3884-V.

CIVIL ENGINEER required as Town Engineer of a town in the Maritimes. Required to supervise and layout work for Water and Sewage Dept., Works Dept., also construction of a general nature for the Electric Light Dept. Salary open. Apply to File No. 3930-V.

JUNIOR ENGINEER, preferably with civil background required for sales and service by a Montreal manufacturer of waterproofing compounds. Salary open. Apply to File No. 3968-V.

CIVIL ENGINEER with at least two years experience required in a Pulp and Paper Mill in the Province of Quebec for surveying and general paper mill engineering and draughting. Salary $250 to $300. Apply to File No 4094-V.

CIVIL ENGINEER required for consulting engineer and surveyors' office in Montreal. Work includes surveying, topographical draughting, preparation of designs and plans of engineering work, etc. Must be bilingual. Salary according to experience with future depending on ability. Apply to File No. 4105-V.

CIVIL ENGINEER, thoroughly experienced and competent in structural design required by an established firm of consulting engineers in Toronto. Applications are invited from engineers with high qualifications and references. Salary open. Apply to File No. 4112-V.

CIVIL ENGINEER age 25 to 35 with experience in structural design required by an established firm of consulting engineers in Toronto. Opportunity for progressing in this work under proper supervision. Salary will be relative to experience and ability. Apply to File No. 4112-V.

ELECTRICAL

ELECTRICAL ENGINEER, recent graduate up required by a manufacturer in Montreal for sales engineering. Must be bilingual and familiar with rotating electrical equipment. Salary $200 up. Apply to File No. 3761-V.

GRADUATE ELECTRICAL ENGINEERS, with 3 to 10 years experience in design, operation, layout of substations, switching stations, and electrical machinery, together with engineering studies, including draughting for a large hydro electric power house in Quebec. Salary $225 up according to experience. Apply to File No. 3787-V.

ELECTRICAL ENGINEER required for power sales by an electrical utility in Province of Quebec. Preferably experienced, bilingual. Salary open. Apply to File No. 3802-V.

ELECTRICAL ENGINEERS with experience in layout and design of generating and transformer stations, required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

SEVERAL EXPERIENCED ELECTRICAL DRAUGHTSMEN for the design and layout of industrial power and control systems required by consulting engineering office in Montreal. Salary open. Good chance for advancement. Apply to File No. 3890-V.

ELECTRICAL ENGINEERS required for sales engineering work in Western Canada. Graduates with some selling experience preferred. Salary open, plus expenses. Apply to File No. 3915-V.

PROFESSOR IN ELECTRICAL ENGINEERING required by a Canadian University in the Province of Quebec for fall 1948 semester. Preferably with teaching and practical experience in power, electrical machinery design, lab., etc. Bilingual preferred. Attractive salary available for right man. Apply to File No. 3982-V.

ELECTRICAL ENGINEERS, age 30 to 40 required for the Commercial and Distribution Department of large Hydro Electric Utility. Must have experience in electrical distribution. Salary open. Apply to File No. 4002-V.

ELECTRICAL ENGINEER, experienced in Power Station Transmission and Distribution design and installation. Permanence and advancement depending upon performance. Salary open. Apply to File No. 4024-V.

JUNIOR ELECTRICAL ENGINEER required by a mining company in Northern Ontario. Salary open. Apply to File No. 4028-V.

GRADUATE ELECTRICAL ENGINEER with a minimum of 2 years practical experience to assist in electrical engineering design work, field work on construction and maintenance of structures, service and installation of equipment required by Manitoba City. Salary $226. to $257. Apply to File No. 4069-V.

ELECTRICAL ENGINEER required by company in Shawinigan Falls, Quebec. Vacancies exist for first class electrical engineer capable of taking entire charge of electrical department also electrical engineer for work as assistant plant engineer. Salary open. Apply to File No. 4106-V.

EXPERIENCED ELECTRICAL ENGINEERS required by consulting engineering office in Montreal as Assistant Engineers, Designers, Checkers, Draughtsmen and Quantity Estimator. Salaries open. Apply to File No. 4110-V.

ELECTRICAL ENGINEER, age 30-40, required as Sales Engineer for Electrical Power Apparatus Company, manufacturing motors, transformers, rectifiers, switchgear, etc. Test course graduate specializing in switchgear preferred. Sales experience desirable but not essential. Location Toronto. Salary open. Apply to File No. 4128-V.

MECHANICAL

MECHANICAL ENGINEERS, preferably with design experience are required for armament research and development in the Quebec area in a government establishment. Salary from $190.00. Apply to File No. 3401-V.

MECHANICAL ENGINEERS required by a Pulp and Paper Company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

JUNIOR MECHANICAL ENGINEER with knowledge of precision machine shop practice and aptitude for research work in metals and plastics required for an organization in Toronto for the production of artificial limbs. Must be veteran. Salary from $225. Apply to File No. 3675-V.

RECENT GRADUATES OR JUNIOR ENGINEERS with mechanical background required by a Montreal Engineering fabricating and contracting firm, for training purposes leading to sales and service. Montreal area. Salary $175. up. Apply to File No. 3810-V.

MECHANICAL ENGINEERS with experience in plant layout and design or ventilation problems or general mechanical design required by a firm in Quebec. Salary from $250. Apply to File No. 3818-V.

MECHANICAL ENGINEER required by a manufacturer in Ontario for the plant operation staff. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER with six to ten years experience in maintenance and engineering work required by alkali manufacturers in Ontario. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER with knowledge of physical metallurgy heat treatment, ability in stress analysis and design required for research work in B.C. Maximum salary $4,000. Apply to File No. 3865-V.

MECHANICAL ENGINEER age 30-38 required for Northern Ontario Paper Mill, preferably with paper mill experience or experience in general layout and design. Knowledge of pumps capacities, piping conveyors, estimating and structural design essential. Salary open. Apply to File No. 3891-V.

RECENT GRADUATES in Mechanical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 3981-V.

MECHANICAL DESIGN DRAUGHTSMAN with experience in re-inforced concrete and structural steel required by a mining company in Northern Ontario. Housing available. Salary open. Apply to File No. 3994-V.

MECHANICAL ENGINEER required as assistant in Chief Engineers Department by large paper company. Paper experience essential, some knowledge of the French language would be helpful. Age 28-40. Salary $350-450. Apply to File No. 4022-V.

MECHANICAL ENGINEER required in Ontario by a firm specializing in machine tools. Applicant must be experienced in production control. Salary open. Apply to File No. 4026-V.

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for colliery plant, screening equipment, hoists, simple steel structures, etc. Salary $240 up depending upon ability. Apply to File No. 4030-V.

CHIEF ENGINEER, mechanical background required by a specialized industrial plant in the Montreal area. Work covers mechanical design, preparation of work drawings, bills of materials, specifications and the ordering of all materials for contracts, also design of necessary tooling. Minimum salary $450.00. Apply to File No. 4066-V.

MECHANICAL ENGINEERS with experience in estimating or design required by well known general engineering firm in Montreal. Good future for those with right qualifications. Salary commensurate with ability. Apply to File No. 4074-V.

MECHANICAL ENGINEER with experience in the design of hydraulic turbines, valves, penstocks, surge tanks and associated equipment required by large manufacturer in Montreal to participate in expanding program of hydro electric development. Salary open. Apply to File No. 4074-V.

MECHANICAL ENGINEER with minimum of eight years experience in the design of heavy mechanical equipment required by well established firm in Montreal for general supervision and checking. Must be alert and aggressive. Salary open. Apply to File No. 4074-V.

MECHANICAL ENGINEER required in Montreal with considerable experience in machine shop practice and some administrative experience in shop work. Applicant should be around 35 years of age and bilingual. Salary depending on qualifications. Apply to File No. 4100-V.

EXPERIENCED MECHANICAL ENGINEERS required by consulting engineering office in Montreal as Assistant Engineers, Designers, Checkers, Draughtsmen and Quantity Estimator. Salaries open. Apply to File No. 4110-V.

JUNIOR MECHANICAL ENGINEER, age 25 to 27 years, preferably with three to four years experience required for general duties by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 4114-V.

MECHANICAL ENGINEERS required for manufacturing and related duties with well established reputable paper company. Four to six years general industrial experience required. Salary open. Apply to File No. 4115-V.

MECHANICAL ENGINEER with two or more years experience in machine shop practice required in Montreal as sales engineer handling cutting oils and other chemicals and oils used in machine shops. Salary open. Apply to File No. 4116-V.

MECHANICAL ENGINEER with at least ten years experience including plant maintenance and preferably in the pulp and paper industry required in New Brunswick. Salary open. Apply to File No. 4117-V.

MECHANICAL ENGINEER for work in the Development Department of a large chemical manufacturing company involving chemical engineering design, preparation of mass and descriptive flow sheets, specification of equipment, comparison of processes, pilot plant liaison work. Must have had three to five years in chemical plant engineering, maintenance or operation, in order of decreasing preference. Must be able to co-operate well with other departments in the Company. Work would be in Montreal. Salary open. Apply to File No. 4119-V.

MECHANICAL ENGINEER preferably with two or three years general plant experience required as production engineer by National Beverage Company in Eastern Canada. Salary open. Apply to File No. 4122-V.

MECHANICAL ENGINEER or other engineer with equivalent draughting training, for position of assistant plant manager of a granite plant 25 miles south of Montreal. Applicant should be 28 to 34 years old with one or two years business experience. Position offers prompt promotion for a capable man as present manager must take over new duties in two to five years. Starting salary about $275.00 per month with regular annual increases. Apply to File No. 4126-V.

MECHANICAL ENGINEER required for a Western industry engaged in the manufacturer of truck bodies and trailers, overhaul and repair of industrial engines and construction equipment, repair and maintenance of R.C.A.F. and civilian aircraft. Service as an Engineering Officer in the R.C.A.F. during the war will be an advantage. An excellent opportunity is offered to the right man. Apply to File No. 4129-V.

MECHANICAL ENGINEER with knowledge of design and considerable experience with steam and diesel engines and refrigeration equipment. Required in Montreal. Preferably bilingual. Must be veteran with overseas service. Applicant should state age, experience and salary expected. Apply to File No. 4137-V.

MECHANICAL ENGINEER OR DRAUGHTSMAN with minimum of four or five years experience. Knowledge of paper mill engineering desirable but not essential. Required by large Pulp and Paper Mill for general engineering design and draughting. Salary up to $400. depending on qualifications. Apply to File No. 4138-V.

METALLURGICAL

RECENT GRADUATES in Metallurgical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 3981-V.

METALLURGICAL ENGINEER required by a farm implement manufacturer in Ontario to take over the necessary duties in new mechanized foundry. Salary open. Apply to File No. 4086-V.

MINING

MINING ENGINEERS with varied experience required by a firm in Quebec for general mine operation, exploitation and development work. Salary from $250. Apply to File No. 3818-V.

MINING ENGINEER with several years experience required by a Company engaged in large scale asbestos production in Quebec. Salary open. Apply to File No. 3935-V.

MISCELLANEOUS

STRUCTURAL STEEL DRAUGHTSMAN AND CHECKERS, preferably graduate engineers but any experienced man acceptable, are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

GRADUATE ENGINEERS required by an industrial and chemical organization with headquarters in Montreal for all phases of research, design, operation, development, production and maintenance. Salaries open. Apply to File No. 3588-V.

SALES ENGINEER with wide engineering experience, wanted by a company in Toronto for the sale of textile machinery and construction equipment. Salary open. Apply to File No. 3639-V.

STRUCTURAL STEEL DETAILER AND CHECKER with considerable experience required for checking shop details by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

DETAILER AND DESIGNER for reinforcing steel with considerable experience required by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

GRADUATE ENGINEER required by an electrical firm in Montreal to organize publicity department and edit trade journal. Salary open. Apply to File No. 3751-V.

STRUCTURAL STEEL DRAUGHTSMAN, qualified to detail and check all classes of structural steel and to supervise draughtsmen in a large drawing office on the West Coast. Salary open. Apply to File No. 3777-V.

BRIDGE ENGINEER, qualified to be in charge of the design and supervision of the construction of highway bridges. Apply stating qualifications, experience, age and salary wanted. Apply to File No. 3780-V.

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open. Apply to File No. 3811-V.

STRUCTURAL STEEL CHECKER AND ONE DETAILER CHECKER wanted for large fabricating plant in Vancouver, B.C. Age between 30 to 40 years preferred. Must be experienced. Give full information and references. Salary open. Apply to File No. 3862-V.

STRUCTURAL ENGINEER required by a Steel Company in Montreal for the design of reinforced concrete frame. Salary open. Apply to File No. 3931-V.

TWO METALLURGICAL ENGINEERS AND ONE CHEMICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No. 3942-V.

SALES ENGINEER required by well known manufacturer of mechanical equipment to solicit industrial accounts throughout the Province of Quebec. Applicants must reply giving full details, age, training, etc. Salary open. Apply to File No. 3951-V.

CIVIL OR MECHANICAL ENGINEER wanted with 5 to 8 years experience for key position in moderate size plant in Manitoba, doing fabrication of Plate Work and Light Steel Work, also Grey Iron Foundry and Machine Shop. This will lead to a key position in a growing organization. Salary open. Apply to File No. 4003-V.

MECHANICAL AND CHEMICAL ENGINEERS, interested in entering the Pulp and Paper industry required in Nfld. Vacancies in Technical Department and studying process work and improved methods of operation. Pulp and Paper experience is not necessary. Salary open. Apply to File No. 4009-V.

POWER PLANT SUPERVISOR required for South America. Age 30-40, single preferred to supervise steam power plant including operating, boiler cleaning and minor repairs. Salary $375. U.S. currency. Apply to File No. 4011-V.

ELECTRICAL OR MECHANICAL ENGINEERS required by large Montreal firm to prepare and analyze specifications for telephone equipment manufacturing and installation. Other types of engineering work also available. Salary open. Please send photo together with particulars of education and experience. Apply to File No. 4018-V.

GRADUATE ENGINEER required as Assistant to Manager of Sawmill and Woodlands operations. Position located in Ontario. Good commercial sense essential also some sales ability. Salary around $400. Apply to File No. 4021-V.

ARCHITECTURAL DRAUGHTSMAN experienced in industrial building construction, with natural aptitude for design work, wanted by large industry in Eastern Townships. Good salary, permanent position to the right man. Apply to File No. 4031-V.

SENIOR INDUSTRIAL ENGINEER required by Management Consultants in Montreal. Experienced in installations of production and cost control, wage incentives, etc. Free to travel, preferably bilingual. Salary open. Apply to File No. 4052-V.

SALES ENGINEER for popular line of Diesel Engines. Applicants must be specialists on Power Units and Generator Sets, required for permanent employment with well established organization. Apply to File No. 4055-V.

GRADUATE ENGINEER, preferably mechanical or electrical background required for drop forging plant operation and production in Province of Ontario by a steel company with headquarters in Ontario. Good commercial sense essential. Salary open. Apply to File No. 4062-V.

INDUSTRIAL ENGINEER with considerable manufacturing experience between 30 and 40 years of age required for plant surveys in Province of Quebec. Must be fluently bilingual. Permanent position. Salary according to qualifications. Apply to File No. 4064-V.

DRAUGHTSMAN preferably with mechanical and structural experience required by engineering firm in Toronto for design of material handling equipment such as belt conveyors also crushing plants and gold mills. Salary $200. to $350. Apply to File No. 4072-V.

POWER STATION OPERATOR with about five years' experience principally in operation and maintenance of turbines and mechanical equipment of hydro-electric plants required by public utility in Brazil. Preferably not over 30 and single but will consider married man without minor dependents. Replies held in strictest confidence. Salary open. Apply to File No. 4073-V.

MECHANICAL OR CIVIL ENGINEER with at least four years experience in stress analysis and Vibration required by one of Canada's leading manufacturers of heavy mechanical equipment. Considerable scope for man of proper qualifications. Salary open. Apply to File No. 4074-V.

SALES ENGINEER required by well known engineering supply company doing business with Mining and Pulp and Paper companies. Excellent opportunity for advancement. Travelling not extensive. No experience necessary but desirable. Salary open. Apply to File No. 4079-V.

TOWN ENGINEER required by town in Ontario. Duties include the supervision of Board of Works and Sanitation Departments as well as acting in an advisory capacity to the telephone, electric and water utilities. Salary from $250. to $300. Apply to File No. 4087-V.

RECENT GRADUATE MECHANICAL OR ELECTRICAL background required by engineering firm in Montreal. Duties include training in Public Utility in Administration Department. Eventually for South America. Salary to start $225. Apply to File No. 4089-V.

SALES ENGINEER preferably mechanical graduate, required for sales engineering work on blowers and vacuum pumps. Compressed air experience would be advantageous. Location in Montreal. Salary and commission. Apply to File No. 4090-V.

JUNIOR ENGINEER preferably with a few years experience in production control and some knowledge of the textile industry required for Montreal area. Salary $250 to $275. Apply to File No. 4092-V.

SENIOR INDUSTRIAL ENGINEER with business administration and mechanical background, bilingual, with at least five years experience in production control, wage incentives and cost control required by an industrial engineering consultant in Montreal Salary open. Apply to File No. 4092-V.

SENIOR DESIGNER with from five to ten years experience and a general knowledge of structural design in relation to building and bridges required by a steel company in Southern Ontario. Salary open. Apply to File No. 4093-V.

JUNIOR ENGINEER with from one to five years experience and at least a working knowledge of structural design of buildings required by a steel company in Southern Ontario. Salary open. Apply to File No. 4093-V.

SALES ENGINEER required by large manufacturer of Air Handling equipment in Toronto area. Applicant should have either industrial or Public Building application and sales experience. Salary open. Apply to File No. 4101-V.

SALES ENGINEER required by Canadian Company in Ontario. Must have thorough knowledge of the preparation of tenders, propositions on Transformers, Motors and Switchgear equipment, also experience in the commercial side of the heavy electrical industry. Salary open. Apply to File No. 4102-V.

MAINTENANCE ENGINEER required in Quebec City to do installation work in heating, ventilating, refrigeration and air-conditioning, gas and diesel motors. Must be bilingual. Salary open. Apply to File No. 4104-V.

JUNIOR ENGINEER required in Quebec City. Preferably with three to five years experience in heating, ventilating and air-conditioning. Salary open. Apply to File No. 4104-V.

CONSTRUCTION ENGINEER, recent graduate, required in Montreal for general duties. Salary around $275. Apply to File No. 4107-V.

MECHANICAL OR ELECTRICAL GRADUATE, age about 35 years with experience in building construction machinery maintenance and repair capable of taking over the engineering and maintenance services in a large textile mill in Province of Quebec. Salary open. Apply to File No. 4114-V.

DRAUGHTSMEN with some experience in building design or architectural work required by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 4114-V.

SALES ENGINEERS, one experienced man, also two juniors willing to learn required by an electrical and power house equipment manufacturer in Montreal. Salary open. Apply to File No. 4121-V.

RECENT GRADUATE preferably mechanical or civil background required by Maritime branch of large industrial Canadian firm. Duties of general engineering nature. Salary open. Apply to File No. 4125-V.

Situations Wanted

CIVIL AND MECHANICAL ENGINEER M.E.I.C., age 42, B.Sc. Civil Graduate work in industrial engineering at McGill University. Seventeen years experience in following field: Manufacture of welding rod and hardfacing alloys, installation of incentive bonus system in two of Canada's largest Aircraft Plants. Production planning on the manufacture of shells and shell parts. Design and construction of explosive proving equipment. Superintendent during construction of one of Canada's largest Shell Filling Plants. Other experience covering Oil Refining, Contracting, and installation of Pulp and Paper Mill Equipment. Interested in position with responsible firm or partnership with consultant. Home in Montreal area. Apply to File No. 981-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., Quebec, with more than 20 years experience in design and construction of dams and Power Plants in U.S.A. and Canada. Desire change in position preferably in the construction field. Apply to File No. 1527-W.

ENGINEER, M.E.I.C., with Bachelor and Master Degrees, over twenty years diversified background of experience, interested in post on plant operation, administration, or general management. Service overseas in army. Now employed but available on short notice. Apply to File No. 1645-W.

CIVIL Engineer, M.E.I.C., Prof. Eng., Quebec, age 39, married. Fluently bilingual with a certificate in Municipal Public Works administration. Experienced in Municipal, Highway Engineering, design of sewer and aqueduct, construction and maintenance. Seeks position as executive, Town Engineer, Construction Superintendent, Sales Engineer. Available on short notice. Apply to File No. 1859-W.

PART TIME WORK: Senior Design Engineer, B.A. Sc. P. Eng. M.E.I.C., has available an experienced group of engineers and draughtsmen desirous of obtaining evening work. Experience in the group includes municipal, mechanical, mining and water-power engineering ranging from the initial layout to the final design, as well as structural steel and reinforced concrete design and layout. All members of this group are permanently employed. Apply to File No. 2463-W.

GRADUATE MECHANICAL ENGINEER, M.E.I.C., P.Eng. (N.S.), age 39, married, desires position in industrial part of Canada. Eight years experience in Mechanical Department shops and in the mills of large steel company. Five and one-half years Engineer Officer R.C.A.F., rank Wing Commander. Five years Sales Engineering, conveyors, drives, pumps, heavy construction equipment. Particularly interested in Sales Executive or Personnel work carrying responsibility and having a future. Employed at present, but desire to get out of the Maritimes to where there is greater opportunity. One month's notice. Correspondence invited. References. Apply to File No. 2711-W.

GRADUATE MECHANICAL ENGINEER, Jr.E.I.C. Desires part time work during evenings and week-ends. Experience in plant layout, design, estimating, etc. Apply to File No. 2715-W.

CIVIL ENGINEER, S.E.I.C., P.Eng. Interested in part time work. Structural steel, reinforced concrete, or earthwork, estimating, designing and draughting. Apply to File No. 2817-W.

GRADUATE ELECTRICAL ENGINEER, McGill '24, M.E.I.C., Prof Eng., Que.; over 20 years experience in high voltage transmission lines, design and construction. Interested in part time or temporary position in general engineering or transmission line work. Location preferably Montreal or in B.C. At present residing in Montreal area, due to certain physical defects the type of work that can be undertaken is limited. Available at once. Apply to File No. 2918-W.

GRADUATE ELECTRICAL ENGINEER, S.E.I.C., Manitoba '47, single, presently employed in electronic research but desirous of entering the industrial or Production engineering field. Preferably in Ontario, or B.C. Experience in maintenance and research. Apply to File No. 2975-W.

Two Industrial Research Engineers

Chemical & Mechanical for Sask. Dept. of Natural Resources

Salary Range $214-$264 per month, including Cost-of-Living Bonus.

Duties: To carry out technical and economic studies of existing and proposed industries to determine industrial opportunities of Saskatchewan.

Qualifications: University graduation in the required engineering field, preferably supplemented with post-graduate studies.

For application forms and further information apply to:

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DRAFTSMEN WANTED

Alberta Firm Requires 3 Structural Draftsmen

One able to check all classes of structures and tanks. Another able to detail all types of structures. A third able to detail light structures and general handling machinery. Must be experienced.

Position permanent if suitable. Please give full particulars of experience and qualifications . . . together with salary expected. Transportation repaid upon completion of six months' satisfactory service.

Apply to File 4167-V

ELECTRICAL ENGINEER, M.E.I.C., P.E.Q., B.Sc. 1931. Age 40, married. Requires employment with opportunity for advancement. Have extensive experience in power generation, conversion, plant power distribution, plant design and construction. Also experienced in management and the setting up of new organizations. Available on one month's notice, additional information upon request. Apply to File No. 2976-W.

CIVIL ENGINEER, M.E.I.C., B.A.Sc., P.Eng. (Ont.) Age 44, single. Past experience includes administrative, executive and sales engineering in metal products, building materials and sub-contract work in construction industry. Also held responsible position in Personnel Administration. Desires permanent position requiring initiative with good future prospects. Apply to File No. 2983-W.

MECHANICAL ENGINEER (27), B.Sc., A.M.I. Mech. E., in responsible position with world-famous engineering concern in England is willing to emigrate to Canada if suitable opening is found there. Experienced in production development work, production planning and manufacturing methods of wide range of power station plant. With initiative and adaptability for most positions on the production side. Further particulars on request. Apply to File No. 2984-W.

GRADUATE ELECTRICAL ENGINEER, Manitoba, age 36, M.E.I.C., 12 years experience in industrial manufacturing. Married with family. Well grounded training in costs and estimating of machinery, structural, miscellaneous Ironwork and platework. Some experience in sales development and promotion work. Now employed but desires position with progressive firm where opportunity for advancement not restricted either in a similar capacity or position under superintendent. Apply to File No. 2986-W.

ENGINEER, B.Sc. (Honors), McGill '31, M.E.I.C., P. Eng. (Quebec). Married, age 40, 9 years experience in general business field, managing and organization of departments. 8 years mechanical engineering experience primarily in erection and maintenance of equipment in Chemical and Metallurgical field. Last 3 years as Chief Engineer of Cement Plant in South America, reconditioning plant, designing and installing new equipment Perfectly bilingual. (English and French). Working knowledge of Portuguese. Desires position with reliable firm leading to position with a future. Locations preferred are B.C., Montreal District, or Southern Ontario—available on short notice. Apply to File No. 2987-W.

ENGLISH ENGINEER, A.M.I.E.E., 33 years of age, married. Wishing to emigrate requires post where his experience will be of most use. 17 years experience comprising workshop, test, development research on public address and television E.M.I. Co. Field and development engineering, radio navigation aids and radio teleprinter equipment. At present Technical Officer, Air Ministry. Could possibly arrange to visit Canada for interviews if required. Apply to File No. 2994-W.

MECHANICAL ENGINEER, M.A., M.I., Mech.E., wide experience in Vibrations and Balancing presently residing in England, interested in emigrating to Canada if suitable contacts could be arranged. For details of past experience apply to File No. 2995-W.

CIVIL ENGINEER, B.A.Sc., S.E.I.C., veteran, aged 26, experience in surveying, industrial layout and inspection, construction of underground heating system. 1 year design and construction water and sewerage system. Presently employed in Ontario. Apply to File No. 2997-W.

CHEMICAL ENGINEER, B.Sc., Queen's, S.E.I.C., married, veteran. Employed at present. Experience in light metals industry; corrosion testing; production control; spectrographic analysis; desires position in chemical or metallurgical process industry. Available on reasonable notice to present employer. Apply to File No. 2999-W.

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Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

The Canadian Liquid Air Company has constructed a new plant at 8615 Stadium Road, Edmonton.

The plant is in full operation. Edmonton was selected as the site of this, the fifteenth Canadian plant of the Company, because of the increasing demand for oxygen and acteylene in the district. Before the erection of the plant, shipments were made from Calgary.

•

In a statement made by the Board of the Canadian Broadcasting Corporation it is stated, " The Board believes that in line with fundamental radio policies laid down by parliament for radio broadcasting, television should be developed in Canada so as to be of benefit to the greatest possible number of people; so that public air channels should be used in the public interest; and with the overall aim of stimulating Canadian national life and not merely of providing a means of broadcasting non-Canadian visual material in this country. The Board will strive for the maximum provision of Canadian television for Canadians."

•

At their exhibit at the Canadian International Trade Fair, Ruston and Hornsby Limited displayed eight diesel engines made at the Ruston and Hornsby plant, Lincoln, and by Davey, Paxman and Company, Ltd., of Colchester. The feature engine on display was Ruston and Hornsby's 80 B.H.P. marine diesel.

The only makers of a complete mining locomotive in the world, according to the Company, Ruston and Hornsby expect good sales in this direction when provincial legislation permits.

On June 17th Imperial Oil, Montreal East refinery, began test operations at one of its four main units. Work on the plant has been under way for the past two years and is now 95% complete.

The units include a 192-foot high fluid catalytic cracking plant or " cat cracker ", the design for which was developed in the U.S. during the war to furnish Allied air forces with high octane gasolines. It is the first of its kind in Canada.

Construction of the " cat cracker " and other units will increase the crude oil running capacity of the refinery by 13,200 barrels to more than 37,000 barrels a day to help meet the unprecedented demands for petroleum products in the province of Quebec.

In addition to the " cat cracker " the new installation includes a light ends recovery plant which prepares refinery feed stock for the manufacture of high octane gasolines, a 13,000 barrel-per-day crude distillation unit and a 4,200 barrel-per-day non-selective catalytic polymerization, or "cat poly" plant. A new water-cooling tower, capable of taking care of 16,000,000 gallons per day has been built. New storage tanks, with a capacity of 2,000,000 barrels have been erected.

•

The Walter Kidde Company of Canada, Ltd., wholly-owned subsidiary of Walter Kidde & Company, Inc., has purchased a new one-storey plant in Montreal, Quebec, basically for the manufacture of carbon dioxide fire protection equipment. The new plant consolidates factory, offices and warehouses, previously located at widely separated points.

Located at 6975 Jeanne Mance Street in a rapidly developing industrial section of the city, the new plant is of reinforced concrete and brick construction. It occupies 8,000 square feet of floor space, and 12,000 square feet of adjacent land has also been purchased for possible future expansion.

A modern sprinkler system and dioxide flooding installation protect production areas, offices, and record vaults from fire. The new plant will be served by the Canadian Pacific Railway.

•

Bucyrus-Erie, South Milwaukee, Wisconsin, has announced a new model in its line of walking draglines. It has been called the 450-W.

The manufacturer claims that it is easily manoeuvred, has great stability and accurate control. It is capable of swinging 8- to 10-cubic yard buckets from 200 to 165 foot booms. Power is supplied by heavy-duty diesel engine. Detailed information may be obtained from the manufacturer.

•

H. M. Turner, president of Canadian General Electric Limited has announced the purchase from War Assets Corporation of a plant at 5781 Notre Dame Street East, Montreal. It will be converted for the manufacture of electrical appliances and employment for 900 people is anticipated when the plant is in full production.

During the war the building was used for the manufacture of tanks. It includes 460,000 square feet of floor space and is of one storey steel construction.

•

Montreal Locomotive Works, Ltd., has received an order for 60 steam locomotives, valued at $7,500,000 from the Indian Government Railways. The locomotives are of the Pacific 4-6-2 type and delivery will begin in February, 1949. Payment will be made in U.S. dollars.

A new lubricator valve that delivers a positive metered amount of oil or grease to each bearing in lubricating systems has just been announced by Titeflex Inc., 738 Frelinghuysen Avenue, Newark 5, N.J.

For further information communicate with the manufacturer.

•

The Bucyrus-Erie Company of South Milwaukee, Wisconsin, has announced that it has acquired ownership of the Milwaukee Hydraulics Corporation, 7923 West Greenfield Ave., Milwaukee.

The Hydraulics Corporation manufactures the Hydro-Crane, a truck-mounted, hydraulically-operated crane. Bucyrus-Erie has acquired the drawings, designs and patent rights from R. O. Billings, who invented the device.

•

A compact, self-contained, d-c arc-welder that may be mounted on a trailer for mobile use, is now available from Canadian General Electric Company.

It is claimed to be ideal for small shop use. It consists of a 200 amp. G-E generator belt driven by a 4-cylinder Wisconsin motor and is mounted as a unit on a welded steel base.

An added convenience is an outlet for the operation of floodlights or standard 110-volt power tools.

•

Leo E. Tutt, Chairman of Directors of the Tutt-Bryant group of Companies, which distribute heavy machinery in Australia, is now touring on this continent. He recently completed a tour of England, Switzerland, Belgium, Denmark, Sweden and Norway.

Mr. Tutt has stated that there is now in progress in Australia a huge expansion programme. Public Works costing about 800 million dollars are to be undertaken and the programme includes roads and bridges, wharves, aerodromes, dams and reservoirs, water, sewerage and drainage schemes, canals and channels, forestry, etc. Mr. Tutt said " much of the work is being carried out in the inland areas and involves the use of great quantities of construction equipment. Since the war years, Australia has become extremely ' mechanically minded ' ".

The Canadian General Electric Company has developed a silicone Anti-Foam Compound to suppress foam in industrial processes.

The compound is a viscous, nontoxic liquid that can be added in concentrated form or as a solution either before or after foaming begins.

In concentrations of from 10 to 1000 parts per million, the compound is valuable in a wide variety of uses in the pulp and paper industry, in the manufacture of soap, paints, synthetic rubber and pharmaceutical products.

Inquiries should be sent to the Chemical Division of Canadian General Electric Company, 212 King Street West, Toronto.

•

R. G. LeTourneau, Inc., Longview, Texas, who recently offered to the construction and material handling market a newly designed 15-ton " Tournacrane ", has taken a further step to meet the smaller capacity lift-and-carry problems so prevalent in industry today. This latest evolution is a new 7-ton unit known as the " Model EC-7 Tournacrane ". For details communicate with the manufacturer, and ask for: Specification pamphlet on Model EC-7.

•

The Shell Oil Company of Canada Limited has announced that following preliminary geological work carried out last summer the Company now plans to drill its first test well about ten miles East of Sussex, N.B. In addition to this work the Company's present plans are for the drilling of at least one, and possibly two, more exploratory test wells in other areas.

The first test well is intended to test the Albert formation and it may be necessary to drill to a depth of 4,000 to 5,000 feet. It is reported that drilling started early in June and the final results should be forthcoming in September. It is interesting to note the Albert formation yields gas in the Stony Creek field which supplies the City of Moncton.

Appointments and Transfers

F. P. Labey has been appointed illumination manager of the Northern Electric Company, general sales division.

•

Prairie Equipment & Radiator, Ltd., 310-314 Burnell Street, Winnipeg, Manitoba, has been appointed distributor for the province of Manitoba for R. G. LeTourneau, Inc., Peoria, Illinois, manufacturers of heavy earthmoving, hauling and lifting equipment.

•

E. E. Hampson has been appointed sales manager of the steel and malleable foundries division, Canadian Car & Foundry Company Limited.

•

Russell M. Richardson has been appointed sales manager of the Arborite Company Limited. He was formerly head of the plastics division of Peckover's Ltd., Toronto. He is a graduate of the University of Toronto and has been engaged in the plastic and metal industries for over twenty years.

•

R. W. Mackay has recently been appointed to the aviation section of Canadian General Electric Company.

He has had exceptionally broad experience in many phases of aviation engineering.

During the war Mr. Mackay held an appointment as a Technical Officer at Britain's aircraft research establishment at Farnborough, England, and since then was a production development engineer with Miles Aircraft.

Born in South Africa, he received his education there, including an apprenticeship in electrical engineering on the South African gold mines. Following this training, he was for five years a member of an Antarctic Research and Exploration expedition.

Publications

For copies of the publications below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing

Canadian General Electric Company has completed production of a 39-page illustrated brochure on " Switchboard Instruments ". Features of the publications are application diagrams, instrument data and mounting dimensions. It also contains tables showing standard watt-meter scales for use with various instrument transformer ratios. Apply to your nearest C.G.E. office and ask for publication No. CGEA-1758E.

●

The Bristol Co. of Canada Ltd., 71 Duchess Street, Toronto, has issued a bulletin illustrating running-time recorders for recording operating time of machines, pumps, presses and other similar equipment. Ask for Specification Sheet OP1511, P.1.

●

The June issue of the Bepco Journal, published by Bepco Canada Limited, 4018 St. Catherine St. West, Montreal 6, contains a short, but most interesting, article on hydraulic log-barking.

●

Hercules Motor Corporation, Canton, Ohio, has published a " Textbook " on their diesel engines which range in horsepower from 12 to 400. For copies, apply for " Hercules Diesel Engines—General Information ".

●

Tracerlab Inc., 55 Oliver Street, Boston 10, Mass., publish a monthly semi-technical bulletin known as " Tracerlog ". Copies are available.

●

Kennametal Inc., Latrobe, Pa., has just published Catalogue RB-1. It describes in detail the company's newly-announced line of chisel-type cemented carbide rock bits for pneumatic percussion drilling.

●

Canadian General Electric Company has published a bulletin describing the wide range of power transformers it makes under Repetitive Manufacture (RM) methods. Ask for bulletin No. CGEA-4283.

●

Darling Brothers Limited, 140 Prince Street, Montreal, has obtained a sound movie entitled " Story of Metal Bellows ". The film was prepared by the Fulton Sylphon Co. of Knoxville, Tennessee. It deals, in a semi-technical manner, with the manufacture of both hydraulically-formed and roll-formed bellows from a disc of metal. It also shows the functioning of various types of pressure and thermostatic devices, fundamental bellows application and the operating principle of different types of temperature regulators. A small part of the film is devoted to the manufacture, assembling and testing of temperature controls. Running time is 28 minutes. The film is 16 mm. Applications for use of the film should be made on your official letterhead.

●

A catalogue supplement, WC-48, has been prepared by the B. Greening Wire Co. Limited, Hamilton, Ontario. It is intended for use in conjunction with their wire cloth and screens catalogue No. 36. It is in the form of a pocket-size volume.

●

The Louis Allis Co., Milwaukee 7, Wisconsin, has developed a specially-designed motor for the food processing dairy and beverage industries. Ask for Bulletin No. 711.

●

The International Nickel Co. of Canada, 25 King Street West, Toronto, has available an attractively-designed booklet outlining the background of the Canadian nickel industry. It also contains interesting descriptions of the many and varied uses of the metal, and an extensive list of Canadian producers of nickel alloys and manufacturing companies using nickel or nickel alloys. It reviews the various uses of nickel alloy steels, nickel alloy cast-iron, stainless and heat-resistant steels, nickel alloys, nickel plating and precious metals produced in conjuction with the nickel industry. The booklet is available in both French and English.

"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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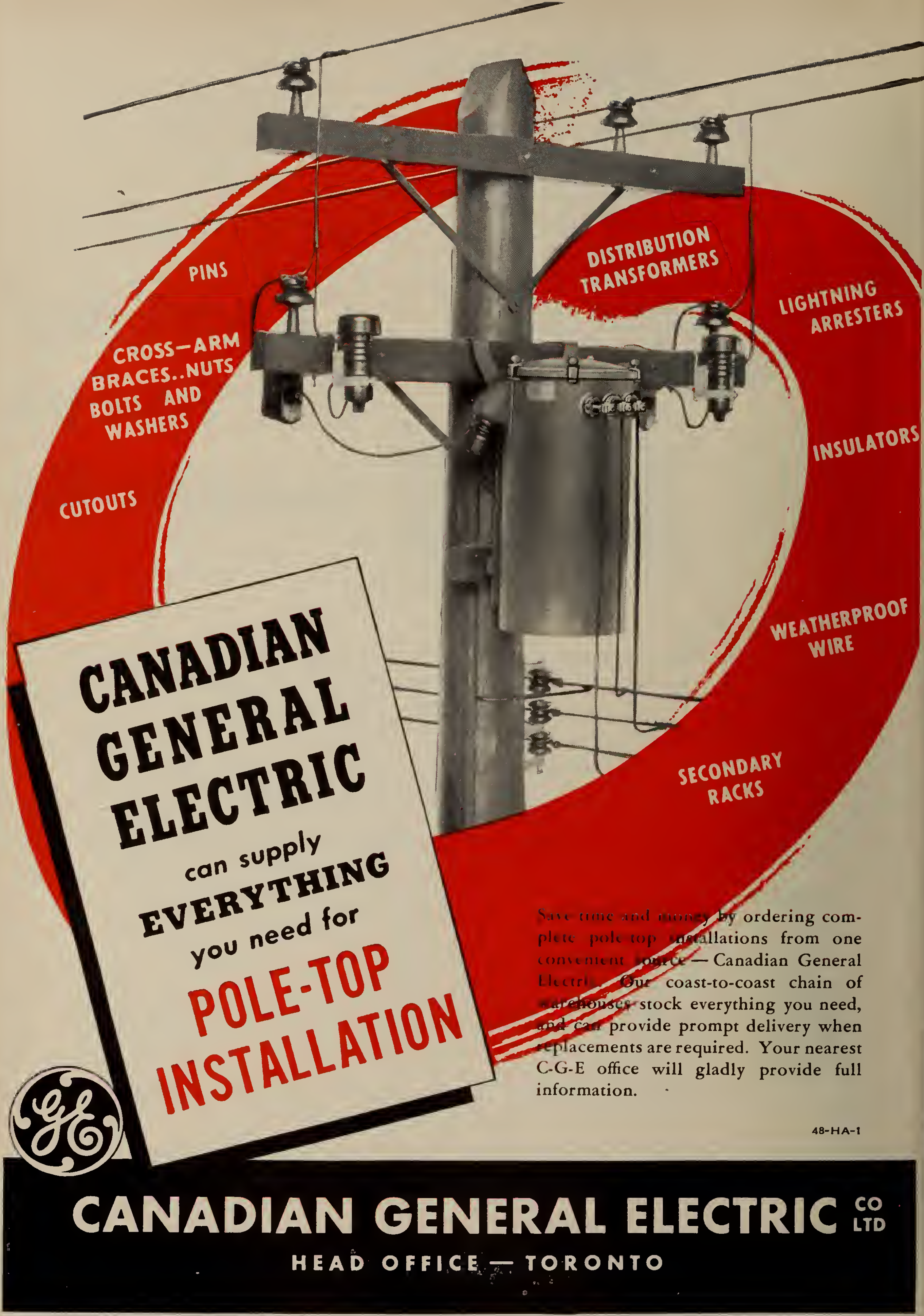
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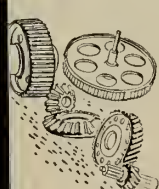

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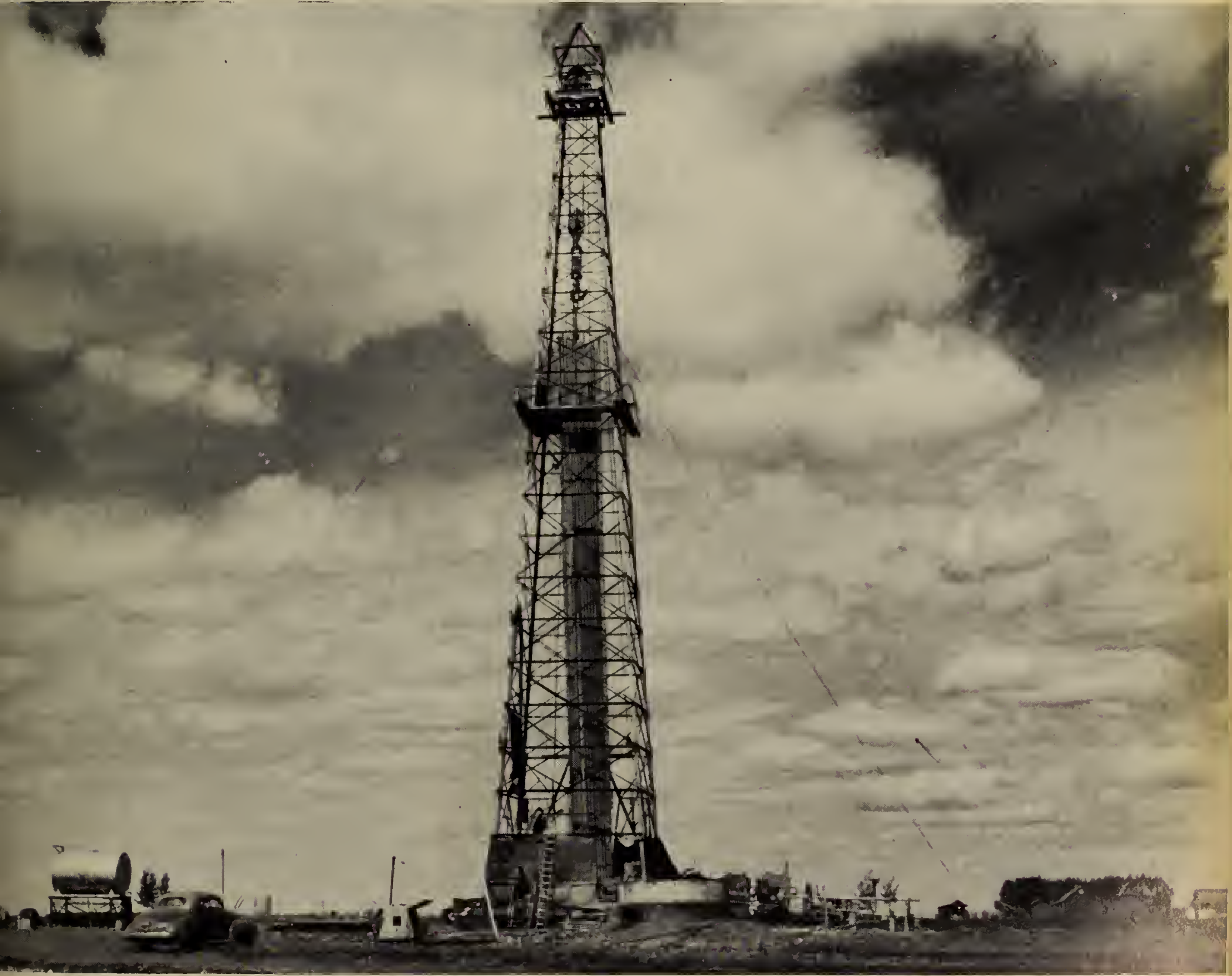
JULY 1948

THE ENGINEERING JOURNAL

VOLUME 31 NUMBER 8
AUGUST 1948



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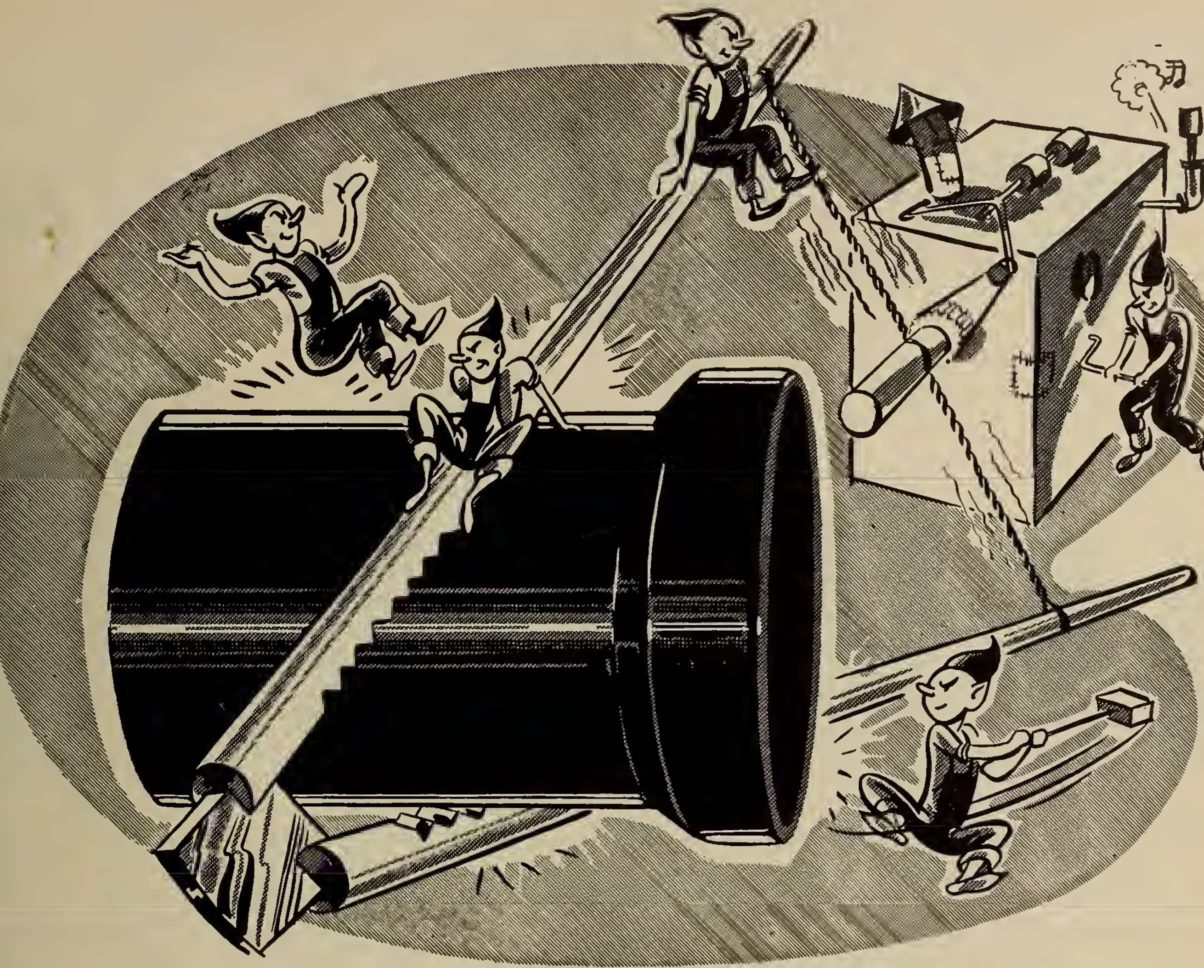

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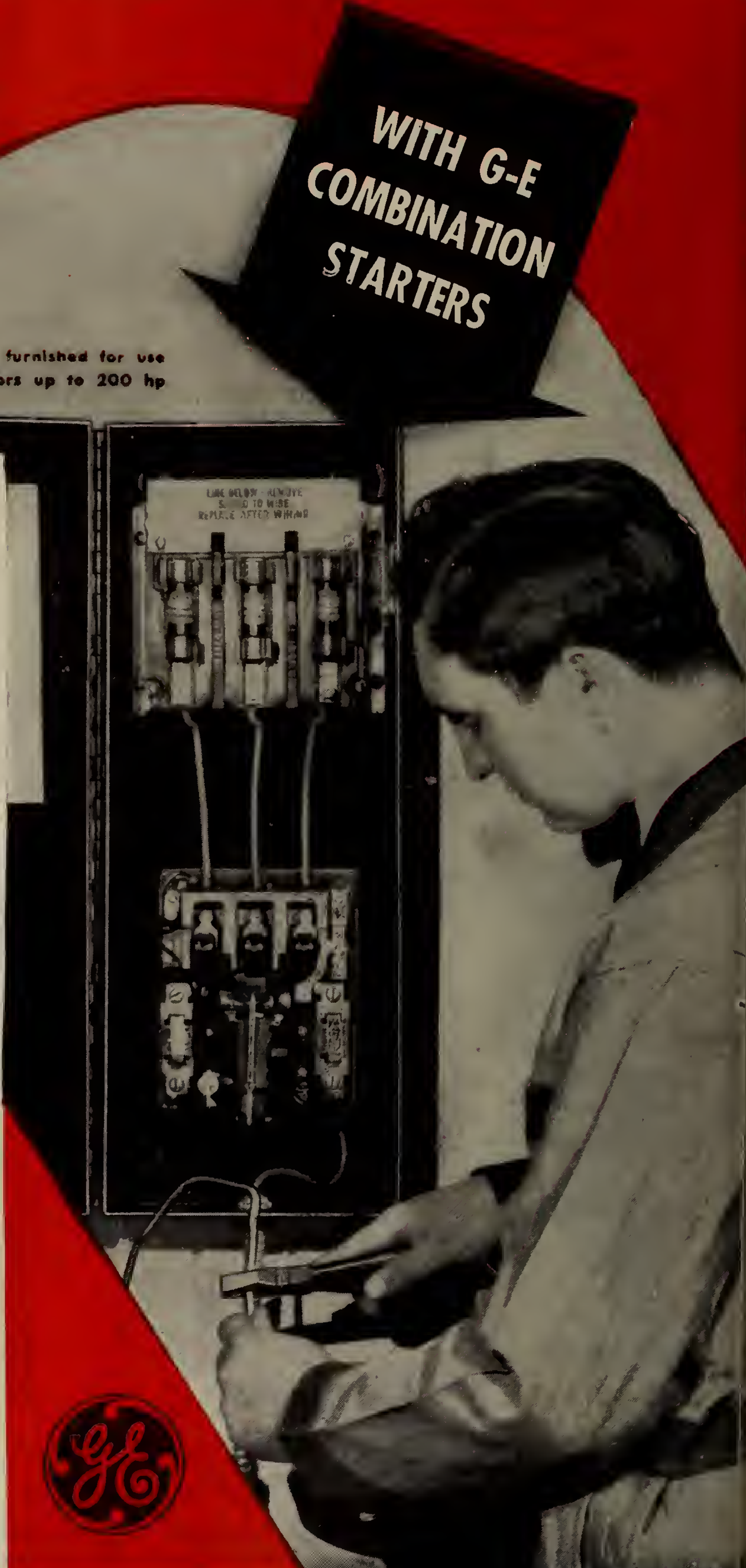

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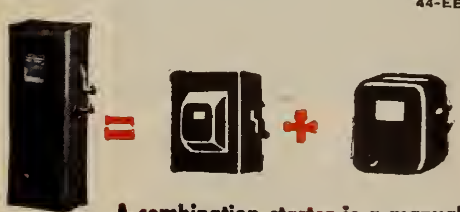

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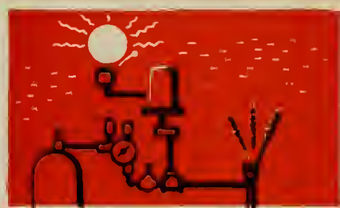

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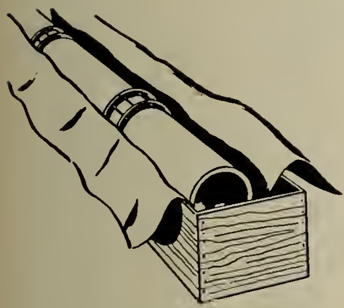

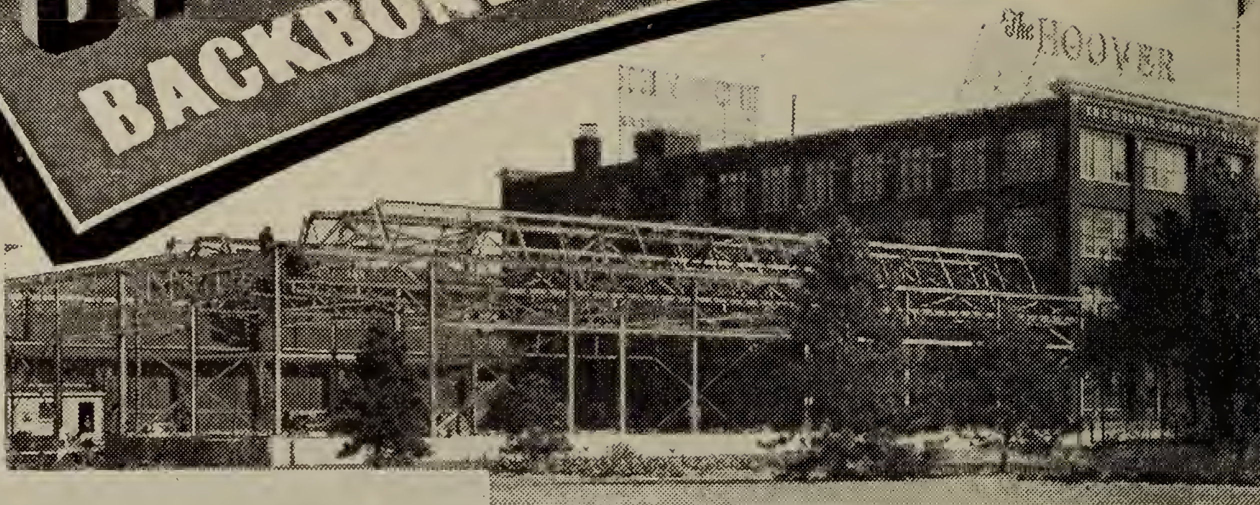

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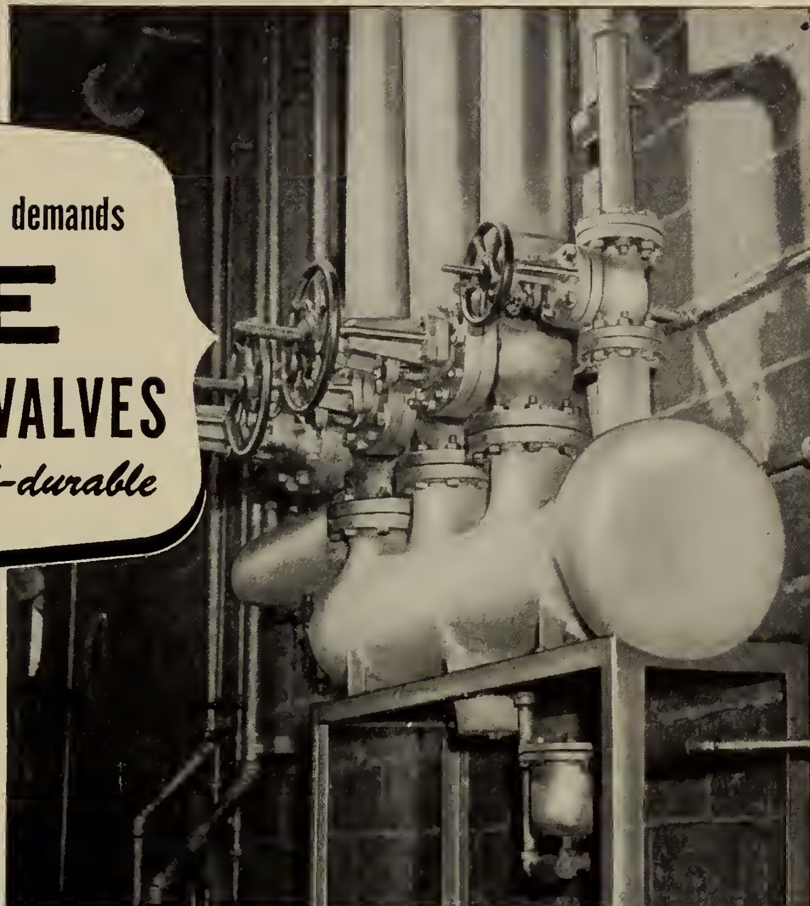

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOLUME 31 | MONTREAL, AUGUST 1948 | NUMBER 8

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CONTENTS

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COVER PICTURE

We selected this picture of the drilling site of Imperial Leduc No. 4 because it shows the most discussed and best known of current Western oil developments. The photograph was taken just before swabbing operations began.

We are indebted to Imperial Oil Limited for the use of the photograph.

THE
PETROLEUM & NATURAL GAS SITUATION IN CANADA

by

Dr. G. S. Hume, M.C.I.M.

Chief, Geological Survey of Canada, Department of Mines and Resources, Ottawa, Ontario

A paper presented at the Annual General and Professional Meeting of The Engineering Institute of Canada, Banff, Alberta, June 3, 1948

Increasing demands for petroleum products, with rationing during the war years, have made the people of Canada conscious of their dependence on foreign sources for supplies of oil. In some areas oil has partly replaced coal as a domestic fuel because of convenience and higher efficiency. But shortages of fuel oil last winter, and higher prices, have caused concern and some re-conversion to coal. Natural gas is an ideal fuel. Alberta, in particular, has large quantities of natural gas, and the public is taking much interest in the available supplies and the uses to which they may be put.

Recently, Max W. Ball, director, Oil and Gas Division, Department of the Interior, Washington, D.C., made the striking statement[1] that " The United States is using more oil today than the entire world used in 1938 ". Herein lies the crux of the situation; the demand has increased so enormously that, with consumption now higher than at the peak of the war, production cannot be increased with sufficient rapidity to maintain a surplus. Futher, Ball states that " the oil fields of the United States are producing at or very close to their maximum efficient rates ", and that there is " no excess available crude oil productive capacity ". During the last three months of 1947, production in the United States amounted to 5.64 million barrels a day, whereas in 1945, peak production during the war was 5 million barrels a day. For many years the United States has been a net exporter of crude oil. In 1947 imports about equalled exports, and it is expected net imports will increase. These conditions are the results of a variety of causes, among them shortages of some materials. Yet the fundamental reason is that oil is becoming harder to find under conditions of vigorous search extending back for many years.

Dr. G. S. Hume

In recent years the number of new oil fields has increased, but the number of large or major fields discovered has declined markedly, and depths of drilling have become greater. In 1947, 33,646 wells[2] were drilled, of which 5,539 were exploratory, resulting in 1,130 productive wells and 4,409 " dry " holes. This gave 424 newly discovered oil fields and 293 newly discovered pay " sands " in old fields, 88 new gas fields and 29 new pay " sands ", and 44 new distillate fields and 54 new pay " sands ". The total number of discoveries of new oil, gas and distillate fields and new pay " sands " in old fields thus was 932,

Pointing out that demand for oil on this continent is increasing more rapidly than the discovery of new supplies, the author shows that Eastern Canada, where prospects of finding domestic supplies are generally poor, is becoming increasingly dependent on South American crude supplies. On the prairies, declining production has failed to meet prairie demand in recent years. The Leduc field will bring these into early balance, but cannot support exports from the Prairie Provinces for long. British Columbia produces no oil. Potential natural gas reserves on the prairies are shown to be sufficient for many years however, and their development is dependent only on price and market outlets.

[1] Ball, Max W., Report on the Oil Situation, Wolverton Committee on Interstate and Foreign Commerce, Feb. 1948.

[2] *World Oil,* Vol. 127, No. 11, p. 68, Feb. 1948.

an increase of 244 or 35.5 per cent over the previous year. From this it is obvious that new fields are being discovered in United States at a relatively fast rate, but even so the demand for oil has increased more rapidly than new supplies have been found.

The Situation in Eastern Canada

The situation in the United States is of great interest to Canadians, because for many years that country has occupied a predominant position in the oil industry among the countries of the world and has been the main source of our imports. It still remains the main source, but in view of the supply situation this position may not be maintained. Imports into Eastern Canada, where the demand is large, have been steadily increasing from South America, particularly from Venezuela, and we are now becoming more and more dependent on this source for an increasingly large part of our supply.

In 1940, for example, with total imports of crude oil into Canada amounting to 42 million barrels, 29 million came from the United States and 13.5 million from South America and Trinidad, with Venezuela supplying 3.2 million barrels and Colombia 9.7 million barrels. In 1947, crude oil imports into Canada were 70 million barrels, an increase of about 60 per cent over 1940. Of these imports 39 million barrels came from the United States and the remainder from the Caribbean area. These figures illustrate the proportional increase in crude oil imports from South America, and in particular from Venezuela, from which place most of the imported crude oil came into Eastern Canada. They do not include imports of oil products into Canada. In 1940 these, including all fuels from naphtha to heavy fuel oils, amounted to less than 3 million barrels, whereas in 1947 they were over 16 million barrels.

South American crude oil is brought by ocean tankers to east coast ports and refineries. From Portland, Maine, a 234-mile, 12-inch pipe line connects with Montreal. This pipe line now has a capacity of 60,000 to 70,000 barrels a day, and it is hoped when steel becomes available to construct a further 20-inch pipe line to raise the total capacity to 140,000 to 175,000 barrels a day. Venezuela crude oil is reaching the large Imperial Oil refinery at Sarnia by pipe line from the New Jersey area, which is supplied by ocean tankers from South America.

The total imports of crude oil into Ontario in 1947, most of which came from United States, were 27.5 million barrels or an average of about 75,500 barrels a day. In September, 1947, imports of Venezuela crude oil into the Maritimes-Quebec area amounted to 62,200 barrels a day, and into the Sarnia refinery 26.6 million barrels, or a total of 88.7 million barrels a day from that country alone. It is obvious, in view of the shortage of crude oil supplies in United States that Eastern Canada, now depending to a considerable extent on imports from Venezuela, will in the future continue to draw more heavily from this source where the production now has reached more than 1.2 million barrels a day. (*World Oil,* Jan. 1948, p. 226).

Prospects in East Not Encouraging

It is not surprising, in view of the demand for fuel in Eastern Canada that the search for oil and gas has continued for many years. Oil fields of southwestern Ontario were among the first to be discovered on this continent, and have had a continuous record of production extending back more than three-quarters of a century. The production, however, has now dwindled to from 100,000 to 150,000 barrels of oil a year, and is thus insignificant in relation to the volume required to meet the demand.

For many years, too, southwestern Ontario has produced considerable quantities of natural gas, and in view of the great importance of this for fuel the search for new fields has been vigorously continued to replace those from which the supply was becoming depleted. The search has met with some success, but, as was apparent under the severe weather conditions of last winter, the demand has greatly exceeded the supply, and costly shut downs occurred in industries that were dependent or partly dependent on natural gas. The natural gas supply has been augmented by the use of propane and manufactured gas, but it is admitted that future shortages are imminent, unless supplies can be obtained from sources outside the province. This does not mean that the prospects are exhausted, but the discovery rate has been less than the consumption rate in spite of well directed efforts to meet the emergency, and the hope of altering this condition seems remote.

In the Maritimes and Quebec the prospects of finding new supplies of oil or gas cannot be considered too attractive, in spite of considerable active exploration. For many years the Stony Creek field in New Brunswick has produced from 20,000 to 30,000 barrels of oil a year and sufficient gas to supply Moncton and adjoining communities. Geological parties working for one of the major oil companies last summer made a very detailed study of the stratigraphy and structure of New Brunswick from Sussex to Moncton, and it is possible that some wells will be drilled.

In past years drilling has been done in various other parts of the Maritimes without any success. The deepest hole ever drilled for oil in Canada was completed in 1945 at a depth of 14,696 feet off the coast of Prince Edward Island. This well was drilled from a pier built in Hillsboro Bay near Governor's Island. An adequate structure had been outlined by geological and geophysical methods, but the geological section proved thicker than had been anticipated, and the well failed to reach the objective where oil could possibly occur. It finished in salt beds well above the prospective oil zone.

In Gaspé Peninsula, seepages of oil were described in 1844 by Sir Wm. Logan, founder of the Geological Survey of Canada. Between 1889 and 1902 some wells were drilled and a small refinery was built, but the amount of oil produced was small, and the operation proved unprofitable and was abandoned. From time to time drilling has been resumed, and at present further drilling is being done. The region has always seemed to hold intriguing possibilities for oil production. Oil seepages have indicated the presence of petroliferous rocks, and the region is in the Appalachian belt, where numerous structures offer favourable conditions for oil and gas accumulations, and where drilling depths to possibly productive strata are not great.

The main lack to date has been the absence of adequate porosity in either sandstone or limestone rocks, to provide reservoirs that can hold sufficient oil to give commercial yields in wells. It would seem highly probable if strata with a 10 to 20 per cent porosity and a reasonable permeability could be found, that the prospects of discovering an oil field would be good.

Rocks may have very fine pore spaces that will "bleed" oil and give shows in wells, but will not give commercial yields. Such shows with oil in moderate amounts have been found in wells drilled in Gaspé, and the present hope of discovering production would seem to depend on finding adequate reservoir rocks.

The Situation in the Prairie Provinces

In 1941 almost no crude oil was imported into Alberta and Saskatchewan, and less than 200,000 barrels into Manitoba, in spite of the fact that Prairie refineries processed more than 9.5 million barrels. The main bulk of this oil came from Turner Valley, which reached its peak production of 10 million barrels in 1942. Since that time, however, due to decreased production and increased consumption, the spread between yield and amount used gradually increased, until in 1947 imports into the Prairie Provinces amounted to almost 20,000 barrels a day or a total for the year of 7.3 million barrels. The increase in consumption is shown by the fact that in 1947 Prairie refineries processed 14 million barrels of crude oil, an increase of 47 per cent over 1941.

The import situation for the Prairie Provinces might not have been so serious if oil had been readily available at nearby United States fields, but this was not so. During the war available crude oil supplies became increasingly difficult to find, and it became necessary to bring much of the oil for Prairie refineries from such far distant States as New Mexico and Northern Texas, with large amounts from the Midcontinent area of Oklahoma. In order to maintain price control, the Dominion paid a subsidy on the freight, but at the end of the war this was discontinued, and as the price of oil products necessarily had to carry the freight charges on the imported crude oil from distant areas, a considerable increase in price resulted.

In view of the enlarged demand for oil products in the Prairie Provinces the discovery of the Leduc field in February, 1947, came at a most opportune time. Certain shortages, particularly casing and other steel products, are affecting petroleum developments. With normal progress, however, within a year or so the Leduc field should be able to reach a productive capacity where it may be expected to overcome the Prairie deficiency, now around 20,000 barrels a day. From the publicity that has been given to a "wild" well at Leduc, some of the public have tended to regard the Leduc field as the answer to Canada's oil needs, but no one familiar with the facts would even suggest such a possibility.

Turner Valley has been regarded as a great oil field, and it will continue to yield oil for many years. It should be recalled, however, that crude oil was found on the west flank of Turner Valley in June, 1936, and the peak production was reached in February, 1942. From that time on production declined, in spite of Dominion Government sponsored efforts to maintain it during the war years. Today the yield from Turner Valley is less than half what it was at its peak of 29,000 barrels a day in 1942. Even so, Turner Valley, up to the present, has yielded more than 90 million barrels of oil and 1,427 MMMcf of gas, of which 1,000 MMMcf was wasted. A costly lesson was learned; it will not be repeated, but a large amount of oil was produced.

Leduc Unlikely to Fill Prairie Demand For Long

It is extremely difficult to assess the possible ultimate yield from Leduc. It is safe to infer, however, even at the present stage of development, that the yield of oil will considerably exceed that of Turner Valley, and it could be twice that amount. In Turner Valley, one drilling rig, operating at a high degree of efficiency, drilled two wells a year. In Leduc, some wells have been drilled in about a month. It is to be expected, therefore, that the development of Leduc will be accomplished relatively quickly. This, of course, means the yield ought to increase fairly rapidly. It will also mean that the field will reach its maximum efficient capacity in a relatively short time. The increase of 47 per cent between 1940 and 1947 in the demand for oil products on the Prairies is a fair indication of the rate of expansion that is still taking place. Under these conditions no one could reasonably expect the Leduc field alone to meet even the Prairie requirements for long after it reaches its peak. It is true, of course, that some other fields are producing, and will continue to produce, and that the Lloydminster field is still expanding at a moderate rate.

The oil from Leduc is a light oil, particularly suitable for making gasoline and light oil products. The oil from Lloydminster is heavy and asphaltic, and is particularly suited to yield heavy fuel oil and asphalt. Thus the two oils are complementary and, in general, not competitive in the same market. The situation on the Prairies, therefore, is a most fortunate one as the great needs for light and heavy oil products are both being largely met from domestic production. The situation at present, therefore, is quite satisfactory, with probable expansion in sight to meet all Prairie needs. However, as already indicated, the development of oil fields is relatively rapid, and an adequate provision for the Prairies for any extended period must necessitate new discoveries from time to time.

No attempt will be made here to outline the prospects for the discovery of new oil fields, but a few observations may be pertinent in relation to the hope of being able to meet future demands and, perhaps, create a surplus. The production in the lower or D_3 zone at Leduc is apparently related to reef conditions in the Upper Devonian. Drilling at Fort Norman in the Mackenzie River area, 950 miles northwest of Leduc, also disclosed that the Norman Wells field was an Upper Devonian reef. Field work by Geological Survey parties in 1921 and 1922 revealed the presence of Devonian reefs in the area southwest of the west end of Great Slave Lake, and in the North Nahanni River area near the big bend of the Mackenzie in front of the Camsell Range west of Fort Simpson. Also, an examination of the Devonian section on the face of the mountain at Brulé, northeast of Jasper, has disclosed beds of corals and associated fossil remains up to a few feet in thickness.

This is scant information on which to base any general statements, but it does seem to indicate the Devonian formations along the Rocky Mountain front and eastwards from it were deposited in part at least under conditions favourable for coral growth, that is, in warm clear seas. There is thus, the possibility that Upper Devonian coral reefs may have a reasonably wide distribution under conditions favourable for oil accumulations. If this is so, the hope of finding other areas in which conditions are similar to those at Leduc would appear to be fairly encouraging. The present activity by the oil companies indicates that this view is widely held.

Natural Gas Resources

The natural gas resources of the Prairie Provinces have been the subject of an intensive study for several months by A. Ignatieff and the writer, for the Department of Mines and Resources, Ottawa. This study has now been completed. In respect to the various producing gas fields and areas that have shut-in gas wells, with no present production, the amount and precision of the data available vary widely. For convenience, therefore, in making an appraisal the reserves were considered as: (1) proven; (2) probable; and (3) potential or possible. To the first group or proven reserves belong those fields that have a production history, and where the decline in pressure has been carefully recorded in relation to the volume of gas produced. Any appraisal based on the decline in pressure method is reasonably accurate where records have been kept, and, consequently, these reserves are regarded as proven. The fields so appraised with the amounts of their reserves to an abandonment pressure of 100 pounds per square inch absolute and 60° F. are as follows:

1. Viking-Kinsella-Fabyan	994	MMMcf.
2. Medicine Hat	78	"
3. Bow Island	25	"
4. Foremost	26	"
5. Brooks	11	"
6. Vermilion	9	"
7. Turner Valley (marketable reserves)	290	"
Total proven reserves	1,433	"

With the second group, or probable reserves, are included those fields where gas wells have been drilled, and where a sufficient amount of data on pressure and reservoir conditions are known to allow a calculation of reserves to be made. In this method the volume of gas in the reservoir is calculated. Sedimentary conditions over any considerable area may vary somewhat. Hence the thickness of a gas producing sand, its porosity, and connate water content may have to be considered uniform for the whole of a gas field on the data obtained from relatively few wells. The reserves calculated on these data cannot, therefore, be as accurately appraised as on the pressure decline method and are therefore considered probable. These reserves, to an abandonment pressure of 100 p.s.i.a., and 60° F. are as follows:

Alberta		
Foremost (California Standard well)	9	MMMcf.
Pendant d'Oreille	260	"
Manyberries	31	"
Black Butte and Pinhorn	39	"
Smith Coulee	2	"
Princess	405	"
Dunmore	8	"
Hanna	12	"
Provost	52	"
Elk Point	8	"
Jumpingpound	920	"
Leduc (gas cap only)	389	"
Athabaska (Deca wells)	16	"
Battleview	18	"
Lloydminster Alberta	15	"
Total Alberta	2,185	"
Saskatchewan		
Lloydminster	24	MMMcf.
Lone Rock	16	"
Unity	25	"
Total Saskatchewan	65	"

Total probable reserves of Prairie Provinces—2,250 MMMcf.

Thus the total proven and probable gas reserves, as calculated, are 3,618 MMMcf. for Alberta and 65 MMMcf. for Saskatchewan or a total of 3,683 MMMcf. for the Prairie Provinces. There are no developed natural gas fields in Manitoba.

Gas Reserves for Seventy Years

These figures seem large, and to get an approximate idea of their significance it should be recalled that in heat value 1 ton of high rank coal is equal to approximately 26,000 cubic feet of natural gas. If, however, the increased efficiency in burning gas is taken into account, 1 ton of coal equals about 20 Mcf. of natural gas. Thus the proven and probable reserves of 3,683 MMMcf. of gas are equal to about 184,150,000 tons of coal. This is equal to 20 years production of coal in the Prairie Provinces at the 1945 mining rate.

Perhaps, however, the magnitude can best be assessed in relation to the gas withdrawals for all purposes in 1947. These amounted to 49,000,000 Mcf. for Alberta and 274,628 Mcf. for Saskatchewan. Thus, without in any way trying to relate the local requirements to the accessibility of the presently developed fields, the appraised volume is equal to 70 years of present day gas production. This might not be considered a long period, because as fields decline in pressure there is also a drop in volume of gas that can be produced in a unit period. It does not however take into account the possible or potential reserves, which, if assessed even on an extremely conservative geological basis, are undoubtedly enormous. Although it would be impossible to estimate their amount in terms of billions or trillions of cubic feet, it is certainly safe to conclude they will eventually prove to be many times the presently developed reserves.

The reasons for such an optimistic view cannot fully be presented here, but perhaps one or two illustrations might be instructive and interesting. Recently the Canadian Gulf Company has made an important discovery in the Foothills, 20 miles southeast of Pincher Creek, in southern Alberta. The well reached the top of the Palaeozoic limestone at 11,700 feet, and tests made above 11,927 feet have shown the well to be capable of producing 44,000 Mcf. and at least 1,000 barrels of high-grade oil a day. The well is being deepened, as it may not have completely penetrated the porous, productive section, which in age is similar to the producing limestone of Turner Valley, the type section of which is the Rundle limestone on Rundle Mountain at Banff. This field, in type of structure, is similar to Turner Valley and Jumpingpound.

Turner Valley has already produced 1,400 MMMcf., and still contains a sufficient amount of gas to supply Calgary at present rates of withdrawal for 15 to 20 years. To appreciate what this means it should be remembered that 92 per cent of the fuel used in Calgary is natural gas, and that peak winter loads now exceed 100,000 Mcf. a day. It should not be concluded from the fact that the Pincher Creek structure is of the same type as Turner Valley that it will have an equal gas content. Turner Valley is unique among all known gas and oil fields in the world in having the greatest amount of productive closure, amounting to more than 5,000 feet.

Other fields such as Jumpingpound, with about 1,000 feet of productive closure, would be considered large, and although there is some uncertainty in Jumpingpound as to the amount of porosity of the reservoir rock which directly affects the gas appraisal, it is thought that the gas reserves may not be less than 900 MMMcf. in a field of 6,300 acres. In comparison, Turner Valley has a gas cap of 10,240 acres and an oil area somewhat greater, in which there are large amounts of gas dissolved in the oil. No doubt two or three Foothills fields similar in type to Jumpingpound or Turner Valley could double the present known gas reserves. One such field at Pincher Creek has been partly proved by one well, and other prospects of similar kind are already under development.

On the Plains a few areas have been drilled primarily in the search for, and the development of, gas fields. This is true of the Viking-Kinsella-Fabyan, Medicine Hat, Bow Island, and Foremost gas fields as well as the presently non-producing areas of Pendant d'Oreille, Manyberries, and other smaller areas such as have been drilled to supply gas for various towns, including Brooks, Vermilion, Hanna, St. Paul, and others. Much of the gas has, however, been found in drilling for oil, as in Turner Valley, Jumpingpound, Princess, Athabaska, and several other areas. This is an important consideration, because developments have shown that where gas reserves have been sought exceedingly large quantities have been found, as shown by the extension of the Viking-Kinsella area by Imperial Oil Limited and the discoveries of Pendant d'Oreille, Manyberries, and other fields in Southern Alberta by McColl Frontenac and Union Companies.

The drilling for gas was largely undertaken before the Leduc field was found, and at a time when it seemed that synthetic oil from natural gas might have to be made to meet the Prairie requirements. There would seem to be no doubt, therefore, based on past experience and known favourable geological conditions, that if large markets and a reasonably attractive price warranted a vigorous search for gas, further quantities would be found in amounts far exceeding those now proven and probable. The discovery of oil at Leduc has provided an incentive for an extensive programme of exploration by numerous oil companies. It will be surprising indeed if the history of the past is not repeated and if large amounts of gas are not found in the further search for oil. The outlook on the Prairies, therefore, is that further enormous supplies of gas will be found in a reasonably short time. Whether or not these are developed would seem to depend on the price offered for gas and the market outlets.

The Situation on the West Coast

No oil or gas is produced in British Columbia. Refineries in the Vancouver and New Westminster areas receive their supplies by ocean tankers, mostly from California but with small amounts from Colombia and Venezuela via the Panama Canal route. In 1947 the crude oil imports into British Columbia were 6.5 million barrels of which 97 per cent came from California and 3 per cent from South America. Thus the imports were at the rate of 17,840 barrels a day. Within the last few years production has been increased in California, but to maintain the reserves at a safe level new discoveries are needed at an increased rate to keep up with the consumption and ever-growing demand. California has the second largest oil production and reserves of any State in United States, but reserves are only 10.3 times the 1947 withdrawal rate.[3] There is, therefore, less optimism about finding new fields than in some other parts of the United States. It may be that in the future, as during part of the war period, the West Coast of Canada will have to depend more on imports from South American countries.

In appraising the gas reserves of the Prairie Provinces the Peace River area of Alberta and British Columbia was not included because of its distance from probable Prairie outlets. There seems good reason to believe that the oil and gas prospects of this area are as favourable as the Foothills and adjoining Plains in Alberta, but to date developments have been relatively small. A gas area of unknown but probably small extent has been found just east of the British Columbia boundary northeast of Pouce Coupe, and drilling in the same general area has given shows of oil in one or two wells. Drilling for gas is now proceeding in British Columbia, with the stated objective, if sufficient supplies can be found, to pipe it to Vancouver. Within the last year or so a certain amount of prospective oil land has been acquired by permit from the British Columbia Government, and it may be that some drilling will be done in the near future.

[3] *Oil and Gas Journal*, Jan. 29, 1948, p. 173.

It is general knowledge that the Nanaimo coal fields are declining and that there is need for new sources of coal on the West Coast. Under present conditions coal from Alberta is being shipped to the Far East and coal areas in the interior of British Columbia are now under investigation. It is thus apparent that the fuel situation on the West Coast is not too good from the long term viewpoint, unless adequate preparations are made to meet any future emergencies that might arise. Fortunately, however, it is known that the coal resources of the Province are adequate for all future requirements, and large areas of potential gas and oil lands await development in the Peace River area.

To the hazards of drilling, common to all areas in the search for oil and gas, the British Columbia Peace River district lacks roads, and is far removed from centres from which equipment supplies must come. Development costs will therefore be high. In order that adequate explorations may be undertaken to produce results, operational conditions must have sufficient appeal to warrant large capital expenditures. The history of development in this country and elsewhere is that in order to find oil and gas fields, many non-productive wells may have to be drilled, and the correlation of data from dry holes is an essential part of the oil-finding business.

Discussion

W. J. Dick, M.E.I.C. [4]

I want to congratulate Dr. Hume on his excellent paper, and to discuss briefly, that portion which deals with the natural gas reserves of Alberta. This paper, like almost all others given at this Convention, deals with the subject and need of Conservation.

The formation of natural gas, within the earth's crust, took hundreds of thousands of years and therefore, when this resource is used or wasted, it cannot be replenished. Dr. Hume has referred to the

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(*Continued on page 429*)

HYDROCARBON SYNTHESIS

by

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A paper presented at the Annual General and Professional Meeting of The Engineering Institute of Canada, Banff, Alta., June 3, 1948

This paper discusses the possibilities of producing synthetic liquid fuels from coal or natural gas. Synthetic production is explained by means of chemical equations—the methods employed in Germany are reviewed and the plants described, as well as the American methods of preparing synthesis gas and the proposed method of processing coal for its production. Noting the current progress in the United States towards production of synthetic fuels, the author concludes that the long range development there is most likely to be from coal. In Canada, while the gas process is economically more attractive than the coal process, reasons are given why synthesis is unlikely to be attempted in the near future.

The demand for petroleum products has increased tremendously over the past few years. Despite a current world crude production of 8,700,000 barrels daily, difficulty is being experienced in meeting this demand. At present levels, world production is almost 60 per cent higher than pre-war figures. The Western Hemisphere produces almost 80 per cent of this total, and has been the largest factor in increasing world production. Known oil reserves are capable of producing a great deal more oil, but rapidly increasing demand in conjunction with the shortage of steel to expand refinery and transportation facilities, has created a difficult supply problem. The United States, for instance, has for the first time become a net importer of oil. Canada, with a current consumption of 270,000 barrels per day, produces less than 10 per cent of its own requirements, and is virtually dependent on foreign sources.

Under these circumstances the possibilities of hydrocarbon synthesis have been receiving increasing attention, particularly from the standpoint of supplementing petroleum products in times of national emergency. This process bears some resemblance to the Fischer-Tropsch process, which was first developed in Germany, in that liquid hydrocarbons are produced by the reaction of carbon monoxide and hydrogen in the presence of a catalyst. However, as a result of research and development work carried on in the United States, by which the process has been improved and adapted to American requirements, this hydrocarbon synthesis process differs radically from the Fischer-Tropsch process in several important respects.

The Fischer-Tropsch synthesis was discovered in 1913, but no commercial application was made until Germany erected a plant in the Ruhr in 1933. Additional plants were installed, and by 1943 the yearly capacity of the nine German Fischer-Tropsch plants amounted to 5,590,000 barrels of liquid hydrocarbons and wax. The average daily production from a single plant was approximately 1,700 barrels. American interest in synthetic fuels dates back to the 1920's and, over the intervening years, a considerable sum has been spent by the government and industry on development work in this field. Last year, for example, it is estimated that the U.S. oil industry spent in excess of $10 millions on this type of research, most of this for processes employing hydrocarbon synthesis as the basic reaction.

The Hydrocarbon Synthesis process under consideration involves essentially three steps: (1) synthesis gas production; (2) synthesis; and (3) product recovery and treating. The first step involves the manufacture of a mixture of hydrogen and carbon monoxide from either coal or natural gas, although other materials containing carbon and hydrogen may be used. The second step involves the catalytic interaction of hydrogen with carbon monoxide to form hydrocarbons. In addition to hydrocarbons, a small quantity of compounds containing oxygen are also formed. The final step involves the recovery of the reaction products from the unconverted gases and their subsequent refining to meet product quality requirements.

Figure 1 shows the chemical equations written to represent the reaction carried out in the production of synthesis gas. The first equation is for the partial oxidation of natural gas which is mainly methane, to hydrogen and carbon monoxide. The reaction as written is exothermic, but additional heat is required to take care of heat losses and to raise the reactants to around 2500 deg. F. Conse-

FIG. 1.

SYNTHESIS GAS GENERATION

$$CH_4 + \tfrac{1}{2}O_2 \longrightarrow CO + 2H_2$$

$$\tfrac{16}{10}CH + \tfrac{1}{2}O_2 + \tfrac{7}{10}H_2O \longrightarrow 1\tfrac{1}{2}H_2 + 1\tfrac{1}{2}CO + \tfrac{1}{10}CO_2$$

quently, a slight excess of oxygen above that indicated by the equation is added, so that additional heat is liberated by the formation of small quantities of carbon dioxide and water vapour.

The second equation illustrates the production of synthesis gas from coal, the formula for coal being represented by CH. It shows the formation of a 1 to 1 ratio of hydrogen to carbon monoxide by the reaction of coal with oxygen and steam. By raising or lowering the proportion of steam used, the hydrogen to carbon monoxide ratio can be raised or lowered.

The synthesis reaction is represented by the idealized chemical equations in Fig. 2. The first equation shows the reaction of two volumes of hydrogen with one of carbon monoxide, to form the synthesis product designated as CH_2; the formulæ representing the approximate atomic proportions of carbon to hydrogen found in the product. The oxygen of the carbon monoxide appears as water. It has been found that the combining ratio of hydrogen and carbon monoxide varies in accordance with the ratio of these two reagents in the feed gas, the combining ratio generally being appreciably lower than the feed ratio. As the feed ratio changes, the manner in which the oxygen of the carbon monoxide is discarded is altered, and the second equation illustrates the reaction in which two volumes of carbon monoxide are combined with one of the hydrogen.

It will be seen that in this case the oxygen is discarded as carbon dioxide. All intermediate combining ratios may be considered to be combinations of these two equations. For example, the third equation illustrates the reaction occurring when equal volumes of hydrogen and carbon monoxide are consumed. In this case the oxygen of the carbon monoxide is discarded partly as water, partly as carbon dioxide. It should be noted that regardless of the combining ratio, the same amount of hydrocarbon product (CH_2) is formed from the same volume of hydrogen plus carbon monoxide in the synthesis gas.

FIG. 2.

SYNTHESIS

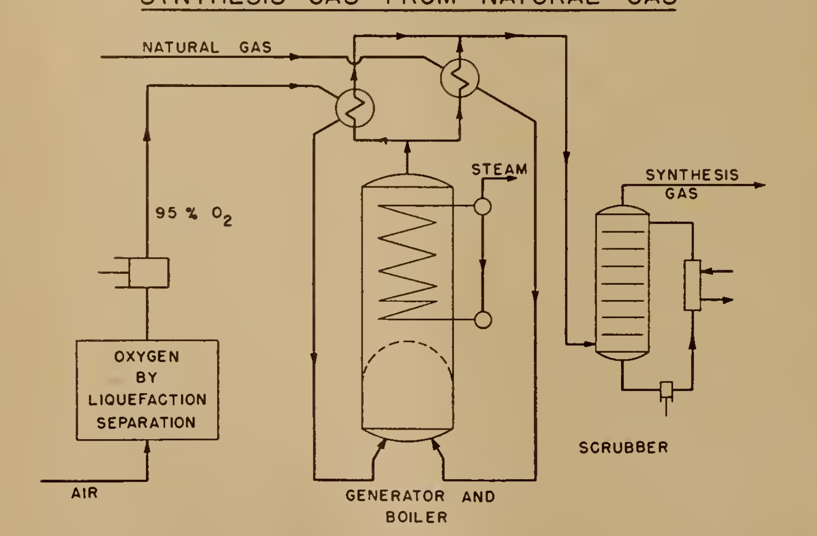
$$2H_2 + CO \longrightarrow CH_2 + H_2O$$

$$H_2 + 2CO \longrightarrow CH_2 + CO_2$$

$$1\tfrac{1}{2}H_2 + 1\tfrac{1}{2}CO \longrightarrow CH_2 + \tfrac{1}{2}H_2O + \tfrac{1}{2}CO_2$$

FIG. 3.

SYNTHESIS GAS FROM NATURAL GAS



Description of Plant and Operating Conditions

It might be of interest to briefly review the German operations before discussing the plant envisaged for erection in the United States. Synthesis gas was produced by the interaction of steam and coke in conventional water-gas generators, although some gasification units were in operation employing coke or coal and oxygen and steam. The hydrogen to carbon monoxide ratio in the synthesis gas was adjusted to about 2/1, since this is the ratio in which these components were consumed in the synthesis step. The gas produced was cooled, treated for sulphur removal and charged to the synthesis section. The plant-scale operations were all carried out with cobalt catalyst. This catalyst consisted mainly of cobalt and kieselguhr, with small amounts of thorium oxide and magnesium oxide.

The synthesis step was carried out at temperatures varying between 350 deg. F. and 400 deg. F., with pressures varying between one and ten atmospheres. The products were mainly straight chain hydrocarbons ranging from methane to heavy wax. The octane number of the material in the motor fuel boiling range was very low, in the range of 0 to 50, so that thermal cracking had to be employed to produce a gasoline of even moderate quality. The diesel fraction, however, was of superior quality. The production of fuels was not the primary objective of the operation, as the hydrocarbons produced were used largely as raw materials for synthetic fats, lubricating oils, detergents, etc.

One of the main problems in the design of the German plants was that of heat removal in the synthesis reactors. The volumetric heat effect was of the order of 60,000—300,000 B.t.u.'s per hr. per cu. ft. of reaction volume, depending on the space velocity employed. These are average figures for the entire catalyst bed. Indications are that at the entrance of the reactor the heat release may be much greater. In the latest reactor design, catalyst in the form of pills was contained in annular spaces between tubes, with a cooling medium (water) on both sides of the annulus.

The necessity of preventing local overheating at any point in the catalyst required that the annular spaces be no more than about ½ in. wide, and this led to an enormous tube area in the reactors. For example, a plant producing 10,000 barrels per day of synthetic oil products would require almost 6 million sq.ft. of heat exchange surface in the reactors. The complexity of the construction required that small capacity reaction units be used and a 10,000 barrels per day plant of this type would require 128 reactors.

Figure 3 shows the proposed American method of preparing synthesis gas. Natural gas and oxygen of 95 per cent purity, prepared from air by liquefaction separation, are preheated to 800-900 deg. F. in separate exchangers using the hot synthesis gas as a heating medium. These preheated gases are introduced into the synthesis gas generation vessel and partial oxidation, mainly to CO and H_2, occurs. The synthesis gas is generated preferably at some pressure slightly in excess of that required for synthesis, so that the gas produced need not be compressed. Natural gas is generally available at sufficient pressure, but the oxygen must be compressed to this high pressure.

The synthesis gas generator is a cylindrical vessel made of internally lined carbon steel. A system of boiler tubes is installed at the discharge end and this boiler produces high pressure steam in cooling the synthesis gas down to about 1,000 deg. F. The synthesis gas is further cooled by heat exchange with the incoming natural gas and oxygen, and is then discharged into the bottom of a scrubbing tower, wherein it is cooled to a temperature in the range of 100-150 deg. F. This flow plan assumes a natural gas of a low sulphur content otherwise a treating plant would have to be added to remove the sulphur present.

FIG. 4.

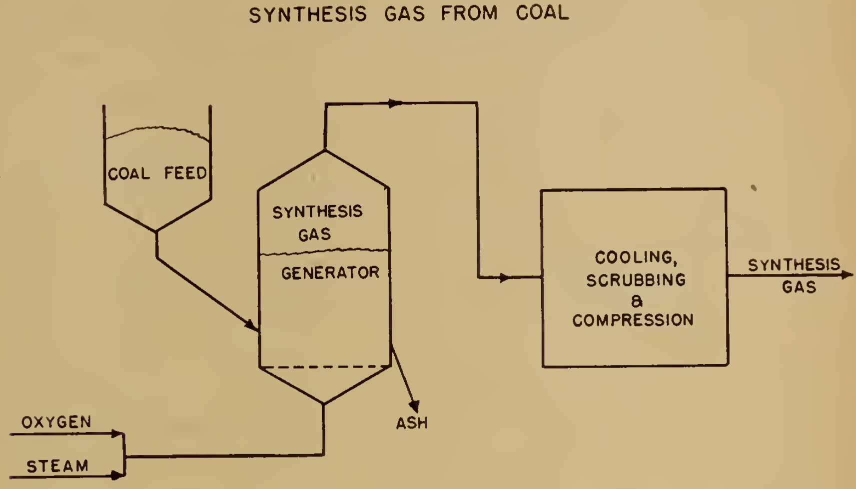


FIG. 5.

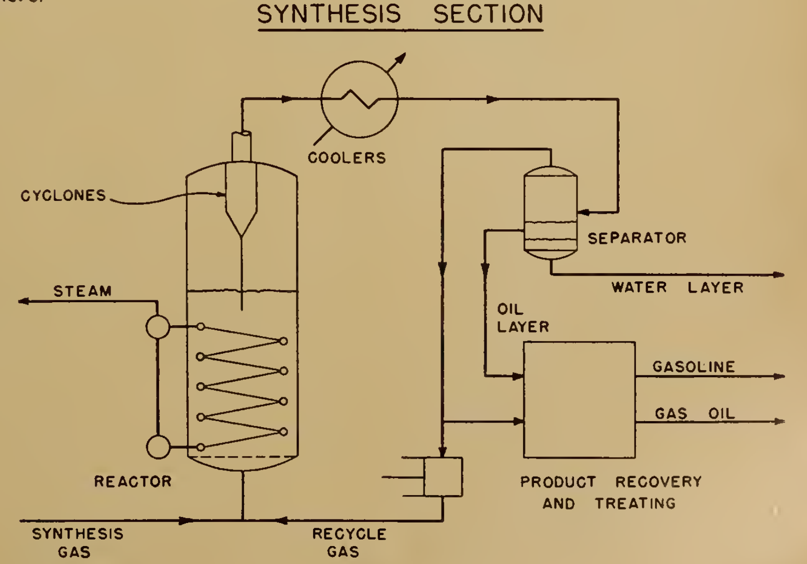


FIG. 6.

FLOW RATES SYNTHESIS FROM NATURAL GAS

NATURAL GAS	123 MM CFD
OXYGEN (95 %)	73 MM CFD
PRODUCTS	
GASOLINES	8,300 B/S.D.
GAS OIL	1,070 B/S.D.

Figure 4 indicates a tentative method for processing coal for the production of synthesis gas. Crushed bituminous coal is fed to a generator, where synthesis gas is produced by the reaction between coal, steam and oxygen. The heat required for the reaction between steam and coal is supplied by burning some of the carbon with oxygen. The synthesis gas from the generator is then cooled and freed of sulphur.

Having produced our synthesis gas by two alternative methods, we can now proceed to the synthesis step. Figure 5 shows a flow plan of the proposed operation. The synthesis gas is charged to reactors, which contain a bed of powdered iron catalyst in the fluid state. The mass exerts a fluid pressure, which may be used to measure the quantity of solids in the vessel and is also the basis of a convenient method of circulating the solids to zones of higher pressure. The fact that it exists in a violently agitated state is a very effective way of establishing a uniform temperature throughout the bed. It is also the means of giving excellent heat transfer coefficients, so that the exchanger surface required to remove heat from the reacting components is only about ½ of 1 per cent of the exchanger area in a German installation of the same capacity. A considerable amount of experience with the fluid technique has been developed in petroleum refining, where it is employed in a gas-oil cracking process.

The catalyst employed will probably consist essentially of a reduced iron oxide ground to a fine particle size. Operating conditions contemplated are pressures in the order of 250-400 p.s.i, and temperatures in the range of 550-650 deg. F. The overhead gases are passed through cyclone separators for dust recovery and possibly final cleanup by means of filters or oil scrubbers should be incorporated. The gases are then cooled and passed through a separator where liquid products are removed.

At this point an oil and water layer are recovered. The water layer contains some alcohols, ketones, etc., in dilute solution. These may be recovered if desired. A part of the gas from the separator is recycled to the reactor inlet for further reaction. The balance of the gas and the oil layer are sent to the refining section. This is a conventional type of processing similar to that carried out in oil refineries. The gases are treated in an absorber for C_3 and C_4 recovery. A polymerization plant for converting unsaturated C_3 and C_4 to gasoline, a treater for the synthetic oil, and the necessary fractionating equipment are also provided.

One important consideration in determining the location of a hydrocarbon synthesis plant is the availability of water. The plant requires large quantities of water both for cooling and for steam generation. Availability of coal or gas and a market to absorb the products are thus not the only factors involved in selecting the site.

Products and Product Quality

Figure 6 indicates the material balance for the type of American synthesis plant outlined previously. This plant employs natural gas as the source of carbon and hydrogen. The quantities of natural gas and oxygen are based on measurement at 60 deg. F. and 1 atmosphere pressure. It will be noted that large quantities of oxygen are consumed and the success of the synthesis operation depends on the ability to meet these oxygen requirements at a low cost. The quantity of oxygenated compounds available for recovery from the water layer varies from 10 to 15 per cent of the total volume of gasoline plus gas oil produced.

The corresponding material balance for the coal operation has not been included, since the develop-

FIG. 7.

PRODUCT QUALITY

GASOLINE	
R.V.P., P.S.I.	9.0
% @ 158°F	22.5
% @ 212°F	45.7
MOTOR O.N. — CLEAR	81
+ 2 C.C. T.E.L.	85
RESEARCH O.N. — CLEAR	95
+ 2 C.C. T.E.L.	99
GAS OIL	
°A.P.I.	21
50% POINT, °F	540

ment of the coal process has not reached the same stage as for gas. It would appear that as an approximate estimate, half a ton of good grade bituminous coal would be required to produce 1 barrel of total liquid products.

As pointed out previously, the oxygenated compounds are recovered in a dilute water solution. Their recovery as pure chemicals is economically attractive in locations where a market exists to absorb the large quantities produced. The compounds which may be recovered include ethyl, propyl, butyl and amyl alcohols, acetaldehyde, propionic aldehyde, acetone and higher homologs. Organic acids are also available for recovery. These consist mainly of acetic, propionic and butyric acids. It should be pointed out that relatively few plants of the size illustrated in the figure might satisfy the present U.S. requirements for many of the chemicals produced from the synthesis process.

Figure 7 indicates the quality of the gasoline and gas oil produced. The quality of the actual gasoline leaving the synthesis reactor has been considerably improved by the addition of polymer gasoline. This gasoline is produced by the polymerization of unsaturated C_3's and C_4's, which are produced in the synthesis step. It is a very high quality gasoline, much superior as far as octane number is concerned to any motor fuel being marketed at present.

Conclusion

In comparing the cost of gasoline produced from crude, natural gas and coal, it appears that in the United States the natural gas process can produce gasoline at a price competitive with gasoline from crude at present crude prices. Two synthesis plants employing natural gas are presently under construction; one by Carthage Hydrocol, at Brownsville, Texas, and another by Stanolind Oil and Gas in the Hugoton Gas Field in Kansas. Both plants produce approximately 7,000 barrels per day of gasoline and gas oil. The synthesis process employing coal is not as well advanced as the gas process, and more pilot plant development appears necessary. Owing to the limited supplies of natural gas in comparison with coal reserves, the long range development is most likely to be with coal. The indicated coal reserves of the United States are so tremendous, being in the order of 3 to 4 trillion tons, that there is sufficient coal to last for some thousands of years, even if to the present requirements we add the coal that would be required to meet the demand for petroleum products.

In studying the possibilities of the early application of the hydrocarbon synthesis process in Canada only the gas process will be considered. At the present time this appears to be economically more attractive than the coal process, and the only one competitive with crude refining. The only gas reserves large enough to support a synthesis plant are in Western Canada. The discovery of the Leduc oil field has greatly strengthened the widely held conviction that this area may ultimately become one of the major oil producing areas of the world. At the present time, Alberta is the fourth most active oil exploration area in the Western Hemisphere, which is an indication of the possibilities anticipated by the industry. The development of major production in this area would be accompanied by a reduction in crude prices as the economic orbit of the crude is extended. In this case the competitive position of a synthesis plant would rapidly deteriorate.

Another factor that makes the installation of a Synthesis plant something of a gamble at this stage is the fact that it is a new process undergoing intensive development. There is a possibility that some developments will take place in the next few years that would render present Synthesis plants obsolete. The investment involved in the construction of a Synthesis plant is of such a magnitude that the average individual or corporation would want to be reasonably certain that all possibilities of major improvements to the process had been explored before they would contract for a plant.

The limited market for chemicals in Canada makes the installation of a Synthesis plant less attractive in Canada than it would be in the United States. It appears that the first few American plants will be able to dispose of these chemicals at an attractive return. The Canadian market is so small that even the production from a moderate sized plant cannot be absorbed.

When the above factors are considered, it appears unlikely that a Synthesis plant will be constructed in Canada in the near future.

DISCUSSION

(Continued from page 424)

enormous increase in the use of petroleum in the United States and to the precarious position of Canada in regard to supply.

It is of interest to note that notwithstanding the fact that United States is the largest producer of oil in the world, it is now an importer of oil; also, that two large synthetic oil plants using natural gas are now being installed, one in Kansas, the other in Texas. It is understood that a similar plant using natural gas was to be installed in Alberta, but the advent of the discovery of oil in the Leduc area postponed the construction of this plant.

In view of the serious oil situation on this continent and Canada's dependence on oil from United States, it is logical to suppose that any consideration of the use of natural gas in Alberta should include reserves of gas for one or more synthetic oil plants in this province in the not too distant future.

The papers given at this meeting invariably show that the demand on our natural resources is increasing enormously as compared with the past and, no doubt, this will continue to be the case. Dr. Hume states that the actual and probable natural gas reserves of Alberta, based on our present consumption, are sufficient for seventy years. This figure was given for appraisal purposes but might be misleading to some people.

There are two natural gas pipeline proposals now being actively mooted for exporting gas from Alberta. These together would require about two hundred per cent more gas than is now consumed in Alberta. If you add to this our normal increase and the gas required for only one 10,000 bbl. per day synthetic oil plant, Alberta's actual and probable reserves would only be sufficient for some fifteen years. In this connection it is of interest to note that the gas consumption in Edmonton has doubled in the last seven years.

The export of gas from Alberta would not only tend to deplete our reserves, but would seriously affect our present coal-mining industry by replacing the use of coal by natural gas. While our gas reserves appear to be very large, serious consideration should be given to Alberta's needs before anything is done regarding the export of natural gas from the province.

The Engineering Phases of Oil Production

A paper presented at the Annual General and Professional Meeting, The Engineering Institute of Canada, Banff, Alberta, June 3, 1948.

by

E. D. Wilson

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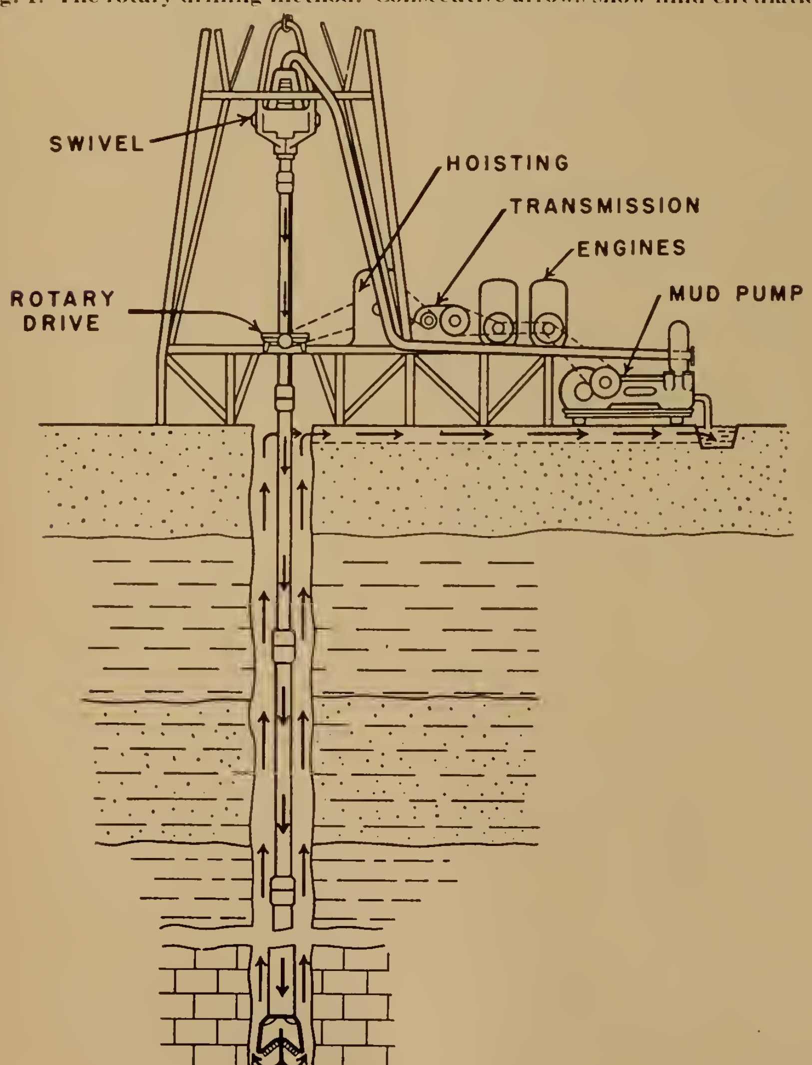
In discussing the production of oil from an engineering standpoint it is considered appropriate to mention first the engineering aspects of the drilling operations, which are a necessary prerequisite. An attempt will be made, therefore, to point out briefly the application of the various branches of engineering in drilling and producing oil wells, and in studying and controlling the behaviour of petroleum reservoirs.

Fig. 1. The rotary drilling method. Consecutive arrows show mud circulation.



Drilling

The vast majority of wells are currently drilled with various types and sizes of rotary drilling rigs. The essential components of a typical rig are shown on Figure 1, and the principle of operation, which is illustrated, is that of rotating a rock cutting tool, at the same time circulating a drilling fluid to remove rock cuttings from the hole.

The development of the rotary rig and drilling tools has resulted from the application and advancement of mechanical and metallurgical engineering. Each component, from the largest to the smallest, has had to be designed to take care of severe stress, high pressures, corrosive action or extremely hard conditions of abrasion. Outstanding examples are found in the design and construction of the rock bit and the drill pipe.

Rock bits have been designed to withstand vertical compressive forces as high as 5000 pounds per inch of diameter, while being rotated at speeds of 50 r.p.m. or more. Each joint of drill pipe is a precision machined tool from the threads and the couplings throughout its length, and its design is a compromise between meeting specifications of pressure and tension, at the same time being as light in weight as possible and resistant to continuous abrasion.

The chemical engineer has also contributed largely to present day ability to drill deep holes through variable formations, by study and improvement in drilling fluid control. Drilling mud, as it is com-

The development of the rotary drilling rig to its present day form is a victory of achievement for the mechanical and metallurgical engineers. The great depths to which the drill now probes in the search for oil have been made possible also through the work of chemical engineers on drilling fluid control. A new phase of engineering has been developed during the last few years and is now termed Reservoir Engineering. The application of reservoir engineering methods has increased the oil reserves of the world by many millions of barrels.

monly termed, is a complex colloidal suspension and is called upon to meet rigid specifications of weight, viscosity, jel strength, and filtration characteristics. To enable the drilling of sections of salt and anhydrite, chemical treatment is required in order to counteract the flocculation of colloidal material and maintain the desired mud properties.

Heaving shale formations also present a difficult drilling problem, requiring careful control of filtration characteristics or the use of special silica base or oil base muds. To combat abnormally high pressures, drilling mud must be capable of carrying up to double its own weight in weighting material, while on the other hand, when highly porous formations are encountered, drilling mud is used to carry large quantities of various types of filler material into the porous zones.

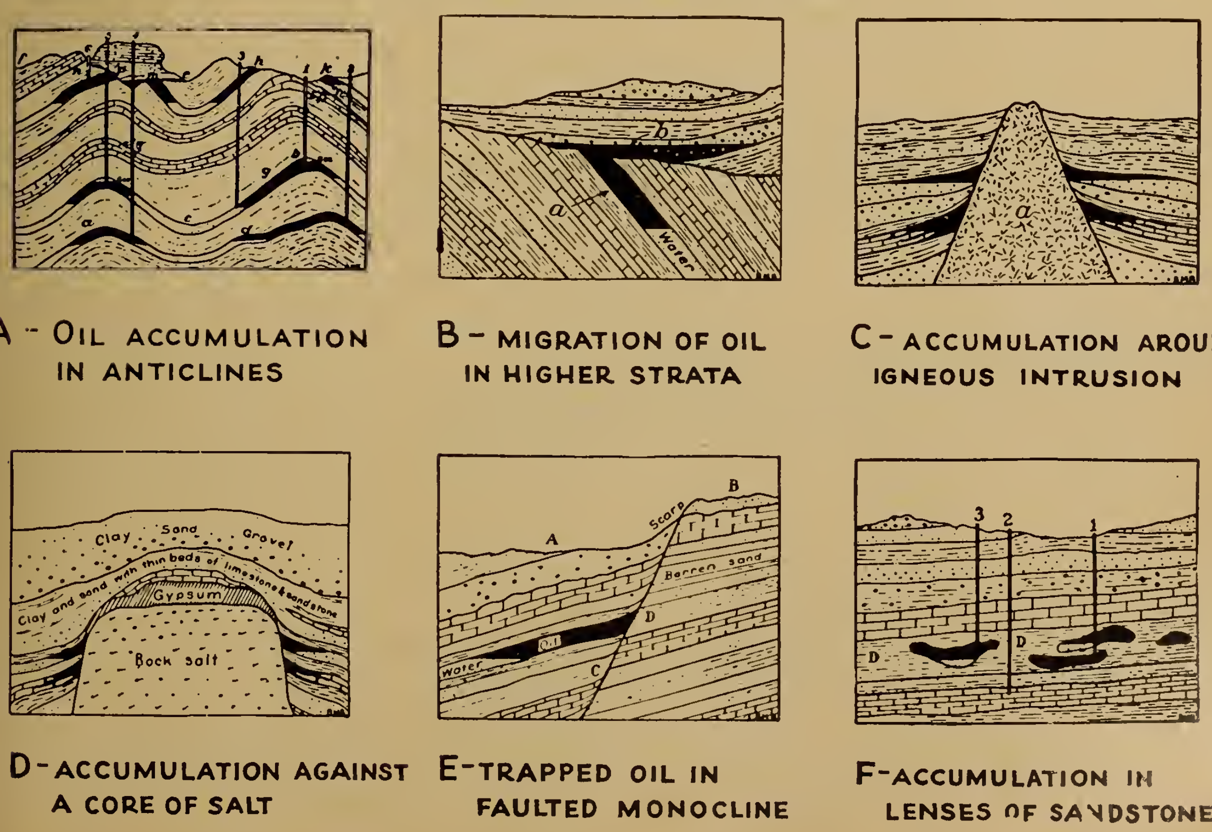
Further improvements in drilling practices and drilling equipment are constantly under study as the search for oil carries the drill to greater depths and the operation of the drilling rig becomes more costly. Recent advances have been made in, and current energies are being directed towards, unitization and portability of the components of the drilling rig, and in mechanization of the operations required in order to reduce fatigue, eliminate hazardous working conditions and achieve greater speed of operation.

The Petroleum Reservoir

Before discussing the engineering aspects of production operations, a short description of petroleum reservoirs and the methods of production may be in order. The three primary requisites for the formation of a petroleum reservoir are, a source bed of the hydrocarbon components, a porous bed which will contain these hydrocarbons, and an impervious bed overlying the porous bed.

There are various types of reservoirs as shown in Figure 2, which are formed by changes in strata, by variation in permeability of the rock, or by a combination of these. Alberta's newly discovered Leduc Field provides an excellent example of a reservoir formed by variation in permeability in the upper zone, and by changes in the strata in the lower producing zone. A cross section of the field is shown in Figure 3.

Fig. 2. Various types of reservoir formations.



A – OIL ACCUMULATION IN ANTICLINES

B – MIGRATION OF OIL IN HIGHER STRATA

C – ACCUMULATION AROUND IGNEOUS INTRUSION

D – ACCUMULATION AGAINST A CORE OF SALT

E – TRAPPED OIL IN FAULTED MONOCLINE

F – ACCUMULATION IN LENSES OF SANDSTONE

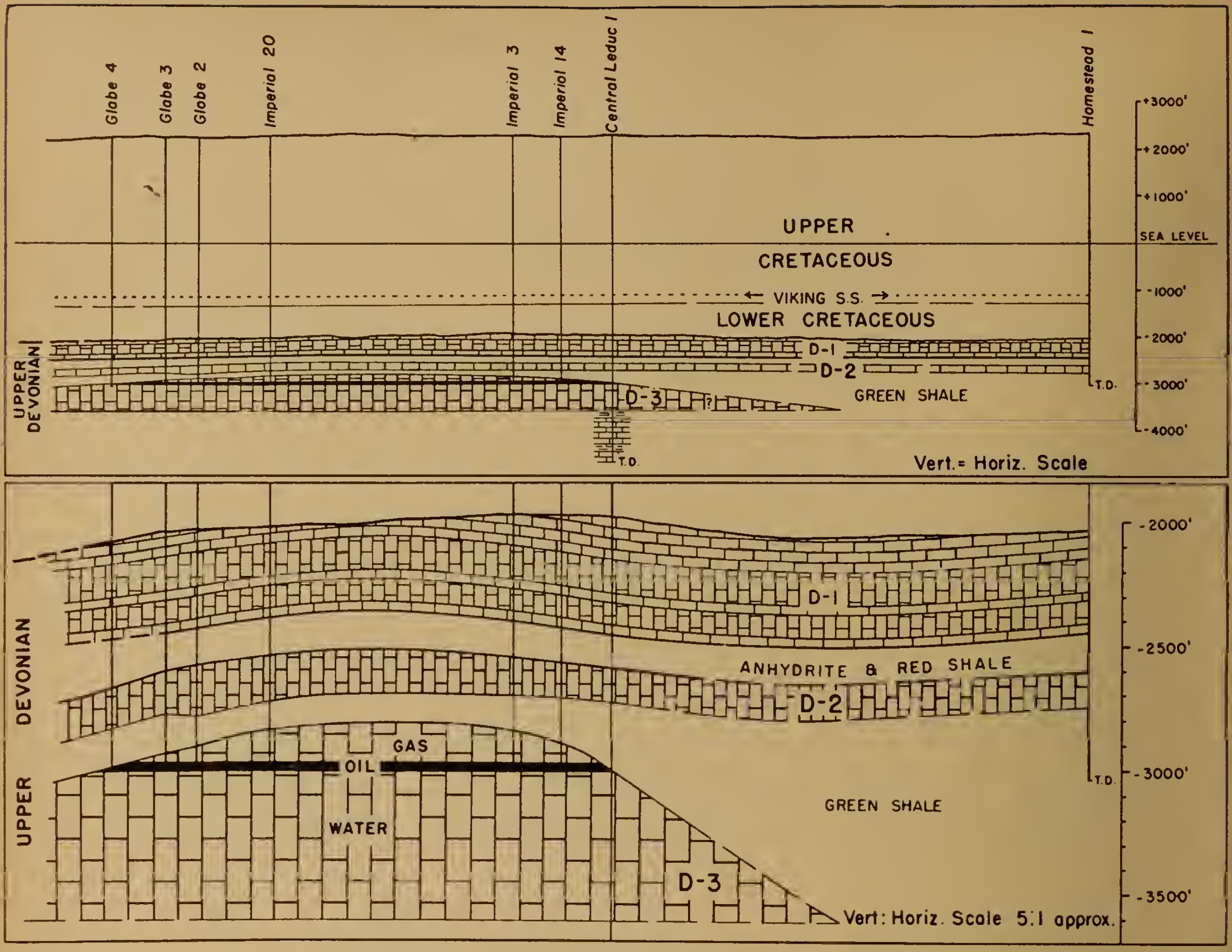


Fig. 3. Cross section — Leduc Oil Field.

The natural gas, oil and water which are trapped in petroleum reservoirs are generally found to be well segregated in the order of their respective specific gravities.

Methods of Production

The simplest method of production is that of natural flow, whereby the latent energies contained in the reservoir are allowed to bring the oil to the surface. This energy may be supplied by the gas in the gas-cap, if present, by the gas-in-solution in the oil, or by the water surrounding the reservoir, all of which are compressed under high pressures. A common method of completing an oil well, controlling the flow and separating the oil and gas is illustrated in Figure 4.

If there is not sufficient energy to cause the well to flow naturally, various types of artificial lift may be used to bring the oil to the surface. These are:

a. Mechanical pumping with
  - i. A sucker rod pump which is a highly improved version of the common water well pump.
  - ii. An electrically operated centrifugal pump, or
  - iii. A hydraulically operated pump.

b. The injection of air or gas to the bottom of the well to assist in lifting the oil to the surface.

Auxiliary Operations

Several methods are used to increase the ability of a well to produce oil. Of these, the commonest are

a. Shooting the productive zone with nytroglycerine, in order to create fractures around the well bore and enable the oil to flow more freely into the well. This method has its application mainly in sandstone formations.

b. Injecting hydrochloric acid into the formation in order to create or enlarge channels through which the oil flows into the well. This method is used mainly in limestone formations.

Engineering Phases of Field Operations

The chemical engineer in the field is concerned with problems of

a. The treating of emulsions which are formed when water is produced with the oil. The breaking down of oil-water emulsions involves careful control of the application of heat and the addition of de-mulsifying agents.

b. The treating and disposal of salt water produced with the oil.

c. The removal of deposits of paraffin from production equipment.

d. The lubrication of equipment.

e. The corrosion of equipment.

Mechanical engineering is ap-

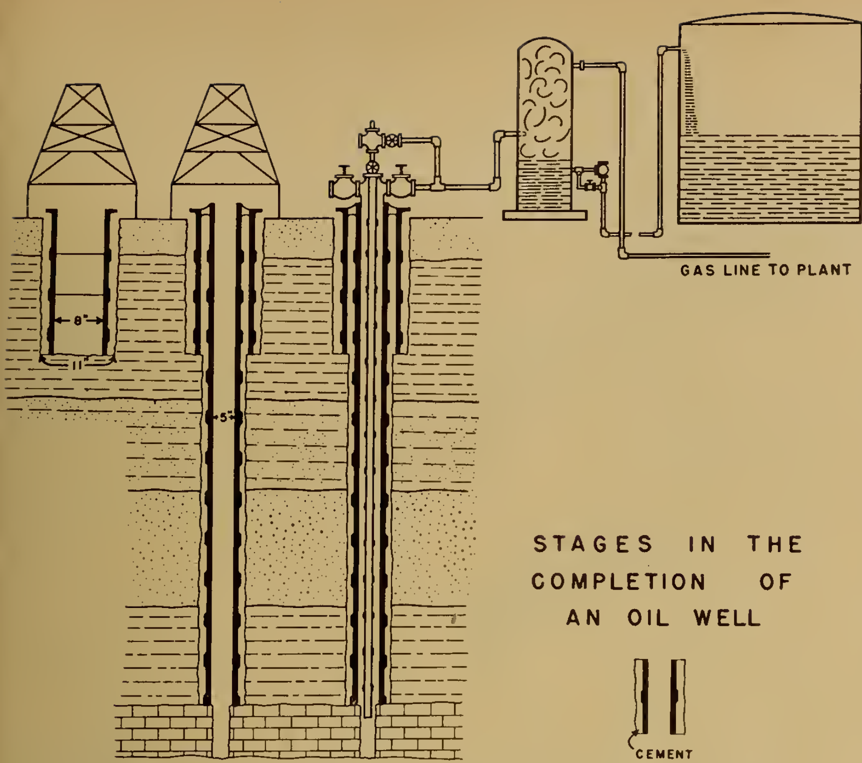
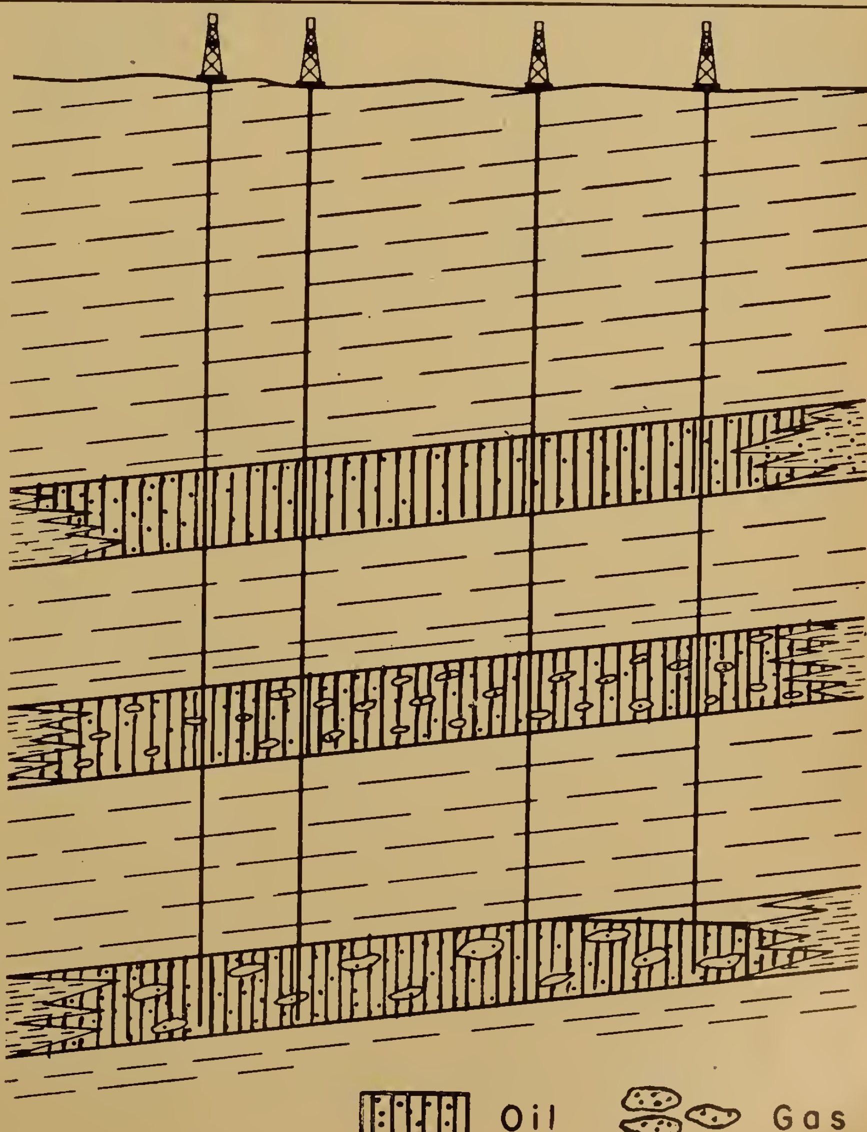


Fig. 4. (above). A common method of completing an oil well.

Fig. 5. (right). Reservoir using gas-in-solution drive.



plied in the field in the form of testing various types of equipment, investigating and reporting of equipment failures, and inventing and developing new or improved production equipment.

Electrical and diesel engineers find scope for their abilities in the many power installations that are required, while the civil engineer is concerned mainly with the construction of roads, production sites, surface drainage problems and camp maintenance.

Engineering in Laboratory and Office

Every oil field requires a service laboratory, where chemistry and physics are applied in the analysis of reservoir fluids and in the determination of the porosity, permeability, and connate water saturation of the reservoir rock. Many of the techniques used have been developed in the research laboratories of the major oil producing companies.

In connection with the production of oil there is a considerable amount of work of an engineering nature to be done in the office which is common to most industries. This work consists of technical report writing, cost estimation and analysis, production forecasting, lease evaluation, general design work, and advising and assisting management. In addition there has developed in the last few years a new phase of engineering which is peculiar to the oil industry and is termed Reservoir Engineering.

Reservoir Engineering

Reservoir engineering may be defined as the study of the extraction of fluids from a reservoir, and of the movements of fluids within a reservoir. The study of reservoirs has been going on for many years. It possibly was begun on fresh water reservoirs in connection with the supply of water for large centres of population. Reports of such studies are dated as far back as the 1880's and 1890's. However, it was not until the late '20's and early '30's that the application of reservoir studies was made to the production of petroleum reservoirs.

Since then the petroleum industry has devoted its best brains and

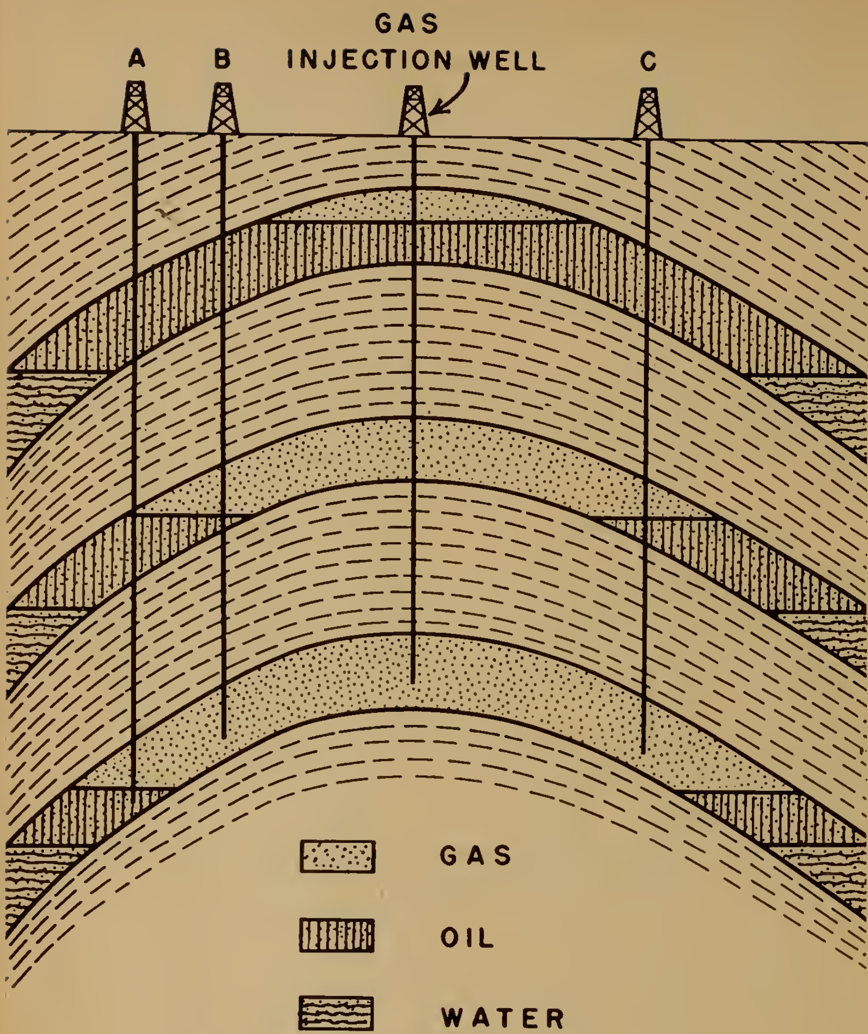


Fig. 6. Reservoir utilizing expanding gas cap drive.

many thousands of dollars to the development of the understanding of petroleum reservoirs. In practice today the diversities of fields in petroleum or production engineering are many, but it is considered that the real petroleum engineer must be one who has the ability to handle reservoir engineering problems.

Reservoirs are classified into three types, according to the drive or recovery mechanism which is functioning within the reservoir. The types of recovery mechanisms are:

a. The gas-in-solution drive, in which the only source of energy is from the gas which is dissolved in the oil. (Figure 5)

b. The gas-cap drive in which the energy required is supplied by an expanding gas-cap above the oil zone. (Figure 6)

c. The water drive in which the energy required is supplied by the expansion of water surrounding the petroleum reservoir. (Figure 7)

Combinations of the above recovery mechanism are common, also, gravitational segregation may play an important part in the three types of drives, and is sometimes classified as a separate type of drive.

Gas-in-Solution Drive: In dissolved gas drive reservoirs a continuous rapid drop in pressure may be expected, with a corresponding rapid rise in gas-oil ratio, which reaches a maximum and then falls off rapidly in the later life of the reservoir. Normally, wells require pumping fairly early and the recovery expectancy is in the range of from 10 to 40 per cent of the oil in place, depending on gravitational segregation.

Gas-Cap Drive: A slower but continuous drop in reservoir pressure characterizes the gas-cap drive reservoir, accompanied by a gradually increasing gas-oil ratio. As a rule, the wells will flow continuously throughout their life and the recovery expectancy may be from 30 to 80 per cent of the oil in place, dependent again on gravitational segregation and also on the degree of reservoir control.

Water Drive: In a water drive reservoir the pressure drops rapidly with initial production and then levels out and remains fairly constant over the remaining life of the reservoir. The gas-oil ratio remains low for a period and then gradually increases. With this type of drive from 50 to 80 per cent of the oil in place may be recovered.

The characteristics of the types of drives described above are illustrated in Figure 8.

Reservoir Analysis

The study of reservoir behaviour begins with the accumulation of data on the composition of the reservoir fluids, the volume of gas, oil and water that are produced, the sub-surface pressure history of the reservoir, details of completion and performance of individual wells, porosity, permeability, and connate water saturation of the reservoir rock and geologic data on the physical shape and size of the reservoir.

From the geologic data and average values of the properties of the reservoir rock it is relatively simple to calculate the volume of oil in place. However, the estimation of how much of this oil will be recovered and the prediction of the behaviour of the reservoir are much more complex problems.

From the reservoir data that have been assembled it may be possible by visual inspection to determine the type of recovery mechanism which is operating. The more exact determination of this information and the solution of several other problems in connection with reservoir behaviour are accomplished by means of volumetric balance.

Volumetric Balance

The volumetric balance is essentially an inventory of the reservoir fluids. This is an extremely useful tool for analyzing the past and predicting the future pressure behaviour under various operating conditions, also the behaviour of the gas-cap and the magnitude of water influx. By use of the volumetric balance and other equations at the same time it is further possible to determine the amount of regional field drainage, the effect of gravitational segregation, and the effect of pressure maintenance. It is also possible to plan artificial lift programmes in advance, and to estimate ultimate recovery and change of same with change in method of operation.

For gas-cap and gas-in-solution drive reservoirs, volumetric balance equations are derived by simply equating withdrawals from the reservoir to the expansion of the remaining oil and gas. In the case of a water drive, reservoir withdrawals are equated to the expansion of the remaining fluid plus the volume of water influx. The results of the volumetric balance may give a false picture of the behaviour of the reservoir. It is, therefore, necessary to check the results against the performance of individual wells before accepting the findings as being correct.

One of the most important applications of the analysis of reservoir behaviour is that of controlling the rate of fluid withdrawal, in order to increase the ultimate recovery of oil. In order to take full advantage of a water drive the rate of fluid withdrawal must be restricted, due to the nature of the action of the water drive. The rate of water influx into a reservoir is a function of time and of the pressure differentials in the reservoir. In years past, water drive reservoirs have been produced at such excessive rates that practically no benefit has been derived from the energy available from the water drive, with the result that large quantities of oil have been left in the ground.

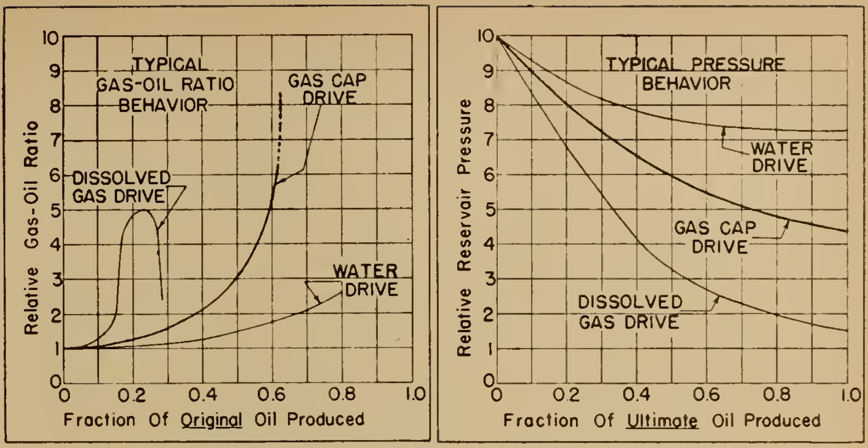


Fig. 8. Characteristics of various drives compared.

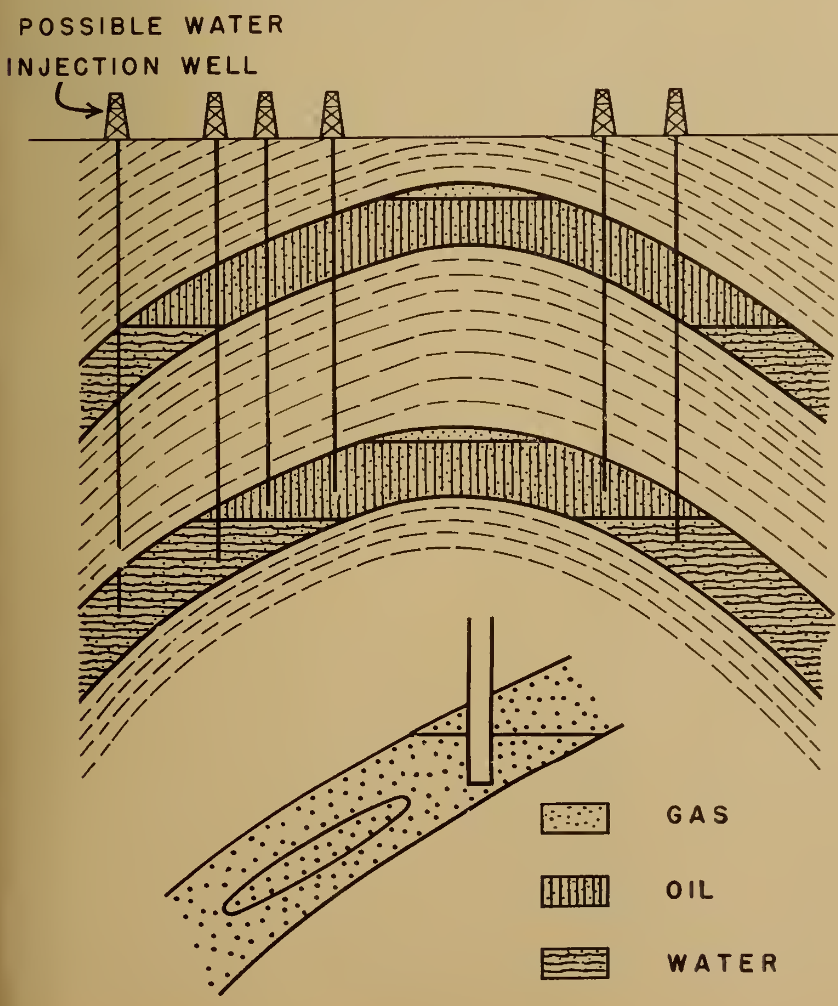


Fig. 7. Reservoir operated by means of water drive.

In addition to taking full advantage of the latent reservoir energies, it is also possible to supplement this energy by means of returning produced gas and water into the reservoir, thus reducing the net fluid withdrawals and maintaining the reservoir pressure. Such methods are referred to as pressure maintenance operations. These are actually secondary recovery methods. They are instituted while the primary recovery operation is still in effect, to differentiate between secondary recovery operations, which are instituted after the reservoir has been depleted by primary recovery methods.

When it is considered that pressure maintenance may result in an increase in ultimate recovery amounting to millions of barrels of oil, but that such operations involve large expenditures in capital equipment installations and operating costs, the importance of careful analysis of reservoir behaviour is easily recognized. The application of reservoir engineering methods has greatly increased the reserves of oil in the producing fields of today. It is hoped that in the future even more efficient reservoir control will be possible as a result of the continuing research and engineering effort which is being directed towards this goal.

Discussion follows.—Ed.

Discussion

J. W. Young, M.E.I.C.[1] In the time available to him, the author has succeeded in giving a broad and comprehensive picture of the services rendered by the engineer in modern oil production. It is regrettable that the time has not been available to permit the expansion of this paper into a review of the various methods in use today, as well as a prediction of what the future developments may be.

In discussing the treatment of oil field emulsions the author mentioned the use of chemical treatment with de-mulsifying agents, but did not discuss the use of electrical de-mulsification equipment. It would be of interest to obtain his opinion as to the relative merits of the two methods of treatment and their fields of application in the future.

F. F. Dyer, M.E.I.C.[2] The main purpose of these discussions as understood by the writer, is not to make the author happy, but to criticize the papers, and possibly bring out items that might have been further developed. If these few remarks appear to be critical it should not be inferred that Mr. Wilson's excellent paper warrants criticism.

The following remarks should be considered with the fact in mind that the writer is not an expert in petroleum production, but are made from the point of view of an interested amateur. His experience has been almost entirely in the refining end of the business which is a very different aspect of the petroleum industry to that of production. Perhaps, though, this is as it should be, since it is almost certain that most of us here are not experts in this subject, in spite of the saying that an expert is anybody more than sixty miles from home.

Mr. Wilson commences his topic at the time of drilling operations. Before the well can be drilled, however, a site must be chosen. In choosing that site engineering has come into play. Pure geology, the study of the rock formation in the area, is possibly not considered to be engineering, but there can be no argument that engineering principles are employed in the specialized processes applied to the search for oil underground. There is a tremendous amount of survey work to be done before drilling can commence. The seismographic surveys are highly technical fields in which engineering plays its part. The instruments used and the processes applied surely have an engineering background.

Again, with the thought that most of us know little about the actual drilling operation and procedure, it seems this paper could have been brought home to us more forcibly if it had gone into more detail on the actual drilling. It has always been a marvel to me how the drill can be directed far down in the earth, so that it will travel in the direction desired, even turning corners when necessary. How can a long, slender piece of steel, reaching say half a mile into the earth be operated so that it ends up at exactly the spot desired? These techniques are surely engineering.

The author has merely mentioned the safety engineering features applied to drilling, and the handling of crude oil. These are extremely important if the well is to be brought into production successfully, without disaster, and even possible loss of life. There have been instances right here in this province where the failure to follow the rules and regulations has had extremely unfortunate consequences.

The foregoing comments appear to be criticism of what the author has not said, rather than what he did cover. Mr. Wilson has a very general topic, and inevitably he could not include everything in the time and space available. He has covered a difficult subject in a very creditable manner.

H. E. Denton, M.E.I.C.[3] The author has delivered an excellent paper on the subject, and is to be commended not only by his audience but by the oil industry as a whole. He has passed on to this meeting valuable information which should be appreciated by everyone. The following comments on this paper are few and in the form of additions rather than criticism. There is no disagreement with a single statement, but a few remarks to cover a few important points are in order. This is such a broad subject, and the author has done well to consolidate so much information in such a short report.

The duties of the various types of engineers have been outlined. Those of the chemical engineer must not be underemphasized. Too much stress cannot be placed on the importance of the control of drilling muds. The use of properly controlled drilling mud makes possible the drilling of oil wells where otherwise it would be impossible. There is being developed lately a " mud engineer "; mostly his duties are in the field, putting into practice what the chemical engineer develops in the laboratory. Time will see much improvement in this phase of engineering.

In the production of oil and gas it is the duty of the chemical engineer to keep abreast of all analytical work so as to be able to advise management where the products can be best marketed and processed. The chemical engineer also plays a most important part in calculating ultimate recovery by the volumetric balance method.

Additional comments are in order on the topic " reservoir analysis ". The author has stated that in order to properly analyze a reservoir no less than nine properties are to be determined, namely: composition of the reservoir fluids; the volume of gas; oil and water that are produced; the subsurface pressure history of the reservoir; details of completion and performance of individual wells; porosity; permeability; connate water saturation of the reservoir rock, and geologic data on the shape and size of the reservoir.

The maximum benefit realized from a reservoir analysis is, of course, in a newly discovered field, in order that proper methods of production can be introduced, the result being the conservation of reservoir energy, which in turn reflects itself on the maximum ultimate recovery.

In a newly discovered oil field many assumptions and estimates have to be made. No back-log or history of the field is available. The production engineer is charged with the duty of making these assumptions and estimates, acquiring all known data, and deciding by which drive or combination of drives the field is energized. With this done he can then determine what the rate of production should be to conserve energy and what ultimate recovery can be expected.

The author has given the esti-

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[1] Producing Dept., Western Division. Imperial Oil Limited, Calgary, Alta.

[2] Imperial Oil Limited, Sarnia, Ont.

[3] Denton Spencer Co. Ltd., Calgary, Alta.

mated minimum and maximum percentages of recovery for each type of " drive ". The averages of these are 30 per cent minimum and 66 2/3 per cent maximum. It is readily seen that a reservoir containing one billion barrels of oil could yield, if produced properly, 666 million barrels; if produced improperly 300 million barrels. It is little wonder that the oil industry is devoting much energy and money toward the improvement of technique used in " reservoir analysis ".

The term " primary recovery " was adopted after the commencement of repressuring operations. Repressuring resulted in what is commonly known as " secondary recovery ". With the improvement of production efficiency it is expected that secondary recovery operations will be unnecessary because of the total depletion of the reservoirs in the single operation.

Some mention should be made about the production of condensate wells, mostly found in the area surrounding the Gulf of Mexico. In that type of reservoir the fluid is principally gas, containing small amounts of condensate. These wells are produced and the condensate removed by stage separation and absorption. The gas is then returned to the formation from which it came. The volume of the liquid removed from the formation is comparatively small. The life of these wells as far as condensate is concerned will be as long as the value of the liquid recovered is in excess of the operational expense. Beyond that limit the reservoir would then contain a lean gas recoverable as it is consumed. Any condensate recovered from that time on would be a by-product. The operation of these wells during the past few years has done much to encourage and promote pressure maintenance in the more commonly known oil wells.

FROM MONTH TO MONTH

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

Collective Bargaining and The Institute

Collective bargaining for engineers has once again occupied the centre of the stage, this time perhaps for its final appearance. The new federal industrial relations legislation known as "An Act to provide for the Investigation, Conciliation and Settlement of Industrial Disputes" (Bill 195) has passed both Houses at Ottawa. Engineers are excluded from its provisions by the following clause—

> *(i)* "employee" means . . . .. but does not include
>
> (ii) a member of the medical, dental, architectural, engineering or legal professions, qualified to practise under the laws of a province and employed in that capacity;

Mention of this legislation has been made previously in the *Journal*, but now that the business has been concluded it may be of interest to members to know just what part the Institute took in it.

Months before the legislation first appeared in the House, the Institute was asked by members of the Cabinet for an expression of opinion. It was stated that what the Institute asked for would be incorporated in the Act. This placed a great responsibility on Council. Accordingly the Committee on Employment Conditions made a careful study of the situation, keeping in mind the experience that had been gained under Order-in-Council 1003. Their recommendation was that the Institute should ask for exclusion from the Act as it was evident from earlier experience that satisfactory legislation permitting bargaining for engineers by engineers was not attainable.

Council debated the committee's report and approved it with only one negative vote and one councillor not voting. The decision was then forwarded to the Minister of Labour. The correspondence covering this appeared on page 232 of the April 1948 *Journal*.

When the legislation made its appearance in the House it did provide exclusion for engineers. At this point members of parliament began to receive from engineers who wanted to be included, telegrams and other communications protesting the exclusion. When the House of Commons committee met, representations were made on both sides of the question.

The subsequent canvassing of branches and the president's talks with the western branches, the many meetings of the Institute's committee, the meetings with other societies, the endeavour to find a common policy acceptable to all, makes up a long and involved story. The outstanding development was that every branch from Lakehead west, supported Council's decision, and that most of the branches in the central and eastern provinces also wired their approval. Toronto, Peterborough and Moncton did not agree with Council's decision.

The wisdom of Council's policy was indicated late in the negotiations when requests for exclusion reached the Department of Labour from all the provincial professional associations and the Canadian Institute of Mining and Metallurgy, thus presenting a solid front on behalf of the profession. In addition, exclusion was asked by the Chemical Institute of Canada and the Royal Architectural Institute of Canada.

In all these deliberations the officers of the Institute were not unmindful of the wishes of those groups which had tried collective bargaining and found it helpful. They kept before them also the experiences of those groups, as in Quebec, which had tried collective bargaining and found it unsatisfactory.

The situation was confused but still all thinking brought Council back to the same conclusion, that the interests of the whole profession, including the younger members would be best served if they were divorced from collective bargaining, and all forms of trade unionism.

There must be other and better ways than collective bargaining for protecting the profession from exploitation by the employers, when such exploitation becomes apparent. The Institute stands ready at any time to discuss the welfare of individuals or groups and to take a part in securing alleviation of working conditions which are not just and fair. There is already a considerable record of attainment in such matters in the history of the organization.

The outstanding features of the long drawn out affair are two. In the first place this marks the first time that the federal government has recognized engineering as one of the professions. Hitherto in all groupings the engineers have been shown separately from the lawyers, doctors, architects, etc. This is indeed a great and necessary step in our ascent to professional recognition.

In the second place the campaign to secure this form of legislation found all the engineering organizations, "singing the same tune out of the same hymn book", as immediate Past-President Grant described it. This too is a unique accomplishment and may presage things for the future. If such unanimity is made possible by the travail of this latest experience, it will indeed have been a profitable one.

Canadian Wins Coveted Medal

A graduate of Toronto University and a Member of The Engineering Institute of Canada, has been awarded one of the most distinguished honours available to engineers in the United States. His many Canadian friends will join gladly with the Americans in applauding the award.

The Lamme Medal is sponsored by the American Society for Engineering Education and is awarded for "achievement in engineering education". This year's winner is Dr. Alexander Graham Christie, professor of mechanical engineering at Johns Hopkins University, a graduate of the School of Practical Science, Toronto, and a former citizen of the Province of Ontario. The following interesting biographical material is supplied by the American Society for Engineering Education.

Alexander Graham Christie, twenty-first Lamme medalist of this Society, was born at Manchester, Province of Ontario, Canada, on November 19, 1880. He was graduated in electrical and mechanical engineering from the School of Practical Science, University of Toronto in 1901 and received the degree of Mechanical Engineer there in 1913. The honorary degree of Doctor of Engineering was conferred upon him by Stevens Institute of Technology in 1939 and by Lehigh University in 1940.

From 1901 to 1904, Dr. Christie was employed by the Westinghouse Machine Company principally on early steam turbine construction and development and on gas engines. After a year as instructor in mechanical engineering at Sibley College, Cornell University, from 1905 to 1907 he was in charge of erection, test and operation of steam turbines, including the first ones made by the company, steam engines, and gas engines for the Allis Chalmers Company. He returned to Canada as mechanical engineer

Dr. A. G. Christie, M.E.I.C.

responsible for construction and operation of the power plant of the Western Canada Cement and Coal Company at Exshaw, Province of Alberta.

From 1909 to 1914, Dr. Christie served as assistant and later associate professor of steam and gas engineering at the University of Wisconsin where he was in charge of the experimental and research laboratories in mechanical engineering. In 1914 he became associate professor and later professor of mechanical engineering in charge of the department at Johns Hopkins University. He retires from that position this year. Since 1916, he has been director of night courses in technology at Johns Hopkins.

During World War I, Professor Christie assisted the Emergency Fleet Corporation in developing courses of training for ship building mechanics and foremen. During the second World War, he served as member of the Jet Propulsion Committee, National Advisory Committee for Aeronautics, as director of Vocational Training for Maryland, War Manpower Commission, and as consultant for the War Utilities Sub-Committee, Technical Industrial Intelligence Committee, War Production Board. Other public services include chairmanship of the Board of Engineers, Province of Alberta, which studied steam and hydro-power developments there in 1929, and membership on the Advisory Board of Engineers, Owens River Gorge Project of Hydro-Electric Development, California in 1942.

Since leaving full time industrial work in 1909, Professor Christie has acted as consultant on a very large number of engineering projects, not only in all parts of the United States and Canada but in England, other countries of Western Europe, and in the Far East. This activity has involved largely engineering of steam power plants on which he is recognized as one of the world's leading authorities, but has also included much work in the hydro-electric field and on a great variety of other projects.

A President is Appointed

Because of the contributions of the late Dr. W. E. Wickenden to the literature of the profession and in particular to the literature of the Institute, the appointment of his successor, Dr. T. Keith Glennan to the office of president of the Case Institute of Technology at Cleveland, will be of interest to the members of the Institute.

Dr. Glennan is a graduate in electrical engineering of the Sheffield Scientific School of Yale (1927). He had a distinguished career in the field of sound amplification, particularly in relation to the motion picture industry.

In 1942 he became director of the Navy's Underwater Sound and Detection Laboratory at New London, Conn., for which service he received the Medal of Merit.

Dr. Glennan follows a gentleman of great accomplishments, great renown and great character. It will be the wish of everyone that the success he has enjoyed in industrial life will follow him into academic life, and that through him Case may continue its excellent record of leadership.

An Encouraging Experiment

McGill University conducted a short course in land subdivision at Macdonald College, Ste. Anne de Bellevue, Que., from May 31 to June 9 last, under the direction of Professor H. J. Spence-Sales. The legal, social, engineering, architectural and other aspects of the laying out of housing developments were treated in considerable detail. The course was in the nature of an exploratory venture to determine the reception which might be expected for short practical courses in the different phases of community planning. The organization committee, which included Professor R. DeL. French as the Institute's representative, has expressed satisfaction with the results.

A nearby tract of about 75 acres was chosen as a guinea pig. After arriving at the fundamental basis of design through class discussion of desired population density, size of family, family income and age brackets, size of lots, width of streets, park and recreation areas and the like, each group of five or six students produced a subdivision of this area meeting the standards set as nearly as practicable. Financial matters were not neglected; an estimate of cost of development, including profit and selling expense, was made for each scheme and the selling price of lots was fixed.

Each group made a relief map in sand of its layout, a scheme which was found very useful in visualizing advantages and disadvantages. Unofficially, each group christened its brain child—few of the names would have met with the approval of the "realtor".

The 34 attending included representatives of federal, provincial and municipal planning authorities, surveyors, consulting engineers, lending institutions, real estate operators and property owners from Halifax to Fort William. Generally, they seemed to feel that they got their money's worth, and many expressed the hope that similar courses dealing with other aspects of planning might be given in years to come.

The School is particularly grateful for the financial support of the Government of the Province of Quebec and of the Central Mortgage and Housing Corporation. Further details of the accomplishments of the course will be reported when the proceedings have been prepared for publication.

Research Activity in India

Through the National Research Council, Ottawa, the Journal *has received the following information which will be of interest to members.—Ed.*

The Government of India has created a Department of Scientific Research with effect from 1st June, 1948. The Department will be in the charge of the Honourable Prime Minister of India and Dr. S. S. Bhatnagar, F.R.S, director of scientific and industrial research, has been appointed the secretary and principal executive officer. The Department will take over the work of the Board of Research on Atomic Energy and the Council of Scientific and Industrial Research. The latter body although attached to the new Department will retain its unofficial character and will continue to function as before.

The new Department will deal also with scientific advice to government departments, *ad-hoc* scientific research in universities and research institutions, research scholarships in applied scientific subjects, international scientific unions, scientific liaison offices, the Scientific Consultative Committee and such other subjects as may be transferred to it. The Department will co-ordinate the scientific activities of the other Ministries and in this work it will be assisted by a Co-ordination Committee consisting of eminent scientists.

Flood Control in British Columbia

It is a matter of interest to all Canadians that the federal and provincial governments have arranged to study jointly the Fraser River Valley in British Columbia. The recent disastrous flood in the most westerly province was a matter for official discussion at the recent Banff Annual Meeting of the Institute, where Prairie Water Problems had already been designated as the principal subject of the conference. From the meeting messages were sent by the president expressing through the Premier sympathy to the citizens who had lost so much, and encouragement to those engineers who were struggling to restrain the wild waters from doing further damage.

There will be general satisfaction over the selection of the personnel for the board. All are well experienced in this field and will be able to tackle the problem without any preliminary loss of time.

There are six engineers, two fisheries experts and one on lands. The complete list is as follows:— A. L. Carruthers, M.E.I.C., former deputy public works minister for British Columbia; Major R. C. Farrow, M.E.I.C., comptroller of water rights for B.C.; Bruce Dixon, M.E.I.C., provincial diking commissioner; F. G. Goodspeed, M.E.I.C., assistant chief engineer, federal Public Works Department; K. W. Morton, M.E.I.C., district engineer for B.C.-Yukon, federal Public Works Department; C. E. Webb, M.E.I.C., district chief engineer, Dominion Water and Power Bureau; George Alexander, deputy minister of fisheries for B.C.; A. J. Witmore, chief supervisor of fisheries for the federal fisheries department, and George Melrose, deputy minister of lands for B.C. Mr. Goodspeed has been proposed by British Columbia Public Works Minister as chairman of the nine-man board.

The purpose of the board will be to examine all existing reports and make other studies dealing with the general economy of the Fraser watershed. Problems of storage dams, flood control, power development, irrigation and the propagation of fish in the Fraser and its tributaries will be considered.

From such information it is expected an over-all programme may be developed for submission to the two governments in the hope that it can be carried out in various stages as the occasion permits or demands.

I thought this might be a suitable topic for discussion at any future meeting of the engineering society presidents. Do you think the case method a good way to develop professional relationships and public responsibilities?

Very truly yours,

F. W. Davidson, Jr.E.I.C.

March 11th, 1948.

My dear Davidson:

Your letter of the 5th was most enjoyable and I find myself fully in agreement with what you suggest.

The development of a spirit of professionalism is not easy to accomplish. You can teach a man how to hit a golf ball, how to address a public meeting and how to drive a motor car but it is a much more difficult undertaking to develop within him a professional spirit.

Like you, I feel that such a spirit must grow naturally within a person almost without any perceptible leadership from the outside. It is the sort of thing which I feel a person gets very largely from his parents and from his associates when he is young and I feel that he actually has it perhaps in an unrecognizable form even when he enters the university.

As you know we hear quite a bit these days about increasing the cultural subjects in an engineering course. I am not an enthusiast for such proposals. I think that one's appreciation of cultural subjects which itself is an indication of culture comes from a proper growing up. I do not think a person who is not fond of literature can be changed in the course of a few hours of lectures during his university years. He learns his love of literature as a small child and its greatest development comes during his high school years. If he doesn't have it when he enters the university I don't think he will ever have it.

I think your suggestion is worthy of a lot of consideration and it certainly should be put on the agenda of our next student conference. In the meantime, however, I'm wondering if you would let us print your letter in *The Engineering Journal*. I think many members would like to read it.

Yours sincerely,

L. Austin Wright,

General Secretary.

Correspondence

Mainly due to lack of space the printing of the following letters has been delayed. The subject matter is entirely timely, however, and should be of interest to members. —Ed.

Harvard University

Graduate School of Business Administration

March 5, 1948.

Dear Mr. Wright:

This letter contains a suggestion for the improvement and teaching of professional consciousness among student engineers.

I am a student of the Harvard Graduate School of Business Administration. I am a former President of the Engineering Society of U.N.B. and winner of the Martin Murphy Prize in 1945. You may recall I sat in as an observer at the first meeting of the Presidents of the Engineering Undergraduate Societies at the Annual Meeting of the Institute in Montreal in February, 1946.

I have followed with interest the enthusiasm shown for these meetings since that time. I feel it is a step forward in co-operative education between the interested parties of theory and practice.

The need for increased cognizance of intellectual honesty and moral force of character on the part of the neophyte is of growing concern. Increased efforts of engineers to bargain collectively, while of importance may relegate the profession to that of union status. I am not saying it is bad to seek more recognition and more pay, but I do think it imperative to preserve the opportunity for recognition of individual merit. Should those now entering university from high schools not gain sight of the profession and its responsibilties it would be most unfortunate.

Dean Young of Toronto has written extensively on the subject and I believe he has suggested that a separate course on professionalism would do more harm than good. He recommends that occasional mention of the subject by professors in the classes would be more practical. With this I can agree and I think it would be quite beneficial as long as faculty members co-operate, but I think a much stronger effort is needed.

The case method of instruction, while inapplicable to most courses in engineering might well be used to develop this professional consciousness in the neophyte. Extracts of legal cases involving fraud on the part of engineers, disguised case material of actual situations in business, and extracts of problems of the engineer in the civil service are a few sources of such material.

The danger of students rebelling against a short course in the regular curriculum could be obviated by having it introduced by students themselves in panel discussions at engineering society meetings. Outside speakers could lead discussions if deemed advisable. A further mixture of thought could be obtained by using practicing engineers and professors in the panels. Another method might be to have one man lead the discussion and the students themselves do all the talking. The advantage to the latter idea is that it builds greater confidence in the student and forces him to think his theme through to a conclusion. These are merely suggested as means of putting the case material across.

Initial instruction should be started early in the student's training at university. Thus the use of the student engineering societies would provide a means of bringing engineers together in their first year. The disadvantage of trying to introduce it in the regular classroom schedule in the early years is that many students have not been segregated into engineering.

BRANCH OFFICERS AT BANFF

(Top, left) G. J. (Skip) Currie, Ira P. Macnab, and M. L. Baker, were delegates from Halifax Branch.

(Left) N. F. McCaghey, Kenogami, Que., and R. N. Coke, chairman of Montreal Branch.

(Right) Delegates from Ontario branches. From top left: C. F. Morrison, Toronto; Major-General G. R. Turner, Ottawa; G. R. Henderson, Sarnia; D. C. Beam, Toronto; E. V. Buchanan, London, Ont.; F. F. Dyer, Sarnia; J. R. Dunbar, Hamilton; J. F. MacLaren, Toronto.

(Right) The Prairie Provinces were represented by (l. to r.): A. H. Douglas, Saskatoon; Stewart Young, Regina; G. R. Fanset, Winnipeg; A. G. Donaldson, Lethbridge; T. M. Parry, Calgary; G. W. Moule, Winnipeg; C. V. Antenbring, Winnipeg; E. K. Cumming, Edmonton; H. W. Tye, Edmonton.

(Lower right) Officers representing the British Columbia branches. Left to right: S. C. Montgomery and E. Mason, Trail, B.C.; G. W. Allan and Sidney Hogg, Vancouver; Kenneth Reid and S. H. Frame, Victoria.

(Facing) A group photo of the delegates to the Branch Officers Conference. Back row, l. to r.: Major-General G. R. Turner, Ottawa; S. C. Montgomery, Trail; Howard Douglas, Saskatoon; A. G. Donaldson, Lethbridge; G. R. Fanset, Winnipeg; E. V. Buchanan, London, Ont.; C. F. Morrison, Toronto; J. R. Dunbar, Hamilton; E. Mason, Trail; H. W. Tye, Edmonton.

Middle row, l. to r.: I. P. Macnab, Halifax; E. K. Cumming, Edmonton; T. M. Parry, Calgary; F. F. Dyer, Sarnia; Sidney Hogg, Vancouver; Stewart Young, Regina; M. L. Baker, Halifax.

Front row, l. to r.: Kenneth Reid, Victoria; N. F. McCaghey, Saguenay Branch; G. W. Moule, Winnipeg; S. H. Frame, Victoria; G. R. Henderson, Sarnia; C. V. Antenbring, Winnipeg; G. W. Allan, Vancouver; R. N. Coke, Montreal; J. F. MacLaren, Toronto.

The following attended the Branch Officers Conference, but were not present for these photographs: T. V. Berry, Vancouver; S. G. Coultis, Calgary; J. Mercier, Quebec City; K. W. Mitchell, Calgary; A. M. Thompson, Winnipeg.

MORE BANFF PICTURES

Largely through the efforts of S. G. Coultis, chairman of the Calgary Committee, arrangements were made to have a group of Indians from the reservation at Morley, Alberta, visit Banff, where they set up their tepees on the athletic grounds adjoining the hotel. The Indians proved to be a particularly interesting feature of the meeting, and their encampment was visited by most of the delegates, their families and their guests.

The Pacific coast features prominently in this photo showing delegates and their wives attending the Annual Meeting. Shown in the photo, taken outside the hotel, are (l. to r.): Mrs. K. Reid, Victoria; Mr. Reid; Mrs. R. F. Binnie, Shalalth, B.C.; Mrs. G. M. Irwin, Victoria; Nat Hunter of the Stoney Indian tribe; Mrs. G. W. Allan, Vancouver; H. N. MacPherson, Vancouver; Mrs. S. Hogg, Vancouver; Chief Enos Hunter of the Stoneys; Mrs. H. N. MacPherson, Vancouver; Miss M. E. Dolmage, Vancouver.

Albertans at Banff. This group includes (l. to r.): Mrs. S. G. Coultis, Calgary; Mrs. F. R. Burfield, Edmonton; Mrs. Howard Tye, Edmonton; Mrs. P. M. Sauder, Strathmore, Alta.; Chief Enos Hunter; Mrs. N. A. Bradley, Edmonton; Miss Linda Hamelin (in front); Mrs. H. J. Williamson, Edmonton; Mrs. D. F. Hamelin.

Winnipeg ladies meet Stoneys. Shown here, from left: Mrs. W. D. Hurst, Mrs. I. W. Beverly, Chief Nat Hunter of the Stoney Tribe, Mrs. F. V. Seibert, Mrs. C. V. Antenbring and Mrs. G. R. Fanset.

Ontario was never like this. Stoney Indian squaws and their children photographed with some of the ladies from Ontario. Left to right: Mrs. W. A. T. Gilmour, Hamilton; Mrs. P. H. Wallace, Cardinal, Ont.; Mrs. H. E. Adams, Walkerville, Ont.; Miss R. J. Gilmour, Hamilton; Mrs. Nat Gunter, and little John Hunter; Mrs. H. R. Henderson, Sarnia; Mrs. Enos Sunter and Miss Ann Poucette of the Ntoneys.

Paleface engineers from Quebec and their wives meet redskin braves at Banff. From left: Brig.-Gen. George Francoeur, Quebec City; Mrs. Tom Kakquitts of the Stoney Tribe; Mrs. Francoeur; A. G. Hibbard, Montreal; Mrs. Hibbard; Mrs. A. C. Trudel, Montreal; Chief Tom Kakquitts; Mrs. W. R. G. Ray, Quebec City, and Mr. Ray.

Mr. and Mrs. H. S. Weldon of Montreal receive the congratulations of Chief Tom Kakquitts on their 25th wedding anniversary. They were photographed on the grounds of Banff Springs Hotel during the Annual Meeting.

The photographs on these four pages were supplied through the courtesy of the Canadian Pacific Railway.

Personals

Notes of the Personal Activities of Members of the Institute

E. P. Murphy, M.E.I.C., Deputy Minister of Public Works, Ottawa received the honorary degree of doctor of laws from the University of Ottawa in June, 1948. Mr. Murphy graduated from Queen's University and joined the Department of Railways and Canals in 1907 as engineer on the Trent Canal. From 1914 to 1918 he was engineer on the St. Peter's Canal, Cape Breton. Later he worked on the Cornwall Canal and on the Severn division of the Trent Canal. From 1921 to 1930 he was division engineer on the construction of the Welland Ship Canal at Thorold, Welland and Port Colborne. From 1930 to 1934 he was superintendent of operations on the southern division of the Welland Canal and from 1934 to 1937 he was construction engineer. In 1937 he became engineer in the Department of Transport and at the outbreak of war in 1939 he was appointed construction engineer of the War Supply Board. Before being appointed deputy minister in 1942 Mr. Murphy was director of the Defence Projects Construction Branch in the Department of Munitions and Supply at Ottawa.

J. B. Carswell, M.E.I.C., the former president of War Assets Corporation, has been appointed chairman of the new Fraser Valley Diking Board. The three-man board, set up in consultation with the British Columbia Government, will be responsible for repairing, strengthening and reconstructing the dikes in the Fraser Valley and removing water and debris from land inundated by recent floods. The Federal Government will bear 75 percent of the costs of reconstruction. The new board will shortly establish offices in Vancouver.

During the war, Mr. Carswell served as representative of the Department of Munitions and Supply in Washington, and was the first president of War Assets Corporation. He retired from this post in 1945, and returned to private practice as consulting engineer in Vancouver. Prior to the war he was president of the Carswell Construction Company of Toronto.

F. G. Goodspeed, M.E.I.C., assistant chief engineer of the Federal Department of Public Works, Ottawa, and **Bruce Dixon,** M.E.I.C., British Columbia provincial diking commissioner are the other members of the board. These two engineers are also members of the Federal-Provincial Board which has been set up to study the overall problem of flood control in the Fraser Valley. Details of this board are discussed elsewhere in this Journal.

W. E. Bown, M.E.I.C., was appointed in May to the position of vice-president of Dominion Steel and Coal Corporation, Ltd., at Montreal. He received the degree of B.Sc. in chemical engineering from McGill University, Montreal, in

W. E. Bown, M.E.I.C.

1923. He had served with the Dominion Steel and Coal Corporation at Sydney, from 1917. He was made assistant superintendent of the coke oven department in 1924, and was promoted assistant general superintendent of the Sydney steel plant in 1930. He came to Montreal in 1943 as general manager of Canadian Tube and Steel Products, Ltd., where he was until his recent appointment.

Dr. J. J. Green, M.E.I.C., chief research aeronautical engineer of the Air Transport Board, Ottawa, was elected recently to fellowship in the Royal Aeronautical Society, England. Dr. Green obtained his doctorate in 1930 from London University (Royal College of Science), England. He had previously obtained degrees of B.Sc. and A.R.C.S., and D.I.C. at the same university. He was a junior research physicist for National Research Council here until 1934, and then assistant research engineer until 1943, and head of the aerodynamics laboratory. Then, with the rank of squadron leader, he was named chief research engineer of the Test and Development Establishment of the Royal Canadian Air Force. It was in 1945 that he assumed his present post with the Air Transport Board at Ottawa.

Group Captain H. H. Hendrick, M.E.I.C., has relinquished command of R.C.A.F. Station at Edmonton, Alta., which post he has held for the past six months. He is now at Headquarters, North-West Air Command, as senior air staff officer. There he will work directly under the air officer commanding, being concerned with operations and training. Before going to Edmonton he was director of signals in Ottawa for two and a half years.

Phil Roy, M.E.I.C., who has been elected chairman of the Kingston Branch of the Engineering Institute is plant engineer for Canadian Locomotive Company Limited at Kingston. Born at Ottawa, he studied engineering at Queen's University, graduating in 1929 with a B.Sc. degree. He worked for Dominion Bridge Company Limited for a short time and then went to the Brompton Pulp & Paper Company Limited, East Angus, Que., where he was concerned with steam plant control and later with electrical installatons and maintenance. From 1932 to 1937 he was in the employ of the city of Ottawa, becoming chief operator of the pumping and purification plant. He went to his present position in 1937 to work on electrical and mechanical maintenance.

Paul Vincent, M.E.I.C., is the new chairman of the Quebec Branch of the Institute. Mr. Vincent has served the Institute and the Quebec Branch on many previous occasions. He was councillor in 1946, and had served as secretary-treasurer of the Branch from 1940 to 1943. He is chief of the engineering

Paul Vincent, M.E.I.C.

division of the Department of Colonization of the Province of Quebec. Born in Montreal, he attended the University of Montreal, graduating with a B.A. degree in 1927. He then studied engineering at McGill University and after working for two years in the building industry, attended Ecole Polytechnique from which he graduated with honours in 1934. After taking a post-graduate course in radio engineering he acted as laboratory demonstrator in electrical engineering at the Ecole until 1935. He worked for three months on the construction of an extension plant of the Aluminum Company at Arvida, Que., after which he joined the Water Levels Board, Department of Transport, Ottawa, conducting hydrographic surveys, stream gauging and weir studies along the St. Lawrence River channel. In 1937 Mr. Vincent was called to direct two surveying parties for the Quebec Provincial Department of Highways. A few months later he took charge of bridges, roads, and drainage projects for the Department of Colonization of Quebec as district engineer. Following three years experience in this field he was made assistant chief engineer and in 1941, was called upon to act as superintendent of all civil engineering work in the Department of Colonization.

L. A. Fraikin, M.E.I.C., vice-president and general manager of Franki Compressed Pile Company of Canada Limited, has been awarded the Cross of Chevalier de l'Ordre de Leopold, by the Belgian Government, for services rendered during and after the war. Mr. Fraikin is a graduate of the University of Ghent, Belgium, 1929, and in 1931 received the degree of master of science from the Massachusetts Institute of Technology. After extensive engineering work in Belgium and Norway, in India, Egypt and England, he was appointed, in 1938, to his present position with the Franki Compressed Pile Company of Canada Limited at Montreal.

Mr. Fraikin served as a first lieutenant in the Belgian Artillery in the Belgian campaign of the recent war. He returned overseas again in 1941 in command of the second detachment of Belgian soldiers to go to England from Canada. On his return he was made head of the industrial section in the Belgian Government's Economic Mission in Canada, in Montreal.

C. E. Hond, M.E.I.C., is with Bloedel, Stewart and Welsh Limited, Pulp Division, at Port Alberni, B.C. He is electrical superintendent of the kraft pulp mill. He was previously at Baie Comeau, Que., as assistant electrical superintendent for the Quebec North Shore Paper Company.

P. B. Hughes, M.E.I.C., is promoted from lecturer to assistant professor in the faculty of applied science and engineering of the University of Toronto. He is a graduate of McGill University in mechanical engineering with extensive practical experience in industry. During the war, following some service at sea, he was an instructor in engineering at the Royal Naval College of Canada with the rank of Lieutenant-Commander. He joined the Ajax staff of the University of Toronto in 1945.

C. E. Olive, M.E.I.C., is promoted assistant professor, from the position of lecturer in the faculty of applied science and engineering of University of Toronto. He joined the University staff in 1945, a former engineer commander of the R.C.N.V.R. He is an honours graduate of the University of London, in mechanical and electrical engineering with varied experience in England, India and Canada. For fourteen years he was chief engineer for Canadian Celanese Limited.

J. A. Murray, Affiliate E.I.C., former lecturer in the school of architecture of University of Toronto is now made an assistant professor. He is a Toronto graduate who has combined teaching with a successful practice in his profession. For a time he held an important place on the staff of the City Planning Board of Toronto.

H. U. Ross, M.E.I.C., of the department of metallurgical engineering of University of Toronto is promoted to assistant professor, from the position of lecturer. He is an R.M.C. graduate, bachelor of engineering and master of science of McGill University. After several years of metallurgical and mining experience, notably with the Algoma Steel Corporation, he joined the R.C.N.V.R. as an engineer officer. As such he was a member of the staff of the Royal Canadian Naval College for the latter part of the War, coming to Toronto in 1946.

W. H. Schippel, M.E.I.C., of McGill University, Montreal, has been promoted from assistant professor to associate professor in the faculty of engineering. Professor Schippel obtained his B.Sc. degree at McGill in 1920, joined the staff as demonstrator the following year, and obtained a degree of master of engineering prior to his appointment as lecturer in 1927. He has been assistant professor since 1944.

K. H. Shone, M.E.I.C., former lecturer at McGill University, Montreal, has been named assistant professor in mechanical engineering. He obtained a B.A. degree from Cambridge, England, where he won the mechanical science Tripos (honours), and where he was twice college prizeman and senior scholar of his college. He obtained an M.A. degree in 1942, served with the Merchant Navy until 1946, and joined the McGill staff last year.

Obituaries

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

John R. W. Ambrose, M.E.I.C., passed away on June 29, in Toronto. He had retired in 1944 as superintendent of Toronto Terminals Railway Company.

Mr. Ambrose was born at Watertown, Wisconsin, in 1878, and was educated at Ripon College and the University of Minnesota. In 1898 he was engineer for the electric light plant at Berlin, Wis., and entered railway work as assistant engineer for the Minneapolis and St. Louis Railroad, in charge of all field engineering and maintenance work. Later he became engineer for the Minneapolis, St. Paul and Sault Ste. Marie Railroad. In 1907 he joined the Grand Trunk Railway as assistant engineer. In 1910 he was appointed engineer on grade separations for the Grand Trunk, and in 1914 he was named chief engineer of the Toronto Terminals Railway Company, later being appointed superintendent.

He was a member of the Canadian Institute of Mining and Metallurgy, the American Engineering Association, and the Association of Professional Engineers of Ontario, and a fellow of the Royal Society of Arts. He was also a member of the Toronto Railway club, and its president in 1935. He joined the Institute in 1911 as an Associate Member, transferring to Member in 1913. He attained Life Membership in 1947.

C. K. S. Macdonell, M.E.I.C., who was divisional engineer for the Ontario Department of Highways at Sudbury, Ont., died on May 31, 1948, as the result of a heart attack.

Mr. Macdonnell was born at Collingwood, Ont., in 1883, but was educated in Dallas, Texas. He did railway work in Texas from 1904 until 1907 when he joined Canadian Pacific Railway. He was transitman for C.P.R., in charge of the construction of terminals at Strathcona, Alberta. The next year he went to Grand Trunk Pacific Railway, to work on alignment west from Saskatoon. In 1909 to 1912 he was town engineer for Collingwood, Ont. He was later engineer for the town of Penetanguishene, Ont., and was at Barrie, Ont., as town engineer from 1912 until his departure overseas in 1915 with the Canadian Expeditionary Force. He was attached to the Royal Engineers and worked on light railway and salvage operations, returning to Canada with the rank of Colonel.

He resumed his position at Barrie, but in 1920 he joined the Ontario Department of Public Works, being posted successively at Woodstock, Barrie, Chatham and Huntsville. He was made divisional engineer at Sudbury in 1914.

Mr. Macdonell joined the Institute in 1920 as an Associate Member, and transferred to Member in 1940. He served as commanding officer for the Grey and Simcoe Foresters from 1928 to 1933.

E. R. Love, M.E.I.C., of Winnipeg, Man., who died in hospital on July 17, 1948, was an associate professor of electrical engineering at the University of Manitoba.

He was born at Reading, Berkshire, England, in 1912, but was educated in Canada. He attended University of Manitoba and, when receiving the degree of B.Sc. in electrical engineering in 1934 he was gold medallist of his class. He did some tutoring in engineering subjects that summer and also worked for the Winnipeg Electric Company. He joined the staff of his University the same year, as demonstrator in charge of the electrical and mechanical engineering laboratories, and remained until 1936. He then spent two years with the

Canadian Westinghouse Company Limited graduate apprenticeship course at Hamilton, Ont., after which he was named sales engineer for electrical apparatus at Winnipeg. In 1940 he enlisted with the Royal Canadian Corps of Signals, serving at Kingston, Ont., with the rank of lieutenant. He was promoted captain and was made instructor at Kingston, in charge of wireless training for officers. In 1942 he was loaned to the University of Manitoba as associate professor, and at the end of the war he joined the staff permanently.

Professor Love joined the Institute in 1931 as a Student, transferring to Member in 1942. He held membership also in the Association of Professional Engineers of Manitoba and in the Institute of Radio Engineers. He was secretary-treasurer of the Engineers' Alumni of his University.

T. F. Leydon, M.E.I.C., of Halifax, N.S., who died recently, was associated with the Nova Scotia Highways Board.

He was born at Halifax, N.S., in 1884. Educated in that city, he started his engineering career in 1905 as chainman, rodman and topographer for the Transcontinental Railway survey. He was later instrumentman on construction for that organization. He worked on surveys and construction of roads from 1913 to 1915, and then he was appointed assistant camp engineer on construction of Camp Borden, Ont. In 1917 he was engineer for Bate McMahon & Company, Ottawa, on aviation camp construction in Ontario, for the Imperial Munitions Board. The next year he was named superintendent and appraisal engineer for the Halifax Relief Commission. In 1919 he was with the city engineer's department in Halifax. He was employed for some years by the Nova Scotia Highways Board and was still actively engaged in this work at the time of his death.

Mr. Leydon joined the Institute in 1940 as a Member.

B. F. Matthews, M.E.I.C., of Kitchener, Ont., died on January 7, 1948, as a result of a heart attack. He was works manager of Dominion Truck and Equipment Co. Limited, in that city.

Born in Bristol, England, in 1888, and educated there, he acquired his technical training at the Merchant Venturers Technical College, obtaining a diploma in 1903. He then spent two years as a junior in the office of the engineer to the urban district council of Portishead, Somerset, England.

Coming to Canada in 1905 he worked in various machine shops and foundries in Ontario and the U.S.A. In 1912 he obtained a position as a draughtsman with Sheldons Ltd., Galt, Ont. From 1916 to 1919 he served in the Royal Air Force as 1st class air mechanic, and he returned then to Sheldons Limited, to be chief draughtsman and estimator. In 1920 he joined A. R. Williams Machinery Company, Toronto, as sales engineer. From 1921 he was chief engineer for Roelofson Elevator Company at Galt, until 1926, when he was named superintendent. His association with Dominion Truck and Equipment Company Limited began in 1928 as chief engineer. He was appointed works manager in 1941 and vice-president in 1942.

Mr. Matthews joined the Institute in 1944 as a Member. He was a past president of the Army and Navy Veterans Association.

News of the Branches

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented at their meetings

Niagara Peninsula

J. J. Miller, M.E.I.C.
Secretary-Treasurer

C. A. O. Dell, M.E.I.C.
Branch News Editor

On Thursday, May 27, the Niagara Peninsula Branch held a joint meeting with the American Society for Testing Materials.

Vice-chairman R. A. Coombes welcomed the members of the A.S.T.M. to the meeting and called on Dr. O. W. Ellis, district vice-chairman of the A.S.T.M. Western New York-Ontario Division. Dr. Ellis introduced Dr. R. B. Gordon, manager of the Metallurgical Development Section, Westinghouse Electric Corporation, as speaker of the evening.

Dr. Gordon gave a highly technical talk on the development and characteristics of alloy metals for use under high temperature (1200 to 1500 deg. F.) and high stress conditions met with in turbo-jet engines.

Over one hundred engineers from the adjoining sections of Ontario and Western New York attended the session.

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At the June meeting the guest speaker was W. J. Corbett, manager of industrial relations, Hayes Steel Company, and member of the Ontario Labour Relations Board. Mr. Corbett gave a most rousing and thought-provoking talk on the timely subject of **Labour Relations**. This subject provided the spark that touched off the most lively session of discussion that the branch has seen for many a day.

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On Thursday, June 3, M. F. Ker, branch chairman entertained the executive, the candidates for offices and the nominating committee, at dinner at the Red Casque Inn. The spirit of co-operation which has prevailed throughout the year was pleasantly high-lighted in the good fellowship and conviviality of the occasion.

Saguenay

J. E. Dyck, M.E.I.C.
Secretary-Treasurer

Junior Section

F. H. Duffy, Jr.E.I.C.
Secretary-Treasurer

A meeting of the Junior Section of the Saguenay Branch was held in the Arvida Protestant School at 8.15 p.m., Tuesday, June 15, 1948.

F. G. Baker, superintendent of the Fluoride Department, for Arvida Works of Aluminum Company of Canada Limited, described to the meeting his recent trip to Europe, where he attended the Centre d'Etudes Industrielles. This is the postgraduate school of international industrial administration founded by Aluminium Limited.

Mr. Barker's address was in the form of a travelogue and outlined many of his impressions and experiences as he travelled to various plants and offices in France, Switzerland, Italy, Holland and England. Working and social conditions in the countries visited were described and various items compared to or contrasted with similar ones in Canada. Some time was spent in outlining the speaker's impression of the Brown Boveri organization, the factories and the classes of workers making up this organization.

At the conclusion of the talk, slides were shown of many of the interesting scenes which had been visited and brief descriptions of the places were given. An interesting discussion period followed, and numerous questions were answered.

The speaker was introduced by the Chairman C. J. Tanner and thanked on behalf of the section by J. T. Madill.

Vancouver

Alan M. Eyre, Jr.E.I.C.
Secretary-Treasurer

Stuart Lefeaux, Jr.E.I.C.
Branch News Editor

The Vancouver Branch was honoured with an address by Dr. Huet Massue, M.E.I.C., on Wednesday, June 16, in the

THE PRESIDENT'S WESTERN TOUR

Winnipeg. H. W. McLeod presiding at the head table, with President Grant on his right.

Saskatoon. Left to right: Mrs. Grant, Professor I. M. Fraser, Mrs. E. K. Phillips, President Grant and A. Howard Douglas.

The dinner meeting of the Calgary Branch in the Palliser Hotel.

Regina. The head table at dinner. Left to right: Miss Young, the President, Saskatchewan Branch Chairman Stewart Young, Mrs. Grant, and A. Howard Douglas, vice-chairman of the Branch.

The Lethbridge Branch meeting, with A. G. Donaldson (centre) in the chair.

A part of the head table at the Edmonton meeting. Left to right: President Grant; His Honor the Lieutenant Governor of Alberta, Mr. J. C. Bowen; H. W. Tye, the branch chairman; Mrs. J. C. Bowen; the Honorable N. E. Tanner, Minister of Lands and Mines for the Province; Mrs. Grant; and Dean R. M. Hardy of the University of Alberta.

The President presents the certificate of the Institute prize to John Brant Kerby, third year engineering student at the University of Alberta.

"Stag" night at Trail, B.C. Back of tables, left to right: R. Pollard, H. P. Hamilton, E. M. Stiles, Branch Secretary E. B. Broadhurst, Dr. Austin Wright, President Grant, Branch Chairman E. Mason, J. W. Wellington, D. J. Irvine, H. M. Coverdale, C. G. Rodgers. Front of tables, left to right: J. M. Heaps, A. E. Ross, A. G. Ballantyne, A. C. Ridgers, A. H. W. Busby, D. Carruthers.

The illness and untimely death of Lorne A. Campbell prevented his receiving the Sir John Kennedy Medal which was to have been presented in Toronto last year. The President, at the meeting in Trail, honoured Mr. Campbell's memory in a presentation of the medal to his son Lorne Campbell, Jr.

The meeting at Kamloops resulted in an application for the opening of a branch in the area. At the head table, left to right, were Mrs. Austin Wright, H. L. Hayne, Mrs. Wade, the President, M. L. Wade in the chair, Mrs. Grant, Mrs. Hayne, and, in the foreground, Mr. Struve.

Vancouver. Left to right: the 1948 president, J. N. Finlayson; President Grant; and G. W. Allan, acting chairman of the Vancouver Branch. The sign may have been placed on the mantel as a reminder from the ladies—the meeting was "stag".

Medical Dental Auditorium. Eighty-five members and guests, including members of the Engineering Bureau of the Vancouver Board of Trade, were present to hear the address on **The Tennessee Valley Authority**.

Dr. Massue is a graduate of the Ecole Polytechnique of Montreal, and Massachusett's Institute of Technology. He was with the Quebec Streams Commission from 1915 to 1927 on investigation and construction, and his present position is economist and statistical engineer with the Shawinigan Water and Power Company of Montreal.

Dr. Massue was greatly impressed with the Pacific Coast area. He included a trip to Grand Coulee and Bonneville Dams on his way from the Banff meeting to Vancouver. The speaker illustrated his talks with slides of prepared statistics on power costs and potentials of North America and detailed figures of the T.V.A. project. The U.S.A. has a total hydroelectric potential of eighty million horse power and a development of nineteen million horse power. The T.V.A. total development to date is two and one half million horse pówer. In Quebec, 60 per cent of the power developed is used by the pulp and paper and aluminum industries. The cost of electricity takes approximately 1.7 cents of the wage earner's dollar for home operation.

Dr. Massue showed charts to illustrate the fact that the cost of electricity is a very small factor in most industrial production. Cheap electricity alone is not an incentive for locating industries. The statistics shown for the T.V.A. illustrated the fact that the reported cost of the government project plus interest charges and lost taxes gives a true picture of the actual cost. The reported cost of the T.V.A. project charged only 40 per cent against power production and the balance against navigation and flood control. Dr. Massue showed that the cost charged against navigation was out of proportion to the benefits to shipping on the Tennessee River. The cost charged against flood control was many times greater than the estimated annual flood damage.

The speaker was most concerned with the wrong impression given the public on the cost of public hydro-electric installations in comparison to private utilities. When taxes lost and interest charges are taken into account the cost of public installations are generally greater than comparable private enterprises.

Many questions were fired at the speaker and answered to the satisfaction of the members. Jack McDonald thanked him for a most enlightening presentation. Three distinguished guests were presented at the meeting: J. F. MacLaren, chairman of the Toronto Branch of the Institute, K. G. Cameron, councillor of the Montreal Branch, and C. E. Sisson of Toronto, past vice-president of the Institute.

T. V. Berry, councillor of the Vancouver Branch, gave a brief account of the 62nd Annual Meeting of the Institute held at Banff June 1 to 4.

LIBRARY NOTES

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEW

TRADE UNIONS IN CANADA; THEIR DEVELOPMENT AND FUNCTIONING:

H. A. Logan. Toronto, Macmillan, 1948. 639 pp., illus., 9½ x 6½ in., cloth, $4.75.

This is a history of the growth of the trade union in Canada, its place in Canadian history, and the influences affecting it. It treats first of the history of unions from 1825 to the present day. It deals with unions in various industries—building, printing, pulp and paper, metal trades, railways, mining, clothing and textiles, the automobile industry, iron and steel, and several others. It traces the growth of national federations and congresses and their activities. The book ends with a discussion of union publications, public relations activity, research and education. There is a bibliography of labour books on Canada.

The work was developed according to the assumption that the trade union movement of a country can be portrayed only through an exploration of individual unions and allied groups of unions, taking into account their form of organization, their struggle for recognition, their association (sometimes their conflict) with each other, and their accomplishment through collective bargaining, quite as much as treating with the legislative activities of the over-all congresses and other expressions of the movement as a whole.

The author states in his preface that the book is mainly descriptive and gives more space to the structure and accomplishment of unions than to the portrayal of doctrines. It is an objective work of general reference. Though the author says that lack of background material made it difficult for a lone investigator to cover the whole field of trade unionism in Canada, the scope of the book is broad and it includes much detailed material. N.T.

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Applied Physics; Electronics Optics, Metallurgy:

Edited by C. G. Suits, George R. Harrison, and Louis Jordan. Office of Scientific Research and Devclopment. Boston, Little, Brown; Toronto, McClelland & Stewart, 1948. 456 pp., illus., cloth. (Science in World War II).

Alternating Current Machines:

Thomas C. McFarland. New York, Toronto, London, Van Nostrand, 1948. 540 pp., illus., cloth.

Battlefronts of Industry; Westinghouse in World War II:

David O. Woodbury. New York, Wiley; London, Chapman & Hall, 1948. 342 pp., cloth.

Electricity; Text Book and Laboratory Manual:

M. M. Das. New York, Toronto, Van Nostrand, c1948. 483 pp., illus., cloth.

Handbook of Structural Design in the Aluminium Alloys:

J. E. Temple. Birmingham, James Booth, 1947. 147 pp., illus., cloth.

LIBRARY REGULATIONS

Hours

	Oct.-May	June-Sept.
Mon.-Fri.	9– 6	9– 5
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Bibliographies and Extensive Literary Searches

Short subject bibliographies will be compiled on request.

Extensive searches will be made at a charge per hour of $1.50 to members, and $2.50 to non-members.

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Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

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

Heating Ventilating Air Conditioning Guide, 1948 (vol. 26):

American Society of Heating and Ventilating Engineers. New York, The Society, 1948. 1280 + 144 pp., illus., fabrikoid.

Heaton's Commercial Handbook of Canada (Heaton's Annual):

Heaton Publishing, Toronto, 1948. 988 pp., illus., fabrikoid.

Industrial Environment and its Control:

J. M. Dalla Valle. New York, Toronto, Pitman, 1948. 225 pp., illus., cloth.

Introduction to Aerodynamic Compressibility:

J. Black. London, Bunhill, 1947. 115 pp., illus., cloth.

Introduction to Color:

Ralph M. Evans. New York, Wiley; London, Chapman & Hall, 1948. 339 pp., illus., cloth.

Manual of Structural Design; 3rd ed.:

Jack Singleton. Topeka, Ives, 1947. 336 pp., illus., fabrikoid.

Pocket-Book for Mechanical Engineers:

David Allan Low, edited by Bevis Brunel Low. London, New York, Toronto, Longmans, Green, 1948. 778 pp., illus., fabrikoid.

Principles of Servomechanisms: Dynamics and Synthesis of Closed-Loop Control Systems:

Gordon S. Brown and Donald P. Campbell. New York, Wiley; London, Chapman & Hall, 1948. 400 pp., illus., cloth.

Quality Control: a Manual of Quality Control Procedure Based Upon Scientific Principles and Simplified for Practical Application in Various Types of Manufacturing Plants:

Norbert L. Enrick. New York, Industrial Press, c1948. 122 pp., illus., fabrikoid.

Reinforced Concrete Designer's Handbook; 4th ed.:

Chas. E. Reynolds. London, Concrete Publications, 1948. 351 pp., illus., cloth.

SPI Handbook:

Society of the Plastics Industry. New York, The Society, c1947. 451 pp., illus., fabrikoid.

Surveying:

W. Norman Thomas. London, Edward Arnold; Toronto, Longmans, Green, 1948. 564 pp., illus., cloth.

Theory of Servomechanisms:

Edited by H. M. James, N. B. Nichols and R. S. Phillips. Office of Scientific Research and Development. New York, Toronto, London, McGraw-Hill, 1947. 375 pp., illus., cloth. (Massachusetts Institute of Technology. Radiation Laboratory Series).

Trends in Engineering Education; The Columbia Experience:

James Kip Finch. New York, Columbia University Press, 1948. 140 pp., cloth.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

Aeronautical Engineering Catalog; 4th ed., 1948:

Institute of the Aeronautical Sciences. New York, The Institute, 1948. 222 pp., illus., fabrikoid.

American Institute of Consulting Engineers:

Proceedings of the Annual Meeting, January, 1948.

American Institute of Electrical Engineers:

Transactions, Volume 66, 1947.

Canada. Census, 8th, 1941:

Dwellings, Households and Families, Volume 5. Ottawa, King's Printer, 1947.

Institution of Naval Architects:

Index to Transactions, Volumes 47 to 88, 1905-1946.

U.S. Highway Research Board:

Proceedings of the 26th Annual Meeting, 1946.

TECHNICAL BULLETINS, ETC

American Society for Testing Materials:

Symposium on Load Tests of Bearing Capacity of Soils. (Special Technical Publication No. 79) c1948.

California Institute of Technology. Industrial Relations Section. Bulletin:

No. 14—Survey of Personnel Practices in Los Angeles County, R. O. Sensor and M. F. Martin.

Canada. Dominion Water and Power Bureau. Water Resources Paper:

No. 96—Surface Water Supply of Canada—Atlantic Drainage (South of St. Lawrence River), 1942-43 and 1943-44.

Chalmers Tekniska Hogskolas. Handlingar:

Nr 69—On the Foundations of Electrodynamics, Gustav Hossjer.—Nr 70—On the Radiation of Sound into a Circular Tube; with an Application to Resonators, Uno Ingard.—Nr 71—Study of Impressive Wave Formation in the Atmosphere, Dietrick Stranz.

Cornell University. Engineering Experiment Station. Bulletin:

No. 35. Pt I—Crushing Strength of Thin Steel Webs, George Winter and R. H. J. Pian.—No. 35. Pt II—Light Gage Steel Columns in Wall-Braced Panels, G. G Gree, George Winter and T. R. Cuykendall.

Ingeniors Vetenskaps Akademien. Handlingar:

Nr 197—On the Harmonic and Bi-Harmonic Problems of a Region Bounded by a Circle and Two Parallel Lines, R. Westberg.

Institution of Mechanical Engineers. (Advance Papers):

Export Vehicle Design, H. W. Fulton.—Motion of a Railway Axle, R. D. Davies and A. F. Cook.—Some Recent Advances in Mechanical Engineering on Shipboard, T. A. Crowe.

International Civil Aviation Organization:

Airworthiness (Air); a Philosophy of Aeroplane Strength Factors (Circular 2-AN/2.—ICAO Regional Manual—North Atlantic (Doc 4500)—Amendment No. 14, June 15th and No. 15, July 1st, 1948.—Supplementary Procedures for the South American Region (Doc 4976)—Amendment No. 1, April 15th, 1948.—Supplementary Procedures for the South Atlantic Region (Doc 4977—Amendment No. 1, April 15th, 1948.— Statistical Summary (Air Transport) No. 1 (Doc 5390-AT/658).

Kungl. Tekniska Hogskolans. Handlingar:

Nr 1—List of Publications of Members of the Staff of the Royal Institute of Technology, Stockholm.—Nr 16—Method of Combined Centring and Levelling for Surveying instruments Equipped with Optical Plumb Indicators, Arne Bjerhammar.

Princeton University. Industrial Relations Section. Selected References:

No 22—Use of Cost of Living Indexes and Budget Studies in Wage Adjustments.

Purdue University. Engineering Extension Department:

Extension Series:—*No. 63—Proceedings of the Thirty-Third Annual Road School, February 1947.—No. 64—Procedings of the Third Industrial Waste Conference, May 1947.*

...Research Series:—*No. 102—Engineering Schools and Departments;—Research Activities for the Sessions of 1946-7.—No. 103—Research in Venting Direct Gas Heaters When No Chimney Connections are Available, C. E. Blome and J. L. Bray.*

Statens Skeppsprovningsanstalt. Meddelande:

Nr 6—Effect of the Air Content of Water on the Cavitation Point and upon the Characteristics of Ships' Propellers, Hans Edstrand.—Nr 8—Further Experiments with Bulbous Bows, Amders Lindblad.—Nr 9—Screw Propeller Characteristics, H. F. Nordstrom.

U.S. Highway Research Board. Bibliography:

No. 3—Bibliography on Frost Action in Soils (Annotated), 1948.—No. 4—Bibliography on Uses of Highway Planning Survey Data (Annotated), 1948.

U.S. Bureau of Standards:

Applied Mathematics Series:—*No. 2 Table of Coefficients for Obtaining the First Derivative Without Differences.*

...Building Materials and Structures Report:—*BMSIII—Performance of a Coal-Fired Boiler Converted to Oil.*

STANDARDS, SPECIFICATIONS, ETC.

American Standards Association: Standards:

Nomenclature for Parts of a Photographic Objective Lens — Z38.4.19 - 1948.—Methods of Designating and Measuring Apertures and Related Quantities Pertaining to Photographic Lenses—Z38.4.20—1948.—Methods of Designating and Measuring Focal Lengths and Focal Distances of Photographic Lenses — Z38.4.21—1948.

British Standards Institution:

Standards:—*Calibration of Carburettor Jets—BS 720: 1948.*

...Codes of Practice:—*CP(B)742—Wood Block Flooring.—CP(B)743— Broadcast Reception: Sound and Television by Radio.—CP(B)744—Sound Distribution Systems for Large Buildings.—CP(B)750—Magnesium Oxychloride Flooring.*

Canadian Standards Association. Standards:

Canadian Electrical Code—Pt II—Specification No. 83—Construction and Test of Electrical Metallic Tubing—CSA-C22.2 No. 83-1948.

Institution of Electrical Engineers:

Regulations for the Electrical Equipment of Buildings, 11th ed., 1945 with inset—1946 supplement.—Revision Section 8—The Installing of Electric Discharge Lamps, 1948.

Lancashire Boiler and Economiser Defects and Repairs:

Sydney D. Scorer. London, John D. Troup, 1948.

Machine à Vapeur Surchaufée:

Emile Guarini. Bruxelles, 1948.

Measurement of Industrial Productive Capacity:

G. A. Armstrong. New York, Armstrong, 1948.

On Writing Scientific Papers:

J. A. Anderson and M. W. Thistle. Ottawa, National Research Council, 1947. (N.R.C. No. 1691).

PAMPHLETS, ETC.

Engineering Research Organization and Activities with Special Reference to The State of Victoria, Australia:

Institution of Engineers, Australia, 1947.

BOOK NOTES

The Institute does not assume responsibility for any statements made; these are taken from the preface or the text or the book.

Prepared by the Library of The Engineering Institute of Canada

AMERICAN STANDARD SAFETY CODE FOR CONVEYORS, CABLEWAYS, AND RELATED EQUIPMENT. ASA B20.1-1947:

New York, American Society of Mechanical Engineers, 1947. 90c.

Safety provisions for all types of conveyors are included in the new standard. Special provisions for safe operation are given for each type. The safety of the worker or operator is given first consideration, but the efficient use of the conveyor has also been kept in mind in selecting guard and other safety devices. The new standard will affect the safety of workers using conveyors in such widely diversified industries as coal mining, fish packing, and ice cream manufacture. This standard was approved by the American Standards Association, October, 1947.

BRITISH STANDARD FOR 30-AMP. FLAMEPROOF PLUGS-AND-SOCKETS AND CABLE-COUPLERS BS 1395-1948:

London, British Standards Institution, 1948. 3/6.

Two types of plugs-and-socket and cable-coupler are covered by this specification, the restrained type which is for use with electrical interlock and the bolted type which is for use with or without electrical interlock. The specification prescribes the dimensions necessary to ensure interchangeability of complete plugs in complete sockets of different makes, and deals with some electrical and mechanical requirements. It does not otherwise specify a fully-detailed design.

BRITISH STANDARD FOR PORTLAND CEMENT (ORDINARY AND RAPID-HARDENING). BS 12-1947:

London, British Standards Institution, 1948. 3/6.

In this revision, the tensile strength test is again retained. An alternative test for fineness has been introduced. The water content of a cement paste of standard consistency is used to determine the water content of mortar for testing tensile strength and of pastes for testing setting time and soundness. The upper limit for the lime content has been slightly increased. A method of determining the percentage of insoluble residue has been introduced as an appendix.

BRITISH STANDARD FOR PORTLAND-BLASTFURNACE CEMENT. BS 146-1947:

London, British Standards Institution, 1948. 3/6.

In this revision, the tensile strength test is again retained. An alternative test for fineness has been introduced. The water content of a cement paste of standard consistency is used to determine the water content of mortar for testing tensile strength and of pastes for testing setting time and soundness. A method of determining the percentage of insoluble residue has been introduced as an appendix.

BRITISH STANDARD SCHEDULE FOR COPPER ALLOY INGOTS AND CASTINGS. BS 1400:1948:

London, British Standards Institution 1948. 7/6.

This schedule brings together in one volume all current British standards for copper alloy ingots and castings. A number of new alloys have been included. The first part of the schedule contains the chemical composition limits and mechanical properties for each of the alloys, in the form both of ingots and castings. In parts two and three general clauses are given, applicable to ingots and castings respectively. A special feature of these general clauses is that they have been revised and co-ordinated to bring them into line with BS 1367—"Code of procedure in inspection of copper-base alloys and sand castings", ot which the schedule is complementary.

BRITISH STANDARDS FOR COPPER FOR ELECTRICAL PURPOSES. BS 1432:1948, 1433:1948, 1434:1948:

London, British Standards Institution, 1948. 2/- each.

These standards include sheet and strip, bar and rod, and commutator bars. They contain requirements concerning quality of material, finish, dimensional tolerances, tensile properties and electrical resistance. They also include a table of temperature co-efficients of resistance.

BRITISH STANDARD FOR GAS LIGHTING UNITS AND FITTINGS FOR SINGLE-FAMILY DWELLINGS. BS 1381:1947:

London, British Standards Institution, 1947. 2/6.

This standard lays down the minimum standards for the efficiency of burners and units, the thermal endurance of glass and silica ware, and the soundness of components of lighting units conveying or controlling gas. An appendix stresses the importance of designing units which combine attractive appearance with ease of maintenance and cleaning.

BRITISH STANDARD FOR HIGH ALUMINA CEMENT. BS 915:1947:

London, British Standards Institution, 1948. 3/6.

This is a revision of the standard published in 1940. The compressive strength test has been improved, and an alternative test for fineness has been introduced.

CANADIAN STANDARD SPECIFICATION FOR THE PHYSICAL PROPERTIES AND PRESERVATIVE TREATMENT OF JACK, LODGEPOLE AND RED PINE POLES AND REINFORCING STUBS, 2nd ed. C.S.A. C15(C)-1948:

Ottawa, Canadian Standards Association, 1948. 50c.

This revision of the 1940 standard differs from the previous issue mainly in the following respects: ultimate fibre stress of 7400 pounds per square inch has been specified for Jack Pine Poles and Stubs and 6600 for Lodgepole and Red Pine Poles and Stubs; reference has been made to the current specifications of the American Wood Preservers' Association instead of the CSA C15(D) for the pressure treatment; the general set-up of the specification has been brought into line with the latest proposed revision to ASA Specifications and Dimensions for Wood Poles.

INTERNATIONAL CIVIL AVIATION ORGANIZATION. STATISTICS DIVISION. FINAL REPORT. First Session, January 1948:

International Civil Aviation Organization, Montreal, 1948. 67 pp., illus., 10¼ x 8 in., paper, 25c. (Doc 5205-STA/526).

One of the basic principles of the International Civil Aviation Organization was that the sound economic development of world air transport depends first on the free and wide-spread dissemination and interchange of all the pertinent facts. The Convention of the Statistics Division, therefore, was framed with an eye to the evolution of statistical machinery that could cope with the facts relating to world air transport.

JACOB INTEGRAPH INSTRUCTION AND TYPICAL PROBLEMS:

Brent C. Jacob, 205 North Mountain St., Bay City, Mich., 1947. 126 pp., illus., 8¼ x 5½ in., paper, apply to author.

The Jacob Integraph is a small transparent triangle having ruled lines and small perforated holes so placed as to make it possible to perform graphically a variety of calculus, arithmetical and analytical computations. It may be used with an ordinary tee-square or triangle or as an attachment on a universal drafting machine. Its most important use is to integrate and differentiate graphically curves of any shape. The Jacob Integraph provides a method by which engineers can use graphical calculus with second or more integrations or differentiations. The accompanying instruction book gives a detailed explanation first, of the simple fundamental operations; and then, of more complex problems in mechanics and engineering, including a variety of practical applications such as determining bending moments and deflections in beams and shafts, impact or collision values, forces and accelerations, volumes of tanks, etc.

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.

METALLIZATION OF PLASTICS:

J. R. I. Hepburn, Cleaver-Hume Press Ltd., London, 1947. 71 pp., 6s.

CELLULOSE PLASTICS:

D. N. Buttrey. Cleaver-Hume Press, Ltd., London, 1947. 127 pp., 7/6.

FABRIC REINFORCED PLASTICS:

W. J. Brown. Cleaver-Hume Press, Ltd., London, 1947. 148 pp., 7/6. Illus., diagrs., charts, tables, 7¼ x 4¾ in., cloth.

Of these three volumes covering various aspects of the plastics field, the first one listed discusses the covering of plastic materials with a metallic deposit in order to modify their mechanical, optical, electrical, thermal or chemical properties. The plastics and metals most suitable for use, the various methods available, and the testing of the resultant deposits are treated.

The second volume emphasizes the general principles rather than specific commercial applications of cellulose plastics. The occurrence and chemical nature of the raw materials, the nitration of cellulose and the processing of nitrocellulose plastics, the manufacture and uses of cellulose acetate, and the preparation and applications of the recently developed cellulose esters are presented.

In the third volume, the manufacture and uses of fabric reinforced plastics are dealt with, and special attention is paid to those factors in resin, in fabric, and in manufacture which influence physical properties.

All three volumes contain bibliographies at the ends of chapters.

COURS DE MECANIQUE, Vol 2, DYNAMIQUE DES CORPS SOLIDES RIGIDES:

H. Favre. Dunod, Editeur, Paris; Leemann Fres., Editeurs, Zurich, Switzerland, 1947. 434 pp., diagrs., tables, 9¼ x 6¼ in., paper, 1380 frs.

Written for engineers, physicists and mathematicians who wish to acquire an overall view of classical mechanics, this book not only presents the theory, but gives the formulas in a direct method applicable to concrete cases. This second volume covers the dynamics of points, rigid bodies, and systems with a full analytical treatment. Problems for student solution follow each chapter. Volume I of the series covered statics, and volume III will deal with the theory of elasticity, elastic bodies and hydrodynamics.

DIESEL ENGINE CATALOG, Vol. 12:

Edited by R. W. Wadman, W. W. Young and B. C. Sisson. Diesel Engines, Inc., New York, 1947. 519 pp., illus., diagrs., charts, tables, 13¾ x 10¾ in., fabrikoid, $10.00.

Presenting a cross-section of the Diesel industry, this volume describes in detail all of the engines available, including new designs developed in the past year. Some forty pages are devoted to various accessories. Following a large advertising section there is an extensive classified listing of manufacturers of engines and accessories. The book is profusely illustrated by photographs, drawings, and diagrams of engine performance and characteristics.

ELECTRON MICROSCOPE:

D. Gabor. Chemical Publishing Co., Brooklyn, New York, 1948. 164 pp., illus., diagrs., charts, tables, 8¼ x 5¼ in., cloth, $4.75.

This book is both an introduction to the use of the electron microscope and a critical contribution to its theory. The fundamentals of electron optics are briefly explained in the early chapters. The concluding chapters on future developments and chemical and structural analysis are more advanced. An appendix considers the diffraction theory of the microscope. Constructional details, preparation of specimens, and description of "commercial" models are given.

ELEVEN AND FIFTEEN-PLACE TABLES OF BESSEL FUNCTIONS OF THE FIRST KIND, TO ALL SIGNIFICANT ORDERS.

E. Cambi. Dover Publications, 1780 Broadway, New York, 1948. 154 pp., tables, 10¾ x 8½ in., cloth., $3.95.

The main tables give $J_n(x)$ for x ranging from 0 to 10.5 at intervals of .01, to eleven places. Supplementary tables give $J_n(x)$ for x ranging from 0 to .500 at intervals of .001, to 15 places, and Taylor Series for J_n of even order for $x = 2$ to 10 inclusive. The introduction contains an explanation of the tables and graphs which show their accuracy.

FLUORESCENT AND OTHER GASEOUS DISCHARGE LAMPS:

W. E. Forsythe and E. Q. Adams, Murray Hill Books, Technical Division, New York and Toronto, 1948. 292 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.00.

Starting with the earliest beginnings of the fluorescent lamp, this book takes the reader through an analytical treatment of the factors influencing the design, construction, operation and performance of gaseous discharge lamps including many lesser known types. From an introduction to light, radiation, and the discharge of electricity through gases, it progresses to complete coverage of fluorescent light principles, components, problems, efficiency, and related factors.

INTRODUCTION TO THE DIFFERENTIAL EQUATIONS OF PHYSICS:

L. Hopf, translated by W. Nef. Dover Publications, New York, 1948. 154 pp., diagrs., 6½ x 4¼ in., cloth, $1.95.

Basic mathematical concepts and methods are developed in close connection with the physical problems to which they can be traced historically. The intuitive rather than formal aspects of mathematical developments are emphasized, and the necessary mathematical background, beyond elementary calculus, is introduced along with the discussion.

LIGHTING DESIGN:

P. Moon and D. E. Spencer. Addison-Wesley Press, Kendall Square, Cambridge 42, Mass., 1948. 482 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.00.

This book has two aims: to provide a text on lighting which rises above the descriptive level and which presents fundamental principles in a quantitative manner; and to present a comprehensive design method that can be used by practising engineers in devising high-quality lighting systems for rooms. The first three chapters give data on nomenclature, lamps and materials. Subsequent chapters deal with the calculation of light and the design of systems of exterior lighting. Graphs and tables are extensively used in the presentation of data.

MANAGEMENT PROCEDURES IN THE DETERMINATION OF INDUSTRIAL RELATIONS POLICIES:

H. Baker. Princeton University, Industrial Relations Section, Research Report Series No. 76, 1948. 81 pp., tables, 9¼ x 6 in., paper, $2.00.

This report considers the allocation of responsibility for final decisions on major personnel policies, as well as the procedures followed on their formation. Information was gathered from 84 companies with considerable experience in handling industrial relations problems. Including only companies engaged primarily in manufacturing, consideration is given to the representative nature of the group in respect to size and industry.

NATIONAL RESEARCH COUNCIL, HIGHWAY RESEARCH BOARD, PROCEEDINGS OF THE TWENTY-SIXTH ANNUAL MEETING, WASHINGTON, D.C., Dec. 5-8, 1946:

Edited by R. W. Crum, F. Burggraf and W. N. Carey, Jr., Washington, D.C., 1947. 618 pp., illus., diagrs., charts, tables, 10¾ x 6½ in., cloth, $7.50.

The papers presented at the 26th Annual Meeting are classified in six sections: three large groups dealing with design, traffic and operations, and soils investigations; and three small groups under maintenance, administration, and materials. The wide variety of topics is covered by authorities from both the practical and research aspects of highway engineering. There is an author index.

NOTES INTRODUCTORY TO THE THEORY AND DESIGN OF GAS TURBINES:

J. Small. Published by the author at the James Watt Engineering Laboratories University of Glasgow, Scotland, 1947. 67 pp., diagrs., charts, tables, 8¼ x 5½ in., paper, 7/6.

This book explains the principles of the gas turbine. It is intended for use by those in the engineering field who wish to understand the basis of this engine. Diagrams and calculations amplify the text. Descriptive and historical matter are omitted.

SIR WILLIAM J. LARKE MEDAL COMPETITION, PRIZEWINNING PAPERS:

Institute of Welding, London, S.W.1, 1946. 156 pp., illus., diagrs., charts tables, 8¾ x 5½ in., fabrikoid, 12/6.

This volume comprises the five papers for which prizes were awarded by the British Institute of Welding in 1944. The five papers deal, respectively, with the following topics: application of arc welding, embodying specific details; manipulators for arc welding, a discussion of machines for the support and positioning of work-pieces; arc welding fabrication from a practical point of view; production aspects in the fabrication of marine engine constructions; copper welding as applied to the repair of locomotive fireboxes.

SURVEYING INSTRUMENTS, THEIR HISTORY AND CLASSROOM USE:

E. R. Kiely. Columbia University, Bureau of Publications, Teachers College, New York, 1947. 411 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth. $3.00.

The first half of this book is devoted to the description of the instruments and methods developed during the period of time from ancient Egypt, China and Babylonia up through Renaissance Europe. The following chapter discusses the development in recent years of instruction in practical geometry and mensuration in the schools as opposed to purely classical treatment. Basic applications of geometry and trigonometry in simple surveying are presented as detailed problems, mainly selected from old practical geometries. A 20-page bibliography is included.

SYMPOSIUM ON METALLURGY OF STEEL WELDING:

Published by British Welding Research Association, 29 Park Crescent, London, W.1, 1947. 104 pp., illus., diagrs., charts, tables, 11¼ x 8¼ in., cloth, 10s.

This book is composed of the papers presented at the first post-war symposium of the British Welding Research Association. The first two sessions were devoted to weld metal, the third to hardened zone cracking and viscosity of welding slags, and the final session to current research. The papers given at this final session were on the electrophysics of the welding arc and the cracking of welded gas mains. Both the verbal and written discussions of the papers are included.

TIMBER DRYING AND THE BEHAVIOUR OF SEASONED TIMBER IN USE:

R. G. Bateson, 2 ed. Crosby Lockwood & Son, London; Technical Book Association of Canada, Vancouver, 1946. 129 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, 10/6.

The principles of timber drying are explained, and methods and equipment for both air-seasoning and kiln-seasoning are described in practical detail. Specific problems are discussed with their solutions, and one chapter is devoted to the behavior of seasoned timber in use.

TRANSMISSION BELTING AND BELT DRIVES.

H. S. Jude. Trade & Technical Press, London, 1947. 322 pp., diagrs., charts, tables, 8½ x 5¼ in., cloth, 30s.

Following a general introductory chapter is a discussion of power losses, the drive layout, and application rules. Leather, rubber, balata, solid woven hair, and cotton belts are discussed, including belts of two-fold construction. Special leather belts, belt fastenings, splices in fabric belts, V-ropes, pulleys and shaftings are considered as well as selection, installation, care, maintenance, and safety measures in the use of belts. British Standard Specifications, useful facts, technical data, and formulae are included in the final chapters.

WORKSHOP YEARBOOK AND PRODUCTION ENGINEERING MANUAL (II):

Edited by H. C. Town. Paul Elek Publishers Ltd., 38 Hatton Garden, London, E.C.1, 1947. 568 pp., illus., diagrs., charts, tables, 8¼ x 5½ in., cloth, 35s.

This book provides data valuable to the production engineer, the designer, and the engineering student. It is divided into three sections, the first consisting of a series of specialized articles on modern machine tool developments. Section 2 covers a wide field of engineering progress, including power transmission, industrial developments, precision tools and methods of machining, and offers descriptions of the latest machine tools. In Section 3 are abridged articles from British and American sources providing the latest information on machine design, press operations, gauging and inspection, metal and heat treatment, welding, electric and other drives, and controls.

Although not available in the Institute Library, inquiries concerning the following new books will be welcomed there or may be sent direct to the publishers.

HANDBOOK OF INDUSTRIAL ELECTROPLATING.

E. A. Ollard and E. B. Smith; published by "Metal Industry" (Louis Cassier Co., Ltd.), distributed by Iliffe & Sons, Ltd., London, Birmingham, Coventry, Manchester & Glasgow, 1947. 308 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., linen, 15s.

Omitting theory, this book provides full practical information for all those whose duty it is to design, erect, maintain or operate electrodeposition plants, and for the laboratory worker who must deal with plating solutions. The book is divided into eight sections as follows: electrical equipment; deposition plant; solution formulas; special formulas; solution testing; deposit testing; glossary; miscellaneous information and tables.

HIGH POLYMERS, Volume VI: MECHANICAL BEHAVIOR OF HIGH POLYMERS.

T. Alfrey, Jr. Interscience Publishers, Inc., New York and London, 1948. 581 pp., illus., diagrs., charts, maps, tables, 9¼ x 6 in., cloth, $9.50.

The range of mechanical properties exhibited by high polymers permits them to be used as "rubbers", plastics, textile, fibers, films, etc. In a systematic treatment of these properties the author attempts to uncover the fundamental principles underlying the mechanical behavior of polymeric structures and to show how this behavior is correlated with the molecular structures involved. This analysis is made on two levels—a phenomenological description and a molecular interpretation. Polymer structures are classified and treated as amorphous linear, cross-linked, and crystalline polymers, and polymers admixed with components of low molecular weight. Original sources, to which reference is made in the text, are listed at the end of each section.

HISTORICAL APPRAISAL OF MECHANICS.

H. F. Girvin. International Textbook Co., Scranton, Pa., 1948. 275 pp., diagrs., tables, 9¼ x 6 in., cloth, $3.25.

Tracing the history of mechanics from the early Greeks to modern times, this book stresses the relationship of mechanics to engineering education. Divided into three parts, part one discusses the early development of science and scientific thinking. The contributions from the Renaissance through Newton are considered in Part II, while Part III is devoted to the mechanics of materials. A bibliography and chronological tables complete the text.

MICROWAVE RECEIVERS.

(Massachusetts Institute of Technology, Radiation Laboratory, Series Vol. 23.)

Edited by S. N. Van Voorhis. McGraw-Hill Book Co., New York, Toronto, London, 1948. 618 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $8.00.

All of the elements making up a wide-band receiver are covered in this volume. After a discussion of the individual circuit types from which a complete receiver is made, the book takes up general matters concerning the assembly, testing and maintenance of microwave receivers, and then deals with actual receivers chosen as examples because they are typical of the important combinations of circuits.

PROBLEMS ON APPLIED THERMODYNAMICS.

V. M. Faires, A. V. Brewer and C. M. Simmang. rev. ed. The Macmillan Company, New York, Toronto, 1948. 151 pp., diagrs., charts, tables, 9¼ x 6 in., paper, $1.70.

These problems are designed especially for use with the author's "Applied Thermodynamics", but may be combined with any text which uses the same terminology and emphasizes the general energy equation. Steam tables and other useful data are provided in an appendix. To suit the needs of individual instructors answers are given for only part of the more than 1400 problems included.

ROTARY VALVE ENGINES.

M. C. I. Hunter. Hutchinson's Scientific and Technical Publications, London, New York, Melbourne, Sydney, Cape Town, 1946. 216 pp., illus., diagrs., charts, tables, 8½ x 5¼ in., cloth, 21s.

The author describes the general principles and applications of the rotary valve in detail and draws comparisons between it and the poppet-valve for use on internal-combustion engines. The development of the rotary valve up to the present time is also discussed with descriptions of various rotary and semi-rotary systems applied to various types of old and modern engines—steam, gas and gasoline. A brief, final chapter presents the author's conjectures on the future development of the rotary valve.

STRUCTURAL ENGINEERING.

J. Husband and W. Harby. 5th ed. rev. and enl. Longmans, Green and Co., London, New York, Toronto, 1947. 591 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, $6.00.

This volume presents the principles of the design of steel, masonry, plain and reinforced concrete structures. Applications of these principles are given in detailed designs of the more commonly occurring structures. The new material included in this fifth edition is devoted to the principles and design of reinforced concrete construction. The general properties of structural materials and the structural analysis of beams and slabs, columns and footings, retaining walls, tanks and reservoirs are fully discussed. An appendix contains many useful charts and tables.

APPLIED JOB EVALUATION, A MANUAL OF INSTALLATION AND OPERATING METHODS.

H. G. Stanway. Ronald Press Co., New York, 1947. 81 pp., charts, tables, 9½ x 6 in., cloth, $3.50.

Intended as a manual of installation and operating methods, this book provides a definite and simple program for analyzing, describing, classifying and rating jobs. Detailed methods are given which may be applied to either large or small firms. A short list of books for reference reading is included.

ELEMENTARY INDUSTRIAL ELECTRONICS.

W. R. Wellman. D. Van Nostrand Company, New York, Toronto, London, 1948. 371 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.00.

Of interest to the beginner rather than to the advanced student, this book contains the basic principles involved in electronic equipment now in industrial use. Following a review of alternating current fundamentals, the basic principles of vacuum tubes and gas-filled tubes are considered. Kenotrons, various rectifiers and amplifiers are discussed as well as high-frequency heating and electronic control of motors, generators, and resistance welding. Photoelectric devices and electronic lamps are also covered.

AN INTRODUCTION TO SOIL MECHANICS.

W. L. Lowe-Brown. 2 ed. Pitman Publishing Corp., New York and Chicago, 1947. 61 pp., diagrs., charts, tables, 9 x 5½ in., cloth, $1.75.

Presenting in simple language a short descriptive survey in soil mechanics this volume will be of interest to practising engineers. After some general introductory material, compression and consolidation of cohesive material are discussed, followed by material on the design of dams and weirs on permeable foundations. The fact is stressed that sound judgment and wide engineering experience are required in applying the principles of soil mechanics. A bibliography is included as well as several appendices on earth pressure theories, slope stability, calculations, etc.

JET PROPULSION PROGRESS, the Development of Aircraft Gas Turbines.

L. E. Neville and N. F. Silsbee. McGraw-Hill Book Co., Inc., New York, Toronto, London, 1948. 232 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $3.50.

Presenting the fundamentals of the gas turbine as applied to aircraft, this book outlines the development of such units in Germany, Great Britain, and the United States. The problems of heat-resistant alloys, special fuels for jet propulsion, and maintenance of jet engines are indicated briefly, as well as future developments and possible uses. Although a considerable amount of technical material has been included, elaborate calculations, engineering formulas, and highly technical discussions have been avoided. Included are a chronology of aircraft gas-turbine developments, a glossary of technical terms and abbreviations, and a comprehensive bibliography covering the period 1941 to March 1947.

METAL PROCESS ENGINEERING.

N. E. Woldman. Reinhold Publishing Corp., New York, 1948. 291 pp., illus., diagrs., charts, tables, 9¼ x 6 in., $5.00.

Based on a post-graduate course, this book contains material on various practical phases of metallurgical engineering and metallurgical processes. It discusses casting, forging, joining of metals, and heat treatment as well as surface hardening and the machining of metals. Tool steels and the mechanical working of metals and alloys are treated. References to more detailed information follow each chapter. Many illustrations and diagrams complement he text.

METALLURGY FOR AIRCRAFT ENGINEERS, INSPECTORS AND ENGINEERING STUDENTS.

R. A. Beaumont. Sir Isaac Pitman & Sons, Ltd., London, 1946. 273 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, 25s.

This book deals chiefly with alloy structural steels, case hardening steels, light alloys, and copper and its alloys which are used in aircraft construction. The production of steel, mechanical methods of working steel, steel-composition, structure, and heat treatment, defective materials and processes, mechanical testing, and temperature measurement equipment are considered. Tables of specifications are given for the steels, copper, and their alloys which are discussed.

MODERN TIMBER DESIGN.

H. J. Hansen. 2 ed. John Wiley & Sons, New York; Chapman & Hall, London, 1948. 312 pp., illus., diagrs., charts, tables, 9¼ x 5¾ in., cloth, $4.50.

The properties of various species of wood, the factors affecting their structure, their assigned working stresses, and modern timber design methods are covered with examples and formulas for use in design. Two new chapters appear in this revised edition, presenting the factors affecting the strength of wood, and a fuller explanation of wood testing methods. Material on the design of all types of joints, of glued laminated members, and of plywood is featured.

TABLES OF SUPERSONIC FLOW AROUND CONES.:

(Massachusetts Institute of Technology, Dept. of Electrical Engineering, Center of Analysis, Technical Report No. 1) 555 pp., $3.50.

FEW REMARKS ON THE LIMITATIONS OF LINEARIZED THEORY IN SUPERSONIC FLOW:

(Technical Report No. 2) 10 pp., free if claimed from M.I.T.)

TABLES OF SUPERSONIC FLOW AROUND YAWING CONES.:

(Technical Report No. 3) 321 pp., $2.50. Under direction of Z. Kopal, Massachusetts Institute of Technology, Department of Electrical Engineering, Cambridge 39, Mass., 1947. Charts, tables, 11 x 8 in., Nos. 1 and 3, cloth; No. 2, paper. (Nos 1 and 3 obtainable from Government Printing Office, Washington, D.C., at prices indicated above.

These volumes present data by means of which the physical characteristics of supersonic flow may be determined readily and with adequate precision. In Reports No. 1 and No. 3, the equations of the problem precede the tables. The construction of the tables is described in the first volume, which deals with cones whose axes are exactly parallel to the stream direction. Report No. 3 covering slightly yawing cones presents an outline of the hydrodynamical theory which is the basis of the computations. The merits and limitations of the theory are discussed. Report No. 2, a ten-page pamphlet without extensive tables, compares the consequences of certain axial-flow equations to non-axial flow, with rigorous solutions for the case in point.

THEORY AND APPLICATION OF MATHIEU FUNCTIONS.

N. W. McLachlan. Oxford University Press, New York; Clarendon Press, Oxford, England, 1947. 401 pp., diagrs., charts, tables, 9½ x 6 in., cloth, $12.50.

Addressed to the technologist, the purpose of this volume is to give the theory of Mathieu functions and to demonstrate their application to representative problems in physics and engineering science. These applications are taken from the fields of radio, acoustics, mechanics, heat conduction, electromagnetism, and others in which oscillatory effects occur. A short historical introduction and a bibliography are included. Although not written for mathematicians, the mathematical treatment is thoroughly carried out.

THEORY AND APPLICATION OF RADIO-FREQUENCY HEATING.

G. H. Brown, C. N. Hoyler and R. A. Bierwirth. D. Van Nostrand Co., New York, 1947. 370 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.50.

Using mathematical analysis, the basic principles of radio-frequency heating are presented. Graphs are used to display results achieved by mathematics. Applications and illustrations of the principles are given from experimental data, including descriptions of laboratory equipment. The rationalized practical system of electrical units is used. Case hardening of steel, the wood-gluing process, and solutions to press problems are discussed as applications. RF dehydration, pasteurization, sterilization and food treatment are dealt with in the closing chapters.

THERMAL INSULATION OF BUILDINGS.

P. D. Close. Reinhold Publishing Corp., New York, 1947. 104 pp., illus., diagrs., charts, maps, tables, 9 x 6 in., paper, $1.75.

General theory and basic principles are followed by information on the calculation of heat losses and the estimation of fuel savings. The prevention of condensation is considered at some length. The types of manufactured insulations are described together with methods of application. The insulation of farm buildings other than residences is dealt with in a separate chapter. Lists of trade names, manufacturers, and trade associations are appended.

THEORY OF MATHEMATICAL MACHINES.

F. J. Murray. King's Crown Press, Morningside Heights, New York, 1947. 116 pp., diagrs., tables, 11 x 8½ in., stiff paper, $3.00.

In presenting a comprehensive discussion of basic principles, the fundamental requirements of both digital and continuous mechanisms are considered with the mechanical and electronic methods for meeting them. An operational approach to the general question of the solution of mathematical problems by machines is proposed. Apart from this, the book is devoted to such mathematical instruments as the planimeter and intograph. Modern devices for the same purposes, based on photoelectric techniques, are also studied.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

August 20th, 1948

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

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

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

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

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

The Council will consider the applications herein described at the September meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

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

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

FOR ADMISSION

BLAIR-McGUFFIE—JAMES CARRUTHERS, of Montreal, Que. Born at Chapel en le Frith, Eng., June 2, 1903. Educ.: B.A., 1924; M.A., 1928 (Mech. Sciences) Cambridge Univ., England; 1924-26, jr. engr., Sir W. G. Armstrong Whitworth Co., Ltd., Glasgow, Scot.; with Francois Cementation Co., Ltd., London, Eng., as follows: 1926-27, asst. engr., 1927-28, engr. i/c, 1928-31, res. engr. i/c St. Paul's Cathedral preservation; 1931-32, tech. mgr., Eternit Pietra Artificiale (London) Ltd.; with Granitese (G.B.) Ltd. (divn. of Francois Cementation Co. Ltd.), as follows: 1932-37, techn mgr., 1937-40, genl. mgr.; 1940-45, Royal Engineers, 2nd Lieut., then Major; 1945-47, asst. to prod. director, Tarran Industries Ltd., London, Eng.; during period, 1931-47, initiation of ten patents relating to mfg. and appln. of Portland cement grouts, special cements, asbestos cement products and methods of curing concrete; at present, designer, reinf. concrete, Shawinigan Engineering Co., Ltd., Montreal, Que.

References: J. A. McCrory, R. E. Heartz, A. L. Patterson, W. Sharples, A. S. Poe, R. M. Carmichael.

BOLTON—STUART MURRAY, of Edmonton, Alta. Born at Lacombe, Alta., Feb. 13, 1919. Educ.: B.Sc. (Elect.), Alberta, 1940; R.P.E., Alberta; 1940-42, apprent. course, Canadian Westinghouse Co., Ltd.; 1942-46, F/Lt. (Engrg. Officer), R.C.A.F..; 1946-47, development engr., Canadian Westinghouse Co., Ltd., Edmonton, Alta.; 1947 to date, manager, pump, engine and elect. dept., Canadian Fairbanks-Morse Co. Ltd., Edmonton, Alta.

References: A. A. Moline, E. M. Coles, M. Gerin, J. E. Cranswick, R. C. McPherson.

BRASS—WILLIAM, of Vancouver, B.C. Born at Prince Albert, Sask., Jan. 23, 1885. Educ.: Private tuition; with Grand Trunk Rly., as follows: 1905-06, axeman, chainman, location and constrn. rly. line, 1906-09, rodman, 1909-13, instru'man., rly. line constrn. grading tunnels, snowsheds, 1913-14, res. engr., constrn. rly. line, 1914-15, instru'man., steel bridge substructures; 1915-19, on active service C.E.F., England and France; 1919-43, dftsman., estimator, mtce., track, bldgs., wharves, C.N.R., 1943-45, asst. engr., mtce., track, bldgs., wharves; at present, private practice as designer and engr. on bldg. project, (structl. steel and reinf. concrete), Vancouver, B.C.

References: J. L. Charles, J. W. Porter, W. W. Walkden, W H. Stuart, W. F. Stevenson, H. W. Tooker, M. M. Price.

BROOKER—HENRY EDWARD, of Arvida, Que. Born at Woolwich, Eng., Jan. 1, 1908. Educ.: Medway Tech. College, 1925-28, awarded Ordinary National Certificate in Mech. Engrg.; with H. M. Dockyard, Chatham, Eng., as follows: 1923-28, engine fitter apprent., 1928-29, engine fitter and turner, 1929-31, dftsman., 1931-47, permanent Admiralty employee with 87% marks, maths., mechanics, engrg. design, dftng., 1932-35, evening lecturer, engrg. drawing and workshop practices; 1935-39, part time lecturer, engrg. drawing, Medway Tech. Coll. (evenings); 1940-45, British Admiralty Tech. Mission, Ottawa, i/c dftng., spec. and gauge depts. (inspecn. approx. 260 contract with inspecn. staff of 2,000 during peak), consultation with firms, resultant modification where necessary of designs, specifications and gauges, etc.; at present, industrial engr., industrial engrg. dept., Aluminum Co. of Canada Ltd.. Arvida, Que.

References: D. H. Nelles, F. A. Dagg, J. E. Dyck, H. W. B Swabey, J. S. Walsh, R. O. McGee.

BROWN—NORMAN LESLIE, Lt. (E), R.C.N., of Ottawa, Ont. Born at Pittsfield, Mass., Aug. 1, 1922. Educ.: B.A.Sc., (Mech.), Toronto, 1946; Aero & App. Engrg., Royal Naval Engrg. Coll., Devonport, Eng., (12 mos.); R.P.E., Ontario; 1944-45, (summers), jr. dftsman. and jr. engr., J. R. Booth Ltd., Ottawa; 1946 to date, R.C.N., Engrg. Branch, c/o Royal Naval Engrg. College, Keyham, Devonport, England.

References: G. R. Lord, S. J. Montgomery, C. G. Biesenthal, T. Foulkes, H. V. Serson, T. Fife.

CHAMPAGNE—ROGER, of Montreal, Que. Born at Montreal, July 7, 1923. Educ.: B.Eng., (Mech.), McGill, 1948; 1944-45-46-47, (summers), International Nickel, Thos. Robertson Co., National Heating Products; at present, genl. mgr., O. Champagne & Fils, Montreal, Que.

References: C. A. Robb, J. Zabinsky, R. H. Patten, E. Brown.

CONNOLLY—HAROLD JAMES, of Ottawa, Ont. Born at Toronto, Ont., Sept. 22, 1897. Educ.: B.A.Sc., Toronto, 1924; R.P.E., Ontario; 1924-35, office engrg., design and residencies on a number projects; 1935-40, various intervals during this period with Province of Ontario; 1941 to date, i/c of waterworks, sewerage and other phases of airport constrn. as asst. supt. engrg., second in command, airport development, Air Services Branch, Dept. of Transport, Ottawa, Ont.

References: W. B. Redfern, E. M. Proctor, F. C. Jewett, C. Flint, D. W. McLachlan.

DAVIDSON—JAMES RUSSEL CLANCY, of Lethbridge, Alta. Born at Calgary, Alta., March 18, 1909, with Alberta gov't., as follows: 1928-31, asst. to the engr. i/c hydrometric and genl. field survey, Lethbridge Northern Irri. Dist., 1932-34 (not in engrg. work), 1935-36, jr. engr., location and constrn. of roads, Waterton Lakes Park, 1936-40, jr. engr., instru'man. on location, highway branch, D.P.W., with Dept. of Transport, airport constrn., 1940-41, jr. engr., instru'man., 1941-44, res. engr., 1944 to date, airway engr. i/c airport constrn. and mtce., organization and direction of contract constrn. of airports and facilities, runways, preparation of sub-grade, of base and top surfacing, etc., Lethbridge, Alta.

References: R. C. Bell, A. L. H. Somerville, N. H. Bradley, A. L. Frame, C. S. Clendening, P. M. Sauder, T. H. Miard.

DAVIDSON—ROBERT ARCHIBALD, of Montreal, Que. Born at Vancouver, B.C., Sept. 23, 1920. Educ.: B.A.Sc., (Elect.), B.C., 1944; 1940-41-42, (summers), mtce. man, British Columbia Telephone Co.; tool maker, Boeing Aircraft; 1944-45, Elect. Lieut., R.C.N.; with Northern Electric Co., as follows: 1946-47, telephone equipt. engr., and at present, time study engr.

References: R. Wilson, E. G. Gagnon, E. H. Hayes, W. N. McGuinness, J. H. Budden, D. B. Spence.

DEWART—GEORGE BLACKWELL, of Sarnia, Ont. Born at Niagara Falls, Ont., June 6, 1910. Educ.: B.A.Sc., Toronto, 1939; R.P.E., Ontario; 1936-39, prod. work in all phases, mine operation, pit operation, International Nickel Co. of Canada, Ltd.; 1939-41, shift foreman, Frood open pit; 1941-45, asst. to mgr., adminis. work, sr. engr., problems of design, mfg. and use of jigs, tools and fixtures, Massey-Harris Co., Ltd.; 1945 to date, works mgr., Goodison Industries Ltd., Sarnia, Ont.

References. M. J. C. Lazier, F. F. Walsh, J. W. Graeb, J. H. W. Bower, R. A. Rule.

DICKSON—DAVID LAURENCE, of Montreal, Que. Born at Belfast, Ireland, Aug. 19, 1923. Educ.: 1940-45, Coll. of Technology, Belfast; holder of Higher National Certificate 1945; Graduate, Inst. Elect. Engineers; with Hugh J. Scott & Co., Ltd., Belfast, as follows: 1940-45, apprent'ship., 1946-48, asst. d.c. designer; 1948 to date, asst. develop't. engr., Electric Tamper & Equipment Co. of Canada Ltd., Montreal, Que.

References: D. J. LaFontaine, M. Harrigan, R. E. Hammond.

FOUCAR—HARRY GORDON, of Sarnia, Ont. Born at Camrose, Alta., April 22, 1909. Educ.: B.Sc., (Chem. Engrg.), 1935; 1932-34, telephone constrn., Alberta Gov't.; with Algoma Steel Corp., as follows: 1935-38, coke plant chemist, 1938-39, jr. engr., 1939-42, asst. to fuel engr., 1942-43, fuel engr.; Polymer Corp. Limited, Sarnia, Ont., as follows: 1943-45, utilities engr., 1945-47, prod. controller, 1947 to date, technical controller.

References: C. Stenbol, W. S. Wilson, F. F. Walsh, G. R. Henderson, E. W. Dill.

GARRETT—EDWARD JAMES, of Lethbridge, Alta. Born at Banff, Alta., Jan. 22, 1907. Educ.: Diploma, Surveying & Drafting, Institute of Technology & Art, Calgary, Alta.; R.P.E., Alberta; with Alberta Gov't., as follows; 1925-26, chainman and rodman, 1927-31, instru'man., highway, sewer, water, etc., 1932-33, res. engr., highway, sewer, etc., 1934-35, location engr., highways, 1936-40, engr. i/c constrn. highway, 1940-41, res. engr., airport cnstrn., Dept. Transport, 1941-42, sr. asst. engr., airport constrn., 1942-43, asst. to supt. engr., highway, 1943-44, engr. ungraded, flight strips and Alaska Highway, 1944-45, airway engr., airport mtce. and constrn., 1945-47, airway engr., airport constrn., Yellowknife, 1947 to date, asst. dist. airway engr., Lethbridge district, airport constrn. and mtce. including services, acting for and in absence of district airway engr.

References: A. L. H. Somerville, R. C. Bell, A. W. Haddow, W. A. Donaldson, H. T. Miard T. O. Nuemann, C. R. Cornish, L. A. Thorssen.

GRAHAM—GEORGE EDWIN, of Saint John, N.B. Born at Worcester, Mass., Dec. 16, 1924. Educ.: B.Sc., (Elect. Engr.), 1946; 1946 to date, New Brunswick Telephone Co., Ltd., Saint John, N.B

References: A. F. Baird, K. V. Cox, A. A. Turnbull, R. M. Richardson, L. S. Mundee, R. B. Marr.

HRENNIKOFF—ALEXANDER PAUL, of Vancouver, B.C. Born at Moscow, Russia, Nov. 11, 1896. Educ.: B.A.Sc., 1930; M.A.Sc., (Civil), 1933, B.C.; Sc.D., M.I.T., 1940; A.M., A.S.C.E.; R.P.E., B.C.; 1920-21, asst. chief party, railway surveys, Kotlas-Soroka in North. Russia; 1921-23, mtce. way, Zabaikalskaya Rly., East. Siberia, engr. in main office, later asst. divn. engr. of Marituy, later of Irkutsk Divn.; 1923, (7 mos.), engr. Zelesniak & Krichinsky Constrn. Co. (constrn. of rly. carbarn, Harbin, Manchuria); 1924, (4 mos.), engr. i/c surveys and constrn. of logging rly., Manchuria, Day-Jay-Tan Co.; 1924-25, (8 mos.), res. engr., constrn. school bldgs. for Chinese Eastern Rly., Harbin; 1928 (summer), instru'man., mtce. of way, Cranbrook divn., C.P.R.; 1929, (summer), and 1930-33, dftsman., Dominion Bridge Co., Vancouver; with Dept. of Civil Engrg., Univ. of B.C., as follows: 1933-40, instructor,1940-45, asst. prof., 1945-47, assoc. prof., 1947 to date, professor. (Misc. design work during summer vacations in steel, timber, reinforced concrete, stress and analysis of aircraft for two summers.)

References: J. N. Finlayson, L. F. Grant, A. S. Gentles, R. A. McLachlan, C. W. Deans, T. V. Berry.

HUNTER—HARRY MELVILLE, of Calgary, Alta. Born at Fairmount, N.D., May 22, 1902. Educ.: B.Sc., (Mining), Alberta, 1927; R.P.E., Alberta; 1923-25, asst. engr., Canmore Coal Co., Ltd.; 1927-39, geologist, Canadian Natural Gas Co., Calgary; 1939-45, R.C.E., with rank of Lieut., and finally Major; with Canadian Western Natural Gas Co., Calgary, as follows: 1945-46, prod. engr., 1946 to date, general supt.

References :P. D. Mellon, E. W. Bowness, F. A. Brownie, F. K. Beach, S. J. Davies, D. P. Goodall, R. T. Hollies, J. S. Neil, B. W. Snyder, C. V. F. Weir.

KENNEY—JOHN HENRY, F/Lt., R.C.A.F., of Edmonton, Alta. Born at Rochdale, Eng., March 10, 1903. Educ.: Tech. Inst. Gt. Britain, 1931-41, genl. elect. engrg., (corr. course); 1935-41, chief engr., i/c heating and power dist., bldg. constrn. and mtce., St. Michael's Coll., Windsor, Ont.; 1941 to date, Constrn. Engr. and Chief Engr., (heating and power), designing heating systems, supvng. heating instlns., designing water and sewerage dist. systems, supvng. water and sewerage dist. system instlns., supvng. bulk gasoline storage and dist. systems instlns., N.W.A.C. Hdqts., R.C.A.F., Edmonton, Alta.

References: R. A. McLellan, C. L. Inglis, C. A. Davidson, H. Keith, J. G. Dale.

KIMLER—WILLIAM EARL, of Canal Flats, B.C. Born at Carnduff, Sask., Apr. 6, 1924. Educ.: B.Sc., (Civil), Sask., 1946; 1946 to date, Tech. Officer, Reconstruction, Grade I, Dominion Water & Power Bureau, Vancouver, B.C.

References: I. M. Fraser, E. K. Phillips, N. B. Hutcheon, C. E. Webb, C. R. Forsberg.

KIRKPATRICK—GUY GORDON, of Peterborough, Ont. Born at Vancouver, B.C., Jan. 31, 1925. Educ.: B.A.Sc., (Elect.), B.C., 1947; 1946, (summer), student asst., pole and dist. ground survey, B.C. Power Commission; at present, student test course, Canadian General Electric, Peterborough, Ont.

References: G. R. Langley, J. N. Finlayson, D. C. Stephenson, H. R. Sills.

KRUPSKI—GEORGE HENRY, of Montreal, Que. Born in Lwow, Poland, Mar. 11, 1907. Educ.: Diplom Ing. (B.Sc., Engrg.), Technical Univ. of Vienna, Austria, 1934; Assoc. M., Inst. M.E., London; 1925-36, designer, A. Fross-Bussin, Vienna; 1936-37, prod. engr., time study, cost estimating, research in sheet metal pressing, L.W.S. Aircraft, Lublin, Poland; 1937, prod. engr., P.Z.L. Aircraft, Warsaw; 1937-39, workshop supt., aircraft factory, responsible for mtce. and prod. (emp. approx. 2,000 hands), L.W.S. Aircraft, Lublin; 1939-47, S/L., Engr., Officer, R.C.A.F.; at present, project engr., Barrett Co., Montreal, Que.

References: W. A. Messenger, M. L. Sherwood, J. Rockley, G. C. Brown, J. Pawlikowski.

LAYTON—ROBERT EDWARD JOHN, of Montreal, Que. Born at Montreal, Dec. 25, 1925. Educ.: B.Eng., (Mech.), McGill, 1947; 1944-45-46, (summers), Northern Elect. Co. and Canadian Car & Foundry; at present, mech. dftsman., T. Pringle & Sons Ltd..

References: C. E. Fraser, G. M. Wynn, C. A. Robb, J. T. R. Steeves, R. C. Barbour, R. DeL. French, A. G. Anderson.

LEE—JOHN EDMUND, of Toronto, Ont. Born at London, Ont., June 28, 1915. Educ.: B.A., (Physics and Chem.), Univ. of Western Ont., 1937; M.A. (Chemistry), Toronto, 1940; R.P.E., Ontario; 1937-40, research fellow in gas, Ontario Research Foundation; 1940 to date, chief chemist, i/c tech. testing, control and devel'pt. plant processes for prod. of gas, etc.; considerable time spent in last five yrs. in steam plant design and instln. incl. two complete water treat. plants, Consumers Gas Co., Toronto, Ont.

References: G. F. Knight, O. W. Ellis, G. R. Connor, P. E. Savage, H. P. World. P. W. Geldard.

MacCULLOCH—WILLARD FRASER, of Georgetown, B.G. Born at Chatham, N.B., Oct. 5, 1899. Educ.: B.Sc., (Mech.), N.S. Tech. Co., 1924; A.M., Inst. M.E.; 1924-25, asst. res. engr., constrn. new section G.T. highway, C.B. Island; with Canadian Ingersoll-Rand Co., New York, as follows: 1926-28, sales and service engr., (foreign branches), 1928-29, on loan to Mutual Chemical Co. of America, N.Y., as supvng. engr., chrome mines, New Caledonia, French Pacific, change-over to modern methods of prod. and transp., 1932-36, admin. of engrg. sales organization, planning, design, indus. and mining instlns. as sales manager, India; 1936-39, Kailan Mining Admin., North China, re-design of water supply and dist. system for mining area, study and improv. of operation and mtce. of complete traffic system, extension of Port Elect. Traction System, etc.; 1939-41, engr. i/c all matters pertaining to mech. and elect., civil engr., for three mining centres, Singareni Colliery Co., Hyderabad Gov't., India; 1941-46, Major R.E., Staff Officer, Indian Army; at present, exe. asst. to mng. director, constrn., transportation, engrg. agencies, etc., Sprostons Limited, Georgetown, B.G.

References: J. C. Batzold, J. B. Stirling, J. M. Cape, G. H. Midgley, J. S. Hewson.

MacLEOD—ERNEST JOHN, of Calgary, Alta. Born at High River, Alta., Aug. 9, 1916. Educ.: B.Sc., (Elect.), Alta., 1939; 1939-42, jr. engr., Calgary Power Co., Ltd.; 1942-45, Radar Officer i/c Radar equipt.; 1946 to date, engr., asst. to J. N. Ford, M.E.I.C., looking after bldg., mtce. and operation of transmission lines and dist. system, Calgary Power Co., Ltd., Calgary, Alta.

References: W. J. Gold, J. N. Ford, F. T. Gale, J. McMillan, H. B. LeBourveau, H. Randle.

MANUEL—FREDERICK RUSSELL, of Toronto, Ont. Born at Oshawa, Ont., Jan. 16, 1903. Educ.: B.A.Sc., 1925; M.A.Sc., 1927, Toronto; R.P.E., Ontario; 1925-26, chemist, research, sewage disposal and water purif., Ont. prov. gov't.; with Canada Dry Ginger Ale Inc., New York, as follows: 1927-29, chemist, control and new prod. devel'pt., 1929-42, plant mgr., supvrn. of operations and control of product, both chem. and bacter.; with Stevenson & Kellogg Ltd., Toronto, as follows: 1942-44, management engr., wage and salary structures, cost controls, plant layout, 1944-46, supvng. engr., 1946 to date, vice-pres. i/c Toronto office.

References: P. Kellogg.

MARTIN—LEONARD, of Montreal, Que. Born at Union City, N.J., July 14, 1912. Educ.: B.Sc., (Mech. Engrg.), Clarkson Coll. of Technocracy Potsdam, N.Y., 1934, (accredited E.C.P.D.); R.P.E., Quebec; 1929-30, (summers), Beauharnois Construction Co., (survey party); 1934 to date, sales engr. and managing-director, H. L Peiler & Co., Ltd., Montreal, Que.

References: G. L. Wiggs, G. B. Lomer, B. Chernovsky, R. L. Sanders, G. D. Zimmerman.

MATHISON—WILLIAM, of Montreal, Que. Born at Edinburgh, Scotland, April 1, 1910. Educ.: B.Sc., (Civil), Glasgow Univ., 1932; A.M., Inst. Civil Engrs.; 1929-30, jr. asst. W. Baird & Son Ltd., structl. engrs., Glasgow; 1931-34, jr. asst., W. C. Easton, chartered civil engrs., Glasgow; 1935-37, engrg. asst., Building Research Station, Watford, Eng.; 1937-38, Asst. Civil Engr., Admiralty, Eng.; 1938-39, asst. civil engr., Stepney Borough Council, Eng.; 1939-46, civil engr. and agent with Sir A. McAlpine, civil engrg. contractors, Wolverhampton, Eng.; 1936-47, lecturer in civil engrg. subjects, Brighton Technical College, Eng.; present, lecturer in civil engrg. subjects, McGill University, Montreal, Que.

References: R. E. Jamieson, G. J. Dodd. C. A. Robb, R. DeL. French, V. W. G. Wilson.

MUIR—JOHN FRED MATHESON, of Vancouver, B.C. Born at Winnipeg, Man., Jan. 26, 1898. Educ.: B.Sc., (Civil), Manitoba, 1923, R.P.E., B.C.; 1923-25, inspectr. bldg. constrn., Public Service, Northern Illinois; 1925-26, detailer and checker, American Bridge Co., Gary, Ind.; 1926-27, structl. designer, F. H. Wells, consultg. engr., Chicago; 1927-28, structl. designer, Turner Constrn. Co., Chicago; 1928-29, structl. designer, Otis Elevator Co., New York; 1929-31, engr. and estimator, J. McDiarmid Co., Winnipeg; with City of Winnipeg, as follows: 1929-36, structl. designer, 1935-38, designing engr., Greater Wpg. Sanitary Dist., and chief dftsman., City of Wpg.; Univ. of B.C., as follows: 1938-42, associate prof., 1942 to date, professor civil engrg.

References: J. N. Finlayson, A. Peebles, S. H. deJong, W. G. Heslop, R. C. Pybus.

NORTH—JOHN TERRY, of Montreal, Que. Born at Hantsport, N.S., May 4, 1904. Educ.: B.A.Sc., (Elect.), B.C., 1927; 1924, (4 mos.), mine surveyer, B.C. Silver Mines; 1925 (4 mos.) electrician's helper, Consolidated Mining & Smelting; with Canadian Marconi as follows: 1927-28, jr. engr., 1928-29, foreman, 1929-33, engr. i/c transformer design, 1933-37, facty. supt. i/c all products; 1937-39, inspector (quality and methods) American Can Co.; 1939-45, R.C.C.S., with rank of Lieut. and finally Lt.-Col.; 1945 to date, engr. i/c can-making machinery, special mfg. problems and genl. supvn. plant, American Can Co., Montreal, Que.

References: D. A. Killam, W. H. Moore, N. N. Wright, A. B. Hunt, W. L. Laurie.

PACAUD—ROBERT ARTHUR, of Montreal, Que. Born at Littlehampton, Eng., Sept. 7, 1914. Educ.: B.Eng., (Chem.), McGill, 1937; with Imperial Oil Limited, Sarnia, as follows: 1937-39, applied lub., research, 1939-40, i/c lubricating grease plant lab., 1940-41, i/c No. 2 plant lab., cracking, gasoline clay treating, phenol treating, etc., 1941-43, i/c crude running section of prod., control dept., crude dist., coking, etc.; 1943-46, Army, Canada, Eng., and Holland; at present chemical engr., plant design and engrg. economics, Donald-Ross & Co., Montreal, Que.

References: J. R. Donald, F. A. Combe, E. A. Ryan, J. T. Farmer, S. L. Burns, C. E. Carson.

PARDY—WILLIAM JOHN, of Westmount, Que. Born at Mt. Brydges, Ont., Oct. 8, 1921. Educ.: B.Sc., (Elect.), Queen's, 1944; 1941, (summer), millwright, Ford Motor Co., Windsor; 1942-43, (summers), surveyor, preliminary line layout and constrn., cable splicing and underground conduit constrn., Bell Telephone Co. of Canada; 1944-46, Lieut., R.C.E.M.E., with Northern Electric Co., Ltd., as follows: 1946-47, engr., power cable development, 1947 to date, power cable design engr.

References: N. L. Dann, N. L. Morgan, W. G. Tyler, J. P. C. McMath, R. A. Kerr.

RANDLE—JOHN ANDERSON, of Calgary, Alta. Born at Calgary, Alta., Jan. 19, 1926. Educ.: B.Sc., (Civil), Alberta, 1947; with Calgary Power Co., as follows: 1944, (summer), dftsman., 1945-46, instru'man., 1947, constrn. inspector, 1947 to date, party chief on Spray Lakes Power project investigation, Calgary, Alta. (civil engr., grade 2).

References: G. A. Gaherty, T. D. Stanley, R. M. Schulte, B. A. Monkham, R. M. Hardy, L. A. Thorssen, I. F. Morrison.

REILLY—PARK McKNIGHT, of Sarnia, Ont. Born at Welland, Ont., May 14, 1920. Educ.: B.A.Sc., (Chem. Engrg.), Toronto, 1943; R.P.E., Ontario; with Welland Chemical Works Ltd., as follows: 1941-42 (summers), tech. asst., 1943-45, jr. engr.; 1945-47, lecturer, chem. engrg., Univ. of Toronto, Ajax, Ont.; 1947 to date, tech. supvr., responsibility for all tech. work done on Butadene dehydrogenation units, Polymer Corporation Ltd., Sarnia, Ont.

References: R. R. McLaughlin, F. F. Walsh, G. R. Henderson, D. H. Welch, W. E. Taylor.

SMITH—ARCHIBALD JAMES, of Calgary, Alta. Born at Kelowna, B.C., Sept. 28, 1918. Educ.: B.Sc., (Mech. Engrg.), Univ. of Aberdeen, Scotland, 1943; A.M., Inst. M.E.; 1937-39, apprent. machinist, fitter, dftsman., G. Cassie & Son, Engrs., Aberdeen; 1941-42, student apprent., British-Thomson Houston Co., Ltd., Rugby, Eng., (summers); 1943, (7 mos.), design engr., design of ore handling material, G. Cassie & Son, Aberdeen; 1943-46, Elect. & Mech. Engr., R.C.E.M.E.; 1946, (7 mos.), design engr., design and layout of steel and iron mfg. plant, B.C. Tube Works Ltd., Vancouver; 1946 to date, asst. engr., design estimating and working management, Riverside Iron Works Co., Ltd., and Dominion Bridge Co., Ltd., Calgary, Alta.

References: R. Barnecut, D. J. Rattenbury, A. Baxter, E. Davis.

SMITH—FRANK FENTON, of Taber, Alta. Born at Bellevue, Alta., Dec. 1, 1919. Educ.: B.A.Sc., (Mech), B.C., 1943; 1943 (8 mos.), jr. engr., Imperial Oil Limited, Calgary, Alta.; 1943-44, jr. engr., Canadian Vickers Ltd., (aircraft divn.), 1944-47, stress engr., Dowty Equipment (Canada) Ltd.; at present, constrn engr., California Standard Co., Calgary, Alta.

References: J. N. Finlayson, F. Tempest.

SMITH—TERENCE BYRNE, of Negritos, Peru, S.A. Born at Montreal, March 28, 1919. Educ.: B.Sc., (Chem. Engrg.), Queen's, 1942; 1942-43, chemist, Defence Industries Ltd., Nobel, Ont.; with International Petroleum Co., Ltd., Negritos, Peru, as follows: 1943-45, engrg. dept., design work on grinding equipt., hydrated lime plant, i/c all phases of prod. of grinding barytes and bentonite, etc., 1947 to date, gasoline dept., later merged with prod., supvrn. lab., testing gasoline, propane, butane, petroleum gases, all phases water treatment and testing, pipe line capacity, surveys, compressor capacities, etc.

References: W. R. Longworthy, O. F. Bush.

STOREY—DONALD JOHN, of Millarville, Alta. Born at Odessa, Ont., June 19, 1910. Educ.: B.Sc., (Mining), Alberta, 1944; 1940-41, (summers), surveyor, MacLeod-Cockshutt Mines; 1942, (summer), dftsman., Shell Oil Co. (Alta.) Ltd.; 1945-47, Engineer Works Officer, R.C.E.; 1947 to date, genl. engrg., Home Oil Co., Limited, Millarville, Alta.

References: J. F. Langston, T. Pascoe, G. W. Webster.

STUCKEN—SERGE, Lieut. Col., R.C.E.M.E., of Edmonton, Alta. Born at Moscow, Russia, Oct. 11, 1902. Educ.: B.A. (Engrg.), Cambridge Univ., 1924; A.M., Inst. M.E.; 1923, vacation work, diesel engine testing, Ruston & Hansby Ltd.; with Metropolitan Vickers Electrical Co., Ltd., as follows: 1924-27, coll. apprent. course, Manchester, 1929-31, engr. i/c constrn. 50,000 K.W. power plant at Montevideo, Uruguay, 1932-36, staff engr., consultg. work, power plant and mill engrg.; 1936-41, chief engr., i/c all engrg. projects, power plant, works, mill work, elect. instlns., etc., Jardine Engrg. Corp., Shanghai; 1940-41, director, Hope Crittall Mfg. Co. (steel windows), Shanghai; director, Macgregor Ironworks, (enamelling plant), Shanghai; engrg. representative British Consul-General's council, Ministry of Economic Warfare, Shanghai; with R.C.E.M.E., as follows: 1944, Major, 1944-46, Lt. Col. Sr. Officer in B.C., 1947 to date, Western Command, Sr. Officer for provinces of B.C., Alberta, Yukon Territory, hdqts. at Edmonton, Alta.

References: J. W. Bishop, C. R. Boehm, J. R. Dunlop, H. Goodfellow, K. H. McKibbin.

TOWNSEND—CHARLES HARRISON, of Hamilton, Ont. Born at Toronto, Ont., Sept. 17, 1920. Educ.: B.A.Sc., Toronto, 1943; R.P.E., Ontario; 1944-46 Officer I/C machine shop, wireless instln. design engineer, Canadian Signals Research Devel'pt., National Research Council; 1946-47, prod. mgr., Cleveland Condensers Ltd., Toronto; at present, sales engr., B. Greening Wire Co., Ltd., Hamilton, Ont.

References: R. W. Angus, W. E. Brown, K. M. Cameron, E. L. Cousins, C. J. Townsend.

WEST—HENRY ALEXANDER SHOLTO, of Ottawa, Ont. Born at Lethbridge, Alta., Oct. 17, 1908. Educ.: B.A.Sc., B.C., 1934; 1929-34, (summers), student asst., Topo. Surveys, Dominion Gov't.; 1934-35, asst. to consultg. engr., B.C. Pulp & Paper, Woodfibre, B.C.; 1935-41, survey engr., Dominion Topo. Survey; 1942-45, Lieut., R.C.E., finally Major; with Dominion Topo. Survey, as follows: 1945-47, survey engr., 1947-48, survey engr. i/c of photo-topo. work, and at present, survey engr., i/c all photo-topo. surveys in Dept. Mines & Resources, Ottawa, Ont.

References: J. L. Rannie, B. W. Waugh, G. R. Turner, J. L. Melville, F. H. Peters, N. E. Rodger, E. M. Medlen.

WHITEHOUSE—RALPH JOHN, of Rossland, B.C. Born at Nelson, B.C., May 3, 1911. Educ.: B.Eng., (Mech.), McGill, 1933; with Consolidated Mining and Smelting Co., Trail, as follows: 1935-43, engrg. divn., 1944 to date, instrument engr., research divn

References: A. C. Ridgers, S. C. Montgomery, E. B. Broadhurst, A. H. W. Busby, D. J. Irvine.

WURTS—GORDON WILMOT, of Montreal, Que. Born at Toronto, Ont., July 11, 1911. Educ.: B.A.Sc., (Mech.), Toronto, 1938; R.P.E., Ontario; 1935-39, marine engr., diesel-steam aux., Imperial Oil Shipping Co.; 1939-40, mtce. engr., Robt. Simpson Co., Ltd., Toronto; 1940-41, instructor in engrg. drawing; 1941-42, plant and layout planning, Four Wheel Drive Auto Co., Clintonville, Wis. and Kitchener, Ont.; 1942-43, prod. methods, Massey-Harris Aircraft divn., Brantford, Ont.; 1943-45, Sub. Lieut. (E), R.C.N.V.R.; 1946, design engr., Dominion Truck Equipment, Kitchener, Ont.; 1946 to date, special materials quality control, i/c physical and chem. corrosion, testing lab., special fabrication techniques, etc., Canadian Vickers Ltd., Montreal, Que.

References: P. W. Gooch, R. K. Thoman, R. C. Flitton, S. Fromson.

For transfer from the class of Junior

BODWELL—GEOFFREY LIONEL, of Toronto, Ont. Born at Vancouver, B.C., on Sept. 19, 1914. Educ: B.A.Sc. (Civil) Toronto, 1937. With Shell Co. of Canada Ltd. as follows: 1937-38, dftsman.; 1938-39, asst. divisional engr.; 1939-41 Corps. of R.C.E.; 1944-45, Brigade Major, HQ 1, Cdn. Army; 1945-46, trainee, Stanlow Refinery Shell Refining & Marketing Co.; 1946-47, installn. mgr. Beirut, Lebanon, Shell Co. of Syria Ltd.; 1947-48, installn. mgr. Djibouti, French Somali Coast for Societe Anonyme des Petroles de Djibouti; 1948 to date, installn. mgr. Massawa, Eritrea for Shell Co. (Red Sea) Ltd. work, receiving tankers, bunkering ships, refuelling aircraft, operating transport, admin., pay accounts personnel, mtce. new construction, Cairo, Egypt. (St. 1934. Jr. 1946)

References: J. P. Carriere, W. G. Swan, N. J. W. Smith, L. G. C. Lilley, L. F. Grant.

BRANDLMAYR—JOHN, of Burnaby, B.C. Born at Linz, Austria, on Nov. 17, 1921. Educ.: B.Sc. (Mech.), Sask., 1945; R.P.E., Ont., summer work as follows: 1942, rodman, Dept. of Transport, Sask.; 1943, i/c experimental work on fabric moulding, bags, blankets, Cockshutt Moulded Aircraft Ltd. 1945-46, mech. engr., design of fertilizer bins, layout of conveyor systems, scheduling, purchasing of equip., Canada Packers Ltd., Toronto; at present, consulting engr. Arthur Pearson, work sawmill, pulp, paper mill design, Vancouver. (St. 1944. Jr. 1947)

References: F. R. Phillips, R. A. Spencer, I. M. Fraser, N. B. Hutcheon, E. K. Phillips.

BOONE—HAROLD PERCIVAL, of Ajax, Ont. Born at St. Andrews, N.B., on Sept. 27, 1912. Educ.: B.Sc. (Elec.), New Brunswick, 1937; R.P.E., Ont.; Can. Westinghouse Co. Ltd., 1937-42, test courses, including 7 months induction motor design apparatus sales correspondent; 1942-44, relay mtce. engr., Quebec Hydro Electric Commission; 1944-46, switchboard design engr. Can. Westinghouse Co.; at present, instructor 2nd yr. Dept. Electrical Engrg., Univ. of Toronto, Ajax Division. (St. 1937. Jr. 1941)

References: J. R. Dunbar, L. C. Sentance, H. W. Haberl, W. J. T. Wright, H. L. Shepherd.

COLLINS—KENNETH FAWCETT, of North Bay, Ont. Born at Haverhill, Mass., on Nov. 23, 1916. Educ.: B.Sc. (Chem. Eng.), Queen's, 1941; R.P.E., Ont.; with Welland Chem. Co. as follows: 1941-42, supervisor i/c chemical control, Nitric Acid Division; 1942-43, chem. engr production, control, develp.; 1943, Chem. engr., trouble-shooting; 1943, Lieut. R.C.E.M.E. Wksps.; 1944-45, Officer i/c Light Aid Detachment, responsible for mtce. repairs on all vehicles, guns; 1945 (2 mos.) attached to Dutch Army; 1946, Capt. Workshop Officer; 1946-48, Capt. posted two year course to Military College of Science, Shrivenham, England; at present completing last term of course, specializing in armaments. (St. 1941. Jr. 1946)

References: J. W. Bishop, J. R. Dunlop, K. H. McKibbin, G. W. Thompson, C. R. Boehm.

DODD—GEOFFREY JOHNSTONE JR., of Minneapolis, Minn. Born at London, England, on May 9, 1918. Educ.: B.Eng. (Mech.), McGill, 1940; summer work—Shawinigan Engineering Co. as follows: 1936, mechanic; 1937 and 38, technical asst; 1939, jr. Engr. St. Maurice Power Corp.; 1940-41, production foreman, Ammunition Division, C.I.L.; 1941-45, Naval Ordnance Inspecting Officer, British Admiralty Technical Mission; 1945, P/2 Ltd. R.C.E.M.E. Barriefield, Ont. and Mtl. basic training; 1946 (April) asst. to chief engr, Russell Miller Milling Co. Mpls. Minn. (St. 1939, Jr. 1944)

References: R. N. Coke, J. A. Coote, G. J. Dodd, R. S. Eadie, C. D. Woolward, L. A. Wright.

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References: R. R. McAlpine, G. N. Kent, F. H. Sexton, H. A. Ripley, M. L. Baker.

FLOUD—JOHN RHYS, of Montreal. Born at Montreal on June 13, 1917. Educ.: B.Eng. (Chem.), McGill, 1941; summer work as follows: 1937, Dominion Textile Co. Ltd.; 1938, Courtaulds (Canada) Ltd.; with Dominion Oilcloth and Linoleum Co. Ltd. as follows: 1941-43, asst. supt. of Table Oilcloth dept.; 1943-45, production planning, aircraft div.; 1945-46, tour of all depts.; at present research chemist. Mtl. (St. 1941, Jr. 1947)

References: O. R. Brumell, E. V. Gage, D. L. Lindsay, J. K. French.

FOSTER—IAN McLEOD of Grand'Mere, Que. Born at Somerset, England on March 22, 1910. Educ.: B. Eng. (Mech.) McGill, 1937. Brown Corp., La Tuque, Que., as follows: 1937, Jr. engr dftg.; 1939, mtce. work, dftg. office supervn.; 1943-45, R.C.E.M.E. Lieut., Canada & overseas; 1945 to date, chief dftsman. Laurentide Division. Consolidated Paper Corp., Grand'Mere, Que. (St 1937, Jr. 1941)

References: R. D. Packard, V. Jepsen, H. J. Racey, G. Rinfret, G. R. Goring, J. Grieve.

FRANKLIN—RAYMOND WILLIAM, of Fort Wayne, Indiana. Born at Winnipeg, Man., Sept. 2, 1921. Educ.: B.Sc.. Eng. (Civil), Manitoba, 1942; R.P.E., Ont.; summer work as follows: 1940, student asst. on Topographical Survey Field Party, Dept. Mines & Resources. Ottawa; 1941, Jr engr. and gunite inspector, hydro-electric plant, Winnipeg Electric Co.; 1942, Jr. engr. D.I.L., Transcona, Man.; 1942-43, instructor in civil engrg., Univ. of Manitoba; 1943-44, Lieut. reinforcement office, R.C.E., Army; 1944-45, wireless air gunner, R.C. airforce; 1945-46, Jr Hydraulic engr. Water resources branch, Manitoba; 1946-47, resident engr. i/c constrn. factory at Lindsay, Ont.; 1947 to date, structural designer, design of industrial buildings, machine foundations, J. Gordon Turnbull Inc., Indiana, U.S.A. (Jr. 1945)

References: E. P Fetherstonhaugh, W. F. Riddell, A. E. Macdonald, C. H. Attwood, B. B Hogarth, G. H. Herriot, L. G. Orr.

HALLE—PAUL EMILE, of Quebec, Que. Born at Breakeyville on July 29, 1913. Educ.: B.A.Sc., Ecole Poly., 1938; R.P.E., Que.; 1938-43, Quebec Dept. of Public Works; 1943 to date, plant and production mgr., St. Laurence Sea Products Co., Quebec. (St. 1937. Jr. 1946)

References: P. A. Dupuis, A. M. Deschene, R. Desjardins, R. Sauvage, L. Martin.

HILLER—WALTER ANDREW, of Edmonton. Born at Sedgewick, Alta., on Feb. 27, 1915. Educ.: B.Sc. (Civil), Alberta, 1943; R.P.E. of Alberta; summer work as follows: 1941 instru'man and chainman, McGregor Telephone & Power Constr. Co.; 1942, instru'man, Dept. of Transport, Calgary Airport; 1943, laboratory technician, D. of T.; 1945, Lieut. R.C.E. O/I road building school, Petawawa; 1946-47, asst. plants engr., Burns & Co., Calgary; at present, constrn. supt. Engineered Bldgs. Ltd., Calgary. (St. 1943. Jr. 1946)

References: A. L. H. Sommerville, W. A. Smith, R. M. Hardy, L. A. Thorssen, J. L. Simpson.

HURDLE—HAROLD LANCELOT, of Montreal. Born at North Bay, Ont., on April 24, 1910. Educ.: B.Sc. (Elect.), Alberta, 1933; 1935-39, Jr. elect. engr. Calgary Power Co. Ltd.; 1939-46, Major Royal Canadian Signals; at present elect. engr., Montreal Engineering Co. Ltd. (St. 1933. Jr. 1938)

References: G. H. Thompson, A. C. D. Blanchard, H. J. McLean, J. T. Farmer. W. R. Davis.

KERFOOT—JOHN GRENVILLE, of Kitchener, Ont. Born at Prescott, Ont., on August 11, 1913. Educ.: B.Sc. (Mech.), Queen's, 1936; 1936-40, production and engr. "Liaison" telephone dept., Phillips Electrical Works Ltd.; with Defence Industries as follows: 1940-42, design superv. Verdun Tool Works; 1942, senior superv. production shift; 1942-43, supt. process engrg. i/c design, devel'pt. equip. layout, Westmount Tool works; 1943-45, Lieut. R.C.N.; at present, vice president, H. Odd Centerless Grinding Co. Ltd. (St. 1936. Jr. 1942)

References: W. C. Watt, J. Waddington, H. B. Hanna, L. Newton, R. E. Grant, J. A. MacGibbon, L. Wood.

KING—HERBERT LORNE M., of Camp Borden, Ont. Born at North Battleford. Sask., on Oct. 17, 1917. Educ.: B.Sc. (Agric Engrg.), Sask., 1940. 1939, surveying, Dom. Experimental Station, Scott, Sask. 1939-40, instructor—I.C. Engines at Univ. of Sask.; 1940-44, chief ground instructor on aircraft engines, navigation, No 15 elementary Flying Training School, Regina, Sask.; 1944-45, Lieut. R.C.E.M.E. active force, Camp Borden, Ont. (St. 1940. Jr. 1941)

References: C. G. E. Downing, N. B. Hutcheon, I. M. Fraser, J. E. Beamish.

LONGWORTH—JACK, of Edmonton, Alta. Born at Bellevue, Alta., on Sept. 23, 1923. Educ.: B.Sc. (Civil), Alberta, M.Sc. Engrg. Univ of Illinois; R.P.E., Alberta; summer 1942-43, asst. engr.. West Canadian Collieries; 1945, Jr. Engr. Engineering and Construction Service, Banff, Alta.; 1945-46, instructor, Dept. of Civil Engrg. Univ. of Alberta; 1947, (summer) structural designer, Davis, Ripley & Associates, Calgary; at present lecturer civil engrg. Univ. of Alta. (St. 1944. Jr. 1947)

References: R. M. Hardy, I. F. Morrison, L. A. Thorssen, R. N. McManus, E. H. Davis, H. A. Ripley.

MARTEL—PIERRE, of Hull, Que. Born at Shawinigan Falls, Que., on August 13, 1917. Educ.: B.A.Sc. (C.E.), Ecole Poly., 1941; summer work as follows: 1937, rodman and transitman; 1938, asst. operator, S.W. & P. Co.; 1941. dftg. and machine design, Canada Iron Foundries, Trois Rivieres; 1941, inspector, Federal Aircraft Co.; 1942-43, Army Training; 1944-45, war advanced course, Military College of Science, England; 1945, Liaison Officer to Ministry of Supply. London, Eng.; 1945-46, Technical Staff Officer, Army HQ., Ottawa. (St. 1937. Jr. 1944)

References: D. A. Waldock, J. Blair, H. Gaudefroy, C. Bourgeois, I. Brouillet, J. Fregeau.

PECK—ROBERT CARTWRIGHT, of Mackenzie, British Guiana. Born at Edmonton, Alta., on March 2, 1918. Educ.: B.Sc. (Civil), Alberta, 1940; summer work as follows: 1938-39, rodman and instru'man on Dom. Topographical Survey; 1940, chainman, C.N.R.; 1940-41, aircraft inspector, civilian attached to the former No. 16 detachment (technical) Edmonton; 1941-44, asst. engr., Demerara Bauxite Co., Br. Guiana; 1945-46, sales engr. Aluminum Co. of Canada, Toronto; at present supt. of Civil Engrg. Dept., Demerara Bauxite Co. Ltd. Br. Guiana. (St. 1940. Jr. 1941)

References: R. M. Hardy, I. F. Morrison, T. H. Henry, J. C. Batzold, R. W. Johnson, P. Merrifield, T. R. Banbury.

SERGI—FRANK JOSE, of La Tuque, Que. Born at La Tuque Que., on Mar. 29, 1916. Educ.: B.Eng. (Mech.) McGill, 1941; summer work as follows: 1937-38-40, engrg. dept. Brown Corporation, La Tuque, Que.; 1939, engrg. dept. St. Maurice Power Corp.; 1941-42, sales-service engr. Bailey Meter Co. Ltd. Mtl.; 1943-47, Officer Commanding R.C.E M.E.; at present, Technical Staff Officers' Course, Military College of Science, Shrivenham, England. (St. 1941. Jr. 1946)

References: J. W. Bishop, C. R. Boehm, W. D. Kirk, R. W. Phillips, R. D. Packard, K. H. McKibbin, C. M. McKergow, W. L. Todd.

SINGER—GERALD GERSHON, of Montreal. Born at Montreal on May 9, 1914. Educ.: B.Eng. (Mech.), McGill, 1938. R.P.E., Que.; 1938-40, dftsman. engr. Canadian Car & Foundry; 1940-42, dftsman., Montreal Locomotive Works; 1942, gen. mgr., Atlas Industries Ltd. Mtl. (St. 1939. Jr. 1944)

References: S. S. Colle, L. Schector, A. Zion.

SWALLOW—MURRAY GORDON, of Quebec City. Born at Russel, Man., on May 26, 1917. Educ.: B.Sc. (Civil), Alberta, 1942; R.P.E., Que.; summer, 1941, chainman, Northern Alberta R.R.; 1942, safety engr. C.I.L. Nobel; 1942-43, dftsman. D.I.L. Nobel; 1943-44, engr. D.I.L. Verdun; 1944-47, chief dftsman., 1946-47, asst. plant engr., Gaspesia Sulphite Co. Ltd.; 1947 to date, asst. plant engr., Anglo Canadian Pulp & Paper Mills, Quebec. (St. 1941. Jr. 1945)

References: R. J Chambers, J. O'Halloran, J. E. Thom, J. F. Morrison, R. M. Hardy.

WILLIS—LLOYD EVERETT, of Monte Creek, B.C. Born at Edmonton, Alta., on Feb. 4, 1918. Educ.: B.Sc. (Civil), Alberta, 1942; summer work as follows: 1937, rodman, Alta. Prov'l. Highway Dept.; 1938, labourer, Banff, Jasper Highways; 1940, instru'man, Topog. Survey, Dept. Mines & Resources; 1941, instru'man, Dept. of Transport; 1942, engr. asst. Alaska Highway; 1942-43, mtce, engr., Defense Industries Ltd., Nobel, Ont.; 1943-46, topog. surveyor, R.C.E. Army, Canada, Overseas; 1946-47, chief of party, topog. survey, air photo control for mapping, field and office, Dept. of Mines & Resources; at present, resident engr., Trans Canada Highway Constrn., Dept. of Public Works, Kamloops. (St. 1941. Jr. 1944)

References: R. M. Hardy, R. S. L. Wilson, H. L. Hayne, H. L. Cairns, J. H. A. Steven, A. M. Reid.

To be transferred from the class of Student

HOCKMAN—JACK BERNARD, of Montreal. Born at Russia on March 22, 1922. Educ.: B.Sc. (Civil), Queens, 1947; summer work as follows: 1944, field engr., Constr. of Foundation, Canada Dry Bottling Plant; 1945, field engr., constrn. of sewer force main, Dorval Airport; 1946, field engr. constrn. of East Malartic Headframe; 1947, field engr. constrn. of R.C. Highway Bridge, Gaspe North, Que.; Jan. 1948, field engr. i/c of test borings for Bridge Site, Buckingham, Que.; at present field engr. Grant Mills Ltd., General Contractors, Mtl. (St. 1947)

References: A. J. Grant, O. J. McCulloch, S. D. Lash, L. F. Grant, J. D. Lee, R. A. Low, D. S. Ellis.

OGILVIE—JAMES D. B., of Niagara Falls. Born at Calgary on May 29, 1918. Educ.: B.Eng. (Chem.), 1939, M.Sc. 1940, Ph.D. 1942, McGill; with the Welland Chemical Works Ltd. as follows: 1942-46, research chemical engr.; 1946 to date, asst. chief chemist, North American Cyanamid Ltd. (St. 1942)

References: C. G. Cline, R. Abbott, G. Asplin, C. A. Dell, A. J. Ring.

SCHOPFLOCHER—PERTER, of Arvida, Que. Born at Frankfurt, Germany on August 23, 1926. Educ.: B.Sc. (Met.), Queen's, 1947. 1947 to date, development engr., Aluminum Co. of Canada Ltd. Arvida, Que. (St. 1947)

References: R. W. Kraft, J. P. Estabrook, A. C. Johnston, A. Jackson, S. N. Graham.

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, recent graduate required for position in Technical Department of a paper manufacturer in Eastern Ontario. Salary open. Apply to File No. 4181-V.

CIVIL

CIVIL ENGINEER required for mechanical logging department. Recent graduate, single. Must be prepared to spend major portion of time in field work. Salary open. Apply to File No. No 4168-V.

ELECTRICAL

*ELECTRICAL ENGINEER, recent graduate, required for junior position in the steam power plant of a manufacturer in Central Ontario. Duties of a general electrical engineering nature with particular reference to operation of the electrical equipment in the power plant. Salary $200. to $225. Apply to File No. 4164-V.

*ELECTRICAL ENGINEER preferably with sales experience but not essential required by Montreal firm for sales engineering. Considerable travelling. Salary open. Apply to File No. 4176-V.

MECHANICAL

MECHANICAL ENGINEER required for sales engineering by large engineering company. Age 25 to 30 years and preferably veteran. Salary around $275 00. Apply to File No. 4165-V.

MECHANICAL ENGINEER, recent graduate, required for manufacturing and related duties with well established reputable paper company. Salary open. Apply to File No. 4172-V.

MECHANIAL ENGINEER with three to five years experience required in Montreal by well established paper company for duties involving machine design, plant and general engineering. Salary open. Apply to File No. 4172-V.

MECHANICAL ENGINEER required for chief engineers department of pulp and paper company operating news and kraft mills. Must have at least 5 years experience in paper mill or with paper machinery manufacturing. Knowledge of Yankee and Fourdrinier special machines desirable. Salary open. Apply to File No 4173-V.

MISCELLANEOUS

GRADUATE ENGINEER required by Pulp and Paper Mill in Province of Quebec. Must have extensive experience in general maintenance, design and development of pulp and paper mill equipment. Excellent future advancement. Salary $6,000. to $9,000. depending on qualifications. Apply to File No. 4161-V.

*MECHANICAL OR ELECTRICAL ENGINEER, recent graduate, required by electrical firm in Ontario to be trained as Time Study Engineer. Salary $200 to $225. Apply to File No. 4169-V.

SALES ENGINEERS, one for Ontario and one for Quebec, required by tool and quality steel Branch Sales Office. Applicant should have some metallurgical training, some experience in tool and die manufacture, good personality and should own a car. Salary open. Apply to File No. 4170-V.

MECHANICAL OR ELECTRICAL ENGINEER, bilingual, experienced in standard investigations and observations. Time Study training not necessary. Required by Montreal firm. Salary open. Apply to File No. 4174-V.

GRADUATE ENGINEER with a few years experience in industrial engineering, methods, time study, etc., required by a well known engineering firm in Montreal. Salary $250. Apply to File No. 4175-V.

DRAUGHTSMAN required by Montreal firm with experience in structural steel or concrete detailing. Salary open. Apply to File No. 4177-V.

GRADUATE ENGINEER required by an oil company in the Maritimes must have sufficient experience in the oil business and the educational qualifications to enable him to determine the specifications of oils required for various industrial machinery. Salary open. Apply to File No. 4178-V.

CONSTRUCTION ENGINEER capable of supervising sundry engineering jobs and pipelines for oil company in the Maritimes. Salary open. Apply to File No. 4178-V.

PLANT MAINTENANCE ENGINEER, mechanical background, extensive experience in pulp and paper preferably Kraft. Required to take charge of Kraft mill maintenance in Province of Quebec. Executive ability. Salary open. Apply to File No. 4179-V.

GRADUATE ENGINEER required for veneer and plywood plant in the Maritimes. Must be fully qualified to assume responsibility for the management, production and general supervision of the plant. Salary open. Apply to File No. 4180-V.

RECENT GRADUATE required by a large National Organization. Must have the following qualifications:- Good appearance, personality, leadership and initiative. Salary $2,400. Apply to File No. 4194-V.

* Filled since appearance in advance notice.

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

CHEMICAL

CHEMICAL ENGINEER OR CHEMIST, preferably with Ph. D., required by a pulp & paper company with plants in Eastern Canada, for research work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER required by a pulp & paper company with plants in Eastern Canada, for mill control and pilot plant work. Salary open. Apply to File No. 3549-V.

CHEMICAL ENGINEER with considerable mechanic and hydraulic experience or mechanical engineer with good chemical knowledge and experience in hydraulics, required by a manufacturer in Ontario. Salary open. Apply to File No. 3928-V.

CHEMICAL ENGINEER, recent graduate is needed by a chemical manufacturing firm situated in the Province of Quebec. Some experience in oil refinery, pulp & paper, or synthetic resin manufacture would be useful. Salary open. Apply to File No. 3978-V.

CHEMICAL ENGINEER OR CHEMIST wanted by large manufacturers of bleached sulphate pulp for their Technical and Development Department. Several years experience preferably in the pulp and paper industry. Mill located in Northern Ontario. Salary open. Apply to File No. 3991-V.

*SENIOR CHEMICAL ENGINEER OR CHEMIST, required by leading Paper Manufacturer in Eastern Canada. Applicant should have some experience in Paper Mill Control work. This position offers plenty of scope for advancement. Salary open. Apply to File No. 4013-V.

GRADUATE CHEMICAL ENGINEERS OR CHEMISTS required by an industrial chemical plant in the Montreal area. Preferably with experience in production and the operation of chemical equipment such as filters, presses etc. Must be able to organize work and direct workmen. Salary $200. up. Apply to File No. 4071-V.

CHEMICAL ENGINEER for work in the Development Department of a large chemical manufacturing company involving chemical engineering design, preparation of mass and descriptive flow sheets, specification of equipment, comparison of processes, pilot plant liaison work. Must have had from three to five years in chemical plant engineering, maintenance or operation, in order of decreasing preference. Must be able to co-operate well with other departments in the Company. Work would be in Montreal. Salary open. Apply to File No. 4119-V.

CHEMICAL ENGINEER for technical department of pulp and paper firm in the St. Maurice Valley. Applicant must have supervisory capacity and also be able to undertake investigational work involving the co-ordination of laboratory experiments and mill operations. Salary open. Apply to File No. 4130-V.

CIVIL

CIVIL ENGINEER to take charge of work in a drainage district in Quebec. Must be bilingual. May be recent graduate. Salary $2,400. per annum for the first three months, $2,700. after 3 months and $3,000 after 12 months. Apply to File No. 3479-V.

CIVIL ENGINEERS with experience in detailing and designing structural steel and reinforced concrete for manufacturers are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

CIVIL ENGINEERS, recent graduate up, required by a pulp and paper company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

GRADUATE CIVIL ENGINEER, required by a public utility in the Montreal area with three or four years experience in design of reinforced concrete and structural steel. Salary $250-$300. Apply to File No. 3766-V.

CIVIL ENGINEERS with some experience on design and field work required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

CIVIL ENGINEERS required as draughtsman in bridge department of large transport company. Preferably with experience in steel, concrete and timber construction. Salary open. Apply to File No. 3884-V.

CIVIL ENGINEER required as Town Engineer of a town in the Maritimes. Required to supervise and layout work for Water and Sewerage Dept. Works Dept. also construction of a general nature for the Electric Light Dept. Salary open. Apply to File No. 3930-V.

JUNIOR ENGINEER preferably with civil background required for sales and service by a Montreal manufacturer of waterproofing compounds Salary open. Apply to File No. 3968-V.

CIVIL ENGINEERS required by a Montreal firm for field inspection in Ontario and North Shore St. Lawrence. Salary open. Apply to File No. 4084-V.

*CIVIL ENGINEER with at least two years experinece required in a Pulp and Paper Mill in the Province of Quebec for surveying and general paper mill engineering and draughting. Salary $250. to $300. Apply to File No. 4094-V.

CIVIL ENGINEER required for consulting engineer and surveyors' office in Montreal. Work includes surveying, topographical draughting, preparation of designs and plans of engineering work etc. Must be bilingual. Salary according to experience with future depending on ability. Apply to File No 4105-V.

CIVIL ENGINEER age 25 to 35 with experience in structural design required by an established firm of consulting engineers in Toronto. Opportunity for progressing in this work under proper supervision. Salary will be relative to experience and ability. Apply to File No. 4112-V.

CIVIL ENGINEER, thoroughly experienced and competent in structural design required by an established firm of consulting engineers in Toronto. Applications are invited from engineers with high qualifications and references Salary open. Apply to File No. 4112-V.

CIVIL ENGINEER around 30 years of age required as Assistant City Engineer of small city in Province of Quebec. General duties eventually to replace City Manager. Salary $3,000 to $3,600 according to qualifications. Apply to File No. 4144-V.

CIVIL ENGINEER. qualified to take charge of all town services including water and electric (distribution system) utilities required by a Town in Nova Scotia. Population 4,000. Salary open. Apply to File No. 4147-V.

CIVIL ENGINEERS required in Eastern Ontario for employment as designers of service systems for housing and other building projects. Preferably men with at least 10 years experience in that line Salary according to qualifications. Apply to File No. 4156-V.

CIVIL ENGINEER recent graduate with up to one year's experience since graduation. Preferably single man. Required by Northern Ontario Paper Mill. Salary around $250. Apply to File No. 4158-V.

ELECTRICAL

ELECTRICAL ENGINEER, recent graduate up required by a manufacturer in Montreal for sales engineering, Must be bilingual and familiar with rotating electrical equipment. Salary $200 up. Apply to File No. 3761-V.

GRADUATE ELECTRICAL ENGINEERS, with 3 to 10 years experience in design, operation, layout of substations, switching stations, and electrical machinery, together with engineering studies, including draughting for a large hydro electric power house in Quebec. Salary $225 up according to experience. Apply to File No. 3787-V.

ELECTRICAL ENGINEER required for power sales by an electrical utility in Province of Quebec. Preferably experienced, bilingual. Salary open. Apply to File No. 3802-V.

ELECTRICAL ENGINEERS with experience in layout and design of generating and transformer stations, required by a public utility in Toronto. Salary open. Apply to File No. 3813-V.

SEVERAL EXPERIENCED ELECTRICAL DRAUGHTSMEN for the design and layout of industrial power and control systems required by consulting engineering office in Montreal. Salary open. Good chance for advancement. Apply to File No. 3890-V.

ELECTRICAL ENGINEERS required for sales engineering work in Western Canada. Graduates with some selling experience preferred. Salary open, plus expenses. Apply to File No. 3915-V.

PROFESSOR IN ELECTRICAL ENGINEERING required by a Canadian University in the Province of Quebec for fall 1948 semester. Preferably with teaching and practical experience in power, electrical machinery design, lab., etc. Bilingual preferred. Attractive salary available for right man. Apply to File No. 3982-V.

ELECTRICAL ENGINEERS, age 30 to 40 required for the Commercial and Distribution Department of large Hydro Electric Untility. Must have experience in electrical distribution. Salary open. Apply to File No. 4002-V.

ELECTRICAL ENGINEER, experienced in Power Station Transmission and Distribution design and installation. Permanence and advancement depending upon performance. Salary open. Apply to File No. 4024-V.

JUNIOR ELECTRICAL ENGINEER required by a mining company in Northern Ontario. Salary open. Apply to File No. 4028-V.

GRADUATE ELECTRICAL ENGINEER required for position with large Northern Ontario Paper Mill. Preferably man with some paper mill or other industrial experience. Salary commensurate with qualifications and experience. Apply stating experience and qualifications. Apply to File No. 4032-V.

GRADUATE ELECTRICAL ENGINEER with a minimum of 2 years practical experience to assist in electrical engineering design work, field work on construction and maintenance of structures, service and installation of equipment required by Manitoba City. Salary $226 to $257. Apply to File No. 4069-V.

ELECTRICAL ENGINEER required by company in Shawinigan Falls, Quebec. Vacancies exist for first class electrical engineer capable of taking entire charge of electrical department also electrical engineer for work as assistant plant engineer. Salary open. Apply to File No. 4106-V.

EXPERIENCED ELECTRICAL ENGINEERS required by consulting engineering office in Montreal as Assistant Engineers, Designers, Checkers, Draughtsmen and Quantity Estimator. Salaries open. Apply to File No. 4110-V.

ELECTRICAL ENGINEER, age 30-40, required as Sales Engineer for Electrical Power Apparatus Company, manufacturing motors, transformers, rectifiers, switchgear, etc. Test course graduate specializing in switchgear preferred. Sales experience desirable but not essential. Location Toronto. Salary open. Apply to File No. 4128-V.

ELECTRICAL DESIGNING DRAUGHTSMEN for work with a firm of consulting engineers in Southern Ontario. Must be experienced. Salary up to $300. Apply to File No. 4133-V.

ELECTRICAL ENGINEER required for Toronto area for engineering and design of power transformers. Salary will be commensurate with ability and experience. Apply to File No. 4141-V.

ELECTRICAL ENGINEER required as Senior Transformer Draughtsman by Canadian Company in Ontario. Must be experienced in layout and design of high voltage power transformers also capable of assuming responsibility. Salary open. Apply to File No. 4146-V.

MECHANICAL

MECHANICAL ENGINEERS, preferably with design experience are required for armament research and development in the Quebec area in a government establishment. Salary from $190. Apply to File No. 3401-V.

MECHANICAL ENGINEERS required by a Pulp and Paper Company with plants in Eastern Canada. Salary open. Apply to File No. 3549-V.

JUNIOR MECHANICAL ENGINEER with knowlege of precision machine shop practice and aptitude for research work in metals and plastics required for an organization in Toronto for the production of artificial limbs. Must be veteran. Salary from $225. Apply to File No. 3675-V.

RECENT GRADUATES OR JUNIOR ENGINEERS with mechanical background required by a Montreal Engineering fabricating and contracting firm, for training purposes leading to sales and service. Montreal area. Salary $175 up. Apply to File No. 3810-V.

MECHANICAL ENGINEERS with experience in plant layout and design or ventilation problems or general mechanical design required by a firm in Quebec. Salary from $250. Apply to File No. 3818-V.

MECHANICAL ENGINEER required by a manufacturer in Ontario for the plant operation staff. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER with six to ten years experience in maintenance and engineering work required by alkali manufacturers in Ontario. Salary open. Apply to File No. 3833-V.

*MECHANICAL ENGINEER age 30-38 required for Northern Ontario Paper Mills, preferably with paper mill experience or experience in general layout and design. Knowledge of pumps capacities, piping conveyors, estimating and structural design essential. Salary open. Apply to File No. 3891-V.

RECENT GRADUATES in Mechanical Engineering required by steel fabricating industry in Hamilton Some knowledge of production operations would be helpful. Salary open. Apply to File No. 3981-V.

MECHANICAL DESIGN DRAUGHTSMAN with experience in re-inforced concrete and structural steel required by a mining company in Northern Ontario. Housing available. Salary open. Apply to File No. 3994-V.

MECHANICAL ENGINEER required in Ontario by a firm specializing in machine tools. Applicant must be experienced in production control. Salary open. Apply to File No. 4026-V.

MECHANICAL DRAUGHTSMAN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for colliery plant, screening equipment, hoists, simple steel structures, etc. Salary $250 up depending upon ability. Apply to File No. 4030-V.

CHIEF ENGINEER, mechanical background required by a specialized industrial plant in the Montreal area. Work covers mechanical design, preparation of work drawings, bills of materials, specifications and the ordering of all materials for contracts, also design of necessary tooling. Salary open. Apply to File No. 4066-V.

MECHANICAL ENGINEERS with experience in estimating or design required by well known general engineering firm in Montreal. Good future for those with right qualifications. Salary commensurate with ability. Apply to File No. 4074-V.

MECHANICAL ENGINEER with experience in the design of hydraulic turbines, valves, penstocks. surge tanks and associated equipment required by large manufacturer in Montreal to participate in expanding program of hydro electric development. Salary open. Apply to File No. 4074-V.

MECHANICAL ENGINEER with minimum of eight years experience in the design of heavy mechanical equipment required by well established firm in Montreal for general supervision and checking. Must be alert and aggressive. Salary open. Apply to File No. 4074-V.

MECHANICAL ENGINEER required in Montreal with considerable experience in machine shop practice and some administrative experience in shop work. Applicant should be around 35 years of age and bilingual. Salary depending on qualifications. Apply to File No. 4100-V.

EXPERIENCED MECHANICAL ENGINEERS required by consulting engineering office in Montreal as Assistant Engineers, Designers, Checkers, Draughtsmen and Quantity Estimator. Salaries open. Apply to File No. 4110-V.

JUNIOR MECHANICAL ENGINEER, age 25 to 27 years, preferably with three to four years experience required for general duties by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 4114-V.

MECHANICAL ENGINEER with two or more years experience in machine shop practice required in Montreal as sales engineer handling cutting oils and other chemicals and oils used in machine shops. Salary open. Apply to File No. 4116-V.

MECHANICAL ENGINEER with at least ten years experience including plant maintenance and preferably in the pulp and paper industry required in New Brunswick. Salary open. Apply to File No. 4117-V.

* Filled since appearance in advance notice.

MECHANICAL ENGINEER for work in the Development Department of a large chemical manufacturing company involving chemical engineering design, preparation of mass and descriptive flow sheets, specification of equipment, comparison of processes, pilot plant liaison work. Must have had three to five years in chemical plant engineering, maintenance or operation, in order of decreasing preference. Must be able to cooperate well with other departments in the Company. Work would be in Montreal. Salary open. Apply to File 4119-V.

MECHANICAL ENGINEER preferably with two or three years general plant experience required as production engineer by National Beverage Company in Eastern Canada. Salary open. Apply to File No. 4122-V.

*MECHANICAL ENGINEER required for a Western industry engaged in the manufacturer of truck bodies and trailers, overhaul and repair of industrial engines and construction equipment, repair and maintenance of R.C.A.F. and civilian aircraft. Service as an Engineering Officer in the R.C.A.F. during the war will be an advantage. An excellent opportunity is offered to the right man. Apply to File No. 4129-V.

MECHANICAL ENGINEER required as Plant Engineer by large Pulp and Paper Mill. Must have paper mill engineering experience. Permanent position. Salary between $475 to $550 depending on experience. Apply to File No. 4132-V.

*MECHANICAL ENGINEER required for work in Alberta by a consulting engineer in Montreal. Duties include supervision of mining machinery. Salary up to $5,000. Apply to File No. 4134-V.

MECHANICAL ENGINEER with knowledge of design and considerable experience with steam and diesel engines and refrigeration equipment. Required in Montreal. Preferably bilingual. Must be veteran with overseas service. Applicant should state age, experience and salary expected. Apply to File No. 4137-V.

MECHANICAL ENGINEER OR DRAUGHTSMAN with minimum of four or five years experience. Knowledge of paper mill engineering desirable but not essential. Required by large Pulp and Paper Mill for general engineering design and draughting. Salary up to $400. depending on qualifications. Apply to File No. 4138-V.

MECHANICAL ENGINEER, around 35 years of age required as Assistant to Project Engineer on construction of large pulp plant. Experience in design and piping essential. Duties in Montreal and British Columbia. Salary $5,000 to $6,000. Apply to File No. 4149-V.

MECHANICAL ENGINEER recent graduate required in Engineering and Servicing Department of Canadian Firm with Headquarters in Montreal. Duties include service work in connection with Railway, Pulp Mill and other Industrial Products. Salary open. Apply to File No. 4150-V.

MECHANICAL ENGINEER with 1 to 3 years experience in production required as Industrial Engineer by industrial and chemical organization with headquarters in Montreal. Duties include responsibility for conducting methods engineering studies using techniques of process charts, time and motion study. Salary open. Apply to File No. 4152-V.

MECHANICAL ENGINEER with 2 or 3 years experience, preferably bilingual, required as Mechanical Development Engineer by industrial and chemical organization with headquarters in Montreal. Duties will be conducting investigations on existing equipment and a certain amount of plant layout work and draughting. Salary open. Apply to File 4155-V.

METALLURGICAL

RECENT GRADUATES in Metallurgical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 3981-V.

*METALLURGICAL ENGINEER required by a farm implement manufacturer in Ontario to take over the necessary duties in new mechanized foundry. Salary open. Apply to File No. 4086-V.

* Filled since appearance in advance notice.

MINING

MINING ENGINEERS with varied experience required by a firm in Quebec for general mine operation, exploitation and development work. Salary from $250. Apply to File No. 3818-V.

MINING ENGINEER with several years experience required by a Company engaged in large scale asbestos production in Quebec. Salary open. Apply to File No. 3935-V.

MISCELLANEOUS

STRUCTURAL STEEL DRAUGHTSMAN AND CHECKERS, preferably graduate engineers but any experienced man acceptable, are required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 3519-V.

GRADUATE ENGINEERS required by an industrial and chemical organization with headquarters in Montreal for all phases of research, design, operation, development, production and maintenance. Salaries open. Apply to File No. 3588-V.

SALES ENGINEER with wide engineering experience, wanted by a company in Toronto for the sale of textile machinery and construction equipment. Salary open. Apply to File No. 3639-V.

STRUCTURAL STEEL DETAILER AND CHECKER with considerable experience required for checking shop details by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

DETAILER & DESIGNER for reinforcing steel with considerable experience required by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

GRADUATE ENGINEER required by an electrical firm in Montreal to organize publicity department and edit trade journal. Salary open. Apply to File No. 3751-V.

STRUCTURAL STEEL DRAUGHTSMAN, qualified to detail and check all classes of structural steel and to supervise draughtsmen in a large drawing office on the West Coast. Salary open. Apply to File No. 3777-V.

BRIDGE ENGINEER, qualified to be in charge of the design and supervision of the construction of highway bridges. Apply stating qualifications, experience, age and salary wanted. Apply to File No. 3780-V

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open. Apply to File No. 3811-V.

STRUCTURAL STEEL CHECKER AND ONE DETAILER CHECKER wanted for large fabricating plant in Vancouver, B.C. Age between 30 to 40 years preferred. Must be experienced. Give full information and references. Salary open. Apply to File No. 3862-V.

STRUCTURAL ENGINEER required by a Steel Company in Montreal for the design of reinforced concrete frame. Salary open. Apply to File No 3931-V.

TWO METALLURGICAL ENGINEERS and ONE CHEMICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No. 3942-V.

SALES ENGINEER required by well known manufacturer of mechanical equipment to solicit industrial accounts throughout the Province of Quebec. Applicants must reply giving full details, age, training, etc. Salary open. Apply to File No. 3951-V.

*CIVIL OR MECHANICAL ENGINEER wanted with 5 to 8 years experience for key position in moderate size plant in Manitoba, doing fabrication of Plate Work and Light Steel Work, also Gray Iron Foundry and Machine Shop. This will lead to a key position in a growing organization. Salary open. Apply to File No. 4003-V.

MECHANICAL AND CHEMICAL ENGINEERS, interested in entering the Pulp and Paper industry required in Nfld. Vacancies in Technical Department and studying process work and improved methods of operation. Pulp and Paper experience is not necessary. Salary open. Apply to File No. 4009-V.

POWER PLANT SUPERVISOR required for South America. Age 30-40, single preferred to supervise steam power plant including operating, boiler cleaning and minor repairs Salary $375. U.S currency. Apply to File No. 4011-V.

*ELECTRICAL OR MECHANICAL ENGINEERS required by large Montreal firm to prepare and analyze specifications for telephone equipment manufacturing and installation. Other types of engineering work also available. Salary open. Please send photo together with particulars of education and experience. Apply to File No. 4018-V.

GRADUATE ENGINEER required as Assistant to Manager of Sawmill and Woodlands operations. Position located in Ontario. Good commercial sense essential also some sales ability. Salary around $400. Apply to File No. 4021-V.

ARCHITECTURAL DRAUGHTSMAN experienced in industrial building construction, with natural aptitude for design work, wanted by large industry in Eastern Townships Good salary, permanent position to the right man. Apply to File No. 4031-V.

SENIOR INDUSTRIAL ENGINEER required by Management Consultants in Montreal. Experienced in installations of production and cost control, wage incentives, etc. Free to travel, preferably bilingual. Salary open. Apply to File No. 4052-V.

SALES ENGINEER for popular line of Diesel Engines. Applicants must be specialists on Power Units and Generator Sets, required for permanent employment with well established organization. Apply to File No. 4055-V.

*GRADUATE ENGINEER, preferably mechanical or electrical background required for drop forging plant operation and production in Province of Ontario by a steel company with headquarters in Ontario. Good commercial sense essential. Salary open. Apply to File No 4062-V.

INDUSTRIAL ENGINEER with considerable manufacturing experience between 30 and 40 years of age required for plant surveys in Province of Quebec. Must be fluently bilingual. Permanent position. Salary according to qualifications. Apply to File No. 4064-V.

POWER STATION OPERATOR with about five years' experience principally in operation and maintenance of turbines and mechanical equipment of hydro-electric plants required by public utility in Brazil. Preferably not over 30 and single but will consider married man without minor dependents. Replies held in strictest confidence. Salary open. Apply to File No. 4073-V.

MECHANIAL OR CIVIL ENGINEER with at least four years experience in stress analysis and Vibration required by one of Canada's leading manufacturers of heavy mechanical equipment. Considerable scope for man of proper qualifications. Salary open. Apply to File No. 4074-V.

SALES ENGINEER required by well known engineering supply company doing business with Mining and Pulp and Paper companies. Excellent opportunity for advancement. Travelling not extensive. No experience necessary but desirable. Salary open. Apply to File No. 4079-V.

TOWN ENGINEER required by town in Ontario. Duties include the supervision of Board of Works and Sanitation Departments as well as acting in an advisory capacity to the telephone, electric and water utilities. Salary from $250. to $300. Apply to File No. 4087-V.

RECENT GRADUATE MECHANICAL OR ELECTRICAL background required by engineering firm in Montreal Duties include training in Public Utility in Administration Department. Eventually for South America. Salary to start $225. Apply to File No. 4089-V.

JUNIOR ENGINEER preferably with a few years experience in production control and some knowledge of the textile industry required for Montreal area. Salary $250. to $275. Apply to File No. 4092-V.

SENIOR INDUSTRIAL ENGINEER with business administration and mechanical background, bilingual, with at least five years experience in production control, wage incentives and cost control required by an industrial engineering consultant in Montreal. Salary open. Apply to File No. 4092-V.

SENIOR DESIGNER with from five to ten years experience and a general knowledge of structural design in relation to buildings and bridges required by a steel company in Southern Ontario. Salary open. Apply to File No. 4093-V.

JUNIOR ENGINEER with from one to five years experience and at least a working knowledge of structural design of buildings required by a steel company in Southern Ontario. Salary open. Apply to File No. 4093-V.

SALES ENGINEER required by large manufacturer of Air Handling equipment in Toronto area. Applicant should have either industrial or Public Building application and sales experience. Salary open. Apply to File No. 4101-V.

SALES ENGINEER required by Canadian Company in Ontario. Must have thorough knowledge of the preparation of tenders, propositions on Transformers, Motors and Switchgear equipment, also experience in the commercial side of the heavy electrical industry. Salary open. Apply to File No. 4102-V.

MAINTENANCE ENGINEER required in Quebec City to do installation work in heating, ventilating, refrigeration and air-conditioning, gas and diesel motors. Must be bilingual. Salary open. Apply to File No. 4104-V.

JUNIOR ENGINEER required in Quebec City. Preferably with three to five years experience in heating, ventilating and air-conditioning, gas and diesel motors. File No. 4104-V.

MECHANICAL OR ELECTRICAL GRADUATE, age about 35 years with experience in building construction machinery maintenance and repair capable of taking over the engineering and maintenance services in a large textile mill in Province of Quebec. Salary open. Apply to File No. 4114-V.

DRAUGHTSMEN with some experience in building design or architectural work required by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 4114-V.

SALES ENGINEERS, one experienced man also two juniors willing to learn required by an electrical and power house equipment manufacturer in Montreal. Salary open. Apply to File No. 4121-V.

RECENT GRADUATE preferably mechanical or civil background required by Maritime branch of large industrial Canadian firm. Duties of general engineering nature. Salary open. Apply to File No. 4125-V.

GRADUATE ENGINEERS required as Assistant Professors, Lecturers and Demonstrators in Civil, Electrical and Mechanical Engineering by a Canadian University. Salaries dependent on experience and general qualifications. Apply to File No 4127-V.

*JUNIOR ENGINEERS required as assistant engineers on construction work at Saint John Harbour. Salary $200 to $250. depending on training and experience. Apply to File No. 4131-V.

MECHANICAL OR CIVIL ENGINEER with shop experience required in Montreal. Duties include design on railway equipment. Salary open. Apply to File No. 4135-V.

*SALES ENGINEER required by prominent distributor of heavy equipment for forestry, road building and construction industries. Head office in Montreal. Working knowledge of French and executive ability necessary. Salary open. Apply to File No. 4140-V.

GRADUATE ENGINEER with engineering and sales experience required as a Street Lighting Specialist in Toronto area. Position involves direct sales engineering with municipalities and utilities also engineering and production problems directly concerned with the manufacture of street lighting equipment. Age under 35 years. Salary open. Apply to File No. 4141-V.

HEATING AND VENTILATING ENGINEER with considerable experience in mechanical equipment for buildings is wanted for office work on heating, ventilating and air conditioning by a firm of consulting engineers in Montreal. Salary open. Apply to File No. 4142-V.

* Filled since appearance in advance notice.

MAINTENANCE ENGINEER, under 30 years of age, required by Public Institution for Montreal area. Duties include maintenance of buildings, heating plants, electric service, etc. Salary open. Apply to File No. 4143-V.

TOWN ENGINEER required for town in Nova Scotia. Applicant must be qualified to take charge of all town services including electric (distribution system) and water utilities. Salary open. Apply to File No. 4145-V.

MECHANICAL OR CHEMICAL ENGINEER with Masters' or Doctors' degree and several years' experience in industrial or University research work required to head the Engineering Development Section of the National Research Council, Atomic Energy Project. Salary open. Apply to File No. 4148-V.

GRADUATE ENGINEER age 32 up, preferably bilingual and with 10 years experience in industrial design required by chemical organization with headquarters in Montreal. Duties include supervision of works design department supply draughting and design service for plant, prepare appropriation requests, maintain cost estimating units, etc. Salary open. Apply to File 4153-V.

MECHANICAL ELECTRICAL OR CIVIL ENGINEER, age 23-30, preferably single and bilingual with some experience in maintenance required by an industrial and chemical organization with headquarters in Montreal. Duties include construction project and design studies. Salary open. Apply to File No. 4154-V.

ENGINEER required in Montreal. Applicant should have railroad construction experience and a knowledge of welding technique also the ability to organize and carry out special track construction jobs. Salary open. Apply to File No. 4157-V.

CIVIL OR STRUCTURAL ENGINEER, 24 to 35 years, required for Northern Ontario Paper Mill. At least four years experience, 2 of which should be on construction and 2 on design. Opportunity to train junior personnel. Salary not less than $400. Apply to File No. 4158-V.

SITUATIONS WANTED

MECHANICAL ENGINEER, M.E.I.C., P.Eng. Ont.; 36, married now employed on top responsible position, desires position with Airlines, or connected with flying. Man with wide technical experience and knowledge. Pilot since childhood, and ex-instructor in power and glider flying Speaks several foreign languages, good organizer, knows jet propulsion and safety of flying problems. Available for responsible, serious and permanent position with future on 6 months notice to the present employer. Will give priority for the position with available living quarters near work. Apply to File No. 140-W.

MECHANICAL ENGINEER, Jr.E.I.C., McGill University. Eight years experience Tool and Production Methods Engineer. Age 38. Married. Presently employed. Desires employment as Production Manager or Materials Engineer for large company. Preferably Montreal area. Apply to File No. 551-W.

CIVIL AND MECHANICAL ENGINEER M.E.I.C., aged 42. B.Sc. Civil Graduate work in industrial engineering at McGill University. Seventeen years experience in following field: Manufacture of welding rod and hardfacing alloys, installation of incentive bonus system in two of Canada's largest Aircraft Plants. Production planning on the manufacture of shells and shell parts. Design and construction of explosive proving equipment. Superintendent during construction of one of Canada's largest Shell Filling Plants. Other experience covering Oil Refining, Contracting, and installation of Pulp and Paper Mill Equipment. Interested in position with responsible firm or partnership with consultant. Home in Montreal area. Apply to File No. 981-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., Quebec, with more than 20 years experience in design and construction of dams and Power Plants in U.S.A. and Canada. Desire change in position preferably in the construction field. Apply to File No. 1527-W

ENGINEER, M.E.I.C., Prof.Eng., Que., with Bachelor and Master Degrees, over twenty years diversified background of experience, interested in post on plant operations, administration, or general management. Service overseas in army. Now employed but available on short notice. Apply to File No. 1645-W.

CIVIL ENGINEER, M.E.I.C, Prof.Eng., Quebec, age 39, married. Fluently bilingual with a certificate in Municipal Public Works administration. Experienced in Municipal, Highway Engineering, design of sewer and aqueduct, construction and maintenance. Seeks position as executive, Town Engineer, Construction Superintendent, Sales Engineer. Available on short notice. Apply to File No. 1859-W.

PART TIME WORK: Senior Design Engineer, B.A.Sc. P.Eng., M.E.I.C., has available an experienced group of engineers and draughtsmen desirous of obtaining evening work. Experience in the group includes municipal, mechanical, mining and water-power engineering ranging from the initial layout to the final design, as well as structural steel and reinforced concrete design and layout. All members of this group are permanently employed. Apply to File No. 2463-W.

GRADUATE ENGINEER (Civil & Mechanical), M.E.I.C., A.M.I.C.E., P.Eng. Ontario & Quebec, Member American Institute of Chemical Engineers, aged 43. Four years waterworks and filtration plant design and construction, sixteen years industrial process and heavy chemical plant engineering. Experienced complete process computations, layout design and specification of equipment for manufacturing and chemical processes. Accustomed to technical development and improvement of manufacturing processes, direction of operation and executive responsibility. Proven ability to direct complete projects from design stage to actual operation. Desires senior position or partnership established Consulting Engineers, or responsible position chemical or manufacturing company. Apply to File No. 2470-W.

MECHANICAL ENGINEER, B.Sc. (Queen's), M.E.I.C., P.Eng. Age 33, married. Presently employed Montreal area is desirous of obtaining position in Ontario. Offers experience in Engineering department management and organization, plant layout, machine design, jigs and tools, sheet metal work and building trades. Available one month's notice. Apply to File No. 2682-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., Que., with more than 25 years experience in reinforced concrete design and construction, interested in position with responsible firm or partnership with consultant would also consider government or municipal position. Apply to File No. 2695-W.

GRADUATE MECHANICAL ENGINEER, M.E.I.C., P.Eng. (N.S.), age 39, married, desires position in industrial part of Canada. Eight years experience in Mechanical Department shops and in the mills of large steel company. Five and one-half years Engineer Officer R.C.A.F.—rank Wing Commander. Five years Sales Engineering, conveyors, drives, pumps, heavy construction equipment. Particularly interested in Sales, Executive or Personnel work carrying responsibility and having a future. Employed at present, but desires to get out of the Maritimes to where there is greater opportunity. One month notice. Correspondence invited. References. Apply to File No. 2711-W.

MECHANICAL ENGINEER, Jr.E.I.C., McGill '45, age 24, single. Experienced in tool design and stress analysis also spent one term as demonstrator in Mechanical Engineering, desires permanent position in industry, preferably Montreal area but willing to travel. Available at once. Apply to File No. 2903-W.

GRADUATE ENGINEER S.E.I.C., Man., '47. Presently engaged in Plant layout and field supervision. Experienced in mechanical and electrical construction and maintenance. Responsible position desired in business and production engineering in progressive firm. Apply to File No. 2975-W.

EXECUTIVE ENGINEER, age 43, P.Eng., M.E.I.C, M.C.I.M., with Mechanical, Structural and Mining Engineering Background, desires contract for position in Executive or Management Field. Apply to File No. 2982-W.

ENGINEER, B.Sc. (Honors), McGill '31, M.E.I.C., P.Eng. (Quebec.) Married, age 40, 9 years experience in general business field, managing and organization of departments. Eight years mechanical engineering experience primarily in erection and maintenance of equipment in

Chemical and Metallurgical field. Last 3 years as Chief Engineer of Cement Plant in South America, reconditioning plant, designing and installing new equipment. Perfectly bilingual. (English and French.) Working knowledge of Portuguese. Desires position with reliable firm leading to position with a future. Locations preferred are B.C.-Montreal District or Southern Ontario—available on short notice. Apply to File No. 2987-W.

ENGLISH ENGINEER, A.M.I.E.E., 33 years of age, married. Wishing to emigrate requires post where his experience will be of most use; 17 years experience comprising workshop, test, development research on public address and television E.M.I. Co. Field and development engineering, radio navigation aids and radio teleprinter equipment. At present Technical Officer, Air Ministry. Could possibly arrange to visit Canada for interviews if required. Apply to File No. 2994-W.

MECHANICAL ENGINEER, M.A., M.I., Mech. E, wide experience in Vibrations and Balancing presently residing in England, interested in emigrating to Canada if suitable contacts could be arranged. For details of past experience apply to File No. 2995-V.

CIVIL ENGINEER, B.A.Sc., S.E.I.C., age 26, experience in surveying, industrial layout and inspection, construction of underground heating system. 1 year design and construction water and sewerage system. Presently employed in Ontario. Apply to File No. 2997-W.

CHEMICAL ENGINEER, B.Sc. Queen's, S.E.I.C., married, veteran. Employed at present. Experience in light metals industry; corrosion testing; production control; spectrographic analysis. Desires position in chemical or metallurgical process industry. Available on reasonable notice to present employer. Apply to File No. 2999-W.

MECHANICAL ENGINEER, Jr.E.I.C., B.Eng. (McGill), Master of Commerce, Toronto '48), aged 27, experienced in Aircraft Industry, Petroleum oilfield work on drilling, production, construction and design. Presently situated in West, but would locate anywhere. Apply to File No. 3006-W.

SALES ENGINEER, Jr. E.I.C., graduate B.Sc., textile chemist, age 32 years, married. Four years of lab. research work, five years of technical sales experience in textiles, coated fabrics, yarns, textile machinery, machine tools, plastics and chemicals. Office and plant management experience. Capable of running business office, efficient correspondent, bilingual, drive own car. Apply to File No. 3019-W.

MECHANICAL ENGINEER, Ph.D. (London), A.M.I.M.E., with extensive mechanical and structural experience in Europe and England and post-graduate research in structures at London University. Age 34. Presently residing in England arriving in Canada August, 1948, and available for employment September, 1948. Apply to File No. 3021-W.

MINING ENGINEER, M.E.I.C., B.Sc., Queen's '33, P.Eng. Que., married, age 37, eighteen years experience in mining exploration, and development work. Desires work in the Rouyn area of Quebec. Apply to File No. 3022-W.

MECHANICAL ENGINEER, B.Sc. (Eng.), A.M.I. Mech.E., wide experience in the aircraft industry. Presently residing in England, but interested in emigrating to Canada. Employed in Canada during years 1941 to 1945. Would consider any appointment in engineering world to start with the assurance of being able to speedily prove worth and ability. Apply to File No. 3023-W.

THE BRITISH MINISTRY OF LABOUR *and* NATIONAL SERVICE

Has requested the Institute to supply names and addresses of Companies in need of Civil Engineers. The Ministry has stated that it has on record the names of a number of men who are anxious to take up residence in Canada. The qualifications of these men range from recent graduation to extensive experience.

Interested concerns are invited to send their requirements to:

The Employment Service,
The Engineering Institute of Canada,
2050 Mansfield Street,
Montreal, Quebec.

Experienced Maintenance Engineer

An important Pulp and Paper Mill in the Province of Quebec has attractive opening for an experienced engineer (preferably in the manufacture of Kraft). Must be capable of assuming complete charge of all maintenance work.

Excellent recreational and educational facilities in vicinity of plant. Good house available. Attractive salary.

Apply to File Number 4179-V.

WANTED—MAINTENANCE MANAGER

For Department of Health to assume responsibility for maintenance and operation of power plant, buildings and equipment of large Hospital. Knowledge of building construction; maintenance of heating, ventilating, plumbing, refrigeration and electrical and mechanical equipment required. Must have experience in power plant operation and capable of organizing and directing maintenance and operating staff.

Application forms may be obtained from the Nova Scotia Civil Service Commission, P.O. Box 943, Halifax, N.S., or by telephoning No. 3-7341-Br. 230.

THE PUBLIC SERVICE OF CANADA REQUIRES

A CHIEF, ENGINEERING AND CONSTRUCTION DIVISION

Department of Mines and Resources,

$6,600 - $7,200

Poster announcements giving full details on display — and application forms obtainable — at Post Offices, National Employment Service Offices, and Offices of the Civil Service Commission throughout Canada.

ENGINEERING INSTRUCTORS REQUIRED

The University of Toronto requires engineering instructors and demonstrators for its Ajax Division for the Session beginning September 20th, particularly in Electrical Engineering and in Engineering Problems and Drawing.

Apply to the Secretary, Faculty of Applied Science and Engineering, University of Toronto.

Position Vacant—Civil Engineering

Graduate in Civil Engineering with extensive experience in the use and design of Structural Steel. Duties will be primarily Public Relations with Architects, Engineers and Public Bodies and he will be required to act as Secretary of a Dominion Association. Applicant must have personality, appearance, the experience mentioned, and should be over thirty-five years of age. Headquarters will be in Toronto, with frequent visits to Ottawa, Montreal and other centres. Salary from $4,800.00 annually upward. Apply to File No. 4201-V.

DRAFTSMEN

THE ENGLISH ELECTRIC CO. OF CANADA LTD.
St. Catharines, Ont.

requires

4 Junior Draftsmen

Preferably with some experience in layout on large power transformers.

This is an excellent opportunity for selected applicants.

All replies to this advertisement held in strictest confidence.

Please address your letter of application to the

Personnel Manager
JOHN INGLIS CO. LTD.
14 Strachan Ave., Toronto

Chief Engineer

FOR

Mechanical Plant

A large general mechanical Engineering Plant in Montreal area has immediate vacancy for a chief engineer. Applicants must be graduate engineer with extensive design experience, must be capable of handling staff of fifty. Good salary, excellent prospects and most interesting work. Write, in detail, in own hand to File No. 4200-V.

Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

Imperial Oil Limited has opened an $8,700,000 refinery in the suburbs of Edmonton, Alberta. The formal opening was attended by government, municipal and company officials. The ceremony was held on July 17, just seventeen months after Imperial Oil brought in the discovery well that established the Leduc field as the largest known source of crude oil in the Dominion.

The refinery will be in full production by the end of the year and will process 6,000 barrels of crude daily. An increase in its capacity to 11,000 barrels a day, at a further cost of $2,500,000 is under consideration. Much of the equipment at the new plant was originally located at Corpus Christi, Texas. When war in the Pacific broke out the equipment was moved, along with other units and parts from hundreds of centres in Canada and the United States, to Whitehorse, Yukon Territory.

The site of the refinery is on the south bank of the Saskatchewan River and it covers 360 acres of land. The plant contains a crude distillation plant and a "cracking" unit is now under construction. The possibility of providing facilities for the manufacture of lubricating oil is being considered.

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New gas fired unit heaters that feature cast iron construction in both the heat exchanger and the combustion chamber have been placed on the market by Automatic Gas Equipment Company, 301 Bruston Avenue, Pittsburgh 21, Pa. They are known as Pittsburgh Gas Unit Heaters, Series "C". Descriptive literature is available on request.

Kennametal Inc., Latrobe, Penna., announce the development and availability of a new series of chisel type rock bits which can be screwed on standard drill rods. These new bits are offered in six sizes, ranging from 1⅜ ins. to 2¼ ins.

The manufacturer claims that they feature new construction throughout. The threads inside the body of the bit screw on steels that have F threads, H threads, and D threads; providing a shouldered contact between the bit body and the drill rod. The blade is held in the body of the bit by an exclusive method developed by the Company's engineers.

It is also claimed by the Company that the 2¼ in. diameter bits are the first cemented carbide bits of this size to be developed, marketed and manufactured in quantities. The manufacturer will supply additional information.

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The annual reunion of the Canadian General Electric Test Alumni Association will be held at the Kawartha Golf and Country Club, Peterborough, on Saturday, September 11.

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The Dominion Oxygen Company Ltd., 159 Bay Street, Toronto 1, Ont., claims that the Heliarc inert-gas-shielded arc welding process has simplified the fabrication of stainless steel trailer tanks. High purity argon gas shields the torch electrode and weld area thus eliminating the use of flux.

In tanks of 1000 gallons capacity, made for the transportation of milk from 14-ga. type 302 stainless steel, the welding time for 912 in. of welding was approximately 45 minutes.

The Company claims that the high sanitary standards required for such containers are easily met with Heliarc welding, because no flux is used. This eliminates spatter and corrosive inclusions, and the final welds are smooth and non-porous.

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Alexander Gray, president and general manager of Gray-Bonney Tools Limited, Toronto, has just returned to Canada from a 42,000-mile air trip. He visited countries in Western Europe, Africa, Central and South America.

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Holub Industries Inc., Sycamore, Illinois, U.S.A., has announced "Hi" Carbide Tipped Masonry Drills. These drills have been designed for use with electric rotary or breast drills. They are designed particularly for drilling hard materials, such as concrete, brick, stone, tile, marble, plaster, sheet rock, etc. Many special features are claimed for these drills. The Company will be pleased to supply additional information.

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The thirty-fifth annual convention of the American Electroplaters' Society terminated on July 1 after a three-day session at Atlantic City. There were over 1200 registrants.

Papers read at the technical sessions covered the scientific, engineering and economic aspects of electroplating and metal finishing. Society honours were awarded to a number of the speakers. The 1948 convention will be held in Milwaukee and the dates will be announced by the society in the near future.

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The Steel Company of Canada Ltd., P.O. Box 460, Montreal, Que., has announced that adjustable pipe hangers are again in plentiful supply. The Company's pipe hangers are made of soft ductible steel and are furnished in straight lengths ten feet long. The hangers can be bent on the job. The hangers are available in black or galvanized steel and are supplied in bundles of 100 or 200 feet.

The Consolidated Mining and Smelting Company of Canada Ltd., Trail, B.C., has announced the receipt of an order for a rod mill for the Sullivan mine. The mill will be part of the equipment for the sink and float project and will be installed at the Sullivan concentrator. It will be used for grinding mine ore and it is believed it is the largest of its kind ever constructed. It was designed by the Hardinge Company Inc., of York, Pa., and will be manufactured by the John Inglis Company Ltd., of Toronto. It will have a diameter of 11 ft. 5 in. and will be 12 ft. long. The rods will be a mixture of 3 in. and 3½ in. and will weigh 95 tons. Power will be supplied by a 720 r.p.m., 1,000 hp. synchronous motor manufactured by Canadian Westinghouse Co. Ltd., Hamilton, Ont.

Simon-Carves Limited of Stockport, England, has completed arrangements with E. C. Badger & Sons Co., for the erection in the United States of sulphur recovery plants. The first plant to be built under this arrangement will be for the Hancock Chemical Co. of Long Beach, California.

The RCA Victor Company Ltd., Montreal, Que., has announced the development of a new miniature " broadcast quality " microphone. The new microphone is smaller than a package of cigarettes and the manufacturer claims that it has the sensitivity of the finest broadcasting microphone. It is now in production and will be available shortly.

One of the smallest broadcast microphones yet developed, the new low-cost RCA " Bantam " velocity microphone is designed for use in radio studios, at remote broadcasts, at conventions and in clubs. The unit is so small that it will not hide the faces of singers, speakers, and other users. It fits comfortably into the palm of the hand and weighs only 12 ounces. The manufacturer will supply additional information on request.

Wheelco Instruments Company, 847 W. Harrison Street, Chicago, has announced the release of a new portable Solder Tin Content Indicator, a checking instrument for quick analysis of solder quality. It provides a means whereby manufacturers of metal containers may determine the ratio of the lead and tin content in solder for process standards and economy.

Please communicate with the Company for complete information.

R. G. LeTourneau, Inc., Peoria, Illinois, U.S.A., has available a folder-type publication describing " Tournarope " which is the trademark name for the cable manufactured by the Company.

Link-Belt Limited, Eastern Avenue at Leslie and Keating Streets, Toronto, 8, Ont., offers a 16-page illustrated book No. 2244 in which is described a new " PA " Positive-Action Oscillating-Trough Conveyor.

The Baldwin Locomotive Works, Philadelphia 42, Pa., offers readers of the " *Journal* " a new bulletin No. 262 in which is catalogued Baldwin Stress-Strain Recorders and Strain Followers. It describes the distinguishing features of twenty-four different recorders for all common makes of testing machines and more than 50 extensometers, compressometers and deflectometers which can be used with the recorders.

A Wiring Inspector's Test Set has been developed by Eastern Specialty Company, Philadelphia 40, Pa., to enable one person to make a complete test of the wiring in any building without additional help. For complete operating data ask for Bulletin No. 42.

Publications

For copies of the publications below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing

Dow Corning Corporation of Midland, Michigan, offers through the Canadian branch of the Company, Fiberglas (Canada) Limited, 1200 Bay Street, Toronto, a most interesting publication entitled " Dow Corning Silicone Mold Release Agents ". It contains technical data on the product and major applications in the fields of lubricating tire molds, curing bags, and in the lubrication of mechanical rubber goods, floor tile and plastics, etc.

Dresser Industries Inc., 1130 Terminal Tower, Cleveland 13, Ohio, will send on request a new 48-page, pocket-size booklet listing the 13 operating companies of Dresser Industries Inc., and identifying the products and services of each.

The booklet shows Dresser equipment at work in the oil, gas, chemical, mining and other industrial fields and it contains abbreviated lists of individual company products and their more important applications. There are also a number of pages covering the gas-fired heating systems, and automatic water heaters built by three Dresser companies for use in homes, institutions and commercial and industrial establishments.

The. B. F. Sturtevant Company of Canada Limited, 19 Melinda Street, Toronto, Ont., offers a new catalogue on their air systems. It covers all applications in dust, fume and vapour removal and pneumatic conveying. Ask for Catalogue No. 291.

The July issue of the " Dominion Engineer ", published by the Dominion Engineering Company Limited, P.O. Box 220, Montreal, contains interesting information on the paper machines manufactured by the Company. The publication is well produced and illustrated. Copies are avaliable.

S. A. Armstrong Limited, Toronto, offer readers of the *Journal* an 8½x11 in. illustrated publication entitled " Armstrong Heat Exchangers ". It contains twenty-seven pages of technical data on the heat exchangers manufactured by the Company. Ask for the publication by name " Armstrong Heat Exchangers ".

From Well to Consumer...

CRANE serves Canada's petroleum industry

IN every phase of handling and processing, Canada's petroleum industry uses Crane valves, fittings and fabricated piping. Crude flow is controlled from well to pipe line—or to tank car or other means of transportation—and into the refinery. There Crane equipment assures ease of control during processing. Then more Crane equipment controls the flow to bulk and service stations, to tanker terminals or elsewhere, en route to the ultimate consumer.

To the industry Crane's extensive manufacturing and distributing facilities provide a comprehensive service for the production, refining and marketing of petroleum products. It assures *one* dependable source of supply, *one* responsibility for all materials, *one* high standard of quality. Equipment has been developed to meet the requirements of high pressures and temperatures, corrosion resistance, and particular service conditions—and has been continually improved as operating experience and Crane research have shown the need.

ONE
SOURCE OF SUPPLY
RESPONSIBILITY
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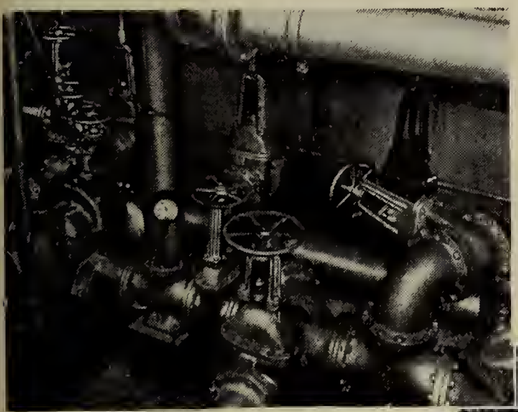

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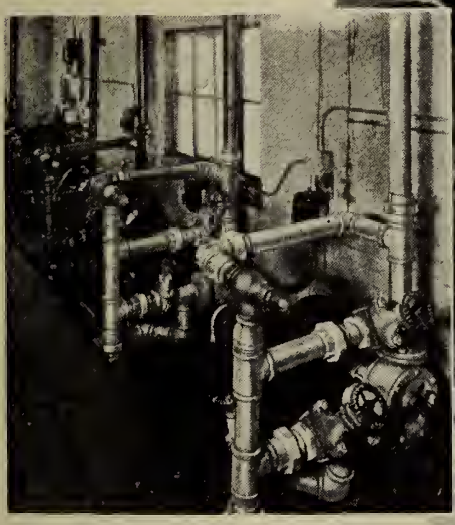

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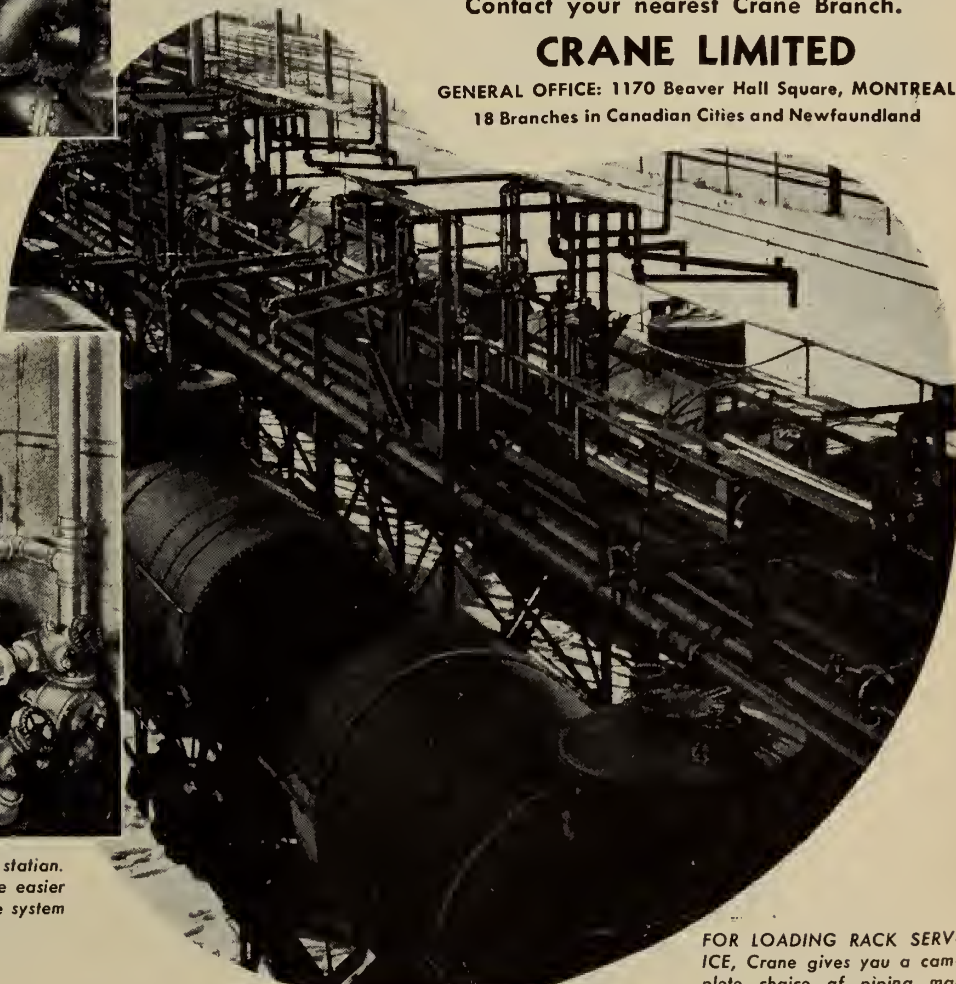

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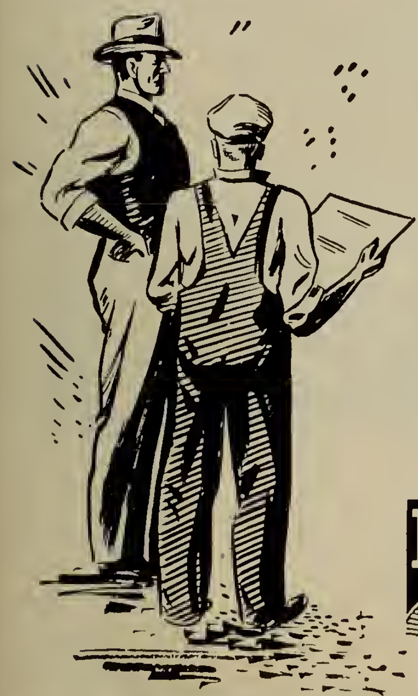

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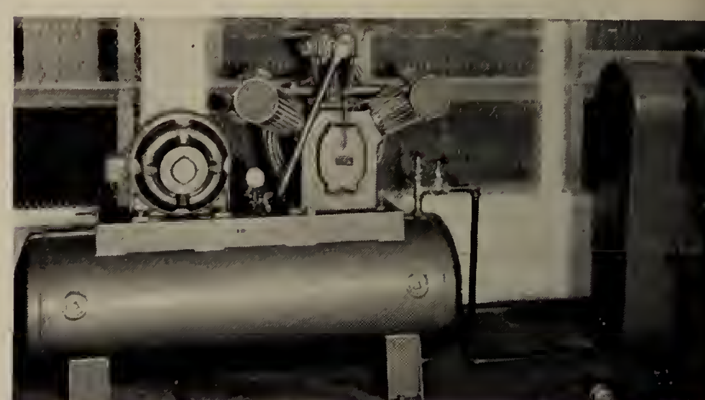

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THE ENGINEERING JOURNAL

VOLUME 31 NUMBER 9
SEPTEMBER 1948

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Looking upstream at Craven Dam on Qu'Appelle River, Saskatchewan. Bird Construction Company, Contractor. P.F.R.A.

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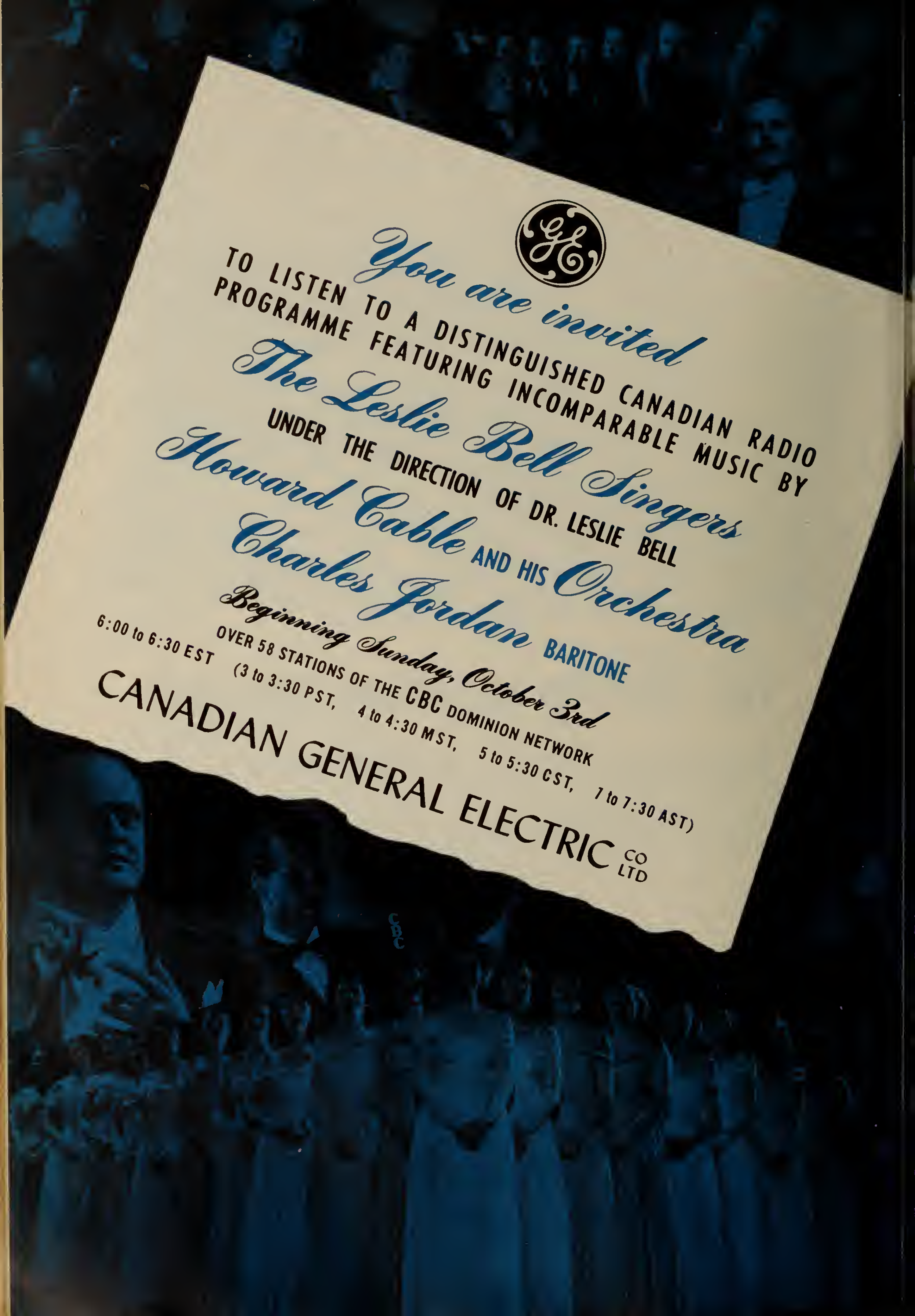

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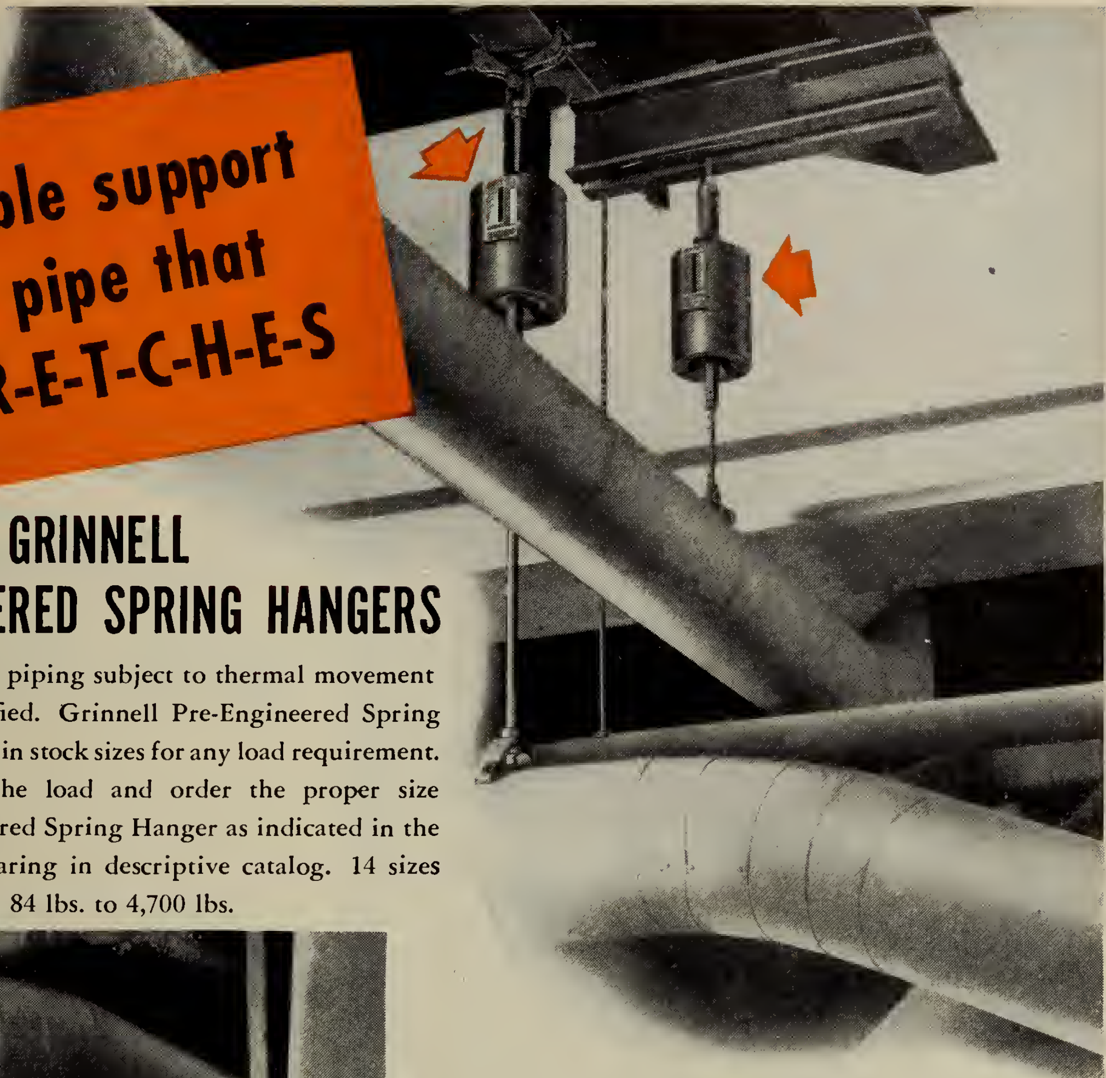

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Simply compute the load and order the proper size Grinnell Pre-Engineered Spring Hanger as indicated in the Capacity Table appearing in descriptive catalog. 14 sizes with load range from 84 lbs. to 4,700 lbs.

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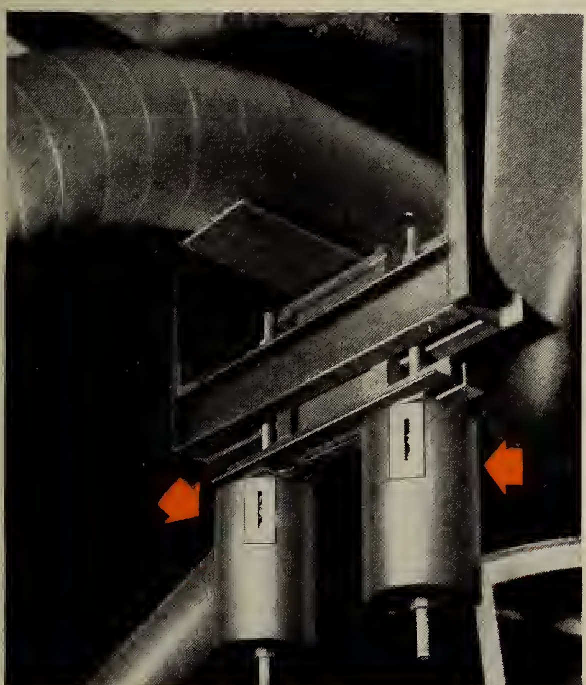

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- Precompression* assures operation of spring within its proper working range where variation in supporting force is at a minimum.
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*Precompression is a patented feature

Write for descriptive folder on Pre-Engineered Spring Hangers Fig. 268.

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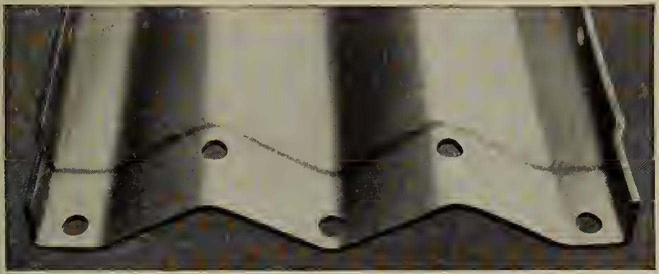

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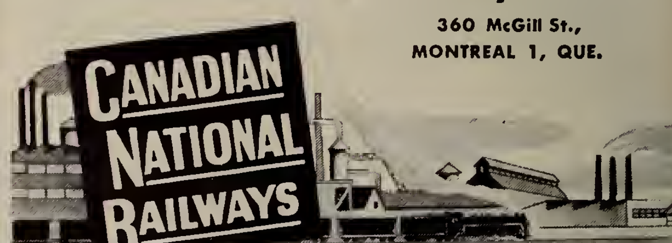

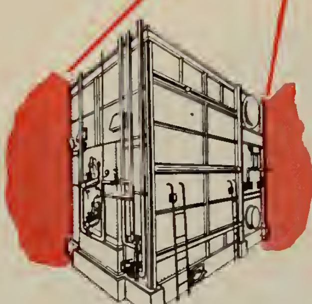


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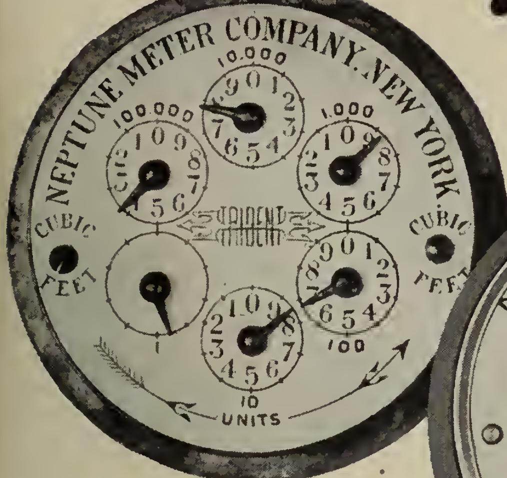

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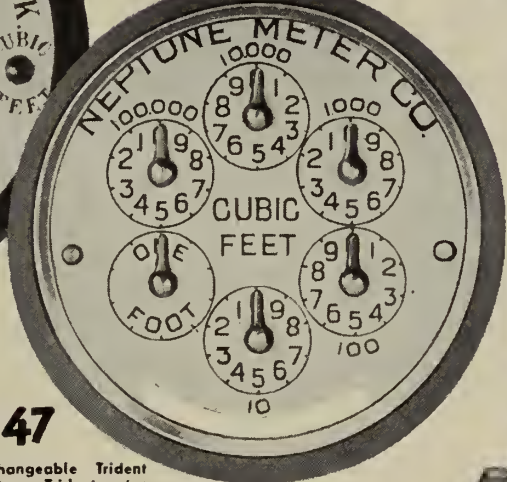

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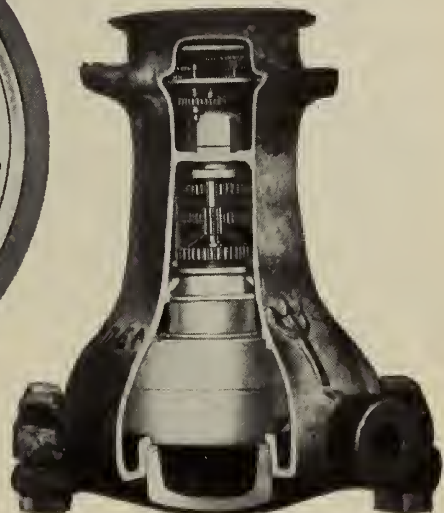

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

VOLUME 31 | MONTREAL, SEPTEMBER 1948 | NUMBER 9

"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

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COVER PICTURE

The economic welfare and development of the Western provinces is of such vital importance to the entire Dominion that the technical section of this issue of the *Journal* has been devoted to papers, delivered at the Annual General and Professional Meeting, on Prairie Water Problems and Achievements.

The authors of the papers are leading authorities on their subjects. The views they have presented and the procedures and processes they have described will be of extreme interest to all engineers.

To find a cover illustration which adequately illustrates all the major benefits to the West through the harnessing and utilization of water presented an impossible task and, therefore, it was decided to use a photograph of one of the simplest, but most important uses, a small irrigation ditch. The photograph is reproduced by permission of Canadian National Railways.

The Saskatchewan River and Manitoba's Water Problem

by

D. M. Stephens, M.E.I.C.

Deputy Minister of Mines and Resources, Province of Manitoba, Winnipeg

A paper presented at the Annual General and Professional Meeting of The Engineering Institute of Canada at Banff, Alberta, June 2nd, 1948

This paper will be of interest, not to engineers alone, but to every native of the Prairie Provinces. Indeed, what ultimately is done with Saskatchewan River water can affect the lives of Canadians from Alberni to Yarmouth. While primarily it is a statement of Manitoba's claims on Saskatchewan River water, the author points out that the Prairie Provinces must decide between more kilowatt hours in Manitoba, with the industrial development they will bring, and more irrigation in the two other Prairie Provinces with its resulting stimulus to farm production. The five regions of the Prairie Provinces are discussed in relation to their needs for water. The proposed diversion from the Saskatchewan for irrigation purposes is translated into hydro electric power lost to Manitoba, and the economic effects are evaluated. Maintaining that a piece-meal approach to prairie water problems is not good enough, the author urges the early formation of a Western Water Board.

The main elements of Manitoba's Water Problem can be briefly stated. In the first place, the Province is a sub-humid region. It lies in a low rainfall area where the annual precipitation ranges from 14 to 22 inches. Except for the occasional spring freshet, when local flooding might occur, we are likely to be chronically short of water. That is the first element of our problem. The second is to be found in the fact that we lie at the bottom of a whole series of drainage basins, the water courses of which rise in, and flow through, other jurisdictions. Many of these water courses flow through provinces or states which also suffer from chronic shortages of water. In some of these the shortages might be more acute than those suffered by Manitoba.

These conditions which exist in jurisdictions outside of Manitoba have given rise in the past, and will no doubt continue to give rise, to watershed developments and water uses which have had and will have an adverse effect upon Manitoba's water supply position. It will be obvious, of course, that to whatever extent water is extracted from streams flowing into Manitoba and is dissipated for irrigation or other similar purposes, Manitoba's chronically bad water supply situation will, to that extent, be worsened.

The third element of our water problem relates to the nature of our terrain. Manitoba is a region of relatively low relief. Surface elevations vary from a maximum of 2724 feet above sea level datum in the Duck Mountains to sea level along the shores of Hudson Bay. Lake Winnipeg, an immense collecting basin for the very large watersheds draining into Manitoba, lies at elevation 713 feet above sea level. The mean level of the Winnipeg River at the Manitoba-Ontario Boundary is approximately 982. The mean level of the Red River at the International Boundary is 750. The Souris River enters Manitoba from North Dakota at elevation 1402. The Assiniboine River enters from Saskatchewan at elevation 1375, and the level of the Saskatchewan River at the Manitoba-Saskatchewan Boundary is approximately 855.

Little Opportunity for Storage

With respect to water, Manitoba's relatively flat terrain imposes certain definite limitations upon us. Above Lake Winnipeg and with the exception of the Winnipeg and Churchill Rivers, there is little natural storage on any of our streams. This means relatively poor natural regulation and a very uneven stream regimen, with flows varying through wide extremes from season to season and from year to year. A second limitation is that there is exceedingly little scope within Manitoba for the creation of large storage reservoirs for the control of river flows. This applies particularly to the Red River, the Souris, the lower reaches of the Assiniboine, as well as the Saskatchewan above Cedar Lake.

The limitations imposed by lack of storage sites are particularly serious when considered in relation to the uneven regimen of our prairie rivers, such as the Red and the Assiniboine. It is with respect to these streams that we are likely to suffer extreme water shortages during certain periods. It is in these same watersheds that we are faced with most acute flood hazards. It is also on these watersheds that the nature of our terrain imposes the most severe limitations in the matter of water storage. With respect to the portion of the Red River within Manitoba, for example, it would be physically impossible to create sufficient storage to provide what might be called adequate river regulation. On the Assiniboine we would have some scope for the development of storage in the deeper portions of the valley in the extreme western portions of Manitoba.

Other and closely related limitations are imposed upon us by the nature of the Manitoba terrain. There are few places, for example, where large dams could be built for irrigation purposes and which would make it possible to command any substantial acreage by gravity. The relatively flat gradients which characterize our prairie streams, when considered in relation to the uneven stream regimen and the relative lack of storage possibilities means, of course, that the prairie streams are not well adapted to water power purposes.

Power is Vital to Manitoba

The fourth element of Manitoba's water problem becomes apparent when we examine water in relation to other resources. Here I would like to refer specifically to energy sources. There are at the present time no large known sources of coal, oil or natural gas in Manitoba. The water power resources, therefore, constitute our main known energy source and energy reserve. Any community which aspires toward an industrial future and which has most, if not all of its energy eggs in one basket would be wise to watch that basket very carefully. It is for this reason that the people of Manitoba place a good deal of emphasis upon water power matters. Water power management takes a rather high place in our thinking and planning.

There is another point which relates to the intense interest which Manitoba takes, and is likely to continue to take, in water power matters. Of the quarter of a million square miles contained within the Province, only 16 per cent is agricultural land. In most of the remainder we must look to forestry and mining to provide the main economic activities of the future. The forests are of such a type as to lend themselves more readily to pulp, paper and cellulose products than to lumber. There are most encouraging indications at the moment that in our northern areas we may relatively soon see some large mining developments, particularly with respect to base metals. The point is that the pulp, paper, cellulose and base metal industries are almost as dependent upon cheap power as they are upon the wood and ores that make up the raw materials.

Without Island Falls on the Churchill River, or some other water power site which would be equivalent in terms of capacity and costs, the Flin Flon mine which now supports a city of 10,000 people would never have been developed. It takes 100,000 hp. to keep Flin Flon going. There are other large known deposits of ore in the immediate vicinity of Flin Flon for the treatment of which still more power will be required. Without the water powers on the Winnipeg River there would be no paper industry at Pine Falls in Manitoba. It takes almost 35,000 hp. to support this community of approximately 1100 people and to provide an economic use for 2,000 square miles of bush land. The lack of cheap power in either of these instances would have resulted in the wastage of resources which otherwise could be and indeed have been enormously productive.

Four Main Regions Have Claim on Saskatchewan Water

It is against this background that we must examine Manitoba's interest in and concern about the Saskatchewan River. I think it would be safe to say that the co-ordinated development of the water and related resources of the Saskatchewan River watershed represents one of the most important and one of the most complex problems in the field of resources management with which Canada is faced today. There are two national governments, three provincial governments, one state government and literally hundreds of municipal governments, each having its own general or special interest in the Saskatchewan River.

There are as well, at least six separate and distinct geographic regions, each with its separate and distinct problems and possibilities relating to the control and use of water, not all of which are by any means compatible with all others. First there is the mountain and foothills area where forest protection, power and storage will probably remain the dominant problems respecting the Saskatchewan River.

Next there are the south-western prairie regions characterized by relatively steep river gradients, semi-arid climate, high summer temperatures, long growing seasons and, not the least important, populated by experienced irrigation farmers. These characteristics have been particularly favourable to irrigation. The steep slopes have made it possible, with a single dam and with a minimum of flooding damage, to command the maximum acreage solely by gravity. The climate has been favourable to irrigation not only because of the high summer temperatures and long growing seasons, but also because of the low precipitation which makes irrigation an *annual* necessity for the wide variety of cultivated crops grown in these localities. The steep river gradients which make it possible to command large land areas at relatively little cost also provide favourable conditions for the generation of hydro electric energy.

Then comes the central prairie portion of the Saskatchewan River watershed. Through this region the Saskatchewan and its tributaries flow through relatively deep valleys, usually several hundred feet below the general prairie level and the river gradients are relatively flat. As the river flows easterly it passes through areas that have somewhat lower summer temperatures and higher annual precipitation. Here dry-land farming is relatively less hazardous and great difficulties would be encountered in using water either for irrigation or for power purposes.

Between the prairie regions and Cedar Lake just above Lake Winnipeg, the river flows through a broad flat valley which is generally lightly wooded, but which is dotted with numerous shallow lakes and large open marshes. Throughout the eastern portion of this broad flat valley for many years the main economic return has been from aquatic fur bearing animals. These thrive in this immense marsh area wherein the water is periodically replenished as the Saskatchewan River overflows its low banks. Much of the eastern portion of this area is a flood plain or delta formation built up through the deposition of silt. During recent years two very interesting experiments have been going forward simultaneously in those portions of the Saskatchewan River delta or flood plain which lie between the Saskatchewan-Manitoba boundary and Cedar Lake.

Manitoba's Marshland Developments

From 1936 up to the present time the Province of Manitoba in co-operation with other agencies, including the Dominion Government and Ducks Unlimited (Canada) has carried out a large programme of engineering work to permit the close control of water levels in the large areas of the Saskatchewan River delta. The primary purpose of this work was to increase and stabilize the muskrat crop, upon which approximately one thousand Indian and halfbreed families have depended for a major source of their livelihood. Since 1940, when these areas first came into production, muskrat pelts to a value of almost $3 millions have been harvested from these marsh areas and $1,873,000 have been distributed, either in monthly payments or in supplies issued to trappers.

The second experiment which has been going forward simultaneously with muskrat rehabilitation in this region is with respect to agriculture. During recent years increasing use has been made of the rich soils of the delta for agricultural purposes. Along the higher lands of the lower Carrot River valley new areas are being brought under cultivation each year. There is now a thriving dairying and farming community just west of The Pas.

These two uses of the Saskatchewan delta, namely, muskrat ranching on the one hand and agriculture on the other, are not altogether compatible. For successful muskrat ranching the periodic peak flows of the Saskatchewan River are an essential requirement, since it is only under these conditions that we can be sure of adequate water for marsh purposes. From the standpoint of successful agriculture these same periodic peak flows, particularly the July and August peaks caused by the mountain water, hold out a constant threat of flooding and constitute the primary hazard.

Power from Diverting Saskatchewan to Big Lakes

The large lake basins of Manitoba might be considered as the fifth natural geographic region of the Saskatchewan-Nelson system. Lake Winnipeg, with an area of some 9,400 square miles, is the main lake of this region. This is the central collecting basin for the entire upper Nelson System. Lake Winnipegosis, with an area of 2,086 square miles, and Lake Manitoba, with an area of 1,817 square miles, lie parallel to and immediately west of Lake Winnipeg. Lake Winnipegosis, the upper of these two lakes, lies at approximately the same elevation as Cedar Lake on the Saskatchewan. It is separated from that lake by an isthmus four miles across at its narrowest point.

By excavating a canal across this isthmus, by constructing a control dam at the outlet of Cedar Lake, and by channel enlargements between Lake Winnipegosis and Lake Manitoba as well as between Lake Manitoba and Lake Winnipeg, it would be possible to divert the main flow of the Saskatchewan through the course described, and to concentrate a head of approximately 90 feet at a single site between Lake Manitoba and Lake Winnipeg.

Economic Value of Storage

The immense storage which would thus be afforded by Lakes Winnipegosis and Manitoba would be particularly advantageous from the standpoint of a low load-factor power plant. It is partly for this reason that in planning future water power developments in Manitoba, especial consideration is given to the Saskatchewan River diversion, and the development of power at what is called the Dauphin River site.

The main lake basins of Manitoba, comprising Lakes Winnipeg, Winnipegosis and Manitoba, are of substantial economic importance to the Province. These lakes are the mainstay of a large and important fishery, which keeps Manitoba in either first or second place amongst the Provinces of Canada with respect to the production of freshwater fish. These lakes are important to transportation and navigation. They bring large areas of the Province within economic hauling distance for forestry and other purposes. There are foreshore values which are of economic importance. These include summer resorts, hunting and trapping rights as well as haying and ranching areas.

Two Million hp. on the Nelson

The sixth important geographic region of the Saskatchewan-Nelson system comprises the valley of the Nelson proper, lying between Lake Winnipeg and Hudson Bay. Over this reach the Nelson falls through slightly over seven hundred feet from Lake Winnipeg to sea level at Hudson Bay. While no accurate long term hydrometric measurements are available, it is estimated that the flow at the outlet of Lake Winnipeg has ranged from a high of approximately 140,000 c.f.s. in 1927, to a low of 28,400 in January 1941. By adding slightly to the latter figure, out of regard to the improved regulation obtainable on Lake Winnipeg, and assuming the natural flow of the watershed were available, it would appear some 2 million hp. of 24 hr. power could be developed on the Nelson proper.

Reasons for Apprehension

Manitoba now has approximately 600,000 hp. either developed or under development. The undeveloped water power resources are estimated at approximately 3,500,000 hp. (ordinary minimum power). It will be seen, therefore, that something between a five-fold and six-fold increase in water power development would completely exhaust our known water power resources. It should be noted in passing that Ontario experienced a five-fold increase in water power development in the fifteen-year period between 1917 and 1931. It should also be noted that the Nelson River represents something over 57 per cent of Manitoba's reserve of undeveloped power.

Having regard to the overriding importance of Nelson River power in Manitoba's overall power picture on the one hand, and having regard to the further fact that, other than water powers, we have no important known fuel and energy reserves, Manitoba's concern about what happens to Nelson River power will be readily understood. It is in the light of these considerations that Manitoba must examine the overall economic effects which would be likely to follow upon large scale water losses from the Saskatchewan River.

Manitoba Power vs. Irrigation Further West

In July 1945 Mr. Ben Russell, Director of Water Resources for Alberta, prepared a very excellent paper entitled "The Saskatchewan Drainage Basin, Water Development Possibilities and Problems". In that paper Mr. Russell stated in part as follows:—

> "It has been estimated on the basis of gravity diversion that the irrigation requirements of the Saskatchewan River Drainage Basin in Alberta may ultimately

be 2,799,000 acre feet and in Saskatchewan 1,228,000 acre feet, or a total of 4,207,000 acre feet or sufficient for 2,539,000 acres. If and when pumping on a large scale is resorted to the limit will raised considerably. . . . "

In the same paper, Mr. Russell estimates that on the basis of the normal year, diversions to the extent of 4,207,000 acre feet would represent a 23 per cent reduction in the total flow of the Saskatchewan River at The Pas, Manitoba. In the low water year, which, of course would be the critical year, these diversions would reduce the flow into Manitoba by approximately 40 per cent. What are the effects which would follow upon these large diversions, in so far as the Province of Manitoba is concerned ? While quite prepared to accept Mr. Russell's estimates as to the amount of water which could be used for irrigation in Saskatchewan and Alberta, the Author is not altogether prepared to accept his appraisal as to the downstream effects of these diversions.

Effect on Manitoba Admitted

In the report already referred to, Mr. Russell says:—

"There is the problem of water levels in Manitoba. . . . When some 4,000,000 acre feet of water is diverted each year in Alberta and Saskatchewan for irrigation, such a diversion is bound to affect the lake levels in Manitoba and therefore protest will undoubtedly be made by that Province. The solution to this is simple, and consists of a control structure at the outlet of the lake to the Nelson River and less water wasted to Hudson Bay and therefore more water for the lakes."

It will be noted that in the matter of the deleterious effects which Manitoba would suffer as a result of large scale diversions from the Saskatchewan River, Mr. Russell confines himself to a consideration of the effect upon the levels of Lake Winnipeg. This would not be the total effect nor even the most important one. We might get a clearer picture of these deleterious effects and the rather profound influence which they would have upon Manitoba if we consider the various reaches of the Saskatchewan Nelson system in order,— starting at the Saskatchewan-Manitoba border.

Needs for Muskrat Farming

The very successful muskrat rehabilitation work which has been carried out in the marshlands of the Saskatchewan River delta has already been mentioned. These projects are regarded as amongst the most advanced and successful marsh management schemes attempted. They provide a sound economic use for large areas of what previously had been waste lands. These projects now supply the major source of income to something between 700 and 1000 families, and have added well over $3 millions of new wealth to the Province during the eight or nine years they have been in operation.

Adequate water supply for these projects depends very largely upon the high summer peak of the Saskatchewan River. Since the western diversion schemes would necessitate the creation of large storage reservoirs and the radical reduction of summer peaks, there is every likelihood that Manitoba's muskrat scheme in the delta area would be an early casualty of the proposed diversion.

The probability that well within the next decade we will be required to develop power from the Saskatchewan-Dauphin scheme and from the Nelson River has already been mentioned. It is important, therefore, that we examine the effect which large scale diversion of Saskatchewan River water would have upon our potential water power resources.

Diversions Mean Loss of Nearly a Million hp.

The first enlargement of the Saskatchewan River in Manitoba is at Cedar Lake which lies at the same elevation as Lake Winnipegosis. A simple calculation will show that at 80 per cent efficiency, the loss of 4,207,000 acre feet per year represents the loss of approximately 440,000 hp. of 24 hr. power. Depending upon the load factor which is used this would probably represent a loss in potential power installations, probably in the range of 650,000 to 750,000 horse-power. In a region which suffers an acute deficiency with respect to fuel or energy sources, 700,000 horse-power represents a lot of power. For purposes of comparison I should point out that when the present expansion programme on the Winnipeg River has been completed, the four large plants on that stream will have total installed capacities of something less than 600,000 hp.

Manitoba's potential water power resources are our major, in fact our only source of low cost energy. Let us translate 440,000 hp. of 24 hr. power into terms of fuels. For this purpose let us assume that it would cost $200.00 per installed horse-power to develop this power. Let us assume that the annual costs of delivering the power would be say 8 per cent of the capital investment. If 440,000 hp. of 24 hr. power were to be developed by the use of coal of say the grade of Alberta bituminous, it would require 1,880,000 tons of coal per year. If this power were to be made available at a cost corresponding with the costs assumed for hydro electric power, it would be necessary that the coal be laid down near the site of Manitoba's power requirements at something slightly under $1.90 per ton.

Loss of Power in Terms of Dollars

If we were to attempt an evaluation of these large energy losses, on the basis of substitute sources of energy in Manitoba, we would arrive at some very interesting figures. On the basis of the assumptions here stated it would be necessary for us to use 1,880,000 tons of Alberta bituminous grade coal each year to develop 440,000 hp. of 24 hr. power from steam plants; also it would be necessary to deliver this coal to Manitoba plants at something under $1.90 per ton if the costs of energy were to be kept in line with those likely to be experienced in hydro power. But the present cost of Alberta coal, or coal of equivalent grade in Manitoba runs from $12.00 to $15.00 per ton.

One method of arriving at the cost of substituting steam power for the 440,000 hp. loss of firm hydro power would be to evaluate the difference between the actual cost of coal and the hypothetical hydro-electric equivalent. This would amount to something between $10.10 and $13.10 per ton. The annual difference, on the basis of 440,000 hp. firm would be something between $19 millions and $25 millions. In so far as there might be an element of permanency to the situation which we are discussing, figures of hypothetical annual losses fail to give a clear picture. For this purpose it would be necessary to capitalize the annual figures referred to. If this were done at say 3 per cent, it would produce figures in the neighbourhood of $500 millions to $800 millions.

Economic Losses to Manitoba

It is not suggested that this is an adequate method for placing a dollar value upon potential water power resources, nor upon the damage which would result from their diminution or loss. This method simply indicates the offsetting amounts which would be necessary if we were to attempt to produce equivalent amounts of power at equivalent costs. It does not take into account the economic loss which would be suffered by the nation, or a province, or a region if, through lack of power, we were unable to develop our forest or base metal resources. It does not take account of the material nature of some water power sites, where a potential development may be an economic undertaking under certain conditions of river flow, but may become a wholly uneconomic undertaking under radically different conditions of flow.

In this latter connection let us examine the power project which we refer to as the Dauphin River scheme. In this case, and with the natural flow of the Saskatchewan River available, it is estimated that up to 250,000 hp. could be installed at the Dauphin River site. The costs would be relatively high, but the probabilities are that it would be an economic undertaking if the full natural flow of the Saskatchewan were available. If during the critical or low water year, however, the Saskatchewan flows were reduced to say 60 per cent of the natural low water flows, the result might be to reduce the potential installation from 250,000 hp. to 150,000 hp. Having regard to the fact that a major portion of the costs of this project would be represented by canals, diversion dams and channel improvements, and that the costs of these would be roughly the same for 150,000 hp. as for 250,000 hp., it will be seen that a drastic reduction of flow in the low water year might very easily change the Dauphin River scheme from an economic to an uneconomic undertaking.

All Three Provinces Need the Water

From the fuel or energy standpoint, Manitoba's concern about large scale diversion of water from the Saskatchewan River will be readily understood if we keep the following points clearly in mind.

1. Manitoba has no important known reserves of coal, petroleum or natural gas. Our water power resources, therefore, constitute the Province's only known energy source or energy reserve.
2. In relation to probable industrial demands for power, and in relation to the nature of our other resources, such as forests and base metal deposits, our water power resources are not large. Our total water power resources both *developed* and *undeveloped* are something less than 57 per cent of Quebec's *installed* capacity.
3. Manitoba would require only a five-fold or six-fold increase in power development to completely exhaust our water power resources. In the Dominion of Canada as a whole, there was better than a four-fold increase in water power development from 1920 to 1945. In Ontario there was a five-fold increase during the fifteen-year period 1917-1931.
4. Diversions from the Saskatchewan River, to the extent which have been proposed for irrigation by gravity alone would represent a direct loss to Manitoba of approximately 440,000 firm horsepower, or between 12 per cent and 13 per cent of our entire water power potential.
   Mr. Russell states, "if and when pumping on a large scale is resorted to, the limit will be raised considerably". It follows, of course, that "if and when pumping on a large scale is resorted to", Manitoba's energy position would be worsened considerably. It should also be pointed out that to whatever extent otherwise economic sites are made uneconomic, Manitoba's reserve of economic power will be to that extent reduced.
5. In this day and age almost every jurisdiction which has any industrial aspirations whatever is examining very closely into its energy resources and energy reserves. The Province of Alberta, which is bountifully supplied with fuel and energy resources, is now examining into its position with respect to natural gas before permitting export. Having regard to the fact that Manitoba is in a chronically "short" position with respect to fuel and energy sources, our concern about water power, our sole source of energy, will be understood.

Piece-meal Approach not Good Enough

This paper was not prepared as an argument against irrigation. The fact is that economic conditions in Manitoba will be favourably affected by whatever steps are taken to produce and maintain higher levels of prosperity throughout the Prairie Provinces. If there is a valid argument against anything in this matter, it is against what might be called a piece-meal approach to the development of this particular watershed. We need a comprehensive approach. We should treat the watershed as a whole. If so, it becomes necessary for us to fully examine the needs and interests of each region of the watershed. We must determine how these needs and interests can best be met. When we have done this, it is necessary that we examine the extent to which these various interests are compatible, and how the interests of each region can be met with the least possible deleterious effect upon all others.

The opinion has already been offered that the co-ordinated development of the water and related resources of the Saskatchewan River watershed represents one of the most important and one of the most complex problems in the field of resources management with which Canada is faced today. Fundamentally it is a problem of inter-relationships and integration.

Steps have already been taken with respect to forest protection on the eastern slopes of the Rockies. They recognize the inter-relationships between forest cover and river control. Immense strides have been taken in irrigation. These recognize the values which soils and water can give to one another. Investigations have been carried out to determine the possibilities of greatly expanding this work, and of enhancing the productivity of other large areas. Some studies have gone forward with respect to the further integration of power and irrigation. Earlier investigations had held out an encouraging prospect that, when additional agricultural lands were required, it would probably be feasible to reclaim for agricultural purposes several million acres in the lower Saskatchewan valley Still other studies have been made and are going forward with regard to power development in Manitoba; studies which recognize the values which power can give to forest and mineral resources, as well as the values which these resources can give to water power.

Western Water Board Needed

We have now reached the stage where planning within individual regions of this watershed is not enough. We have reached the time when inter-regional studies should go forward; when the effects upon each region which are likely to follow upon works in each other region should be thoroughly appraised and understood. The setting up of a Western Water Board, which has recently been agreed upon by the Governments of Canada, Alberta, Saskatchewan and Manitoba, will be accepted by the people interested in the Saskatchewan River as a most constructive step. This Board, with representatives from the four major jurisdictions concerned in the Saskatchewan River, should provide an excellent medium for the co-ordination of engineering work relating to this stream. In addition, it should facilitate the inter-regional studies referred to.

Discussion

T. C. Main, M.E.I.C.[1]

Mr. Stephens has ably and, I think, fairly presented Manitoba's claim for a fair share of water from the Saskatchewan river drainage basin. He has covered many aspects of Manitoba's water and power problems, but he has left no doubt in our minds that he and Manitoba are preparing to do battle for their share of the Saskatchewan River water. This is entirely as it should be. Mr. Russell has guardedly put in Alberta's claim for her share of the water. I am sorry indeed that a competent engineer from Saskatchewan has not done likewise for that province.

I was particularly interested to hear about Manitoba's marshland developments. Recent destructive flooding of farm lands adjacent to these marshes suggests that settlements have already encroached too far on areas that are essentially producers of fur-bearing animals and other useful wild life. My studies suggest that such areas will produce more wealth in fur if they are developed for that purpose than they will in wheat. To produce agricultural crops consistently, vast amounts of money will have to be expended to prevent annual flooding. An even greater amount must be spent to insure that during a year like the present, floods will not drown out the settlers. I am afraid that the unfortunate settlers now will bring pressure to bear on the Government to go in for costly drainage and diking. Such a programme, in my opinion, would be unwise. Manitoba now has enormous areas of farm lands. Her marshlands are extremely valuable and should be preserved and improved.

Mr. Stephens suggests that periodic floods in the Saskatchewan river are essential for replenishing the delta marshes. Economic development of power and a great increase in irrigation will tend to reduce and possibly eliminate entirely the high April and July peaks on the Saskatchewan. Important as the fur crop is to Manitoba and Canada, we cannot afford to curtail these more important industries merely to flood such marshes. It is certain that eventually pumping and possibly diversions from the Carrot and Pas rivers will be necessary to keep these marshes at an optimum elevation. As the pumping head would be low, pumping should be economically possible. In any case, high water is not an unmixed blessing to the muskrat population, as a large percentage of the current crop of muskrats is usually drowned due to flooding of muskrat houses. Such losses could be prevented if water elevation was maintained artificially.

I heartily agree with Mr. Stephens that piecemeal approach to the water problems of the Prairie Provinces is extremely wasteful. It is presumed that the proposed Prairie Provinces Water Board will carefully study the whole Saskatchewan river drainage basin, and compare the economic advantages to the Prairie Provinces from the developments of farm lands, power or other natural resources, before making allocations of the annual discharge to each province. To me, it seems extremely important that the commissioners study these problems not from the standpoint of three individual provinces, but thinking of the best interests of people from the Manitoba-Ontario boundary to the summit of the Rockies. I hope there will be no horse trading. This may be necessary when dealing with the United States, but is not in this case. Engineers of Western Canada will watch these developments with great interest.

[1] Main and Rensaa, Consulting Engineers, Edmonton, Alberta.

A. E. Palmer[2]

The concluding statement in Mr. Stephens' paper is fundamental. A study of the use of the waters of the Saskatchewan river system should be on an inter-regional basis. The history of the utilization of all river areas of deficient water supply substantiates this statement. Experience shows that water utilization eventually must be based on its greatest beneficial use to society.

If the waters of the Saskatchewan river are to give maximum service to Canada they must be used where they will produce the most in terms of supplying human needs. If the greatest benefit accrues from using the water for crops, it should be allocated to that purpose. If for power, then power should receive first consideration. Where it can be used for both the situation is fortunate. The people of Canada will expect any Board set up to plan the utilization of this great resource to keep the fundamental concept of beneficial use uppermost in mind. Regional requirements, of course, must be considered, but only in proper relation to the entire area the river serves.

One factor must be clearly kept in mind in considering the Saskatchewan river. That is that much of the water of the South Saskatchewan can be used for irrigation, while most of the flow of the North Saskatchewan will not be available for that purpose. It seems logical that much of the needs of the lower reaches of the basin must be supplied by the North Saskatchewan.

While a complete study of the eventual use of these waters is essential it does not necessarily follow that development should be halted until such a study is completed. Irrigation development is so slow that it will be many years before sufficient water is diverted to seriously affect the downstream users. But studies should be under way, because decisions on such a big problem cannot be made overnight. *(Continued on page 504)*

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THE WATER RESOURCES OF ALBERTA

by

Ben Russell, M.E.I.C.
Director of Water Resources, Province of Alberta, Edmonton

A paper presented at the Annual General and Professional Meeting, The Engineering Institute of Canada, Banff, Alberta, June 2, 1948

The author outlines the Alberta Water Resources Act, and other Dominion and Provincial legislation affecting water resources of the province. Surface waters are classified, and the various drainage basins delimited. A brief description of the several irrigation projects, existing and projected, is given. Development of power in the province is noted and the growth of energy production recorded. Available water supplies are related to demand, and factors limiting beneficial use are enumerated. Possible benefits accruing from interconnection of power from the Bow and Red Deer are pointed out.

International and interprovincial problems respecting the division of water are discussed. Examples are shown of how wasted energy can be used for pumping. Control of the Bow River by the Province to satisfy needs of power and irrigation is explained. The paper concludes with a description of the administration of water areas and drainage districts, and an explanation of how the "duty" of water for irrigation has been determined.

All surface waters in Alberta were, by an Act of Parliament dated 1884, made the property of the Dominion. By terms of the Natural Resources Transfer Agreement dated 1929 they were transferred from the Dominion to the Province and have since been administered under the Water Resources Act. Under the provisions of this Act the Responsible Minister has very wide powers and responsibilities to promote the most beneficial use of the water supplies, and to estimate the extent and location of irrigable lands in the respective drainage basins.

Legislation

The Water Resources Act

This legislation provides that surface waters cannot be taken, diverted or impounded otherwise than by virtue of a licence, except by property owners or occupiers and then only for household, sanitary, fire protection, and stock-watering purposes. No one can divert or obstruct the flow or impound water unless authorized. No grants under the Act give any exclusive right in the water or the shores or beds of the waters. Applicants for the use of waters or the construction of works have precedence according to their respective dates of filing, subject to precedence in the following order (1) Domestic (2) Municipal (3) Industrial (4) Irrigation (5) Water Power (6) Other purposes.

The Act provides all of the conditions necessary to acquire a water right, and directs that water be granted for beneficial use only, and that licences can be cancelled for non-use and amended to meet requirements of beneficial use. Part II of the Act applies wholly to water powers. The Dominion Water Power Regulations of 1921 have been adopted by the Province. The Regulations provide that lands required for development remain vested in the Crown. The right to develop a water power may be granted to any approved applicant for a definite term of years under specified conditions. Control is provided over the development, storage, transmission, and management of the property.

The Irrigation Districts Act

To facilitate the development of irrigation and the financing of construction, the Irrigation Districts Act of 1922 provides the necessary machinery. It provides for an elected Board of Trustees, with power to conduct the affairs of the water users and sets out in great detail the procedure for erection, construction, financing, elections, and other necessary procedure for a District.

Legislation respecting Company Projects

A number of large irrigation projects were originally constructed by privately owned Companies, but have in recent years been taken over either by the water users or by the Provincial Government. Legislation was enacted to incorporate these Water Users Districts, providing for the transfer to a Board of Trustees of the Irrigation District, or to the Province, the entire irrigation works, as well as all rights and privileges of the Company from the Dominion and Provincial Governments.

By agreement between the Dominion, the Province and the Canada Land and Irrigation Company it is proposed to turn over to a Canal Association, consisting of water users, the main canal and appurtenant works of the Canada Land and Irrigation Company. The division of responsibility as between Dominion, Province and Company will be set out in detail by enactment.

The Prairie Farm Rehabilitation Act

As a result of a national emergency, due to prolonged drought in the thirties, the P.F.R. Act was passed by Parliament in 1935. It was amended in 1937 and again in 1939, but provides essentially for an Advisory Committee to advise the Minister of Agriculture as to the best methods to secure the rehabilitation of the drought and soil drifting areas of the Provinces of Alberta, Saskatchewan and Manitoba.

Other Acts

Some thirteen additional Acts are in force relating to surface waters, irrigation, drainage, and other related matters. A knowledge of the provisions of these Acts is essential for the administration of the Water Resources of the Province.

Classification and Extent of Water Resources

Surface waters in Alberta may be classified as: (1) permanent streams which have their source in the mountains, (2) the small and less permanent prairie streams, and (3) other miscellaneous streams of a sporadic nature which, during the summer, may go practically dry but which are most important in the aggregate primarily for domestic, stockwatering, and many other purposes.

With the exception of a few land locked streams they can all be included in the main drainage basins of the Milk, South Saskatchewan, North Saskatchewan, Peace, Athabaska and Hay Rivers.

Milk River Drainage Basin

The Milk River rises at the foot of the Mountains in the United States just east of the Hudson Bay divide. After flowing for some 216 miles through Alberta and Saskatchewan it recrosses the Boundary and joins the Missouri river. Although the flow is not great, the United States turns into it from the St. Mary River large quantities of water for use in the United States. It is quite feasible and economical to redivert this water in Canada from a point on this stream near the town of Milk River.

South Saskatchewan Drainage Basin

This basin is made up of the following main streams and drainage basins: Waterton, Belly, St. Mary, Old Man, Little Bow, Highwood, Bow and Red Deer rivers. These streams all join together in Alberta to form the main stream which, in Saskatchewan, is joined by a number of smaller streams from the Cypress Hills and is later joined by the North Saskatchewan river to form the Saskatchewan river. The stream is most important to Southern Alberta and Southern Saskatchewan and will require to be supplemented ultimately by a diversion from the North Saskatchewan river drainage basin. This is necessary in order to meet the ultimate requirements for irrigation in Alberta and Saskatchewan.

The following are the drainage areas from which stream flow measurements are available:—

above its mouth 53,325 square miles, 7.4 million acre feet; At Saskatoon: 50,900 square miles, 7.17 million acre feet; At the Alberta-Saskatchewan Boundary: 49,797 square miles, 7 million acre feet; At Medicine Hat 20,610 square miles, 5.5 million acre feet.

The Bow River is the most important stream for irrigation and power in the province. The area of the drainage basin is 9,770 square miles and an average annual run off close to 2.7 million acre feet.

The Drainage Basin of the Red Deer river is 18,160 square miles and the average annual run off exceeds 1.5 million acre feet. It is also an important stream for the development of irrigation and power.

North Saskatchewan River Drainage Basin

This basin is made up of the main streams and drainage basins of the Clearwater, Brazeau, Sturgeon, Battle, and Vermillion rivers. The drainage basin above the point where it is joined by the Clearwater is 2,948 square miles and the average run off 3.0 million acre feet. The drainage area above Edmonton is 10,495 square miles and the average annual run off 5.6 million acre feet. These streams all join in Alberta to form the North Saskatchewan river proper, which then flows through Saskatchewan to join the South Saskatchewan river. The drainage area of the Clearwater river is 1,214 square miles and the average annual run off 698,000 acre feet. The Clearwater itself and that portion of the North Saskatchewan above the Clearwater can be diverted to the Red River or to the South Saskatchewan Drainage Basin through the Raven river. The drainage area of the Brazeau River is 1,930 square miles and the average annual flow is unknown. The stream has possibilities of development for water power.

Surveys and Investigations

Since 1906, when water resources legislation was first enacted by the Dominion, surveys have been carried out in Alberta to determine the available water supplies, their most beneficial use for irrigation, water power and other purposes. Since 1931 such surveys and investigations have been the responsibility of the Province, and have been carried out with the assistance of the Water Power Bureau of the Department of Mines and Resources and the Water Development organization of the P.F.R.A.

Stream flow records, topographic maps, and other data prepared as a result of these surveys and investigations, furnish the basic data for irrigation, water power and other purposes. These basic surveys, supplemented by further details, will supply the data with which to plan the ultimate development of the Water Resources of the Prairie Provinces.

Since 1935, when the P.F.R.A. Water Development organization was set up in the Province, additional water development investigations have been made. Many small projects and some larger ones have been constructed. Several larger projects are now being surveyed and designed.

The Calgary Power Company has in recent years completed a fairly extensive and detailed water power investigation of the Bow River and its tributaries and, as a result has constructed a number of reservoirs and power stations on the stream.

Irrigation

Irrigation in Alberta was initiated by the Alberta Railway and Irrigation Company. This company was organized in 1883 for the purpose of irrigating a large tract of dry land to the south and east of Lethbridge. The project was initially developed to supply water from the St. Mary River for an irrigable area of some 36,000 acres but has been greatly extended since that time. Since this early development, fifteen large irrigation projects with a total irrigable area of 719,000 acres, have been constructed in the Province at a cost of some $35 millions. In addition to this some $700,000 has been spent on the construction of some 700 smaller and privately owned irrigation projects.

Milk and St. Mary River Development

The original plans of the Alberta Railway and Irrigation Company contemplated the full use of the St. Mary River, and extended far beyond its present bounds. The plans however were greatly curtailed when, after the United States Reclamation Act was passed by Congress in 1902, steps were taken to divert water from the St. Mary and Milk

Rivers for use in the United States. Subsequently the project was limited to an area some 120,000 acres, which it was considered could be adequately served from the St. Mary river without storage under the terms of an order by the International Joint Commission. The present St. Mary and Milk river Development is merely an extension of the original Alberta Railway and Irrigation Company project. It is described in another paper presented by Mr. Gordon MacKenzie. (see page 485).

Belly River Projects

In the general vicinity of Cardston there are four small projects irrigated from the Belly river as follows: The United, Mountain View, Leavitt and Aetna Districts. The latter three have a common intake on the Belly river, but the United District diverts its supply from a point on the stream below. The rainfall in this area is generally sufficient for the growth of cereal crops, but generally insufficient for such crops as alfalfa, clover and hay. The main purpose of these projects is to supplement the feed supply for stock in years of low precipitation.

The Macleod Irrigation District

The most recent development in the Province is the Macleod Irrigation District, which is now constructing an initial development for something like 10,000 acres. Depending upon the success of this initial development it is proposed to gradually extend the system to include 27,000 acres.

North Saskatchewan Project

This is a proposal by the late William Pearce of Calgary, to utilize the flow of the Red Deer, Clearwater, and North Saskatchewan rivers to irrigate a large area of country to the North of the South Saskatchewan river approximately from Hanna to the Alberta-Saskatchewan Boundary. The original surveys were made years ago by the Dominion Reclamation Service, but more recent surveys have been made by the Water Development Organization under the P.F.R.A.

As a result of these investigations the following are the general conclusions:

(1) It is feasible to utilize large quantities of water from the Red Deer, Clearwater and North Saskatchewan rivers and, by gravity canals and pumps to irrigate some 450,000 acres in Alberta.

(2) Water power developed at the diversion dam on the Red Deer River will pay for a large portion of the construction cost of the dam and plant.

(3) In the case of pumping water from Buffalo Lake by an exchange of power between the Red Deer and Bow River plants summer energy, now available from the Bow River, may be used for pumping purposes on the Red Deer River, thereby conserving the Red Deer river power for use in the winter. Thus by loaning and borrowing power as the need arises, these two complementary systems could provide for the maximum amount of power for industry and the maximum social service to the communities served.

P.F.R.A. Water Development in Alberta

Following is a summary of small projects constructed under the P.F.R.A. in Alberta up to March 31, 1947.

Type	Number	Financial Assistance
Dugouts	1372	$127,896.
Stockwatering dams	1392	119,953.
Irrigation Projects	365	58,785.
Total		$306,634.

In addition to the above, fourteen large water development projects, with a total irrigable area of 111,835 acres and total storage capacity of 42,310 acre feet, at a total cost of $786,890. have been undertaken in the Province to that date since 1935.

Water Power

Prior to the transfer of the water resources from the Dominion to the Province some water power surveys were made of the Bow, Red Deer, North Saskatchewan, Athabaska and Peace rivers. The Calgary Power Company has since made more detailed surveys of some of the power sites. In more recent years the Department of Water Resources, in cooperation with the Alberta Power Commission, has endeavoured to review most of the early investigations, and to carry out further investigations of power developments which might be incorporated into a comprehensive power system in Alberta. These investigations, made in the light of the present trend of development, and with a better knowledge of the existing and future power requirements, as well as with more recent knowledge of stream flow data and topography, will here be discussed.

Load Data

The Calgary Power Company power stations presently available to carry the company loads are listed in Table I.

The Calgary Power Ltd. system is inter-connected with the following plants in addition to the above.

Station	Capacity Horse-power	Kilo-watts
Edmonton Steam Plant	53,600	44,000
Lethbridge " "	10,550	7,890
Total	64,150	51,890

The growth in the production of energy in the Province may be summarized as follows:—

Total Generation capacity, 233,300 k.w
Generation for 1945 566,240,917 k.w.h.
Generation for 1946 599,328,668 k.w.h.
Increase, 1946 over 1945 33,087,751 k.w.h.
Generation for 1947 673,879,992 k.w.h.
Increase, 1946 over 1945 74,551,324 k.w.h.

The following reservoirs have been constructed on the Bow River by the Calgary Power Limited to increase the water flow of the stream:–Ghost reservoir, Lake Minnewanka, Upper Kananaskis Lake and the Barrier reservoir. The total capacity of these sites is approximately 368,000 acre feet. They serve to maintain an average winter flow of 1,700 c.f.s. The development of additional storage at Spray lakes will further increase the flow to approximately 2,300 c.f.s. In addition to the power sites which have been developed there are at least eight other sites which may be developed on the streams.

Factors Governing Amount of Water Available

Table II gives a summary of water available at possible points of diversion on various Alberta rivers.

Table I

Station	Head in ft.	Capacity Horsepower	Kilowatts
Ghost plant	105	37,450	28,000
Kananaskis Falls plant	77	11,600	8,653
Horseshoe " "	73	19,500	14,547
Cascade " "	345	23,000	17,158
Barrier " "	148	13,500	10,070
Calgary Steam "		14,000	10,444
Total		119,050	88,872

It will be quite evident that there is sufficient water in the streams to adequately serve all of the irrigable lands in the Province. However, average yearly flows tell only part of the story, because there are at least five governing factors which condition the actual available water supplies. The volume of water which can therefore actually be used beneficially must be some percentage of the annual output of the streams, depending upon these conditioning factors.

Storage factor. If the flow of streams were constant, the matter of providing diversion facilities would be comparatively simple. However most of the flow occurs in a few months, and on some streams in a few weeks, after which the subsequent supply is comparatively small. This means that without storage facilities to control and regulate the supply, most of the flow cannot be diverted economically.

Gravity Diversion Factor. The possibility of conveying water by gravity is dependent, first upon the distance of the stream below the lands to be irrigated, and second on the slope or fall of the stream itself. If, for instance, the river with a slope of 4 feet per mile is 200 feet below the general elevation of the lands to be irrigated, it would require a canal of from seventy-five to one hundred miles in length, depending upon the slope of the canal and other factors, to bring water by gravity to the prairie level. Without knowledge of the suitable location for gravity diversions, it is not possible to determine the irrigable areas. Because sufficient surveys have already been made for possible gravity diversions, irrigable areas can be approximately estimated.

Economic Value Factor. A most important factor is the economic value of irrigation. Should we regard irrigation in a narrow sense, namely whether it pays the water user or land owner, directly, to rehabilitate a certain tract of land? Or should the broader view be taken, having regard not only to the individual benefits, but also to the general community and the country as a whole?

Until recently the capital cost of irrigation works has been charged wholly to the lands benefited. These have been made to bear all of the costs. It has been determined, however, that the amount of such capital cost which the lands can support under average conditions, is something like from $20.00 to $25.00 per acre, depending upon soil, topography, location, and other factors. From the narrow view point therefore the irrigable areas are definitely limited by the ability of the land to pay the capital costs.

But what of the sociological view? The basis of this is that a rural population of prosperous and contented farmers are of benefit, not only to merchants of adjoining towns as reliable customers, but to the municipalities as taxpayers, the railways who transport the produce, and to the nation as a whole. Advocates of this latter or sociological view contend that other beneficiaries of the farmers' improved position should share the cost of such improvements. However, if the land is not to bear the whole of the cost, what proportion should it bear? Until the question can be answered, the ultimate development of irrigation cannot be predicted with any degree of certainty.

Pumping Factor. Still another important factor is that of pumping possiblities, which resolves into a question of economics. For example, it is manifestly uneconomical to spend a dollar to pump water to produce sixty cents worth of crops. There is a point however, where pumping with cheap power may be justified by the value of the crop grown. Gasoline or diesel power generally makes the cost of pumping much over thirty feet doubtful. Using cheaper fuel, the height may be increased, and by employing water power (and particularly the off-peak power available during the summer) the limit is still higher. Such latter schemes imply interconnected systems of water power and pumping plants. A project of immediate interest is the joint development of power and irrigation on the Bow and Red Deer rivers.

Double Harness for the Bow and Red Deer

The Bow is the most important river in the Province, for both irrigation and power, but most of the flow is required to irrigate adjoining lands. If however power facilities on the Bow, where large quantities of water are passed downstream for the irrigable lands below, were used to generate power for pumping purposes, such cheaper power could be utilized to pump water for irrigation purposes in some distant drainage basin such as the Red Deer basin.

The Red Deer has splendid storage facilities, adjacent to which, are large tracts of irrigable lands not yet developed, partly because the lands are above the general elevation of some of the reservoirs. If, however, the summer power now wasted on the Bow River were used to pump water to land in the Red Deer river drainage basin, considerable areas of good lands could be reclaimed, conserving the Red Deer river water for use in the winter. Thus by exchanging power as the need arises these complementary systems could provide for the maximum power and irrigation development, and the maximum service to the communities they serve.

The entire problem of water resources available for irrigation however is one of some complexity. Within broad limits it is possible to speak with some degree of certainty. Yet beyond these limits are numerous factors which make it impossible to estimate with confidence. Some of the complexities are due to the fact that statistics are not available. Others are due to human or sociological factors which cannot be gauged by methods known to engineers.

International Problems

Events leading up to the Boundary Waters Treaty are fully explained in the St. Mary and Milk River Water Development report already referred to. The situation with regard to the St. Mary and Milk rivers is very well summed up in that report as follows:—

"Reservoirs have been constructed within the United States of sufficient capacity to regulate the United States share of the St. Mary and Milk rivers. Preli-

TABLE II

Name of Stream	Diversion Point	Average Annual Flow
Waterton river	Sec. 3-4-28-4	486,000 acre feet
Belly "	" 21-4-27-4	229,500 " "
St. Mary "	" 1-5-24-4	574,700 " "
Oldman "	" 5-9-26-4	1,022,000 " "
Willow creek	Tp. 10-27-4	112,000 " "
Bow River	Sec. 36-20-19-4	3,000,000 " "
Red Deer River	" 32-38-23-4	1,346,000 " "
North Saskatchewan River	" 26-39-9-5	3,750,000 " "
Total		10,520,200 " "

minary surveys have been made of reservoirs in Canada which would enable Canada to use its full share of these waters. The findings of the Committee (the Meek Committee) are based on the assumption that the division of the water supply was finally settled by the International Joint Commission's Order of October 4th, 1921, and that Canada may proceed to construct the necessary works to utilize fully its share of the waters."

More recently however, the problem of how to make better use, not only of the Milk and St. Mary Rivers, but also of the Belly and Waterton Rivers, has been studied by the United States Bureau of Reclamation. In a report by W. G. Sloan, assistant director of the United States Reclamation Bureau, it is suggested that the Canadian interests are not yet aware of the great possibilities of the South Saskatchewan River; that the flow at Medicine Hat is approximately 11 million acre feet, and that a much greater and more beneficial use may be made of the water.

The present and prospective uses of the South Saskatchewan River are fully discussed in this paper. The average annual discharge at Medicine Hat is 5½ million acre feet. The stream is inter-provincial, and it is estimated that to meet the ultimate irrigation requirements in Alberta and Saskatchewan it will ultimately be necessary to divert into it considerable quantities of water during the summer from the North Saskatchewan Basin.

Reference to the International Joint Commission

The 1921 order of the International Joint Commission has never been completely acceptable to the Water Users Associations of Montana, who contend that the order does not effect an equal division of the St. Mary and Milk River waters. These Associations appear to take the view that new conditions arising since the Order was made should justify a new hearing by the Commission, and possibly a new division of waters crossing the Boundary. Included as well, they believe, should be the waters of the Belly and Waterton Rivers, the head waters of which lie in the United States. The Governments of Canada and the United States have, therefore, agreed to refer these questions to the International Joint Commission for joint examination and an advisory report, including recommendations.

Inter-Provincial Waters

All of the important streams in Southern Alberta, with the exception of the Milk River, contribute to the drainage basins of streams which cover two or all three of the provinces of Manitoba, Saskatchewan and Alberta. They consist of the North and South Saskatchewan river drainage basins and tributaries, and the Battle River, which joins the North Saskatchewan near Battleford. Other smaller streams which cross the Provincial boundary are the Lodge, Middle, Battle creeks, or tributaries of the Milk river and Boxelder, Eyehill, Blackfoot, Big Gully creeks as well as several other smaller streams. To apportion these and other inter-provincial or Dominion-Provincial streams, a Prairie Provinces Water Board will be established.

Allocation of Saskatchewan River between Alberta and Saskatchewan.

The area of the entire Saskatchewan River basin is 149,500 square miles or more than double the combined area of the Maritime Provinces. It contains most of the large centres of population, and a large percentage of the agricultural lands in Alberta and Saskatchewan. Water development projects must therefore, play a very important part in the agricultural and industrial development of the two provinces and of the country generally. The average annual discharge of the North and South Saskatchewan rivers combined as they pass into Saskatchewan, is estimated at 13 million acre feet. The average annual flow of the Saskatchewan as it passes into Manitoba is estimated at about 18 million acre feet.

An estimate of 1,923,305 acres has been made for the ultimate development of irrigation in Alberta. The best estimate available for Saskatchewan is 925,000 acres. Together, these give a total of 2,848,305 acres. Although the development of water power does not deplete the streams, it does decrease the summer flow and increase the winter flow.

In order to equitably allocate the inter-provincial waters it will be the duty of any Prairie Provinces Water Board, when set up, to make a comprehensive survey and study of the available supplies and probable uses in the Saskatchewan river drainage basin.

Irrigation by Pumping

There is considerable waste of energy in the presently designed and operated irrigation projects. Why should this potential energy be wasted? The answer to this probably is that the energy is seasonable, and therefore not suitable for most power loads. Furthermore it is generally not practical with present day equipment, to develop the energy. Much of the potential power could however be developed, to pump water to lands above the canal system. There seems little reason why costly drop structures should not be so designed as to develop the potential energy.

A more important use of irrigation structures for power development has already been referred to on the Bow and Red Deer Rivers. By the construction of a dam 190 feet high on the Red Deer River at Ardley it is possible to create some 370,000 acre feet of storage on the river above the irrigable areas. Some 300,000 acre feet of additional storage at Buffalo lake lies adjacent to the supply canal, but 45 feet below. This storage could be made to produce from 75 to 100 million kwh. of energy annually. Operated in cooperation with the Bow river plants such a power station could provide a large percentage of the winter energy required in Alberta, as well as additional summer energy to pump water to irrigate lands.

Provincial Control of the Bow River Flow

Water power undertakings on the Bow River, because of low winter flow, are faced with the necessity of storing summer water for winter use, whereas water in the summer is required for irrigation. The possibility of conflict betwen the interests therefore exists. The problem is to determine to what extent each should be allowed to develop, and in what order.

A series of low flow years began in 1936 and records obtained since that time have considerably modified previous estimates. The average flow of the Bow river at Calgary for the period 1911 to 1935 is 2.5 million acre feet per year. The average for the period 1936 to 1946 is 1.9 million acre feet per year. Based upon the early records it was considered that the water supply was adequate for an almost unlimited development of irrigation and power.

Fortunately for those responsible for the administration of the water resources of the Province the areas originally contemplated for irrigation, totalling 844,000 acres, have for a number of reasons been greatly reduced. They are now limited as follows:—

Western Irrigation District (C.P.R. Western section) . .	50,000 acres
Eastern Irrigation District (C.P.R. Eastern section	281,000 "
Bow River Project (C.L. & I. Co. and extensions)	240,000 "
	571,000 "

A comprehensive water supply study made of the Bow River by F. R. Burfield, M.E.I.C., chief engineer of the Water Resources Department, shows that in a normal year there is sufficient water for 571,000 acres from the Bow River, and that the regulations of the Bow River for power to a minimum average flow of 2,300 c.f.s. will not conflict with the use of the river for irrigation. The critical year, however, is 1941.

Until ways and means are determined to construct storage on the Bow river below Calgary and above the irrigation projects, it is proposed to limit further development of irrigation to the above areas, and to limit regulation of the river for power to an average minimum winter flow of 2,300 c.f.s.

Figure I is a mass diagram and hydrograph for the flow of the Bow River at Calgary for power development, and below Calgary for irrigation development for the low flow period March 4, 1940 to May 13, 1942.

The quantity of water which could be stored in power reservoirs between May 5th, 1940, and Sept. 17, 1940 is 248,995 c.f.s. days or approximately 497,990 acre feet. The storage capacity available at the head waters including the proposed Spray lakes reservoir is approximately 570,000 acre feet.

The release of this storage from September 24th to May 5th, 1941, together with the natural flow during the period, gives an average regulation for that period of 2,222 c.f.s. continuous flow. Which over the present heads on the Bow river is equivalent to firm power of approximately 51,500 hp.

The quantity of water which could be stored for the period May 20th 1941 to October 29th, 1941 is 178,832 c.f.s. days or approximately 357,664 acre feet. The release of this storage for the period November 5th 1941 to April 22nd 1942 together with the natural flow during the period would maintain a regulated flow of 1,813 c.f.s. continuous flow or equivalent to firm horse power of approximately 42,000 hp.

During the open water season at the critical period for irrigation say April 1st 1941 to October 31st 1941, the quantity available below Calgary for irrigation is 1,425,220 acre feet.

Water Areas

There has been for a considerable period of years a general lowering of lake levels in Alberta. This has been partly due to natural causes, but also due to land and road drainage, and extensive clearing and cultivation of lands in the drainage basins. Demands have arisen from land owners and would-be land owners to purchase or lease accrued areas and reclaim more lands by drainage. The result generally of depleting lakes and sloughs has been to destroy them as sources of surface and underground water supplies, while the value of the lands reclaimed has not been great.

Although lakes and sloughs are now abnormally low, there is evidence that they have been still lower. There is also good reason to believe that they are on their way back, and for this reason their beds and shores should not be permanently disposed of.

The experience in Alberta has been, that in order to protect their lands, owners of lakes and slough beds when flooded, immediately apply for permission to drain and this has been the cause of much difficulty and ill advised drainage projects. The Department of Water Resources has recently commenced a survey of all water areas in the Province with a view to replenishing all such areas either by control works at the outlets or by diversion from other sources.

Drainage

Drainage in Alberta must be considered a necessary evil. In the early days, in order to construct roads a certain amount of drainage was necessary, and in some areas is still necessary. Except where there is a reasonable chance of unwatering good agricultural lands, however, without destroying useful water areas, drainage is now discouraged in the Province.

Duty of Water and Canal Capacity

The original Regulations under the Irrigation Act provided for a second foot for each 150 acres of irrigable land. It so happens that one second foot flowing for 153 days (the irrigation season) will deliver an amount of water equivalent to two feet in depth over the area which considering losses is generally adequate. However, the rate is impractical, and it is thought that in fixing the duty it was intended that depth should apply, and not the rate. However, many of the early projects were designed for a rate of one second foot for each 150 acres, consequently the canals were too small for the areas contemplated.

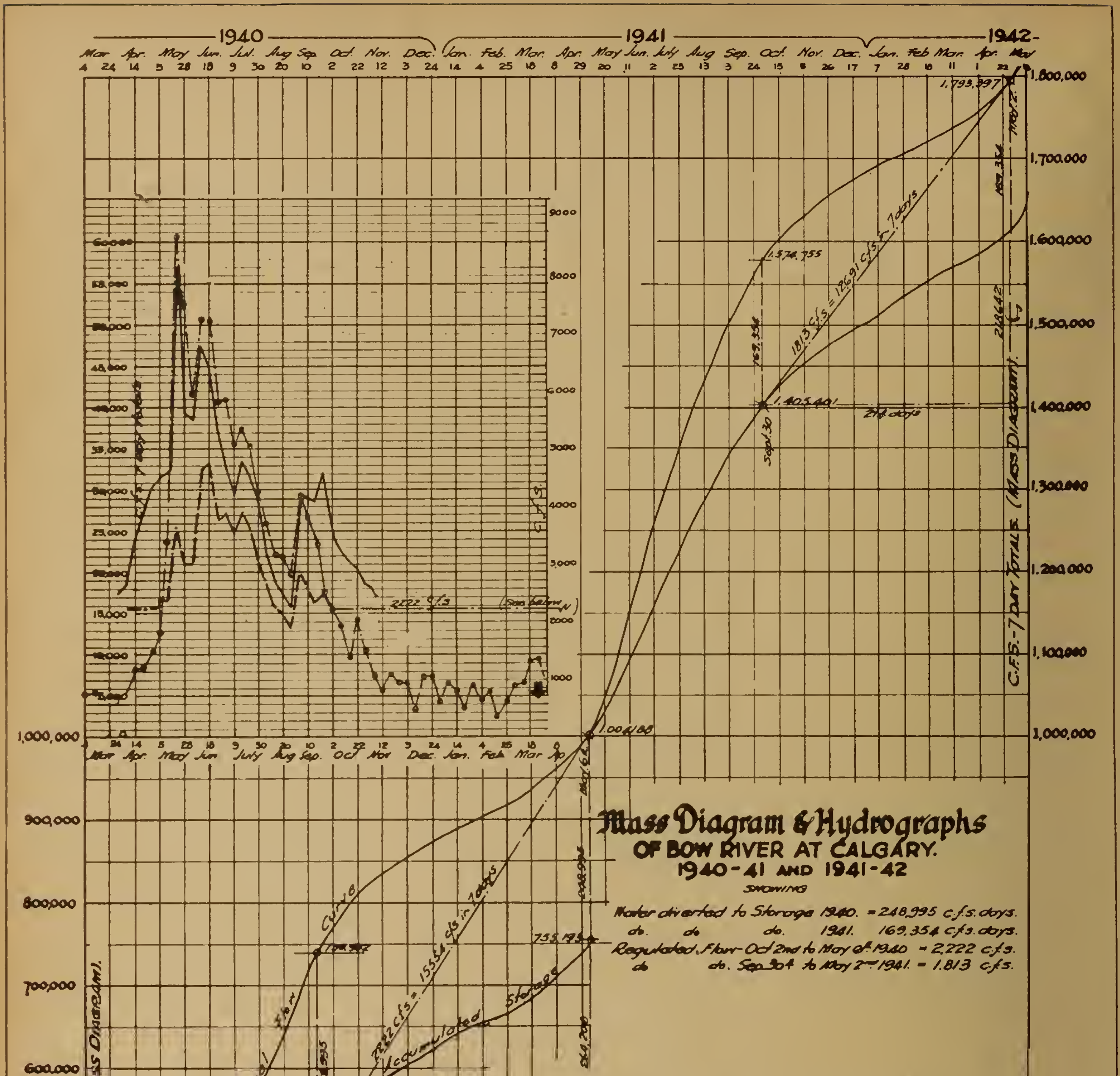
As a result of certain experimental work carried out by the Dominion Reclamation Service some years ago in the Brooks area, it was determined that in addition to the precipitation, an average irrigation during the season of eighteen inches was adequate for the growth of crops, but no experiments were made to determine canal capacity.

The late Mr. S. G. Porter, M.E.I.C., with his extensive knowledge of irrigation in the United States, about 1917 derived a formula which was considered applicable to Canada. This was later adopted by the Dominion Reclamation Service and canals designed accordingly. The basis of the formula is that water can be rotated from one group of water users to another, thus saving capacity. The experience has been, however, that the season is so short that practically the whole of the irrigable lands require water almost at once, with the result that the demands are for larger and larger canals.

To admit the necessity for supplying all of the water users under canals with water at the same time, and to carry this out in connection with large projects, would be extravagant. Under such conditions it is doubtful whether it would be feasible or at least economical at all. There are many factors affecting canal design such as duty of water, diversity of crops, soil type, intensity and distribution of precipitation. These are all factors which should be studied by agriculturists and given proper consideration along with engineering and economic factors in designing canal systems.

Economics

One of the conditioning factors to the estimates of irrigable lands is the economic factor. This was discussed in a paper by D. W. Hays, M.E.I.C., published in the *Engineering Journal* of May 1941. It was further discussed by the late Mr. S. G. Porter, M.E.I.C. in his paper published in the semi-centen-


Mass Diagram & Hydrographs
OF BOW RIVER AT CALGARY.
1940-41 AND 1941-42
SHOWING
Water diverted to Storage 1940. = 248,995 c.f.s. days.
do. do do. 1941. 169,354 c.f.s. days.
Regulated. Flow - Oct 2nd to May 8th 1940 = 2,222 c.f.s.
do do. Sep. 30th to May 2nd 1941. = 1.813 c.f.s.
LEGEND: Natural Flow shown
Regulated Flow
Available for Irrigation.
C.F.S. 7 DAY TOTALS (MASS DIAGRAM).
1940
1941
1942
1,800,000
1,700,000
1,600,000
1,500,000
1,400,000
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
1,793,997
1,574,755
1,405,401
1,004,188
755,195
490,987
2222 c.f.s.
1813 c.f.s. - 214 days
231 days
214 days
Natural Flow
Accumulated Storage

nial number of the *Journal*, dated June 1937.

Since that time Governments have begun to recognize the principles enumerated in these papers. It is hoped that before long definite rules, as suggested by the St. Mary and Milk River Water Development Committee, will be adopted by agreement. These rules provide for a definite division of cost between the Dominion, the Province, and the water users.

No more fitting conclusion to this paper could be made than to quote from the paper above referred to by the late Mr. S. G. Porter, who did so much to promote and encourage irrigation development.

"Further irrigation development by private capital probably cannot be expected in Western Canada, for the reason that its benefits are too widespread to be readily assessed. There is no practical way for an individual or corporation to levy and collect its costs. But it is a safe prediction that where a water supply is available and can be developed at a reasonable cost, its wealth producing value and possibilities of general benefits will be recognized, and will result sooner or later in development under a policy whose aims will be to distribute the burden of cost more evenly over all who enjoy its economic benefits."

Discussion

J. M. Wardle, M.E.I.C.[1]

Mr. Russell's paper gives a complete summary of the present situation in Alberta in regard to irrigation and water power. He has in addition presented an interesting possibility for consideration, namely, the feasibility of using surplus summer power from Bow river plants to pump water into storage reservoirs in the Red Deer River Basin. The amount of surplus power that would be available for pumping operations will, of course, depend upon the capacity of the eventual installations in the Bow river plants. Storage of water is again one of the important factors.

Mr. Russell mentions two important matters that will bear repetition. The first of these is the establishment of a Prairie Provinces Water Board to investigate and report on irrigation and power projects that might be planned to utilize the common waters of the Prairie Provinces, and to recommend the allocation of such waters. Just recently the set-up and functions of this Board were agreed upon between the three Prairie Provinces and the Dominion. Its members will consist of a representative from each of the Prairie Provinces, and a representative from each of the two Dominion Departments chiefly concerned, namely, the Department of Agriculture and the Department of Mines and Resources.

Recommendations of the Board to be effective must be approved by Orders in Council passed by the participating Governments. The formation of a Board of this nature was recommended by the Dominion Water and Power Bureau of the Dominion Government as far back as 1929-30, and its establishment now is a source of great satisfaction.

The second matter is related to the division of international waters as between Canada and the United States, and which is mentioned in Mr. Russell's reference to the International Joint Commission. The Dominion Government took the stand that the division of the St. Mary and Milk River waters should not be referred to the International Joint Commission for further review, but be regarded as finalized by the 1921 order of the Commission. References to the International Joint Commission are now confined to the Belly and Waterton Rivers and to the international waters east of the Milk River Watershed and including the Red River of the North.

Mr. Russell has dealt with the present status of the water resources of Alberta, and has outlined future irrigation possibilities. Let us now try and look ahead twenty-five years or more, and hazard a guess as to how future conditions may affect the regimen of the flow of the main rivers in the Prairie Provinces. There are some doubts as to whether we can expect there will be no great change in the present character of the flow in our rivers and streams. Unless there is fairly complete regulation by storage reservoirs, we must expect more rapid run-off in the spring, and greater variations in stream-flow.

During the time in which irrigation and power have been developed in the Prairie Provinces with water from the East Slope of the Rockies, we have had in the final stages of hot dry summers, a fairly substantial flow of water from the melting glaciers. Millions of acre-feet of water held in the glacial ice have already flowed down the Bow and the North and South Saskatchewan and their tributaries to the east. Now the great recession of glaciers on the East Slope has become very noticeable, and is confirmed by the surveys of typical glaciers commenced some three or four years ago by the Department of Mines and Resources. The gradual lessening of water supplies is touched on at two or three points in Mr. Russell's paper, namely, the lowering of Prairie lake levels and the reduction in the original irrigation areas planned in Alberta.

Many engineers attending this meeting will, themselves, have noticed the great changes in such glaciers as the Crowfoot, the Bow, the Peyto, and the Saskatchewan and the Athabasca glaciers in the Banff-Jasper area. At one time these glaciers filled the valleys they occupy, and kept these valleys at a fairly low temperature throughout the year. The cold ice underneath the winter snowfall retarded its melting and extended the run-off over a comparatively long period. As the glaciers melted away and receded, the temperature of these valleys increased and melting of the ice was greatly accelerated.

We have now come to the stage where it seems that between the next twenty-five and fifty years our glaciers, from the water supply standpoint, will be almost negligible. In the mountains we will be dependent for stream-flow on winter snowfall and on rain throughout all our large drainage basins. We will have a flashier run-off each spring, because of the higher temperatures of the mountain valleys, and the fact that snow melts much quicker than ice.

It is hoped that a quick run-off will be retarded by better forest

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[1]Director of Special Projects, Department of Mines and Resources.

protection and by reforestation of the Eastern Slopes, towards which a start is being made this year by the Eastern Rockies Forest Conservation Board. Nevertheless, we have to face in future the diminution and eventual loss of any appreciable glacial flow of water. This loss will have to be made up by storage reservoirs at every point where these are feasible. Such reservoirs will be located not only in prairie areas, but in the foothills and in the lower mountain valleys.

In the low relief areas where there are possibilities of large storage reservoirs, these will have to be designed for more than seasonal supplies of water. They should be large enough to provide minimum supplies of water for four or five successive low-flow seasons. Extra storage in high-flow years might be obtained by high level reservoirs, and which would be filled by gravity or pumping after the ordinary or operating reservoirs are full. Just what storage should be provided for to make up for the loss of water from the glaciers is not known, although it is hoped that the Dominion Water and Power Bureau of the Department of Mines and Resources will be able to initiate measurements of streamflow from one or two typical glaciers next year.

A rough estimate of the amount of water held in ice storage gives an unexpectedly high figure. That section of the Columbia Ice Fields which will drain easterly has an area of some 200 square miles, when isolated glaciers and glacial tongues in that Ice Field area are taken into consideration. Averaging this ice at the conservative depth of 150 feet shows that there is stored in the Columbia Ice Fields 19,200,000 acre-feet of ice, which is equivalent to 17,600,000 acre-feet of water. Many times this amount of water has already flowed easterly from the glacial areas.

The statements made are somewhat in the field of conjecture, but it is believed they are worthy of serious consideration. It is certainly not too early to face the possibilities mentioned, and to plan for the surveys that will be necessary for a comprehensive water control and conservation programme. When we think that the major economy of the Prairie Provinces depends on water supply and power, and that this economy is of national interest, the need of action in the not too distant future seems very evident.

A. E. Palmer[2]

There is one paragraph of Mr. Russell's paper that calls for comment; that is his reference to required agricultural studies in relation to irrigation development. A statement as to such studies as have been made, are under way and are projected by the Dominion Experimental Station at Lethbridge should be of interest here.

The Department of Agriculture Farmers Bulletin No. 10, "Use of Irrigation Water on Farm Crops," reports the results of seventeen years of study of the seasonal water requirements of alfalfa, wheat, potatoes, sugar beets, and sunflowers. Several years of similar tests also have been conducted with barley, peas, and field beans. A summary of this data is included in a report of the station's activities now in the hands of the printer.

Quite extensive rotation and crop sequence studies under irrigation are under way at the Lethbridge station, and data is accumulating that will assist in the proper evaluation of crops in relation to fertility factors and seasonal water requirements. More detailed and accurate studies of the duty and economic use of water now are being established at Taber, which is more nearly representative than Lethbridge of conditions that prevail in the areas that will be brought under water in the St. Mary Milk River Development. The present plans of this work are: (A) Prototype studies of water use on the Taber Irrigation Project; respecting gross duty of water for the project and water used on individual farms. (B) Plot studies of water requirements of different crops in relation to soil moisture and fertility. Plot studies also are planned for the Red Deer project area.

W. L. Foss, M.E.I.C.[3]

The design of a canal system for irrigation purposes involves problems similar to those which arise in the design of a power distribution system. Diversity of use enters the picture and becomes more important as the project increases in size. Factors governing the capacity of canals cannot be completely evaluated without the benefits of actual operating experience.

Unfortunately, the older projects in Alberta suffer either from shortages of water due to lack of storage, or the canals have insufficient capacity. Further, there are no really large projects from which data can be obtained to evaluate the effect of size. It is therefore not possible to obtain from studies of existing projects all necessary information required for the sound design of a large project.

Studies of existing projects have been made and peak canal flows have been plotted against both acreage irrigated and the number of users under a given canal. Results from the different projects varied widely, but sifting the data and using what seemed to be the best, gave a curve covering areas up to about 30,000 acres. By extending the curve, estimates were made for larger acreages, and formulae worked out for the design of canal systems.

The law of probability governs some of the factors. Two main factors are: 1. Irrigation factor, and 2. Demand factor. The irrigation factor is the percentage of the total irrigable land in the project which is actually irrigated in any one year. The demand factor is the percentage of the total number of water users on the project expected to use water at the same time. Both of these factors, and more particularly the latter, will vary, roughly in order of importance, with size of project, type of crop grown, soil and climate, and the human factor, i.e. habits of users.

By far the most important of the above conditions is the size of the project. If water is being delivered to five users, the chances that all five will want water at the same time are high. If water is being delivered to 500 users, however, the probability that all will want water at the same time is very remote.

The problem, then, of designing canal systems resolves down to assessing the factors mentioned. It is not good enough to go to other countries for information, as conditions are apt to be so dissimilar as to be useless. The problem is our own and must be solved here in Western Canada. Some of the older projects are being studied further, and it is hoped that not too many mistakes will be made until more is known about the problem.

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The St. Mary-Milk River Irrigation Project

by

G. L. MacKenzie, M.E.I.C.

Chief Engineer, Prairie Farm Rehabilitation Branch, Department of Agriculture, Canada

A paper presented at the Annual General and Professional Meeting, The Engineering Institute of Canada, Banff, Alberta, June 2, 1948

Outlining the early history of the Alberta Railway and Irrigation Company project at Lethbridge, Alberta, its subsequent extension to irrigate additional areas, and the investigations and planning which have led up to Canada's decision to make use of her full share of these boundary waters, the author describes the design of the component structures and tells how they are being built.

Of special interest to the engineer concerned with the handling of water are the descriptions of tunnel design and the methods employed in building Canada's highest earth fill dam.

The agricultural economy of large areas in Western Canada periodically experiences serious losses from drought conditions, with the result that the prosperity of these areas fluctuates widely: irrigation in areas of deficient rainfall not only stabilizes but also increases the overall production and prosperity of the region. The St. Mary-Milk River project will make a major contribution to the agricultural economy of Southern Alberta, as it will utilize the major portion of the waters of four rivers; the St. Mary, Milk, Belly, and Waterton, to irrigate a half a million acres of land.

This project has been under investigation by the Prairie Farm Rehabilitation Branch intermittently since 1939. The investigational work has included water studies, agricultural soil surveys, foundation exploration at dam sites, topographic surveys, preliminary structural designs and more recently the final structural designs and specifications. Construction of two of the main dams, the St. Mary and the Pothole, and the connecting canal, is under way.

What the Project Accomplishes

History of Irrigation on the St. Mary River

In January 1899, the Alberta Railway and Irrigation Company obtained authority under the North West Irrigation Act to divert from the St. Mary River the total low water flow and in addition they had authority to divert sufficient to make a total of 2,000 second feet during high stages. The Company, in 1902, planned to extend their proposed works and considered using water from other sources. Also at this time the United States Reclamation Service proposed to divert waters, in the United States, from the St. Mary to the Milk River for use on their projects. The Canadian Government protested the proposed diversion and as a result the Boundary Water Treaty of 1909 was negotiated. This treaty provided for the creation of the International Joint Commission to deal with boundary waters generally.

In 1921 the International Joint Commission apportioned the flow of the St. Mary and Milk Rivers. The tabulation below gives in round figures each country's share of the average annual flow for the period 1922 to 1940 on these streams.

During the 1922 to 1940 period, Canada had constructed irrigation works capable of using only 165,000 acre feet out of its share of 403,200 acre feet. During the same period the United States had constructed storage and irrigation works capable of utilizing its entire share of the two streams. This condition would jeopardize Canada's claim to her share of the waters of these streams if the United States decided to press for more water from these sources. It was, therefore, exceedingly important that construction should be started on the St. Mary project to safeguard Canada's right to her share of these International waters.

	Acre Feet		
Normal Flow of Milk River	......	......	116,000
Canada's share	40,600	......	......
United States' share	......	75,400	......
Normal Flow of St. Mary River	......	......	611,300
Canada's share	362,600	......	......
United States' share	......	248,700	......
Totals	403,200	324,100	727,300

Existing Irrigation on St. Mary and Milk Rivers

A diversion was constructed on the St. Mary River in 1903 near Kimball. This diversion, which did not have any storage, provided water for irrigating nearly 113,000 acres of land south and east of Lethbridge. The Chin Reservoir, developed in 1921, supplied water for an additional 13,000 acres of land near Taber. This area has since grown to nearly 20,000 acres. The area actually irrigated has never exceeded 120,000 acres. The water supply for 100,000 acres of this land is very uncertain due to lack of storage and to the variability in river flow. The lands in these two areas are shown in the map, Figure 1.

Proposed Expansion of the Irrigable Lands

The St. Mary and Milk River Water Development Committee was established in February, 1941, to investigate the additional works required to utilize fully Canada's share of the St. Mary and Milk Rivers. This Committee was also charged with the responsibility of selecting the most feasible plan to put these waters to use and with the selection of areas to be irrigated. They were also to make recommendations regarding the share of the costs to be carried by the Dominion, the Province, and the Irrigation District. Their report was published in February, 1942, and recommended that Canada should construct, at an early date, the necessary irrigation works to utilize its share of the St. Mary and Milk Rivers. The Commission reviewed the difficulties encountered by existing irrigation districts and concluded that the practice of assessing all costs of construction against the irrigable lands was the primary cause of their financial difficulties. As a result, the Commission proposed that the Dominion assume the construction cost of main reservoirs and main canals and that the Province of Alberta should carry out the remainder of the construction programme. The Province could charge part of its costs to the farmers.

This project has been studied by the Dominion Reclamation Service and the Prairie Farm Rehabilitation Branch. The entire project has been carefully studied and scrutinized by the St. Mary and Milk River Water Development Committee. The scheme generally has been carefully considered and found to be feasible from an engineering and economic point of view.

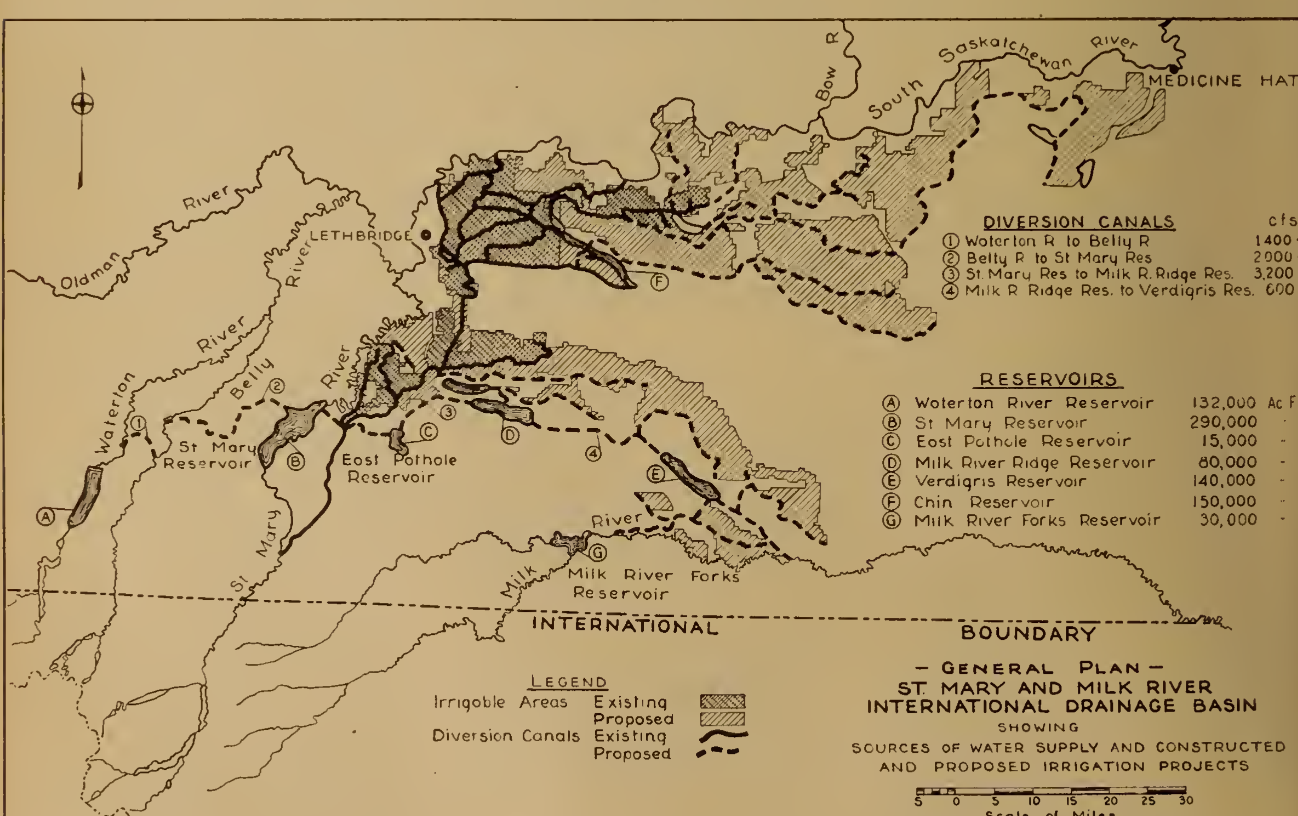
The plans for this development provide for a diversion canal from the Waterton River to the Belly River with a capacity of 1,400 c.f.s Then a diversion canal with a capacity of 2,000 c.f.s. will carry water from the Waterton and Belly Rivers into the St. Mary Reservoir. The main supply canal out of the St. Mary Reservoir will have a capacity of 3,200 c.f.s. and will supply water to irrigate a total of 513,000 acres of land. This means that the present area of 120,000 acres of land served by the St. Mary River will have an adequate supply and that an additional 393,000 acres of land will be brought under irrigation. Alberta now has approximately 509,000 acres of land under irrigation. The additional 393,000 acres represents a very substantial increase in the irrigable lands of Alberta, and will add stability to the agricultural economy of the Province. Figure 1 shows the location and extent of the new lands that can be irrigated by this project.

General Outline of Irrigation Scheme

Water Supply

Figure 1 shows the location of the streams providing the source of

Fig. 1



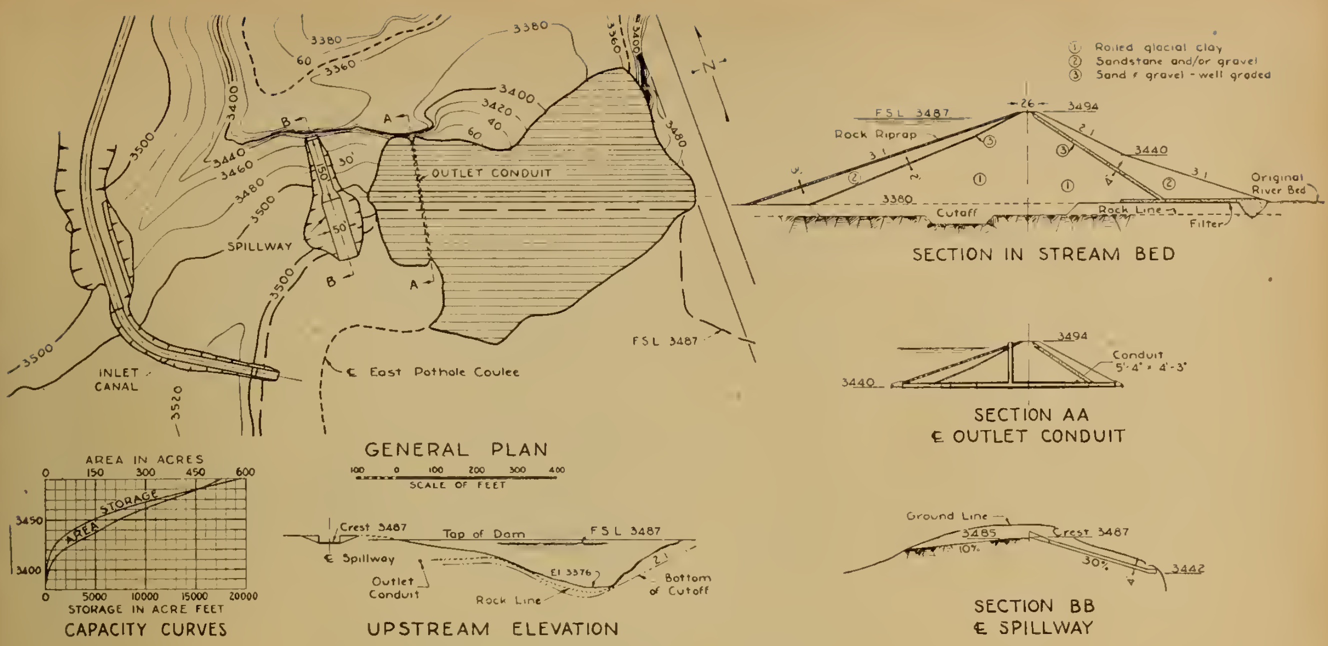


Fig. 2. Structure layout and details Pothole Dam

the water supply for the St. Mary-Milk River Project. The St. Mary River provides the main source of water supply and the Waterton and Belly Rivers provide additional water. It is not planned to divert any water from these last two rivers during the period of October 16th to April 15th each year. On the Waterton River it is planned to divert varying quantities of water during the period April 16th to October 15th. The maximum flow that will be diverted from this stream is 1,400 c.f.s. On the Belly River, water will be diverted during the same period (April 16 to October 15) and will reach a maximum of 628 c.f.s. during the month of heavy irrigation demands. The Milk River provides an independent source of water supply for a separate irrigation area of 18,000 acres.

Main Canals

Figure 1 also shows the location of the diversion canals from the Belly and Waterton Rivers, as well as the location and capacity of the main supply canals in the system. The main canal leading from the St. Mary Reservoir has a capacity of 3,200 c.f.s. and a bottom width of 56 feet with two-to-one side slopes and a depth of 16 feet. This main canal has been constructed as far as Pine Pound Coulee, which will probably be crossed with two 14 ft. diameter wood stave syphons. The map of Figure 1 also indicates that there are many miles of canals with capacities of over 2,000 c.f.s. These canals will require the construction of many structures such as bridges, drops and checks.

Storage Reservoirs

This project fortunately has a number of storage reservoirs located throughout the area in addition to the main supply reservoirs on the St. Mary and Waterton Rivers. The map of Figure 1 shows the location of these reservoirs with respect to the irrigable lands, and the following tabulation shows their capacities:

Reservoir	*Capacity*
Waterton	132,000 ac. ft.
St. Mary	290,000 " "
Milk River Ridge	80,000 " "
Verdigris	140,000 " "
Chin	150,000 " "
Milk River Forks	30,000 " "
Pothole Coulee	15,000 " "
Total Storage	837,000 " "

Fig. 3. The St. Mary River at the site of the St. Mary Dam.
National Film Board Photo

The estimated water supply needed for irrigation is approximately 740,000 acre feet, and with a total storage of 837,000 acre feet the project is in a good position for water supply during low flow periods.

Damages

The lake formed by the St. Mary Dam will flood about 11,600 acres of land and will interfere with the railway bridge on the Canadian Pacific Railway line from Cardston to Raymond. The lands on the west side of the river, having an area of 5,800 acres, belong to the Indians of the Blood Indian Reserve, and it has required lengthy negotiations to gain possession of them. The flooded area on the east side of the river includes two Hutterite colonies and a total area of 5,785 acres is involved. The Hutterite colonies contain 70 to 80 buildings of assorted sizes and designed for various uses. Many of the buildings are served with sewer and water and represent a serious problem in obtaining title to the lands that will eventually be part of the reservoir area. There will be no major damages resulting from the construction of the other reservoirs in the project.

Pothole Dam

The main canal from the St. Mary Reservoir has to cross the Pothole Creek soon after it leaves the reservoir. Pothole Creek flows in a comparatively narrow, but very deep, gorge and presents a difficult problem for a canal crossing. Consideration was given to crossing this creek with a syphon or a flume and it was finally decided to construct an earth dam and create a balancing pool on the canal that would have a usable storage of 14,000 acre feet. The construction of the earth dam appeared to possess some advantages over the other alternatives, although in the final analysis the dam was built for an entirely different reason.

In August 1943, the Raymond Irrigation District made a request to the P.F.R.A. to construct the

Fig. 4. Structure layout and details, St. Mary Dam.

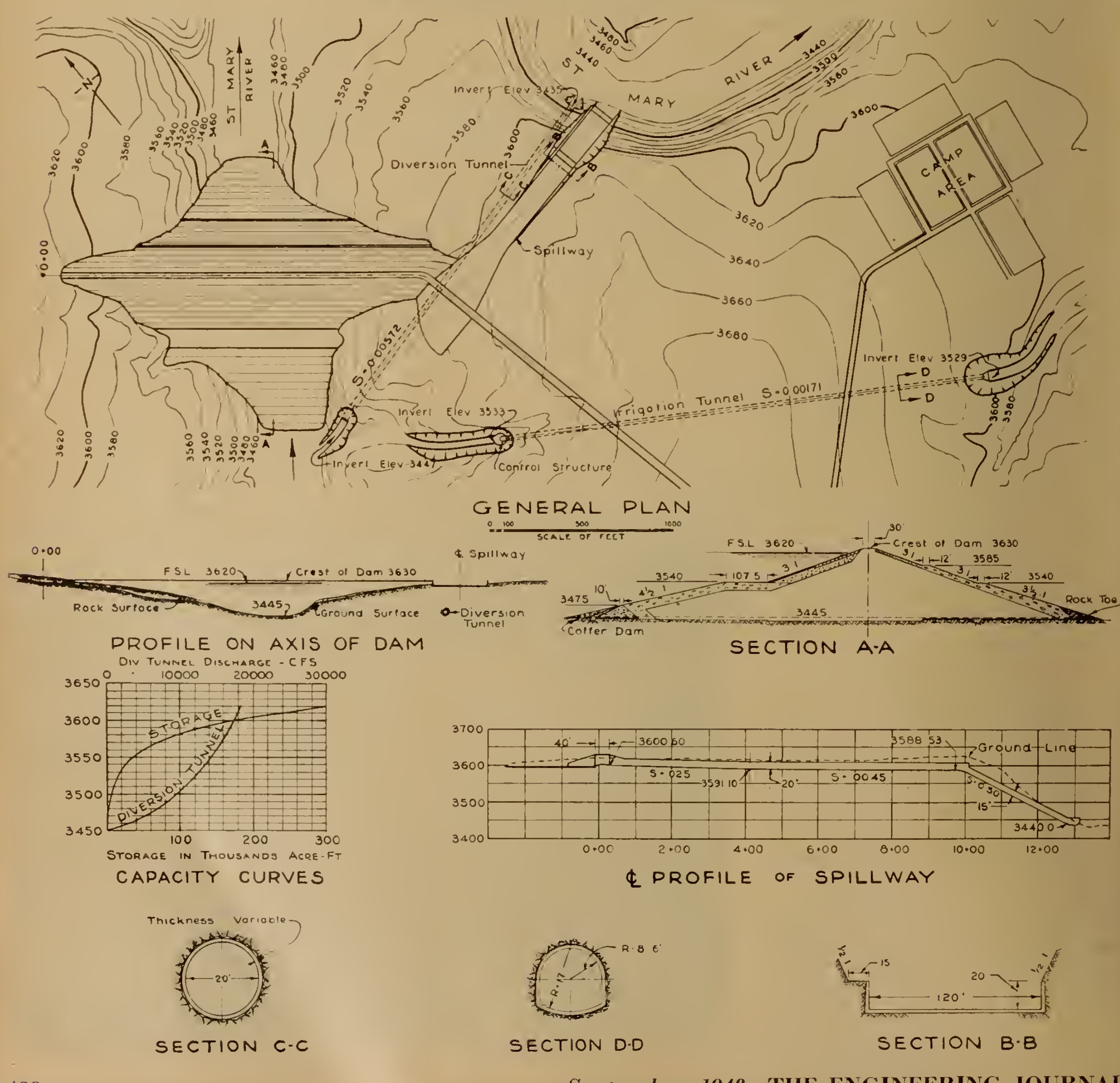


Fig. 5. Tunnel supports at inlet end of the diversion tunnel, St. Mary Dam.

" The rock under the dam consists of sandstones, more or less indurated, interbedded with soft shales, some of which are clay shales, carbonaceous shales, and one coal seam four to five feet in thickness. These rocks are of Upper Cretaceous age and are designated the Foxhills sandstones, which are overlain near the top of the valley by the St. Mary River formation. The rocks at the Pothole Dam are slightly older than those at the surface at the St. Mary River Dam."

The west abutment of the dam is a narrow ridge. This ridge at the site of the spillway has a width varying from 200 feet at full supply level (3487) to 500 feet at elevation 3410 at the bottom of the coulee. Bedrock occurs at about 3445 or slightly higher, and the material above the bedrock is boulder clay. The bedrock and the boulder clay appear to be quite impervious, but due to the short length of the seepage path it was considered desirable to place a clay blanket along the upstream side of this ridge, extending from the toe of the dam to the chute at the intake canal.

dam at Pothole Coulee to provide this 14,000 acre feet of storage for surplus water from the A. R. & I. canal. This could then be used to provide additional water to the Raymond Irrigation District, which suffered serious water shortages in low water years. The dam would also fit into the St. Mary-Milk River Project when its construction was approved. Their request received the approval and support of the Alberta Government, and as a result an agreement was negotiated between the Dominion Government and the Province of Alberta.

This agreement provided that the Province of Alberta would finance the construction and maintenance of Pothole works until it became a part of the St. Mary-Milk River Project. The Dominion agreed at that time to allow this cost to be credited to the Province's share of the cost of the St. Mary Project. This agreement resulted in work starting on the Pothole Dam before the work on the main dam at the St. Mary site. Work was begun in 1946 and is now nearing completion. Figure 2 shows the general layout of this dam. It shows the location of the inlet and outlet canal, and the principal features of the structure.

Geological and Foundation Conditions

Dr. John Allan, M.E.I.C., consulting geologist for the P.F.R.A., examined the site of the Pothole Dam and reports as follows:

Description of Pothole Dam

The dam is a rolled earth fill structure with a crest length of approximately 850 feet and a maximum height of 130 feet. The construction of this dam involves the stripping of approximately 100,000

Fig. 6. Drilling jumbo, diversion tunnel, St. Mary Dam.

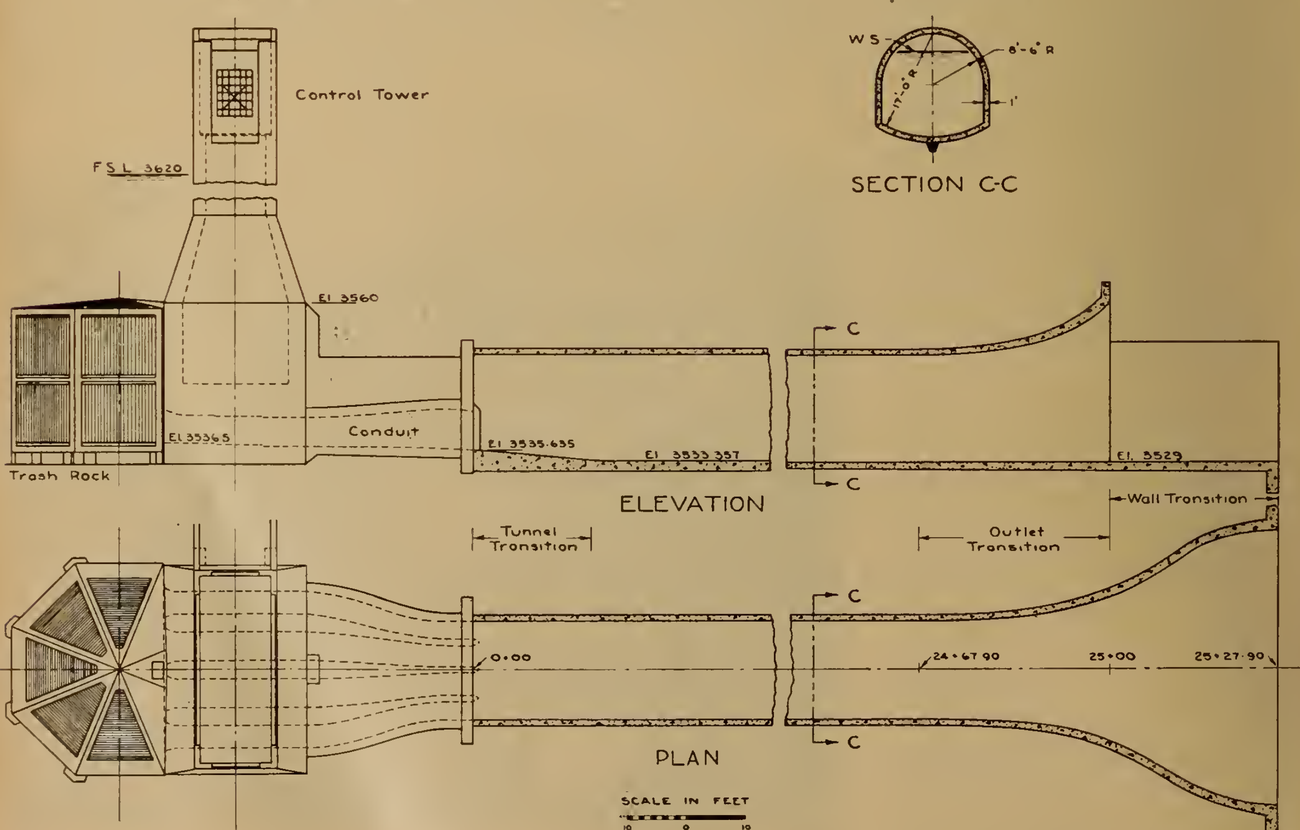
Fig. 7. Pouring concrete in diversion tunnel, St. Mary Dam, using travelling form for the crown.

cubic yards of material, and the placing of 350,000 cubic yards of impervious material in the rolled earth core, the placing of 30,000 cubic yards of gravel fill and the placing of 40,000 cubic yards of rock. Figure 2 shows a typical section through the dam, and shows the location of the cutoff trench and the manner in which the dam is zoned.

Construction Material

The material for the impervious rolled fill is obtained from two borrow pits adjacent to the site but on opposite sides of the valley. The material in these borrow pits is a silty glacial clay suitable for the core of a zoned dam, but not ideal for a homogeneous section. This soil, while very well graded from clay sizes up to sand, is quite plastic and exhibits the properties associated with clays. It is highly impervious, rather difficult to compact, and when compacted in the dry state absorbs water and swells. The natural water content of the soil in the borrow pits ranges from 7 per cent to 12 per cent. The required water content, as determined

Fig. 8. Plan and elevation of the irrigation tunnel as submitted for model test.



by the compaction tests, varied from 14 per cent to 17 per cent, so that from 2 per cent to 10 per cent has to be added to this material to bring it to the proper moisture content for efficient compaction.

The P.F.R.A. has followed the general practice of specifying that the material be brought to the proper water content in the borrow pit. At this project the borrow pit irrigation ditches were flooded previous to excavation, in order to increase the water content of the top 10 feet. The area was irrigated for a period of one month and then drained and allowed to dry for one month. The depth of penetration varied throughout the pit, but an average penetration of 8 feet was obtained. The water content, after the wetting and drying cycle, varied from 20 to 22 per cent at the surface to 14 per cent at a depth of 8 feet. Most of the material was excavated with shovels, which gave a fairly well mixed material.

The rolled fill was compacted with two types of rollers; one was the American Steel Works roller, which had feet 7 inches long and produced a foot pressure of 260 p.s.i. when ballasted with water; the other, a McCoy roller, Model USHD-2, which had feet 8¼ inches long, produced a foot pressure of 400 p.s.i. when ballasted with sand and gravel. An average of ten roller passes were applied to each layer and the compacted thickness averaged 4 inches. The average compacted dry density of the fill with this equipment was 105 pounds per cubic foot, which is 91 per cent of the modified Proctor density.

Pothole Spillway

The drainage area in the Pothole Coulee above the dam is 100 square miles and a concrete spillway, having a discharge capacity of 1,400 c.f.s. when the head on the crest is 4.00 feet, is provided to take storm flows that might originate in the drainage area. The spillway has a crest 50 feet in length, located at elevation 3487.0. The chute width narrows from 50 feet at the crest to a uniform width of 30 feet at a distance 25 feet downstream from the crest. The chute has a slope of 30 per cent down to elevation 3442.0 when it levels off, to discharge into the coulee. A concrete cutoff wall 18 inches thick and 5 ft. 6 in. deep is provided at the crest. A 6 inch layer of gravel is provided under the spillway chute slab to supply drainage.

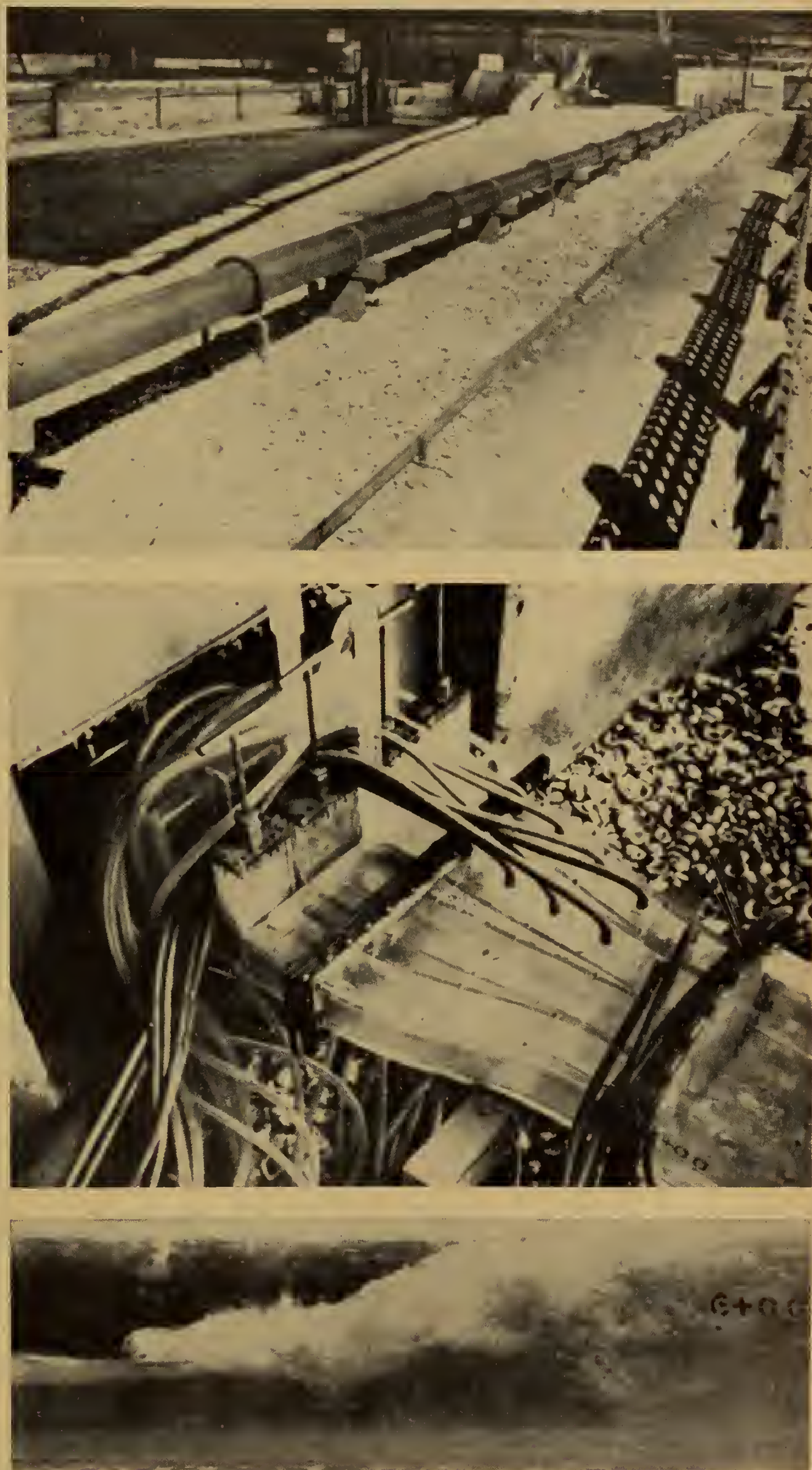
A reinforced concrete conduit equipped with control gates is provided to discharge water into Pothole Coulee to supply water for the Raymond Irrigation District and for stockwatering below the dam. The general details of this structure are shown in Figure 2.

St. Mary Dam

The St. Mary Dam is a zoned rolled earth fill with a maximum height of 186 feet and a crest length of 2,600 feet. The length at the base, across the stream bed, will be 300 feet. The length of the base

Fig. 9. Hydraulic model of irrigation tunnel.

Top—**General view of the 100-foot long model.**
Centre—**View of the gate control structure being tested.**
Bottom—**Photo of the hydraulic jump occurring at Sta. 6+ 00 with three gates open and discharging at design capacity.**



parallel to the stream is 1,450 feet. The construction of this dam will require placing 4,000,000 cubic yards of fill. Figure 3 shows the St. Mary River at the dam site.

The construction is being divided into three separate contracts. The first contract covered the construction of the diversion and irrigation tunnels, and was awarded to Bennett & White Calgary Limited in 1946. The second contract was awarded to the W. C. Wells Construction Company Limited, for the construction of the earth fill dam, in the fall of 1946. A third contract will be awarded in the near future for the construction of the spillway and control works. The total estimated cost of the dam is approximately $4,000,000.

Diversion Tunnel

Figure 4 shows the location of the diversion tunnel, the irrigation tunnel, and the cofferdam. It is planned to divert the flow of the St. Mary River through one circular tunnel 20 feet in diameter with a length of 2,115 feet. This tunnel is lined with reinforced concrete and will have a capacity of 6,500 c.f.s. under a head of 18 feet, which will be provided by the cofferdam. At the end of the diversion period it is planned to plug the diversion tunnel, making provision to pass enough water for riparian uses.

The rock in the region of the diversion tunnel is composed of interbedded layers of soft shale and sandstone with some mud seams. The rock has horizontal bedding planes with an upstream dip of about 3 per cent. The roof could not be arched successfully because of the horizontal bedding planes.

The general plan of the tunnelling operation was to tunnel approximately half the distance from the outlet end and then to tunnel the remainder from the inlet portal while concreting operations were performed from the outlet end. Tunnelling was started at the outlet portal on September 23rd, 1946, and a distance of 1,029 feet was driven by March 17th, 1947. The rock in this section of the tunnel did not require support and no serious rock falls occurred. The rock did, however, disintegrate readily when exposed to air, with the result that fragments of rock continued to spall off the roof.

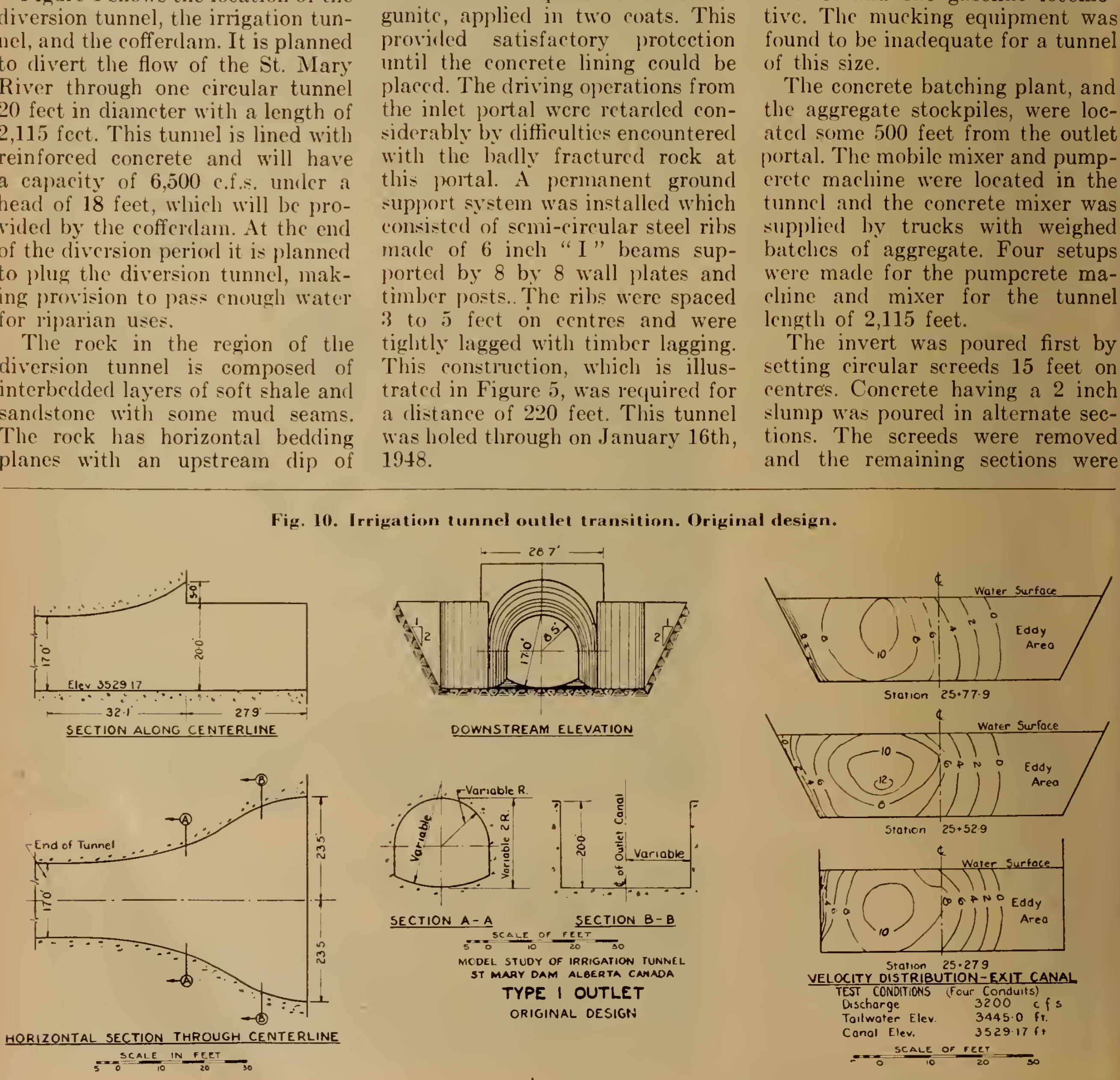
To control this, about 850 feet of this portion of the tunnel was coated with a 3/4 inch thickness of gunite, applied in two coats. This provided satisfactory protection until the concrete lining could be placed. The driving operations from the inlet portal were retarded considerably by difficulties encountered with the badly fractured rock at this portal. A permanent ground support system was installed which consisted of semi-circular steel ribs made of 6 inch "I" beams supported by 8 by 8 wall plates and timber posts. The ribs were spaced 3 to 5 feet on centres and were tightly lagged with timber lagging. This construction, which is illustrated in Figure 5, was required for a distance of 220 feet. This tunnel was holed through on January 16th, 1948.

Two methods were used in driving the tunnel. At first the bench and heading method was used with approximately 45 holes in the face and 16 holes in the bench. The length of round was 6 feet. Four feet of material was left in the invert to make a roadway for the mucking equipment. The muck was removed by overhead loaders and dumptors. The trimming and sizing costs were high in this method. The driving method was then changed to the full face heading method employing 6 automatic feed drills mounted on a 16 foot, 3 tier track-mounted jumbo, shown in Figure 6. Approximately 62 holes were drilled in the face and the length of round was 12 feet. The material from this driving method was mucked with a Conway 75 mucking machine, three 5 yard mine cars, two battery locomotives and one gasoline locomotive. The mucking equipment was found to be inadequate for a tunnel of this size.

The concrete batching plant, and the aggregate stockpiles, were located some 500 feet from the outlet portal. The mobile mixer and pumpcrete machine were located in the tunnel and the concrete mixer was supplied by trucks with weighed batches of aggregate. Four setups were made for the pumpcrete machine and mixer for the tunnel length of 2,115 feet.

The invert was poured first by setting circular screeds 15 feet on centres. Concrete having a 2 inch slump was poured in alternate sections. The screeds were removed and the remaining sections were

Fig. 10. Irrigation tunnel outlet transition. Original design.



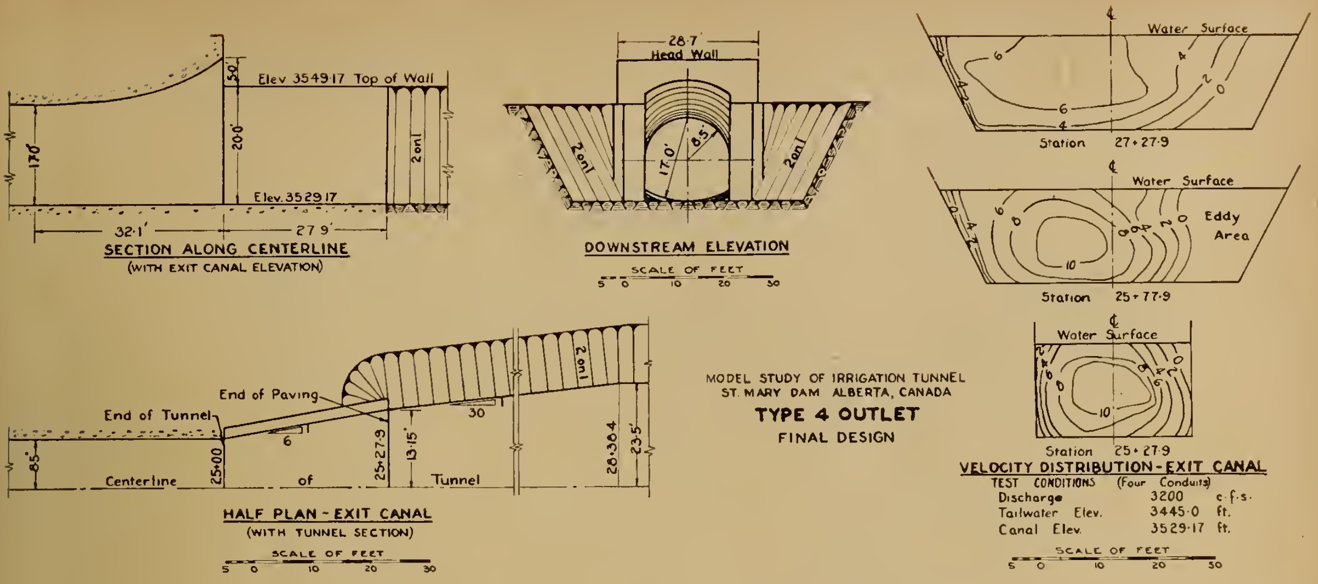


Fig. 11. Irrigation tunnel outlet transition. Final design.

poured. Four travelling retractable forms, 32 feet long, shown in Figure 7, were used to pour the arch concrete. The concrete was pumped through ports in the arch forms and vibrated with immersion type vibrators.

Irrigation Tunnel

The location of the irrigation tunnel is shown in Figure 4. It is 2,500 feet in length, is located some 90 feet above the stream bed, and is of the horseshoe section shown in Figure 8. It is to be used to supply water from the reservoir to the main supply canal. The plan and elevation of the irrigation tunnel, including the trash rack, control structure, gate transition and tunnel transition outlet are shown in Figure 8. The control structure will contain two 5 foot by 5 foot and two 4 foot by 5 foot high pressure gates, and the control is designed to pass 3,200 c.f.s. at heads varying from 25 to 81 feet. The structure was designed so that hydraulic jump would occur in the tunnel, without reaching the roof, for varying combinations of gate discharge. Model studies were made on this structure at the Waterway Experiment Station, Vicksburg, Mississippi, to check the hydraulic characteristics and to develop means for correcting any uneconomic, unsafe or undesirable conditions that might exist in the proposed design. Figure 9 shows photographs of this model. The model was also used to carefully check on the possibility of cavitation occurring in the structure. The only major alteration recommended to date is in the outlet transition. The original design, shown in Figure 10, resulted in an unbalanced velocity distribution pattern. The model studies have produced a simpler form of transition, shown in Figure 11, with a greatly improved velocity distribution at the outlet.

Foundations

The foundation for this dam was carefully explored by diamond drill holes and a thorough geological study of the area was made by Dr. Allan. Forty-three diamond drill holes were put down, varying in length from 30 to 220 feet, with a total footage of over 3,000 feet. The rock along the sides of the valley in the vicinity of the dam is quite uniform, and belongs to the St. Mary River formation. This formation is quite young and consists of interbedded shale and sandstones. The shales and sandstones of this formation have a very low resistance to weathering, but when protected from wetting and drying are as durable as rocks in older formations. This rock in the unweathered condition has a low permeability.

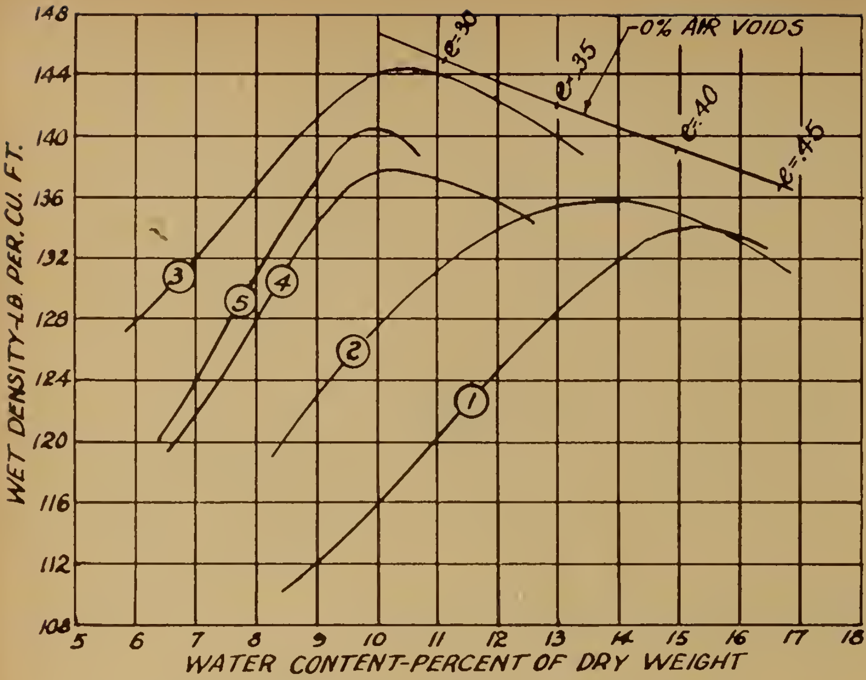
This property was tested by filling completed diamond drill holes with water and observing the time required for the water level to reach the ground water table. The results showed that the top portion of the bedrock was quite pervious, but that the rock became more impervious with depth. This was to be expected because in every hole, weathered and fractured bedrock was found for some distance below the contact with the overburden.

The field work and geological studies indicate that the site is satisfactory for a dam of the proposed size. Considerable stripping will be required to remove the fractured and weathered rock, so that fill can be placed on sound bedrock.

Fill Materials

Three types of materials will be used in the main fill:—impervious, selected pervious and random pervious. The impervious material will be secured from a borrow pit close to the north end of the dam, and the average haul will be about 2,000 feet. The selected pervious material is sand, gravel and rock up to 12 inch size with not more than 10 per cent smaller than the 100 mesh, and it must be free from shale and sandstone. It will be secured from a borrow pit on the north side and the average haul will be about one mile. The random pervious material is sand, gravel and rocks and may contain small amounts of shale and sandstone. It will be secured from a borrow pit on the north bank and the average haul will be about 2,000 feet.

The properties of the impervious fill materials were determined by exhaustive laboratory tests performed by the P.F.R.A. Soil Mechanics Laboratory in Saskatoon. The physical properties of this material were presented by Mr. R. Peterson, soil mechanics engineer, in his paper "Soil Mechanics as Applied to P.F.R.A. Problems with Special Reference to the Proposed St. Mary Dam", which was published in the



1 STANDARD PROCTOR COMPACTION - 12" DROP
2 STANDARD PROCTOR COMPACTION - 18" DROP
3 CALIFORNIA COMPACTION - STATIC LOAD 2000 P.S.I.
4 LABORATORY SHEEPSFOOT COMPACTION - 102% COVERAGE FOOT PRESSURE 500 P.S.I.
5 FOOT PRESSURE 1000 P.S.I.

Fig. 12. Compaction curves of fill material for impervious section of St. Mary Dam.

May, 1945, issue of *The Engineering Journal*. The testing covered classification tests, compaction, shear and consolidation tests, and a brief summary only of the results will be presented here.

Classification Tests

Field Classification—Silty glacial clay (glacial till)

Specific Gravity of soil solids, average — 2.71

Percentage of soluble solids, average — 0.18

Water content in borrow pit Minimum—6%; Maximum—15%

Liquid Limit, average — 35.3

Plastic Limit, average — 14.5

Plasticity Index, average — 20.8

Clay sizes — 30%

Silt sizes — 35%

Sand sizes — 35%

The optimum moisture content was determined for five different methods of compaction and the compaction curves obtained are reproduced in Figure 12. These curves show that the density increases and the optimum water content decreases with an increase in compactive effort.

The tentative section originally proposed for the St. Mary Dam is shown in Figure 13. This section has been modified by flattening the slopes and increasing the base width, and the section that will be used is shown in the same figure. The section was increased and the pervious blankets thickened because the St. Mary glacial clay contains a higher percentage of clay and silt than is considered desirable. The original section would have required compaction equivalent to the high densities attained by the California method, which would have required very close control on the moisture content. The high densities in turn would have created difficulties due to the danger of swelling near the face of the slopes and at the top of the dam. For the adopted cross-section, it is planned to compact the material to a density slightly greater than the range given by the Standard Proctor method, or about 92 to 94 per cent of the Modified Proctor method.

Compaction

The specifications for compaction of the impervious section of the St. Mary Dam required the contractor to bid on the basis of nine passes of the roller over each six inch layer of compacted fill. He was also required to bid a unit price for extra rolling per hundred square feet per pass of the roller. If more than nine passes are required he will be paid for it at the tender price. If less than nine passes are required a deduction will be made at the same bid price per pass. This method of payment removes all hazard from the contractor's bid, and gives the engineer control over the amount of rolling without danger of friction with the contractor. It will, however, require some extra inspection.

The compaction equipment is being supplied by the Government but will be operated and maintained by the contractor, and will consist of: three double drum oscillating rollers with 7 inch feet yielding a foot pressure of 560 p.s.i. when loaded with sand and water; one double drum oscillating roller with 8 inch feet yielding a foot pressure of 208 p.s.i. without ballast and 436 p.s.i. when loaded with sand and water; one double drum oscillating roller with 10 inch feet yielding a foot pressure of 363 p.s.i. without ballast and 530 p.s.i when loaded with sand and water; one single drum roller with 10 inch feet yielding about 360 p.s.i. without ballast and 500 p.s.i. when loaded with sand and water. All rollers are 60 inches in diameter.

Riprap

The riprap for protecting the upstream slope of the dam from wave action presented a serious problem. The local shales and sandstone lacked sufficient durability to be considered for this purpose. Field boulders were the only local materials that possessed sufficient durability, but the supply was very uncertain. It was finally decided to ship rock from Frank, near Coleman, Alberta. This rock comes from the disastrous slide which buried the village in 1903. The rock is durable and is obtainable in the required sizes at a cost that is not excessive.

Spillway

The spillway will contain 12 stoplog openings 20 feet wide by 18 feet high. It will have a capacity of 60,000 c.f.s. with the pools at elevation 3621.5, or 53,000 c.f.s. with the pool at full pond level of 3620.0. The preliminary designs for this structure take the general form shown in Fig. 4. Stoplogs will supply the required control. It is planned to have the hydraulic properties of this structure thoroughly investigated by model tests, so the form shown in this paper should not be considered as final.

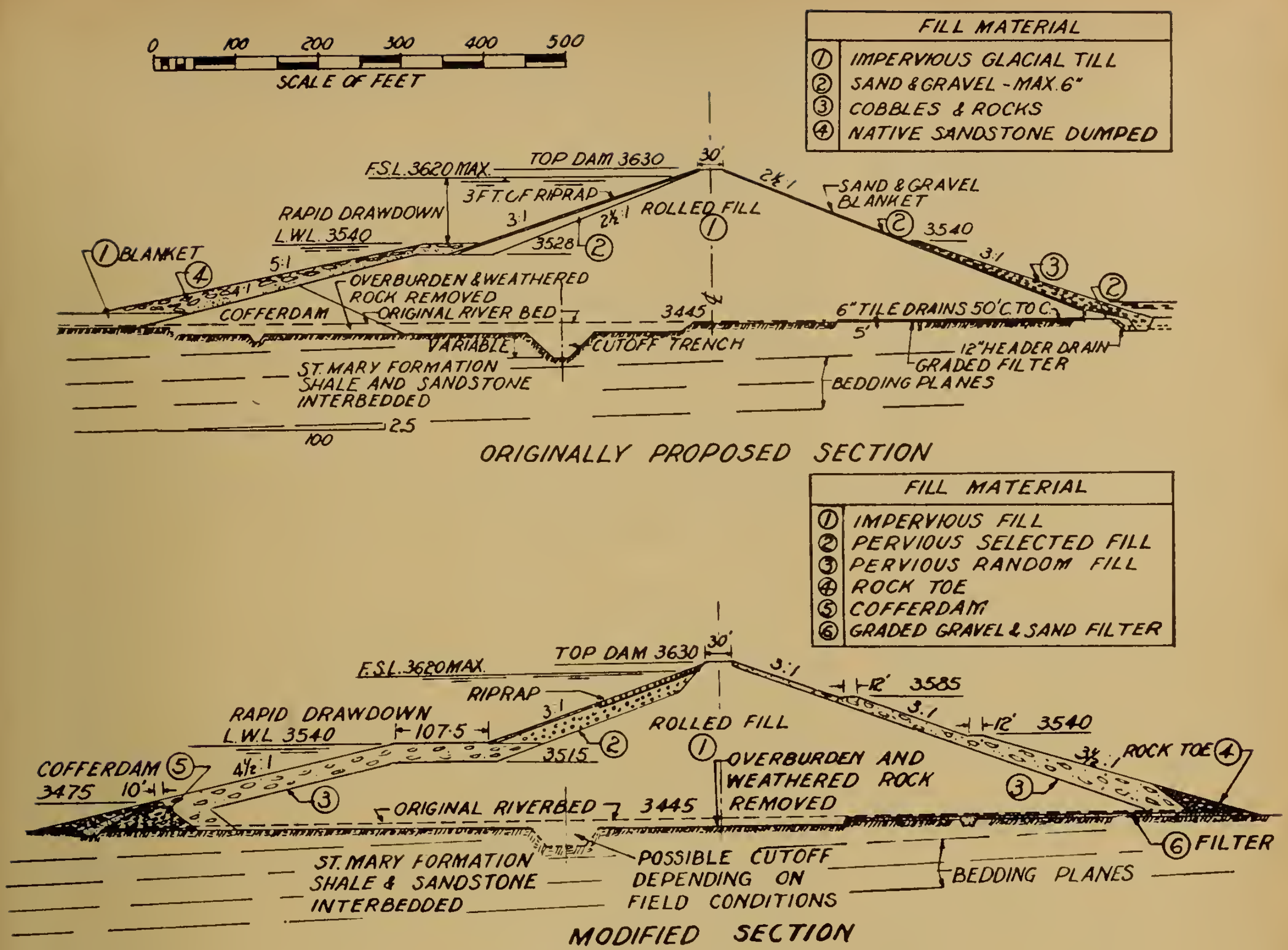


Fig. 13. Original and modified section for St. Mary Dam.

Test Installations

During the past few years more attention has been paid to soil studies previous to and during the construction of earth dams. In keeping with this trend, it is now becoming common practice to install apparatus in earth fills in order to observe their behaviour during construction and later during operation. This type of apparatus is used for the purpose of measuring the settlement or compression within the fill, the pore pressure within the soil structure, and the seepage or free water line through the structure.

Two types of pore pressure measuring devices and one type of settlement measuring device are being used by the P.F.R.A. These devices have been installed in the Pothole fill and it is planned to use similar equipment in the St. Mary fill.

The pore pressure installations will give warning of excessive pore pressures caused by consolidation in the impervious material. High pore pressures may cause a reduction in shear strength, and it may be necessary to either suspend fill construction until the pore pressures are dissipated through drainage, or in other cases it may be necessary to modify the design. Pore pressure measuring devices will also give valuable information on the location of the seepage line, the effectiveness of cutoffs, and the relative permeability of the various materials in the dam and foundations.

It is now recognized, in connection with the settlement of fills, that the best procedure is to compact impervious fill materials to such a density that they will neither consolidate nor swell. Settlement devices make it possible to determine this ideal density in the field and at the same time estimate the settlement that might still occur after construction.

The test installations at Pothole have, on the basis of results to date, provided valuable information that can be used in connection with the St. Mary Dam.

Progress

This outline presents the project as it stands today. The Pothole Dam is nearing completion and the St. Mary Dam is in active construction stage and should be completed in 1950. Some work has been done on the main canal, and completion of this and the construction of reservoirs will be the next stage. As the various stages proceed the water can be delivered to the different sections of the area. Before much of the land comes under the ditch it will be necessary to complete the diversions from the Waterton River and Belly River to complete the water supply for the project. The estimated cost of the whole project is $15,000,000.

Maj. Gen. H. B. Ferguson of Washington, D.C., is the consulting engineer for the St. Mary Dam, and Dr. J. A. Allan, M.E.I.C., of Edmonton, is consulting engineering geologist. The project and structures design is under the direct supervision of W. L. Foss, M.E.I.C., project engineer for the St. Mary-Milk River Project. J. G. Watson, M.E.I.C., is resident engineer on the St. Mary Dam, and J. H. Harding, JR.E.I.C., is resident engineer on the Pothole Dam.

Discussion

Ben Russell, M.E.I.C.[1]

Mr. MacKenzie gives the capacity of the main canal from the St. Mary River as 3200 c.f.s., which he states will supply water to irrigate a total of 513,000 acres in the project. While there is that amount of irrigable land and more which could be irrigated, the limiting factor is the available water supply. Heretofore, the project has been so limited to 465,000 acres, 120,000 of which are under presently constructed canals and 345,000 acres of new lands.

It is presumed that the additional water available is from the Waterton River and will be made available through storage, but such storage development will add considerably to the total construction cost, which will then considerably exceed $15,000,000. It would probably be interesting if Mr. MacKenzie could explain the situation with regard to the Waterton River diversion.

It might be pointed out that the St. Mary and Milk River development is an enlargement and extension of the Alberta Railway and Irrigation project, which to facilitate the development of the larger project, has recently been taken over by the Alberta Government. It is now operated for the Alberta Government by a manager, P. M. Sauder, M.E.I.C., and assistant manager, George Brown, M.E.I.C.

Further water appropriation from the St. Mary, Belly, and Waterton Rivers will require to be made for the projects by the Alberta Government, and the construction plans approved.

W. L. Foss, M.E.I.C.[2]

The author has perhaps attempted to cover too much territory in a single brief paper. Any one of the several subjects touched upon would provide data for a paper of equal length.

In discussing the irrigation tunnel, the author neglects to mention the outstanding feature of this design. This feature is the successful attempt on the part of the original designers to dissipate 30,000 hp. of energy without spending any money on stilling basins, baffles, or any other type of energy dissipator. The simple structure which was, in any case, required to carry irrigation water from the reservoir to the canals, is utilized "as is" for the dissipation of this rather large amount of energy.

It is not claimed that this is the first time energy has been dissipated in an outlet pipe, such as may be found through smaller dams and structures almost anywhere. It does seem, however, that the successful calculation of energy losses from point to point in the tunnel along with the prediction of water levels and location and height of jump is rather unique. Testing engineers at Vicksburg had not seen this attempted before, and agreed that the design was definitely original. The model tests bore out the original calculations exactly, even as to the location of the jump, and the magnitude of negative pressures.

The author might well have elaborated more on this point instead of devoting so much space to the outlet transition. Since there is a rock cut for some distance beyond the concrete transition, this feature of the test is not important. Even if it had been important, it is not agreed that the author is correct when he states that, quote: "The simpler form of transition, shown in Figure 11, shows a greatly improved velocity distribution at the outlet". If the section at station 25+77.9 in Figure 10 is compared with the section at the same station in Figure 11, it will be seen that they are almost identical. This section is 50 feet downstream from the end of concrete and is therefore significant.

The question of the design of the outlet transition was never considered to be one of the important problems. One reason for the model test was to check for negative pressures in and beyond the conduits, where velocities reach 63 feet per second. Another reason was to make certain that waves and pulsations in the high velocity jet would not reach proportions which may cause bad flow conditions.

In connection with the design of the earth dam on the St. Mary, the author failed to mention an important point. This point has to do with the discovery in 1946 of one and one-half million yards of pervious material right near the site. The cross-section in Figure 13 referred to as the "original design" was first drawn up in 1940 essentially as shown. This was done for estimating purposes only, and at that time it was agreed by various authorities consulted that gravel would have to be hauled fifteen miles or more. Exploration work for borrow material had hardly begun, but it was known that plenty of impervious glacial till was available for the construction of a dam of this size.

The desirability, if not the absolute necessity, of a fair percentage of pervious material for the construction of a dam of this size is universally known. It is necessary at times, however, to make the best use of the material at hand. If gravel had not been discovered, it would probably have been necessary to greatly increase the quantities in the dam, and close control during construction would have been essential.

The author has left the impression that the original section was submitted because at that time it was considered to be a satisfactory design. Nothing is further from the truth and the present design owes its superior qualities largely to the discovery of pervious material close at hand.

In conclusion it must be agreed that Mr. MacKenzie's paper is very comprehensive and enlightening to the general reader. It gives a clear picture of the project, and criticism is confined to technical details which will be of interest only to hydraulic engineers.

[1] Director, Water Resources, Province of Alberta.

[2] Supervising Engineer, P.F.R.A., St. Mary Milk River Project, Lethbridge, Alta.

Irrigation in Western Canada

Its Possible Effect on Industry & Population

by

A. E. Palmer, M.Sc.

Superintendent, Dominion Experimental Station, Lethbridge, Alta.

A paper presented at the Annual General and Professional Meeting, The Engineering Institute of Canada, Banff, Alberta, June 2, 1948

This paper deals with the potential development of food processing industries arising from further irrigation development in the prairie provinces. Briefly describing existing plants and their annual value of production, the author discusses the possibilities for beet sugar production and its chances of competing with cane sugar, as well as the market prospects for canneries, creameries and other processing industries. Possible growth in rural and urban population resulting from irrigation development is assessed.

The possibilities for industrial development and land settlement that may accompany irrigation expansion in Western Canada are impressive. They may be predicted with some degree of certainty from the experiences of existing irrigation projects in Alberta and similar ones elsewhere, and by examining the potentiality for production that should exist on the projects as they are developed.

Industrial Development

The usual industrial development that accompanies dense settlement may be expected, as irrigation projects are constructed and become populated. The possibility of electric power production as an integral part of some of the projects will also stimulate certain industries. However, the type of industries that are almost certain to be of major importance are those devoted to the processing of bulky crops that cannot be shipped for long distances in their unprocessed state. This is the type of industrial development that will be considered in this discussion.

It should be understood that the establishment of food processing industries is a natural accompaniment of irrigation development under conditions as they exist on the Canadian prairies. One reason for this is that there are large acreages in block, with uniform soil and climatic conditions, where a sufficient supply of raw products can be secured without long freight hauls. A second reason is that a uniform supply of the raw material, both as to quantity and quality, may be expected each year because of small fluctuations in yields. This is because the drought factor has been eliminated in an arid area where there is but a minimum of other climatic hazards. Under irrigation a dry climate with long growing seasons becomes a valuable asset to those who make large investments in processing plants. This explains why the beet sugar and canning industries are growing in Southern Alberta.

Present Development of Industries

Now let us see what has taken place in this regard in the irrigated areas now operating. So far, most of the processing plants have been located in only three of the existing projects in Alberta, i.e. the A.R. & I., now the St. Mary Development, the Lethbridge Northern, and the Taber projects. These have a total irrigated area of 250,000 acres.

In these projects there are two sugar factories, with a third now under construction, and three canning factories, one of which has a freezing plant, and is one of the largest canning plants in Canada. The total value of these plants when the new sugar factory is completed at Taber will be about $9 millions, or an investment of about $36.00 per acre for each irrigated acre of the projects served. The revenue from sugar and canned goods in 1947 was about $9 millions.

Future Development of Industries

While the Lethbridge-Taber area has had important food processing development, this cannot be considered as complete. Neither is it safe to say that other areas yet to be brought under irrigation may have a similar growth of industries. Perhaps of the 1,000,000 additional acres projected for irrigation in Alberta, 750,000 acres would be potential sugar-beet and canning crop territory. 250,000 more acres of land now irrigated is satisfactory for these crops. With no more intensive development than now exists in the Lethbridge area the projected development in Alberta could well support 12 additional sugar factories and 12 canneries.

Obviously such expansion may not be feasible under existing market conditions. Twelve additional sugar factories could supply Canada with 65 to 70 per cent of her entire present sugar needs. The market for canned goods is problematical and may be greatly influenced by the extent of development that takes place in Canada's Northland. The growth of these industries thus depends on markets as well as on irrigation expansion.

The Position of Beet Sugar

While future market possibilities cannot be predicted, it should not be overlooked that the irrigable lands of our prairies are one of the world's natural sugar bowls, as well as a potential source of other processing crops. The average production in Alberta is now almost two tons of refined sugar per acre per year. That is about equal to the acre production from cane in some tropical areas, and it takes no more man hours of labour to produce a pound of beet sugar than it takes for a pound of cane sugar. This is partly due to the high sugar content of our beets, almost 18 per cent, which is higher than from most beet producing areas, and compares with 11 per cent of sugar in the cane plant. Considering all factors that go into the cost of producing sugar, the irrigated areas of the "dust bowl" of Western Canada should be able to compete with almost any other sugar producing locality where wage scales are similar.

Two factors will greatly affect the competitive position of this locality in sugar production. These are, the influence of the present social changes on wage rates in tropical sugar producing countries, and the mechanization of beet and cane agriculture. The agitation for better standards of living by the peons, if successful, may materially improve the position of beet sugar. Mechanization of sugar beet agriculture is progressing rapidly and is likely to be fairly complete in a decade. Mechanization of cane farming, especially harvesting, is not developing nearly as rapidly, but if both become fully mechanized the factor of wage differentials will be less important.

The position of the sugar beet is definitely improving in the world sugar picture, and this may have a marked influence on the proportion of Canada's sugar that the irrigated lands will produce. The total amount of sugar that the world will demand also is problematical, but a greater consumption is indicated because of increased industrial use.

Obviously the reason for considering the sugar situation in connection with irrigation is that sugar refining at present promises to be the most important food processing enterprise in our irrigation development. If a market is available it is likely to be as important as it has been in the localities now served by sugar factories in Alberta, and may duplicate the development of the northern irrigated prairie area of Colorado, which has soil and climatic conditions similar to ours. North of Denver, Colorado, twelve sugar factories are operating in an area having about 800,000 acres of irrigated land.

Vegetable Canning

Canning crops of importance today in Southern Alberta are peas, corn, beans, pumpkin, carrots, and table beets. Some pork and beans have been canned, and dry beans for such a product can be grown without difficulty. This year a start may be made with asparagus. Cabbage for kraut could well be added to the list. So far a tomato variety has not been found that is suitable for canning, and that is adapted to the climate of the area. However a breeding programme is under way at the Lethbridge Experimental Station that may produce such a tomato.

Other Processing Crops

Other food processing besides sugar and canning is not so far of great importance on present irrigated prairie lands. There is some production of creamery products, which could be developed to sizeable proportions by the use of irrigated pastures. Dairying may well become of major importance in the Youngstown to Coronation area if the Red Deer project is installed. Climate, soil, and topography there indicate that permanent pastures may be one of the logical uses for much of that area. It is almost impossible to predict other food processing that will develop. Much will depend on the use made of agricultural crops in the manufacture of plastics, fuel alcohol, and various synthetics. The irrigated lands are potential sources of large, concentrated production of carbohydrates from other crops besides sugar beets. The future of this is still to be explored.

Population Possibilities

The possibilities of food processing industries has been considered before discussing the population potential of irrigation projects. This was done because the number of people the land will carry will be much greater if specialized crops are produced for processing plants, than if grain or meat products are the principal sources of income. The present development in Alberta indicates this difference. In the sugar beet and canning crop areas, there is a farm family now for about each 80 acres of irrigated land. In the other districts this farm population is about one half as dense.

Should farming develop only as intensively as it is now in the Lethbridge-Taber area it is safe to estimate a farm family of five for each 80 acres, including farm labourer's families. This would give a population potential of 46,875 farm residents for the 750,000 acres of the projected development in Alberta considered to be climatically suited for intensive production of processing crops.

The number of urban people supported by the business created from the irrigated lands has been estimated at from one to two for each person on farms. If we take the mean of this figure, or $1\frac{1}{2}$, we get a possible urban population of some 70,000 and a total on farms and in towns of about 127,000 for the 750,000 acres of favourably situated lands. This is slightly over one person for each 6 irrigated acres.

The population possibilities of the additional 250,000 acres of projected irrigation development in Alberta would be less per acre. Perhaps it would not be more than one half, or about 12 acres per person on and off the farm, or a total for the area of just over 20,000. Thus the grand total for the million acres of expected additional irrigation in Alberta indicates a possible total of 147,000 increase in the population. The possibilities of the Saskatchewan area where large scale irrigation is being considered are not well enough known by the author to warrant discussion here.

Discussion

C. S. Clendening, M.E.I.C.[1]

The speaker, Mr. Palmer, has covered food processing of specialized crops on irrigation lands very fully as practised to date. He has mentioned that other products could be grown if markets are found. This is important, since there are great opportunities for research work in other crops that may be grown on irrigated land and manufactured into not only food stuffs, but other manufactured materials as well. Irrigation is a great asset to the country as a whole, and if this country of ours is to have the population it should have, these natural resources will have to be developed. A little study will show that our water resources protected and used properly will give as great a return as any other resource.

S. H. Hawkins, M.E.I.C.[2]

The subject of Mr. Palmer's paper is very timely. The question of the effect of fairly large scale irrigation development on population and industry is of very general interest to all of us. Present world trends appear to indicate that increasing populations and general demand for higher living standards will bring most of the remaining wide open spaces in the temperate zones under the plough in the not distant future.

Many of the still unproductive areas are arid or semi-arid, and of the latter class we possess a large share in Western Canada. It seems reasonable to suppose that much of this land where water is available and where soil, climate and topography are favourable will, as demand for production increases, be finally put under irrigation.

World population, despite the bigger and better wars of the twentieth century and despite birth control, the motor car and the airplane, is increasing at a terrifyingly accelerated pace. The subcontinent of India alone contributes an annual increase of something more than 5,000,000 people. One hundred and fifty years ago Malthus predicted that chronic hunger would be the lot of the vast majority of mankind, and for long his arguments appeared sound. Then the industrial era was born and the age of plenty arrived, and until quite recently Malthus has been generally discredited.

However, during the past twenty-five years many people have come to realize that the Malthusian theories may not be far off the beam. There have in that time been several terrible famines in China, India, and on the Volga and in the Ukraine, and of course the chronic food shortage of the past four or five years in Britain and in large areas of Europe. Rice has been terribly short in Asia and wheat, in spite of several enormous crops in Canada and the U.S.A., has had to be dealt out with care.

One of the obvious ways to increase world food supplies is by irrigation of areas in which soil and climate are favourable for agriculture, but where rainfall is inadequate for the production of cereals and root crops, or even of grass with any certainty. Man has, along the Nile, in Arabia and north Africa, in India and central Asia, and elsewhere since the very earliest times, diverted or pumped water from rivers or wells into the land to augment his food supply. Many historic cities and peoples depended almost entirely on these irrigated lands for their existence. Samarkand, Bokara and Babylon, and the Nile Valley cities are examples.

More recently, in the New World, and especially in the United States, men have turned their eyes to the streams which pour out of the Western mountains, and have, since 1900 brought many millions of acres under the ditch. The Bureau of Reclamation has, since 1902, expended about one billion dollars on irrigation, and now proposes to expend in the next ten years about two billion. This indicates the trend of thinking in Washington with one eye no doubt on the increasing population of the U.S.

Here in Canada we have no great and rapidly growing population to demand food in excess of our capacity to produce, but we have large semi-arid areas of fertile soil fairly adjacent to mountain sources of water supply. And, as Malthus pointed out, we have these swarming millions of Asia, and to a lesser degree of Europe, living on the thin edge of starvation, clamouring for food. Can one doubt that under the growing pressure of this demand, we will in some way be compelled to develop these great potential sources of supply. Mr. Palmer states that the several projects now under consideration in Alberta could add some million acres of irrigated land to the total for this Province.

Let us examine the arguments in Mr. Palmer's paper in reverse. What happens to an irrigated territory, when for some reason, generally war and anarchy, the canals and reservoirs fall into disuse or are destroyed? We have several historic examples. Samarkand, under the great Khans and until the death of Tamerlane, was the centre of a vast system of canals and ditches, fed by the Amu Darya River the Oxus of Alexander. Turkestan was one of the centres of world wealth and culture. After Tamerlane the empire disintegrated, the canals went unrepaired and the desert took over. One can read the same story in the histories of the Sumerians, the Babylonians, and the Assyrians, who successively occupied the Mesopotamian plain. These empires rose or fell with the waxing or waning of their great irrigation systems. What would happen to Egypt and the Nile Valley, should the Nilotic flood fail to arrive? The southern foothills of the Atlas were once well watered by mountain fed streams and supported a teeming population, as French and Algerian scientists have proved. The lower slopes were forested and animal life was abundant. But the streams dried up, desiccation followed, and the forest, and the animals and the men and their cities were swallowed by the desert.

Mr. Palmer is too modest. He points out only the direct gains in population and industry, which may be expected to follow successful irrigation under favourable soil and climatic conditions. There is also a great indirect gain in rail and road traffic, in demand for manufactured consumer goods, and cars and trucks and machines and building material. Every successful irrigation project is like an oasis in the desert, a focal point around which stability and prosperity will be created.

Denver, Salt Lake City, our own young Lethbridge, and scores of other western cities are irrigation babies. East and south of Hanna, on our projected Red Deer Project, lie two million acres of mostly fair quality land, from which

(*Continued on page 504*)

[1] Project manager—Lethbridge Northern Irrigation District, Lethbridge, Alberta.

[2] Project engineer—Prairie Farm Rehabilitation, Regina, Sask.

Hydro Power Development on the Eastern Slopes of the Canadian Rockies

A paper presented at the Annual General and Professional Meeting, The Engineering Institute of Canada, Banff, Alberta, June 2, 1948

by
T. D. Stanley, M.E.I.C.
Production Superintendent, Calgary Power Ltd.

Tracing the history of early hydro power development in Alberta, the author outlines early projects built by Calgary Power, as well as the more recent additions for storage and generation. The importance of storage on rivers arising on the Eastern Slopes of the Rockies is shown, as well as how Alberta rivers are naturally divided between storage and production sections. Various local problems in design and operation are discussed. Reasons are given why storage for power is advantageous to irrigation. In conclusion Alberta's hydro power resources are described and suggestions given as to how they may be fully utilized.

When the first white explorers travelled across the plains towards the snow capped Rocky Mountains, the peaks appeared only as a barrier to their progress westward towards the "North-West Passage". However, these mountains have turned out to be the source and reservoir for the rivers which water the great plains of the Prairie Provinces. As the main use of the waterways at that time was for transportation, the Bow River at Calgary was considered a "navigable stream". But it was soon discovered that this river had far too steep a gradient to be used for the transportation of anything but saw logs.

A sawmill was built in Calgary in 1886, and in connection with the mill pond a fall of 12 feet was developed. The electrical industry was in its infancy when the Calgary Water Power Company used this 12 feet of head to develop 280 hp. in the first hydro plant on the Bow. The plant, built in 1893, was authorized by the Dominion in Water Power License No. 6. This plant produced power until 1928, when obsolescence and small output dictated that it be shut down.

Early Calgary Power Co. Plants

As the country developed, so did the demand for building materials, and the Canada Cement Company built a cement plant at Exshaw. In 1909 the Calgary Power and Transmission Company, later to be known as the Calgary Power Company, and more recently as Calgary Power Ltd., was formed to develop the head on the Bow River at Horseshoe Falls near Seebe, nine miles from the Cement Plant at Exshaw. This cement plant was the first concentration of load in Alberta, and it was natural that nearby hydro power be used to oper.-ate it.

The Horseshoe plant of the Calgary Power Company was completed in 1911 with an installed capacity of 20,000 hp. It is still in operation, and is situated at Seebe, Alberta, about 60 miles west of Calgary. This plant was built on very meagre water records, and after the first winter of operation it became evident that the winter flow would have to be supplemented if firm winter power in any quantity was to be produced. In order to correct this deficiency the first storage development on the Bow River was constructed at Lake Minnewanka in the winter of 1912. This development raised the level of the Lake some 16 feet, with 12 feet of active storage, affording some 44,000 acre feet of storage.

In 1913 the Kananaskis Plant was built 2½ miles above the Horseshoe plant at Kananaskis Falls, just below the confluence of the Bow and Kananaskis Rivers. It has an installed capacity of 12,000 hp., and is operating today. These two plants develop a total head of 149 feet.

In 1911 and 1912 the Dominion Government realized the need to study the power resources of the Bow River basin. Mr. M. C. Hendry was given this assignment, the results of which are summarized in Water Resources Paper No. 2. This paper gives a very complete description of the power possibilities of the Bow and is a credit to the engineer who prepared it. Subsequent information and events have proven him right in most cases, although some variations have been necessary because of the developments in the art of power generation. It is interesting to talk to one of our prominent Western members, Mr. P. M. Sauder, when he tells of survey work done on the Bow River below its confluence with the Kananaskis in 1905.

More Recent Installations and Storage

The Kananaskis and Horseshoe plants, combined with the City of Calgary steam plant, and the steam and hydro plants of the Calgary Water Power Company, carried the load in the Calgary area until 1929. However, in 1921 the Calgary Power Company, wishing to start a programme of expansion to feed the many towns and hamlets in the Province, as well as to extend to the cities of Edmonton, Lethbridge and Drumheller, made application for the development of the Spray project (first investigated by M. C. Hendry in 1911 and 1912).

After years of negotiation this expansion programme was started in 1926, but included the Ghost plant instead of the Spray. The Spray was not developed due to its being in the National Parks, in spite of the fact that development of storage in the head waters was so essential. The Ghost plant, completed in 1929, was built just below the confluence of the Ghost River with the Bow. This plant has an installed capacity of 37,450 hp. with an ultimate capacity of 55,450 hp. A head of 110 feet was developed by a combined concrete and earth fill dam. 75,000 acre feet of storage is available.

In 1932 the initial development of storage at the Upper Kananaskis lakes was completed, giving a capacity of 40,000 acre feet. The depression which followed, and the slow recovery, meant that these plants were adequate until the beginning of the war, at which time industrial expansion for war purposes in the Calgary area required additional generating capacity. To meet this necessity the Cascade plant near Banff was constructed, and the Lake Minnewanka storage enlarged to 180,000 acre feet. This plant was completed in August, 1942, with an installed capacity of 23,000 hp. under a head of 340 feet.

The development has two interesting features, Firstly, the control dam between Lake Minnewanka and the canal to the power house where, although the top half of the reservoir comes off by gravity, the balance is pumped by means of three axial flow pumps, having a combined output of over 700 c.f.s., using 2200 hp., and raising the water an average of 14 feet. Secondly, in order to increase the inflow to storage a diversion scheme is in operation, whereby water is diverted from the head water of the Ghost River back into the mountains, to pass through three plants before it reaches the mouth of the Ghost River. The value of this water is also enhanced, because it is held in Lake Minnewanka for winter use.

The fall of 1942 saw the storage further developed on Upper Kananaskis Lake to its final capacity of 100,000 acre feet. It was considered this plant capacity would be adequate for some years to come, as it was expected the load would drop off following the war. However, in common with all other electric utilities, the load continued to increase, and the Calgary Power Company completed the Barrier plant on the Kananaskis some seven miles above Seebe in 1948. A head of 151 feet was created by means of an earth fill dam. The plant has a rated installed capacity of 13,500 hp. backed up by 15,000 acre feet of storage.

The loads have continued to grow at a phenomenal rate. Whereas the actual electrical load in this Province is small as compared with the load in other provinces of the Dominion, it is found that the rates of increase are greater, the average for the first four months of 1947 being in excess of 18 per cent. It is now evident that additional plant capacity is necessary in the Province. Even with the installation of 30,000 kw. in the Edmonton steam plant which is presently being carried on, additional hydro power or other development must be proceeded with at once.

So much for the history of the development of hydro power on the Bow River, which includes all the presently developed water power on the eastern slopes in Alberta. Mr. Russell, in his excellent paper, has mentioned that there are many power sites available in Alberta. It is not necessary to enumerate them here, but there are several factors which will influence the development of these sites, and which make the Bow the principal power stream of the Province now and in the immediate future.

Storage Important on "Eastern Slope" Rivers

The most significant phenomenon which affects the production of power on the eastern slopes of the Canadian Rockies is the seasonal variation in the flow of the rivers. During the winter, when all precipitation is in the form of snow, the only available water supply is from glacial melt due to pressure, ground water storage and the natural storage of relatively few lakes. Conversely, the late spring and early summer flows are very high when the winter snows are melted by excess rain during this period. On the average, 70 per cent of the total flow occurs during the three and one-half months from May 15 to Sept. 1.

The minimum flow at Calgary has been recorded as low as 360 c.f.s., whereas the estimated peak is 99,000 c.f.s., making a ratio between minimum and maximum of 1 to 275. It is thus necessary, both for power and irrigation, to store some of this excess run-off to be used in the late fall and winter. This condition is in contrast to many of the eastern streams in Canada, which are fed from the many lakes and muskegs of the Precambrian Shield, where the run-off is much more gradual due to the natural storage facilities in these lakes.

It becomes very essential early in the development of any stream for power purposes that storage be developed on its upper reaches, in order to supply additional water during the winter season. As the low water season extends for a period of from 200 to 220 days, the storage capacity required is appreciable in comparison to the flows in the river during the winter. The slopes of these mountain streams being very steep, it is essential in order to create large volumes of storage, that lakes exist in the headwaters. The levels of these lakes may be raised to afford the necessary storage; provided, of course, that there is sufficient drainage area above them to supply the required water during the high water period. The Bow River has these necessary lakes, both on the main stream and on its tributaries. However, the lakes on its tributaries are much more important than the Bow Lakes, which are on the main stream.

The winter flow of the Bow at Seebe, without storage, averages some 500 second feet, and by means of storage developments, this may be increased to between 2300 to 2500 second feet.

The best storage sites in the Bow basin are on the three main tributaries, namely, the Cascade, Spray and Kananaskis. The storage on the Cascade has already been developed in Lake Minnewanka, where 180,000 acre feet are available. The Upper Kananaskis lake has been developed with 100,000 acre feet of storage. For the future the Lower Kananaskis lake will afford an additional 100,000 acre feet, and the Spray Lakes area can produce 180,000 acre feet. It is thus apparent that approximately one-half of the available storage on the Bow has now been developed, and the average winter flow has been increased to between 1500 and 1700 second feet at Seebe.

Two other noteworthy streams in the Province are the Athabaska and the North Saskatchewan. The Athabaska has some similarity to the Bow, in that storage may be developed at Maligne Lake, Bruel Lake and Jasper Lake. For this reason, and others which will be pointed out later, it is a stream of some power potentialities. The North Saskatchewan has only small lakes in its upper reaches, and these would provide very little storage. Any storage which may be developed on this river would have to be done on its lower reaches, by means of extra large dams on the main river. However, as pointed out in Mr. Russell's paper, the North Saskatchewan can supply much needed water for both irrigation and power by diversion into the Red Deer.

Storage and Production Sections

The drainage basin of the Bow River in the mountains and foothill area may be divided into two sections. The first, the storage area mentioned above, which is upsteam from the Kananaskis plant; and second, the power producing area which extends from the Kananaskis forebay to below Calgary above the irrigation dam at Carseland. Between the Carseland dam and the point at which the Bow joins the Oldman to form the South Saskatchewan, the river has entered the plains area and its power possibilities have greatly reduced, but its irrigation potentialities have increased.

It is obvious that storage alone will not produce power, and head must be created to achieve power production. In the storage area all the above mentioned sites can produce power in connection with the storage developments. The Cascade has 340 feet developed, the Spray has 1285 feet capable of development, while the Kananaskis has 151 feet developed with at least an additional 600 feet for the future. In the power section of the river there is an over-all drop of some 1155 feet, of which 259 feet have now been developed, but power sites exist to develop 960 feet of this total. This shows the very high percentage of possible development, and when used in conjunction with the storage area, affords ample power potentialities to supply the adjacent industrial area for some years to come.

Bow the Principal Source of Power

There are several sites on the Athabaska River which also fall into this category. At the present time, however, they are too remote from existing load centres to afford economical development in comparison with the development of power on the Bow River.

Another reason why the Bow River is, at the present time, the principal power stream of the Province is that the demand for power first occurred in the settled areas adjacent to the Bow River, and as the first power plants were built along the Bow, and the storage developed as early as 1912, the Bow, so to speak, got a head start on the other streams in the Province.

Once development has started on a stream it becomes more and more necessary from a cost standpoint to continue its development, because the increment of costs of development becomes relatively less. This is an obvious fact to those interested in power development, but to illustrate: if the water in a reservoir can be used through say 200 feet of head, and another plant is constructed with an additional 200 feet of head, the value of the stored water in the reservoir has doubled. The Bow River, at the present time, has an average winter flow of around 1500 c.f.s., which means that about 1000 c.f.s. is available from storage, and with this start it is very hard for power sites on other rivers to compete on a cost basis.

Good Sites Only on Bow and Athabaska

As the waters on the eastern slopes which feed the prairies rise in the mountains, it is logical to suspect that in the general processes of geological change gravel and debris should be carried from the mountains to the plains area. We find this to be the case, as in practically all streams from the mountains huge gravel deposits can be found in the river beds. In fact, some of the streams are flowing on such tremendous deposits that very little of the stream is flowing on the surface. One of the notable streams in this regard is the Ghost River. It is an axiom that in order to build a dam one must have good foundation conditions in places where the river bed is narrow. Many of the streams on the eastern slopes have very deep valleys, which are reasonably narrow, but these valleys have been filled up with debris and gravels so porous that it is impossible to build structures on them.

The Bow River, in the power section referred to, is the exception to this general rule. Due to some unknown conditions the Bow has cut itself a narrow and deep bed in the bottom of a wide valley. In so doing, it has carried all the gravels and debris out on to the plains and exposed the bedrock in many places along its course, making available reasonably good foundations for dams at shallow depths.

The heavy glaciation which has taken place in the Bow River basin has left great deposits of glacial till, a material ideal for the construction of earth fill dams. This type of dam is much cheaper than concrete, provided suitable material is available for its construction. Whereas there is ten times more yardage in an earth fill dam than in concrete, the relative cost of moving dirt by modern dirt moving equipment has been going down through the years, while the cost of concrete is going up. Even if ten times the yardage has to be moved, it is much cheaper to move ten yards of earth at say 50c per yard than it is to place one yard of concrete at say \$15.00 or \$20.00 per yard. As the dams are relatively large in comparison with their power output it is necessary to achieve all the economies possible in these developments. If it were not possible to build earth dams the developments could not be constructed.

Bedrock is available on the Athabaska River, but the North Saskatchewan and the Red Deer, in common with most of the other rivers, when they reach the prairie regions, have poor foundation conditions. As they require high dams the problem of building structures becomes very expensive, if not prohibitive.

Problems in Design and Operation

The centers of hydro power production in Canada, as we all know, are in Ontario, Quebec and eastern Manitoba. It is characteristic of the Precambrian area that coal and natural gas are not present. In the area fed by the drainage from the eastern slopes of the Rockies, where the rocks are of sedimentary origin, there is an abundant supply of coal and natural gas. Hence the cost of power developed by fuel plants, as compared with what it would be in other sections of Canada, is reasonably lower. As a kilowatt hour, from the consumer's standpoint, is the same no matter how developed, it is the cheapest type of development which must be used. Thus, at all times the competition of fuel plants with hydro must be considered in the studying of possible power sites in this area.

In common with most parts of Canada, the difficulties of operating hydro plants on the eastern slopes during freezing temperatures are numerous. The steep river gradients and resulting high water velocities combine with low temperatures to form large quantities of frazil ice which, in the form of slush, is carried downstream and deposited in plant forebays or on other obstructions. If the forebay is large enough it will prevent this ice from reaching the plant. If the water comes from a large lake, operating a canal is not difficult; but the operation of a power and irrigation canal which takes off from a river running with slush is a real problem. If this can be solved the conflict with irrigation could be reduced, in that water could be passed to storage during the winter, also a development like Shepard, (in the Western Irrigation District east of Calgary) combining power and irrigation in a common canal would be practical.

In deciding whether or not a certain site is economical to develop, it is necessary to establish the amount of power required within the immediate and near future. There are sites, particularly in the northern part of the Province, which would be quite economical to develop if say 200,000 hp. were required. The cost per hp. would not be high excepting that if only an additional 50,000 hp. were required within the next few years, the carrying charges on the other 150,000 hp. would very soon "eat up" the economical advantages of developing such a site, as would the cost of transmission to the load centres.

The development in the art of electrical controls has strengthened the case for hydro power in this area. Many of the sites are in the 10,000 to 50,000 hp. capacity range and are most economically developed by a single unit plant. The operating costs for staff in a small plant are relatively high, as an operator can look after a 100,000 hp. plant as easily as he can a 10,000 hp. plant. However, remote control equipment has now developed to the state where a group of hydro plants can be operated from a central control room, and thus offer reasonable economies. An example of this is the 13,500 hp. Barrier plant, which is controlled by the operators at the Horseshoe plant.

Power and Irrigation Developments Mutually Advantageous

Mr. Russell, in his paper, mentioned the possible conflict between storage for power and irrigation requirements. This is such an important problem that it will bear mentioning again. There is no doubt that at first glance one would feel that the storing of water in the summer time, during the high water period, might be detrimental to irrigation. This is not the case. Most of the water stored is water which cannot be used due to lack of capacity in irrigation canals and irrigation storage. Even with all the economical power storage sites developed on the Bow, there is only 35 per cent of its total watershed under control, and the balance can still produce major floods and give sufficient water to carry on the irrigation projects.

It is possible, if one assumes that all water tributary to these reservoirs is stored in the months of April to October inclusive, the irrigation season, that there would be a shortage of water for irrigation in April, September and October. This shortage could also exist without storage. In actual operating practice it is always necessary to have water to carry the electrical load. As the flows in these periods tend to be low, water will be released from storage to carry the electrical load and supply additional water over and above the natural flow for irrigation purposes.

This applies particularly in April, the first two weeks in May before the spring runoff from the mountains starts, and in September and October when the approaching winter has reduced the natural flows but increased the electrical load. The inherent smoothing out of the flow which is achieved by storage allows the irrigation projects to receive water over a longer period of time, and thus reduces the canal capacity required. Therefore it is reasonably safe to say that the storage for power purposes helps, not hinders, irrigation.

In order to raise the water from the river bed so that it may be fed by gravity to the irrigation areas, it is often necessary to build high dams, as is the case of the proposed Ardley Dam in connection with the William Pierce irrigation scheme on the Red Deer River. As described in Mr. Russell's paper, these heads can be used for economical power developments, because for a combined project the cost chargeable to either irrigation or to power is not as great as if they were developed by themselves.

Alberta's Power Resources Abundant

There is at present developed in the Bow Basin some 106,000 hp., with an ultimate development of at least 550,000 hp. possible; however, to achieve this, careful planning in the selection of the plant capacities is necessary. The capacity of the plants at the storage site should be as small as possible and yet allow the passage of all the stored water during the drawdown period. Excess capacity should be installed in the main river plants, particularly those with good pondage, so that in summer the main river plants can carry the full load and make use of the high river flows. The plants at the storage reservoirs would not be operated at all, except for short time peak due to the necessity for storing water. During the winter, when the storage plants would operate at nearly base load, the main river plants would have the capacity to carry the short time peaks.

Investigations of other rivers in the Province have not been carried far enough to give a detailed picture of the possible power available. In their very conservative estimate, the Dominion Water and Power Bureau have estimated that a total of 1,250,000 hp. is available in Alberta. We in Alberta feel that this is very low, and with the combined irrigation and power schemes the total available is very much higher, although no actual revised estimate has been made as yet. It is certain that at the present rate of development there is enough power available to last this Province for some time to come. As far as the industrial development of the Province is concerned there is no reason for a shortage of power in the future, because the development of power by coal and gas in this Province is extensive. This certainly keeps the hydro engineer well aware of his economics.

There is no doubt that the Bow is the most important stream in the Province as regards both irrigation and power, although other streams can offer a goodly quantity of each. The Athabaska is the stream which most closely approximates the Bow as far as power is concerned. The North Saskatchewan can certainly supply large quantities of water by diversion to the Clearwater and the Red Deer for irrigation and some power. In general, the water supply on the eastern slopes is somewhat limited, but as the total head possible of development is very large, particularly on the Bow, the net result is that plenty of power is available, although the plants in themselves may have to be of small capacities. But if they are remotely controlled, the operating costs can be kept reasonable.

Co-operation From Park Authorities

One of the problems which arises in regard to development of power on the eastern slopes is that the best streams—namely the Bow and the Athabaska, rise within the National Parks. If anything like full use of these rivers is to be made in the future of the Prairie Provinces, both for power and irrigation, it will be necessary for the National Parks to take a more liberal view of any application for the diversion and use of these waters. With good co-operation by all the interests concerned, it would appear that there are plenty of economical power sites to be developed. As each site is developed, particularly those on the headwaters which contain storages, other sites lower down the river become economically feasible and, as the load grows, may be developed in progressive steps to keep pace with the electrical demand of the Province.

Discussions (*Continued*)

STEPHENS PAPER

(*Continued from page 475*)

W. L. Foss, M.E.I.C.[3]

The writer is not familiar with conditions in Manitoba and is, therefore, not qualified to discuss many points in this paper. Attention should be drawn, however, to certain figures pertaining to irrigation water requirements which the author quotes from an article by Mr. Ben Russell. The author assumes all water diverted from river beds for irrigation purposes is lost to the streams. If the irrigable areas are in the drainage basin of such streams, this assumption is not valid. There is considerable return flow, though the portion of the return flow due to deep percolation may have a considerable time lag.

The writer recently made a study of various projects in Alberta to find the net amount of irrigation water actually applied to the land. On the Lethbridge Northern Irrigation District, which is a typical example, the average is 1.35 ft. The average rainfall in this area during the growing season is about 7 inches, or 0.58 ft. The total water requirement for a maximum crop is then 1.90 feet, and this is slightly greater than the figure arrived at after extensive experiments at Brooks. On this basis, and introducing a factor of safety, the legal duty of irrigation water is set at 1.5 ft. The irrigation engineer adds from 10 to 30 per cent to this figure, depending upon the length of canals, type of soil and so on, to cover what he calls conveyance losses. These losses, however, are almost entirely seepage or percolation losses, and therefore, are not entirely lost to the drainage basin, but must appear in the streams at some future time.

Another source of return flow is surface waste. It is not possible to operate canals so that exactly the right amount of water is flowing to take care of farmers' requirements. Spillways are therefore provided, and it is difficult to operate a project without spilling back at least 20 per cent of the water diverted during the season.

A third source of return flow is that due to deep percolation through the land which is irrigated. A two ton crop of alfalfa will use about 0.75 feet of water through transpiration. The evaporation loss from the surface of cultivated soil is about 20 per cent of that from a free water surface, or about 0.45 feet, in Southern Alberta during the growing season. It is seen then that evaporation and transpiration losses total about 1.20 feet. Since experience indicates that, for maximum yield, a total of about 1.8 feet of water including rainfall, should be applied to the land, the difference of about 0.60 feet must be lost through runoff and percolation. At least some of this waste must return to the streams.

Another point to be considered in determining water consumption for irrigation is the irrigation factor. Even the best developed irrigation districts in the drier sections of Southern Alberta rarely actually irrigate more than 80 per cent of the irrigable area in any given year. Districts in slightly cooler and wetter areas have factors much less than this.

In conclusion, it is believed safe to say that from 30 to 35 per cent of water provided by irrigation water rights would find its way back to the streams. This would not be true, of course, if the diversion were made to some other drainage basin. However, the author's conclusion that the entire Saskatchewan River Basin should be the subject of an integrated study cannot be disputed. Mistakes can easily be made in planning if the overall picture is not available or is ignored.

[3] Supervising engineer, the St. Mary Milk River Project, Lethbridge, Alberta.

PALMER PAPER

(*Continued from page 499*)

the population, animal and human, have almost vanished, the victims of desiccation. This is the area which Mr. Palmer considers would, under irrigation, create and support a population of from 15,000 to 25,000 people, in a stable productive economy.

The other areas to which he refers offer even more attractive possibilities, being somewhat further south and having generally more favourable topography and soil conditions. These areas, when developed, will create the same sort of economy, which now prevails, in the country surrounding Lethbridge, Taber, and Brooks. Mr. Palmer gives a very reasonable estimate of the population and industrial gains which may be expected to result from the irrigation of our most favourable dry areas in Alberta.

FROM MONTH TO MONTH

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

Due Recognition

The many members of the Institute who met Air Commodore Frank Whittle, inventor of the turbo-jet engine, at the 1947 annual meeting in Toronto will be delighted to know that his great contribution to engineering knowledge and to his country's success in war, has been recognized officially by the granting of a knighthood. He is now Sir Frank Whittle, K.B.E., C.B., F.R.S., etc.

Further, for his inventions and his loyalty he has been awarded £100,000 tax-free. This is the second largest award ever made to a citizen by the British Government for " services rendered ". Sir Frank gave his patents, his incorporated company and his services to the nation without charge. At the conclusion of the war when such services were being appraised by the Government he declined to place any claim before the Government committee. Fortunately, his accomplishments were so clear and so readily recognized that the committee had no difficulty in reaching its decision—a decision that will be well received by the British people.

His Canadian friends join with others in many parts of the world in congratulating him. It is a pleasure to see outstanding merit and sacrifice recognized in so practical a manner.

Exchange of Greetings

The Societé des Ingenieurs Civils de France celebrated its one hundredth anniversary this summer at Paris. The Engineering Institute was represented by J. W. Simard of Montreal and Dean Adrien Pouliot of Quebec. The following message was presented on behalf of the Institute:—

" The Engineering Institute of Canada is happy to join with societies all over the world in celebration of this notable occasion.

" On behalf of the Council and members we offer congratulations on attaining this distinguished anniversary, and on the outstanding work accomplished in those many years. A pioneer and a leader in engineering organization the Societé has made great contributions to the profession, not only in France but throughout the world.

" It is our wish that the record of success may continue and that the future may be even more brilliant than the past ".

In reply the following cablegram was received from the Societé during the annual meeting at Banff:—

" Le président des Ingenieurs Civils de France celebrating the hundredth anniversary of the Societé in Paris begs me to forward to you his personal greetings and to all members in the name of those present here his wishes for a happy and successful meeting. (Signed) J. W. Simard ".

Found

Someone has lost a pocket book and some money. They were found in the reading room at Headquarters. Every effort has been made to trace the owner. Innumerable addresses in the book have been checked without disclosing the owner's identity—(or any other interesting information!) It is proposed to return the money to the person who found it if the rightful owner doesn't turn up soon. Please communicate with Headquarters if you are the owner.

New Degree Courses at Alberta

The office of the Dean of the Faculty of Applied Science, University of Alberta, Edmonton, has informed the Institute that several new courses are being inaugurated this year. They include Petroleum Engineering, Engineering Geology and Irrigation Engineering. Also a special sequence of courses is being offered in the third and fourth years of Mining Engineering to suit the needs of students primarily interested in Coal Mining as a career. In the following paragraphs details of each course are given.

Petroleum Engineering

The Petroleum Engineering course is being offered under the direction of the Department of Chemical Engineering. A sequence of fundamental courses of particular interest to a Petroleum Engineer is being offered during the third and fourth years. The third year work includes additional courses in Chemistry, Geology and Mechanical Engineering as compared to the regular Chemical Engineering curriculum and during the fourth year an additional course in Geology and two courses in the application of fundamental principles to Petroleum Engineering are included. At the present time about fifteen applications have been received for entrance to the third year of the course.

The course was established following strong representation by the Association of Professional Engineers of Alberta and the petroleum industry in the Province of Alberta. Western Canada Petroleum Association is cooperating with the University administration in the organization of the new course.

Engineering Geology

A course in Engineering Geology is being offered to engineering students whose academic record during the work of their first two years places them in about the top 20 per cent of their class. Such students will be permitted to select a special sequence of courses during their third and fourth years in the fields of Geology, Mining and Civil Engineering in addition to the basic courses common to all engineering degree courses.

Irrigation Engineering

A new degree course in Irrigation Engineering is being offered under the direction of the Department of Civil Engineering. It provides for a special sequence of options during the third and fourth years in which four courses in agricultural sciences and two special courses in the application of engineering principles to irrigation work may be taken in place of courses in Applied Mechanics and Structural Engineering in the regular Civil Engineering curriculum. The course is intended to suit the interests of students primarily concerned with a career in connection with the extensive irrigation projects now being proceeded with in the western provinces.

Mining Engineering

A special sequence of courses during the third and fourth years of Mining Engineering are being provided for students primarily interested in Coal Mining as a career. Options in the Department of Mining Engineering for such students have been available for a number of years but the curriculum has been completely re-organized in consultation with representatives of the coal mining industry in Alberta.

It is apparent that Alberta is trying to so educate its young men that they will be better able to avail themselves of opportunities in the fields of engineering concerned with the development of the resources of the Province. This policy may react to the benefit of Alberta in that it will tend to reduce the percentage of engineering graduates who leave the Province to earn their livelihood. Such a purpose would seem to well justify these changes and additions even though they are at variance with the trends in engineering education elsewhere.

There are clear signs in the United States that educationalists there, now favour fewer and fewer specialized courses. Experience has shown that the divisions of engineering mean less and less to the graduates. The majority do not follow the branch of engineering in which they specialized at university, nor do they find much difficulty in changing from one branch to another after graduation. All this has indicated to many who have studied the subject that a student at university should be given a basic training only,—such a training that upon graduation or later, he will be able to practise in any field without confusion or difficulty.

Alberta is rich in natural resources. Also it has certain problems of irrigation and flood control. The fields of irrigation, petroleum, coal and other minerals offer many good opportunities for engineers. It is natural that the provincial university should recognize this and so arrange its courses that the graduates are properly equipped to enter the local field. It will be helpful also to have suitable summer employment so readily available.

It will be interesting to watch the results. The university has shown courage and initiative, and a flexibility in its thinking that is encouraging. For these things it is to be congratulated.

American Institute of Electrical Engineers Meets in Mexico City

Leo Scharry, secretary of the Junior Section, Montreal Branch, has submitted an account of the summer meeting of the American Institute of Electrical Engineers. Leo represented the Institute and officially tendered the good wishes of our president, Council and members for the success of the meeting. Following are excerpts from his address delivered in Spanish at the General Business Meeting.

'Mr. Chairman, ladies and gentlemen. On the part of the president, the Council and the members of The Engineering Institute of Canada, I have the great pleasure of bringing to this assembly the best wishes for a most successful meeting.

'Last year at about the same time, the A.I.E.E. held its annual summer meeting in Montreal, Canada. The majority of the members who were your hosts are members of The Engineering Institute of Canada.

'The Engineering Institute of Canada was founded in 1887. It is a national body comprising engineers of every specialty from the Atlantic to the Pacific whose aim is to facilitate the acquirement and interchange of professional knowledge among its members, 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.

'It is not my intention to go into details relative to our organization of over 10,000 members, but it is my intention to tell you that as engineers we are very proud to associate with other engineers of other countries, whose interests parallel ours in striving to better our way of life.

'At the moment in Canada, there are thousands of engineers who are present at this Convention in spirit. They are looking forward to the results of the meeting. The hospitality of our Mexican hosts has done much to strengthen the ties between the engineers of our three countries.

Officers of Chemical Institute

The Institute received with interest the recent announcement of the election of officers of the Chemical Institute of Canada for the year 1948-49. The new president is Mr. T. W. Smith of Canadian Industries Limited, Montreal. Dr. E. W. R. Steacie, of National Research Council, Ottawa, is vice-president. Chairman of the board of directors is Mr. Eric B. Lusby of Imperial Oil Limited, Sarnia. Mr. J. Charles Honey of Canadian Johns-Manville Company Limited, Toronto, has been elected treasurer.

Surveyor's Level for Sale

The *Journal* is advised that a Gurley surveyor's Level, without tripod, is offered for sale by Mrs. N. Brockhurst, Apt. 5, 4530 Girouard Ave., Montreal. Interested readers should phone or write to Mrs. Brockhurst for further particulars. The telephone Number is EL. 7411.

Henry Girdlestone Acres Medal

Perpetuating the memory of the late Dr. Henry Girdlestone Acres, Mrs. Acres has established in the University of Toronto a medal in perpetuity, the first one of which was awarded in June of this year to George S. Collins, S.E.I.C., who graduated with high honours in electrical engineering.

Mr. Collins, who also won the Medal of the British Association for the Advancement of Science in his graduating year, was in his first year awarded the Baptie Scholarship, and the John M. Empey Scholarship; in his second year the Second Association of Professional Engineers of Ontario Scholarship; and in his third year the Jenkins Scholarship. While at the University he was active in athletics and music.

Employed during the summers by the Hydro-Electric Power Commission of Ontario, and by Canadian Currents, Limited, he has resumed work with the latter company on graduation.

It is gratifying to know that the extraordinary contribution made by Dr. Acres to the practice of engineering in Canada is being so fittingly marked by the medal established in his honour.

The medal is to be awarded annually to the student who stands highest in the work of the third and fourth years combined in either civil engineering, mechanical engineering or electrical engineering.

The designs were prepared, and the dies were made under the supervision of Mr. Emanuel Hahn, R.C.A.

Meetings of Other Societies

The 19th Annual Meeting of the **Canadian Chamber of Commerce** will be held at the Hotel Vancouver, Vancouver, B.C., October 26 to 28, 1948.

The programme will cover subjects of vital importance to business and to the welfare of all Canadians, such as, maintaining and improving our Canadian way of life, national transportation problems, foreign trade and the dollar shortage, and human relations in business. The business policy which will be adopted will provide a platform for business for the coming year.

Registration and reservation cards may be obtained from D. L. Morrell, executive secretary of Canadian Chamber of Commerce, Board of Trade Building, Montreal.

The 26th Annual Convention of the **American Institute of Steel Construction**, will be held in Quebec, October 4 to 7, 1948.

L. Abbett Post, executive vice-president of the American Institute, advises that hotel reservations should be arranged directly with G. J. Jessop, manager of the Chateau Frontenac, Quebec, Que.

R. S. Eadie, vice-president of The Engineering Institute of Canada will speak on Canadian Trends in Structural Steel Design at a session on October 6.

Personals

Notes of the Personal Activities of Members of the Institute

R. V. Macauley, M.E.I.C., who is executive vice-president of the Bell Telephone Company of Canada, was recently appointed a director of the Company and a member of the executive committee. Mr. Macauley has been connected with the Bell company since 1913.

Colonel J. P. Carriere, M.E.I.C., is now chief engineer of the Dufresne Engineering Company in Montreal. He had been city manager and chief engineer for the City of Hull, Que., since 1946. Colonel Carriere was retired from the Canadian Army to the reserve list in 1945, and returned to the Federal Department of Public Works for whom he had served at London, Ont., and at Montreal, before joining the R.C.E., and going overseas in the recent war. He was deputy chief engineer of the 1st Canadian Army in Europe, before his return to Canada.

H. R. Welch, M.E.I.C., president and general manager of Welch and Johnston Ltd., Ottawa, is a member of the newly formed Ottawa Transportation Commission which now operates the transportation system of the city. The system formerly owned by the Ottawa Electric Railway Company became municipally owned in August.

P. E. Radley, M.E.I.C., of The Aluminum Company of Canada, Ltd., has been appointed assistant general manager in charge of engineering, purchasing and traffic. Mr. Radley entered McGill University after serving as a gunner in the artillery in the first world war and in 1923 graduated with a B.Sc. in chemical engineering. Mr. Radley joined the Aluminum organization in 1923 at Shawinigan Falls as a member of the technical department. From 1930 to 1939 he was in Arvida, after which he was assigned to duties in England. On his return to Canada he was made works manager at Shawinigan Falls, and later works manager at Arvida. In 1944 he was named manager of the Smelter Division, and since then has held various important posts, leading up to his recent appointment.

W. L. Pugh, M.E.I.C., has been appointed chief engineer of the Aluminum Company of Canada, Ltd. Mr. Pugh graduated in civil engineering from Lehigh University, Pennsylvania, with a degree in civil engineering. Prior to joining the Aluminum Company in 1937 he worked with the Lehigh Railroad, the Canadian National Railway and Canadian Industries Limited. In 1941, he was appointed chief draughtsman of the Company, and in 1945 assistant chief engineer.

R. A. Lemieux, M.E.I.C., engineer and manager of the City of Arvida, was recently elected president of the Quebec section of the International City Managers Association. Mr. Lemieux graduated from Ecole Polytechnique, Montreal, in 1937, and for several years was with the Department of Roads of Quebec. In 1941 he was appointed city engineer and secretary treasurer of the municipality of Sillery, Que., and it was in 1943 that he went to his present position at Arvida.

W. L. Inglis, M.E.I.C., is now representative for British Columbia and Alberta for Dominion Tar and Chemical Company's fibre conduit division. His headquarters are in Vancouver. A civil engineering graduate of University of British Columbia, he was a wing commander during the war with the construction engineering branch of the R.C.A.F. After the war he was district manager in British Columbia for Housing Enterprises of Canada Limited, until his recent appointment.

J. M. Jopp, M.E.I.C., was appointed in April last as chief engineer of the Brown Corporation, La Tuque, Quebec. He had been design engineer for the Corporation from 1945, when he joined the organization, coming from the Abitibi Power and Paper Co. Limited, Sault Ste. Marie, Ont.

Bruce McColl, M.E.I.C., has been taken on the staff of the Woodlands Section of the Canadian Pulp and Paper Association. He will have charge of mechanization activities. Mr. McColl, a graduate in mechanical engineering of Queen's University, with particular experience in power plant design and development, comes to the Association from Canadair Limited, Montreal, where he was chief of the power plant section of the design office.

W. J. C. Gall, Jr.E.I.C., is engaged at the Swiss Federal Institute of Technology at Zurich. During July of this year he was in Jugoslavia during which time he had an opportunity to visit with the Canadian Minister to that country and to participate in certain social engagements attached with the diplomatic service of the Legation.

D. B. Mutton, S.E.I.C., third year engineering student at the University of Toronto, was awarded the Engineering Institute Prize for 1947-48 session. He further distinguished himself by winning the Wallberg Undergraduate Scholarship and the Chemical Institute of Canada Prize. The possession of the Wallberg Scholarship made him ineligible to hold three other scholarships which he won, and they were awarded by reversion to other students. Mr. Mutton's outstanding work in third year follows notable successes in the preceding years.

Obituaries

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

Richard John Durley

1868-1948

Richard John Durley, M.E.I.C.

In the death of Richard John Durley, the profession of engineering in Canada lost one of its most distinguished members — a man whose life, in the main was devoted to the welfare of the engineer and the betterment of the profession. By reason of his professional employment he had unusual opportunities to make and maintain contacts with engineers, and because of his keen sense of professional responsibility he neglected none of them. Hence his influence was broad in the land and his deeds constitute an important chapter in the history of the profession.

In 1938 Mr. Durley retired from the position of general secretary of the Institute, but for many years after maintained a close contact with it. His continued services to *The Engineering Journal* were of great value to the publication committee and his frequent appearance at Headquarters was a matter of pleasure and satisfaction to the staff. In these quarters he will indeed be greatly missed.

Mr. Durley was an example of the well developed engineer. He was interested in many things besides those strictly related to his profession. He was a great reader, a student of English literature, an enthusiastic and skilful follower of Isaac Walton, and a yachtsman. He was well informed on matters of the day, and with his keen intellect and his delightful sense of humour was able to discuss such things in a most entertaining manner. His ability to see through and understand people was unique, although he never spoke unkindly of any one.

Mr. Durley came to Canada in 1896 and for the following fifty-two years took a prominent part in engineering affairs, first as assistant professor of mechanical engineering at McGill, then as full professor. During the first world war he was in charge of gauges and standards for the Imperial Munitions Board, and at its conclusion became secretary of the Canadian Engineering Standards Association. In 1925 he was appointed general secretary of The Engineering Institute of Canada, a position he occupied for thirteen years.

He was born in Bierton, Bucks, England, in 1868 and graduated from University College in London in 1887 with the degree of B.Sc. His early training was in shipbuilding but in 1893 he won a Whitworth scholarship and at the end of the following year became chief lecturer at the Municipal Technical School, Hull.

He has served as honorary secretary and member of the Canadian committee of the Institution of Civil Engineers and also as the Canadian member of the council of that body. He was a life member of the American Society of Mechanical Engineers, the Canadian Standards Association and The Engineering Institute of Canada. He was the author of many technical papers and of the text book " Kinematics of Machines " which was adopted by several universities. In 1918 he was awarded the M.B.E. for his work with the Imperial Munitions Board. He is survived by his widow, one daughter, Mary Elizabeth, and one son, Thomas Richard, a member of the Institute.

It is to those who had the pleasure of working close to " R.J." that his loss is most poignant. He was a man who could be appreciated in the full only by close association. His modesty and reserve hid from many people the sterling qualities that endeared him to his friends. He worked industriously and intelligently but never sought public acclaim for his accomplishments. Although he had been in retirement for ten years he will be well remembered by those who had the privilege of knowing him. He was a grand gentleman and the profession has been greatly enriched by his association with it.—L. A. W.

Louis A. Amos, M.E.I.C., well known Montreal architect, and a former mayor of Lachine, Que., died at his Lachine home on August 20, 1948, after a brief illness.

Born in Montreal in 1869, Mr. Amos attended Royal Military College, Kingston, and was graduated with the Governor-General's Medal with honours in engineering.

Mr. Amos studied architecture under the late Arthur Cox. He became Mr. Cox's partner and for 20 years practised under the firm name of Cox and Amos. The company designed numerous churches, hospitals and banks in Montreal, Quebec and the Eastern Townships as well as the first 10-storey building in Montreal, the old Eastern Townships Bank, Victoria Square.

After the death of Mr. Cox, Mr. Amos practised alone for several years, then in 1925 took into partnership his son, P. C. Amos, who had graduated from McGill University.

Mr. Amos joined the Province of Quebec Association of Architects in 1894 and was one of the charter members. For many years he was member of the council and in 1934 became president of the association. He was elected a fellow of the Royal Architectural Institute of Canada and a Fellow of the Royal Institute of British Architects. He attained life membership in the Engineering Institute this year, having joined as a Student in 1893. He became an Associate Member in 1896, a member in 1915.

For 50 years he was architect for National Breweries Ltd., and designed the malting houses and the brewery stock cellars for Dow, Dawes and Ekers breweries in Lachine and Montreal.

As associate architect he designed the nurses home for Notre Dame Hospital, the power house there and the new Court House. He was awarded the gold medal of merit of the P.Q.A.A. He was associate architect for the Laurentien Hotel in Montreal.

E. W. Neelands, M.E.I.C., of Falconbridge, Ont., died in hospital in Toronto, on July 10, 1948.

He was born at Mount Pleasant, Michigan, in 1881. He taught public school for two years before entering University of Toronto, where he was graduated in 1907 with the degree of B.A.Sc. in civil engineering. He qualified as an Ontario land surveyor in 1909. On graduation he became associated with H. W. Sutcliffe, engineer, in New Liskeard, Ont. He specialized in water power and municipal engineering working in many Ontario cities and towns, among them Cochrane, Cobalt and Smooth Rock Falls. His firm handled a great deal of waterpower work in Northern Ontario for the provincial government.

In 1922-24 he was district engineer at Temiskaming, for the Department of Northern Development, and then for two years he was town engineer at Noranda Mines. He then practised engineering at New Liskeard for some years, but went to Newfoundland in 1930 to be chief engineer of roads. He was with the Ontario Department of Highways for two years and then joined the Falconbridge Nickel Mines where he was field engineer until the time of his death. While in the mining industry he was loaned in 1936-37 to be chief engineer of roads again for Newfoundland. Later, in 1947, he made plans for the townsite of Kerr Addison Gold Mines, through the courtesy of his company.

Mr. Neelands joined the Institute in 1912 as an Associate Member, becoming a Member in 1940. He attained life membership in 1946.

Seaforth Duff MacNab, M.E.I.C., who had recently retired after many years on the staff of McGill University, died in Montreal on July 27, 1948, after a long illness.

Mr. MacNab who joined the Institute in 1918, was born at Mahone Bay, N.S., in 1869, and was educated in Halifax. He served a full machine shop apprenticeship and then entered the Testing Laboratory of McGill University as assistant on the care of equipment and testing materials. In 1903 he was made assistant in charge of strength of materials and hydraulic laboratories, his work including maintenance and calibration of apparatus and equipment of laboratories, installation of new equipment, and design of accessories for special purposes. He was in charge of a great variety of commercial and scientific testing work, the design of special methods and appliances for conducting them, and their demonstration to classes. He was later made superintendent of the testing laboratory, and he remained in that position until his retirement.

John S. Misener, M.E.I.C., of Dartmouth, N.S., who died on October 11, 1947, was refinery manager for Acadia-Atlantic Sugar Refineries Limited of that city.

Born in Boston, Mass., in 1873, he started an apprenticeship with MacDonald & Company, Halifax, in 1888. He went to Acadia Sugar Refining Co. Ltd., at Woodside, N.S., in 1891. Promoted to chief engineer in 1893 and to assistant manager in 1916, he was made manager in 1924.

He was a Member of the Engineering Institute from 1919, attaining life membership in 1945. He was granted an honorary life membership in the Association of Professional Engineers of Nova Scotia in 1945. He served on the Wartime Housing Board and the Nova Scotia Fuel Board. He was an ex-commissioner of the board of the Nova Scotia Hospital.

William Frederick Casey, M.E.I.C., who was director, president and general manager of Canadian Locomotive Company Ltd., Kingston, Ont., died in hospital there on July 15, 1948, following a lengthy illness.

Employed by the Canadian Locomotive Company since he was 14 years old, Mr. Casey was influential in the rise of the concern from a small industry to a major Canadian one. During his direction locomotives were manufactured for the Canadian National and Canadian Pacific railways, and were also supplied for Russia, France, Belgium, India and Jamaica.

W. F. Casey, M.E.I.C.

Born at Kingston, Ont., in 1887, he attended St. Mary's School, and Regiopolis College there. In 1901 he entered the employ of the Canadian Locomotive Company as a machinist's apprentice. Promotions came rapidly and, between 1902 and 1911 he was successively draughtsman and foreman of shops. In 1911 he was placed in charge of estimating. After retaining this post for three years, he was appointed assistant to the vice-president. Two years later he became manager. In 1919 he was promoted to vice-president and general manager. In 1932 he became president. Last December he relinquished the managership but retained his presidency. He was also president of the Direct Steaming Company Limited of Canada.

Mr. Casey was a member of the Canadian Manufacturer's Association, and of the Association of Professional Engineers of Ontario, of the Newcomen Society, and the Engineers Club of Toronto. He joined the Engineering Institute in 1922.

His principal recreation was yachting. He was a member of the Kingston Yacht Club, the Royal Canadian Yacht Club in Toronto and the Lake Yacht Racing Association. He was also a member of the Kingston Flying Club.

Richard Lewis Waycott, M.E.I.C., of Halifax, N.S., died on November 17, 1947. He was born at Marysville, N.B., in

1886. However, he was educated in Fredericton, N.B., after which he spent seven years, 1906 to 1913, in the employ of the Grand Trunk Railway engineering department. in the Winnipeg and Sioux Lookout Districts. From 1913 to 1916 he was employed by Canadian National Railway engineering department in Nova Scotia. From 1916 to 1921 he was field engineer for the Nova Scotia Steel Company at New Glasgow, N.S. He was then in the employ of the Nova Scotia Department of Highways for five years, and he spent nine years in the Province of Quebec in the employ of the Canadian Pacific Railways, and the Shawinigan Engineering Company. In 1935 he returned to Nova Scotia and was with the Department of Highways, being located latterly at Halifax as resident engineer on surveys and construction work.

Mr. Waycott became a Member of the Institute in 1940.

G. W. LaMountain, M.E.I.C., who was with Aluminum Company of Canada at Arvida, Que., died in Montreal on April 21, 1948.

Mr. LaMountain, who was born at Champlain, N.Y., in 1888, attended the United States Naval Academy, graduating with a B.Sc. degree in 1912 and doing post graduate work in gas and diesel engines. In 1912 he was assigned duties, and until 1924 was general assistant engineer to the chief engineer on various types of ships in the U.S. Navy. He retired from the Navy in 1926 and accepted a position with Duke Price Power Company. He was appointed superintendent of properties of that company, whose name eventually was changed to Saguenay Power Company Ltd., and he remained there until 1939. Going to the Aluminum Company of Canada Limited, he was manager of personnel until 1942. He then received the appointment of superintendent of properties for Aluminum Company of Canada Ltd., and all its subsidiaries in the Chicoutimi-Lake St. John District of Quebec. His headquarters were at Arvida, Que. He was still in that position at the time of his death.

Mr. LaMountain joined the Institute as a Member in 1944.

Professor Ray H. Patten, M.E.I.C., of McGill University, Montreal, who died at his home on August 1, 1948, was born in Hamilton, Ont., in 1892.

Professor Patten had been on the faculty of McGill since 1920, when he received the degree of B.Sc. in mechanical engineering. He qualified in electrical engineering the next year while lecturing in mechanical engineering. In 1930 he was made assistant professor of mechanical engineering, and he was given the rank of associate professor in 1945.

He was always very active in research and made many contributions to advancement in the field of heat transfer and heating and ventilating of buildings. During the past 25 years, Professor Patten was associated with the National Research Council of Canada, and was particularly active during the recent war. He carried out an intensive research programme on substitute fuels for motor vehicles.

Professor Patten was a member of the Corporation of Professional Engineers of Quebec. He became a Member of the Institute in 1945.

NEWS of the BRANCHES

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented at their meetings

Montreal

The annual visit of the President of the Institute, Dean J. N. Finlayson, to the Montreal Branch will coincide with the opening meeting for the autumn which is planned for the evening of 30th September 1948. The President will be entertained at dinner at the Mount Stephen Club. He has kindly consented to address the members at the opening meeting, which has been arranged to take place in Cardy Hall at the Mount Royal Hotel. The programme is similar to that of last year; a short business session, the president's address, and refreshments. Last year's meeting was well attended by the members and it is hoped that an even greater number will turn out this year. It is one of the occasions of the year when an opportunity is available for members, old and new, to meet old friends and make new ones.

Members are reminded of the exhibit of the work of Robert Maillart on Reinforced Concrete Bridges which will be on view at the Institute Headquarters from October 7th for several days.

The programme of the Junior Section will be printed on the Branch programme this year. All members are invited to attend the meetings. Those who are particularly interested in any feature of the Junior Section's activities are requested to contact the section secretary, Leo Scharry, LAncaster 8193, for further information.

St. Maurice Valley

G. W. Ince, s.E.I.C.
Secretary-Treasurer

J. G. MacLeod, M.E.I.C.
Branch News Editor

Junior Section

E. A. Love, s.E.I.C.
News Editor

On Tuesday evening, June 29th the Junior Section of the St. Maurice Valley Branch held the opening dinner of their summer activities at the Cascade Inn in Shawinigan Falls. Over 70 engineers and summer students attended.

Rex Ford, chairman, introduced the executive for the coming year: J. E. Muggah, vice-chairman, A. H. Baker, secretary-treasurer and E. A. Love, publicity. The chairman then gave an outline of the programme of activities for the coming season. Following the dinner, the speaker, E. R. Williams, works manager of the Shawinigan Chemicals Company, was introduced by T. S. Gambel.

Mr. Williams presented a chronological talk on his recent visit to the Union of South Africa. He also spoke of the various industries in the Union as well as some of the labour problems encountered there. A discussion period at the conclusion of his talk enabled the gathering to ask questions of interest to the individual. The speaker was thanked by J. O. Kelly.

Vancouver

Alan M. Eyre, jr.E.I.C.,
Secretary-Treasurer

Stuart Lefeaux, jr.E.I.C.,
Branch News Editor

On Wednesday, July 28th, the Vancouver Branch was entertained by the B.C. Research Council at the University of British Columbia. The members attended a complimentary dinner at the U.B.C. Faculty Club overlooking Howe Sound. George Allan, M.E.I.C., who arranged the visit for the Branch, took the chair in the absence of P. B. Stroyan. Dr. S. E. Maddigan, director of the Research Council, outlined the work of the Council and some of the present projects. Dean J. N. Finlayson, president of the Institute, and Dr. L. Austin Wright, secretary, honoured the branch by their presence and expressed their appreciation of the work of the Research Council. L. V. Kelly thanked Dr. Maddigan for the most excellent dinner and his able description of the projects. The meeting then adjourned to the B.C. Research Council Laboratories to view the work taking place.

The sixty-five members in attendance were dispersed into four groups: Dr. P. C. Trussell, Dr. R. H. Wright, Mr. Ronald Klinck and Mr. Don Smith acted as leaders of the groups. The experiments were demonstrated and explained by the staff of the Laboratory. The apparatus demonstrated included: a model foundry for the testing of alloys, a gasification oven for experiments with sawdust and wood waste, a Wilfey table for the specific gravity separation of minerals, a flotation machine for minerals, a centrifuge and apparatus for testing food products for micro-organisms, a di-electric apparatus for recording moisture content of materials with an oscilloscope, a viscosity test for the sodium alginate content of British Columbia seaweeds, an X-ray diffraction apparatus for determining the composition of compounds and many others of a complex arrangement.

The members expressed their appreciation of the visit by their intense interest and a multitude of questions; all agreed that the visit was most enlightening and entertaining.

LIBRARY NOTES

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEW

THEORY OF SERVOMECHANISMS

Edited by H. M. James, N. B. Nichols, and R. S. Phillips. (Massachusetts Institute of Technology. Radiation Laboratory Series Vol. 25) N.Y., Toronto, London, McGraw-Hill, 1947. 375pp., illus., 9¼ x 6 in., cloth, $5.50. (in Canada)

In this presentation of the theory of servomechanisms, the emphasis has been affected by the special interests of the Radiation Laboratory. These were specifically automatic-tracking radar systems. However, the authors intended to provide a volume which would be, at least in part, of use to every designer of servomechanisms.

The book falls into two parts: the first is devoted to the sinusoidal steady-state analysis familiar to engineers in its application to electrical systems; the second to statistical methods of servomechanism design. Each part is provided with an extended mathematical introduction and abundant illustrations.

A servo system is defined here as a combination of elements for the control of a source of power in which the output of the system or some function of the output is fed back for comparison with the input and the difference between these quantities is used in controlling the power. The term "servomechanism" is restricted to servo systems involving mechanical motion.

Servo systems are dealt with as power amplifiers and as means of remote control; and also as transformers of information or data from one type of power to another, and as null instruments in computing machines. After the introduction, a mathematical background is given in detail. In the next chapter are given examples of the physical devices that are common components in electronic servo loops. General design principles for servomechanisms are dealt with next, followed by filters and servo systems with pulsed data and statistical properties of time-variable data. RMS-error criterion in servomechanism design is discussed, and the book ends with applications of the new design method, which includes the servo with proportional control and the tachometer feedback control. An appendix provides a table of integrals. M.B.

ABSTRACTS

INSTITUTION OF ELECTRICAL ENGINEERS

Summaries of Papers read in London, Second Half Session 1947-48.

Display of Three-Dimensional Information on a Cathode-Ray Tube, *E. Parker and P. R. Wallis.*

Considered with particular reference to a radar system in which a narrow pulsed beam of radio-frequency energy is used to explore automatically a volume of space.

Electrical Measurement of Pressure and Strain (with particular reference to the testing of Circuit-Breakers), *R. W. Wild.*

Gives specific design data of two known types of pressure recorders, which were designed for the short-circuit testing of circuit-breakers, and where the phenomena recorded could be readily correlated with all the other physical quantities involved in such tests.

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Canada's New Northwest; a Study of the Present and Future Development of Mackenzie District of the Northwest Territories, Yukon Territory, and Northern Parts of Alberta and British Columbia:
North Pacific Planning Project, Ottawa, 1947. 155pp., illus., paper.

Design of Machine Elements:
M. F. Spotts. New York, Prentice-Hall, 1948. 402 pp., illus., cloth.

Dictionary of Terms used in the Paper, Printing and Allied Industries:
Gerard H. Lafontaine. Toronto, Howard Smith Paper Mills, 1948. 110 pp., paper.

Distillation and Rectification:
Emil Kirschbaum. Brooklyn, Chemical Publishing Co., 1948. 426 pp., illus., cloth.

Electric Power and Government Policy; a Survey of the Relations between the Government and the Electric Power Industry:
Twentieth Century Fund, New York, 1948. 860 pp., illus., cloth.

Elementary Steam Power Engineering, 3rd ed:
Edgar MacNaughton. New York, Wiley; London, Chapman and Hall, 1948. 640 pp., illus., cloth.

Elements of Fuel Technology:
Godfrey W. Himus. London, Leonard Hill, 1947. 506 pp., illus., cloth.

FBI Register of British Manufacturers, 20th ed., 1947-48:
Federation of British Industries, London, 1948. 646 pp., illus., cloth.

Fireproof Construction:
Walter C. Voss. New York, Toronto, Van Nostrand; London, Macmillan, 1948. 286 pp., illus., cloth.

Forming of Austenitic Chromium-Nickel Stainless Steels:
V. N. Krivobok and George Sachs. New York, International Nickel Co., 1947. 309 pp., illus., cloth.

Industrial Research, 1947:
Percy Dunsheath. London, New York, Todd Reference Books Ltd., 1948. 535 pp., cloth.

Manual of Report Preparation; Correspondence and Technical Writing:
Frank Kerekes and Robley Winfrey Dubuque, Iowa, Wm. C. Brown Co., 1948. 397 pp., illus., paper.

Modern Petroleum Technology:
Institute of Petroleum, London, 1946. 466 pp., illus., cloth.

NFPA Handbook of Fire Protection, 10th ed.:
Robert S. Moulton. Boston, National Fire Protection Association, 1948. 1544 pp., illus., fabrikoid.

Principles and Methods of Telemetering:
P. A. Borden and G. M. Thynell. New York, Reinhold, 1948. 230 pp., illus., cloth.

LIBRARY REGULATIONS

Hours

	Oct.-May	June-Sept.
Mon.-Fri.	9–6	9–5
Thurs. (Oct.-Mar.)	9–8	9–5
Sat. (closed Jy.-Aug.)	9–12	9–12

Bibliographies and Extensive Literary Searches

Short subject bibliographies will be compiled on request.

Extensive searches will be made at a charge per hour of $1.50 to members, and $2.50 to non-members.

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Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

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

Research in Industry; its Organization and Management:

C. C. Furnas for Industrial Research Institute. New York, Toronto, Van Nostrand; London, Macmillan, 1948. 574 pp., illus., cloth.

Rotary Drilling Handbook, 4th ed:

J. E. Brantly. New York, London, Palmer Publications, 1948. 568 pp., illus., fabrikoid.

St. Lawrence Navigation and Power Project:

H. G. Moulton, C. S. Morgan, and A. L. Lee. Washington, Brookings Institution 1929. 674 pp., illus., cloth.

Traffic Engineering Functions and Administration:

Public Administration Service, Chicago, 1948. 137 pp., illus., paper.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

National Electronics Conference:

Proceedings, Volume III, 1947.

TECHNICAL BULLETINS, ETC.

Institute of Metals. Reprints:

Effect of Crystal Arrangement on "Secondary Recrystallization" in Metals, J. S. Bowles and W. Boas.—Effect of Vibration on a Precipitation-Hardening Aluminium Alloy, R. F. Hanstock.—Lattice Spacings of the Solid Solution of Copper in Aluminium, E. C. Ellwood and J. M. Silcock.—Micro-Hardness Testing of Metals, E. W. Taylor.—Note on the Aluminium-Manganese G. Phase, K. Little, and W. Hume-Rothery.

Institution of Mechanical Engineers. Advance Papers:

Calculations of Compressible Fluid Flow by the Use of a Generalized Entropy Chart, J. Kestin and A. K. Oppenheim.—Comparison of Some Carbon Molybdenum Steels on the Basis of Various Creep Limits, A. E. Johnson and H. J. Tapsell.

International Civil Aviation Organization. Publications:

Aeronautical Chart Division (Map), Fourth Session, Final Report (DOC 5400, MAP/555).—Airworthiness (Air; Effect of Air Temperature upon the Rate of Climb of an Airplane Equipped with a Constant Speed Propeller (Circular 1—AN/1).—ICAO Regional Manual—North Atlantic, Amendment No. 16, July 15, 1948.—Rules of the Air and Air Traffic Control (RAC Division) (DOC 5500-RAC/566).

Ohio State University. Engineering Experiment Station. Bulletins:

No. 132—Investigation of Bridge Impacts with a Mechanical Oscillator, C. T. West.

Svenska Forskningsinstitutet for Cement och Betong Vid Kungl Tekniska Hogskolan I Stockholm. Meddelanden:

N:R 10—Method for Solving Partial Differential Equations with Application to Rectangular Plates, Sven T. A. Odman.

U.S. Bureau of Standards. Building Materials and Structures Reports:

BMS 109—Strength of Houses; Application of Engineering Principles to Structural Design, H. L. Whittemore and A. H. Stang.

U.S. Highway Research Board. Bulletins:

No. 11—Polarized Headlight System, E. H. Land, J. H. Hunt, and V. J. Roper.

STANDARDS, SPECIFICATIONS, ETC.

British Standards Institution. Standards:

No. 904:1948—Dimensions of Instrument Jewels.—1440:1948—Endless V-Belt Drives.—1443:1948—Sizes of X-Ray Film and Intensifying Screens.

...Codes of Practice:

CP(B) 754—Impulse Clock and Timing Systems.—CP(B) 760—Roof Slating.—CP(B) 761—Installation of Electrical Fire Alarms.

Edison Electric Institute. Publications:

No. Q-4—Guide for Specification on Indoor Metalclad Switchgear.

THE CIVIL ENGINEER IN WAR

The Institution of Civil Engineers, London, England, has announced the publication, in a strictly limited edition, of a comprehensive collection of papers on the engineering problems of the second World War.

The three volumes entitled, "The Civil Engineer in War" have been prepared in co-operation with the Admiralty, War Office, Air Ministry and other government departments. They comprise 1400 pages with 1000 diagrams and photographs. Lists of the titles are available, in limited quantity, from Institute Headquarters on request.

Under authority of the Institution of Civil Engineers, these important volumes will be issued in this country by the Engineering Institute of Canada. Orders may be placed now with the Library at Headquarters and should be accompanied by a remittance in the amount of $9.75 payable to the Institute to cover all charges.

PAMPHLETS, ETC.

Condensation in an Experimental Panel Cooling Installation:

A. D. Kent. Ottawa, National Research Council, 1948.

Deterioration of Structures of Timber, Metal, and Concrete Exposed to the Action of Sea-Water:

J. Bryan. London, Institution of Civil Engineers, 1947.

Measurement of Fluid Pressure; Pressure Gauge Equipment, its Application, Installation and Maintenance:

J. R. Fawcett. Manchester, Emmott, 1948. (Mechanical World Monographs No. 42).

Speed Control of Electric Motors:

Emmott, Manchester, 1948. (Mechanical World Monographs, No. 45).

Stormwater Standards Committee Draft Report on the Second Term of Reference:

Institution of Engineers, Australia; Sydney, 1948.

BOOK NOTES

The Institute does not assume responsibility for any statements made; these are taken from the preface or the text of the book.

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 MACHINES.

T. C. McFarland. D. Van Nostrand Company, Toronto, New York, London, 1948. 540 pp., diagrs., charts, tables 9¼ x 6 in., cloth, $7.00 (in Canada).

Each chapter of this new textbook represents a broad subdivision of the general topic, thus preserving the logical unity of the several topics while allowing the instructor to do his own choosing of the order of presentation. These separate chapters cover single-phase and special-purpose transformers, polyphase transformations, induction machines, synchronous machines, both mechanical- and electronic-type power converters, single-phase motors, and alternating current motor controls.

APPLIED PHYSICS (Science in World War II).

ELECTRONICS, *edited, C. G. Suits with a foreword by K. T. Compton.*

OPTICS, *H. K. Stephenson and E. L. Jones, edited by G. R Harrison.*

METALLURGY, *L. Jordan.*

Little, Brown and Company (Atlantic Monthly Press Book), Boston, Mass.; McClelland & Stewart, Toronto, 1948. 456 pp., illus., diagrs., tables, 8½ x 5½ in., cloth, $7.00 (in Canada).

Written for both the layman and the scientist, this volume continues the report on the work of the Office of Scientific Research and Development. The first section is concerned with electronics and evaluates the work done on radar countermeasures, other related fields, and the propagation of airwaves. The second section deals with optical instruments of all kinds. It also discusses the work done on sound control and land-mine countermeasures. In the third section are descriptions of the work done on aircraft metals, armor, guns, metals for particular services, and an examination of enemy matériel.

HANDBOOK OF STRUCTURAL DESIGN IN THE ALUMINIUM ALLOYS.

J. E. Temple. James Booth & Company Limited, Argyle Street Works, Nechells, Birmingham 7, England, 1947. 147 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, 21s.

Of interest to engineers who deal with framed structures, this book covers the use of light-weight material in construction. It is divided into two parts. In Part I the most suitable alloys are described with regard to their general properties, characteristics of strength, and general working. Part II covers the more technical aspects of the subject. It is written for engineers already experienced in the design of steel structures. Stress is laid chiefly on those questions in which practice might be expected to differ in the usage of the light alloys and of steel.

(Continued on page 514)

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

September 20th, 1948

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

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

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

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

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

The Council will consider the applications herein described at the October meeting.

L. AUSTIN WRIGHT, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

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

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

FOR ADMISSION

ABBEY—DOUGLAS REEVES, of Chilliwack, B.C. Born at Moose Jaw, Sask., May 21, 1922. Educ.: B.Sc. (Chem. Engrg.), Sask., 1945; 1945 to date, R.C.E., with rank of Lieut., Instructor, School of Military Engineering, (RCSME), Chilliwack, B.C.

References: L. G. C. Lilley, W. W. Perrie, H. F. Wickware, R. A. Spencer. I. M. Fraser, E. K. Phillips.

BURNS—GORDON M., of London, Ont. Born at Toronto, Ont., Dec. 21, 1922. Educ,. B.A.Sc. (Mech.), Toronto. 1948; 1946 (summer), mechanic, Dominion Rubber Co.; 1947, (summer), dftsman., Babcock, Wilcox, Goldie, McCulloch; 1948 to date, asst. engr., Geo. E. Humphries of M. M. Dillon & Co., consultg. engrs., London, Ont.

References: M. M. Dillon, G. E. Humphries, E. A. Allcut, S. W. Archibald, A. M. Snider.

ELLIOTT—GORDON, of Saint John, N.B. Born at Morpeth, North. Eng., June 24, 1895. Educ.: Royal Navy, Harwich, Eng., School of Signals, 1912-14; 1914-19, Canadian Army, Signals; 1920-48, New Brunswick Telephone Co., at present, outside plant engr., co. supervision and direction of 5 asst. engrs. (Asks for Affiliate).

References: R. M. Richardson, A. A. Turnbull, A. G. P. McDermott, R. E. Tweedale, J. M. Redding, K. V. Cox.

FREDERICK—MICHAEL, of Montreal, Que. Born at Cobalt, Ont., Nov. 21, 1919. Educ.: B.Sc., (Chem. Engrg.), Queen's, 1943; with Ayerst, McKenna & Harrison, St. Laurent, Que., as follows: 1943-44, jr. engr., pilot plant and prod. work initiating prod. of penicillin, 1944-47, jr. engr. & chief dftsman., worked on design of industrial bldgs. re additions to plant. Work included architectural, design of heating systems, elect. lighting, air-conditioning, sprinkler systems, sewer systems, etc.; 1947 to date, design engr., design of salt plant, flow sheets, equit. layout, bin design, pile foundations, Dominion Tar & Chemical Co., Ltd., Montreal, Que.

References: J. G. Welsh, D. S. Ellis, A. Jackson, S. D. Lash, W. S. Bowles.

LACOMBE—JEAN PAUL, of Montreal, Que. Born at Montreal, Que., June 20, 1915. Educ.: B.A.Sc., C.E., Ecole Poly., 1941; R.P.E., Quebec; 1939, (4 mos.), student tech., aid surveyer, Dept. of Mines & Resources, Ottawa; 1941-42, dftsman., structl dftng., design & estimates, Dominion Bridge Co., Lachine; 1942-44, pipe dftsman, pipe material checker, Fraser Brace Co., Ltd., Montreal; 1944 (2 mos.), tech. aid surveyer, C. C. Lindsay, Montreal; 1945, (2 mos.), dftsman., Wm. Baxter, Montreal; 1944-45, dftsman., amm. factory, Dr. R. F. Brown, St. Paul L'Hermite, Que., 1945-47, bridge engr. on constrn., bridge service, Prov. Min. Public Works, Quebec; 1948, (3 mos.). civil engr., grade 2, Dept. Public Works, wharf service, Rimouski, Que.

References: D. B. Armstrong, P. A. Dupuis, L. McLaren, P. G. Gauthier, J. A. Laniel, J. Ain, L. Trudel.

MICHELL—HUMPREY GEORGE, of La Paz, Bolivia. Born at Miniota, Man., Oct. 1, 1894. Educ.: B.Sc., (Elect.), Manitoba, 1920; M., A.I.E.E.,; Winnipeg Hydro Electric System, 1920-22, asst. to distr. engr., 1922-26, distr. engr.; with Mexican Light & Power Co., as follows: 1926-28, distr. engr., responsible for design & layout of systems 1928. (4 mos.), supt. of distr. i/c of distr. system and substations, 1928-32, supt. of transmissions & distr., i/c distr. and transmission system, meter & telephone depts., and small substations; 1934-39, elect. engr., i/c all elect. system, Mexico Tramway Co.; with Bolivian Power Co., Ltd. La Paz, as follows: 1939-46, mgr. Oruro divn., i/c co's southern divn., 1946-47, mgr., i/c tech. operation of La Paz divn., 1947 to date, genl. mgr. i/c co.'s operations in Bolivia. (this co. is the major elect. supply co. in the country).

References: G. H. Thompson, J. H. McLaren, J. K. Sexton, W. R. Davis, J. T. Farmer, D. Stairs, H. J. McLean, A. C. D. Blanchard.

O'NEILL—JAMES HENRY, of Windsor, Ont. Born at Detroit, Mich., Sept. 7, 1918. Educ.: B.Sc., (Civil), Univ. of Detroit, 1947 (accredited ECPD); R.P.E., Ontario; 1939-44, instru'man., surveying on railroad right of way, drawing work in office, divn. engr.'s. office; Pere Marquette R.R.; 1944-45, similar duties, except the field work was on industrial surveying, Mason L. Brown & Sons, surveyers; 1945-48, structl. engrg., supervising and checking srtuctl. steel details, Laucomer & Manser, (U.S.); at present, conducting structl. detailing & design business in Windsor, (Cerget & O'Neill), for firms both in Canada and the U.S.

References: W. G. Mitchell, P. E. Adams, G. V. Davies, J. M. Wyllie, F. J. Pollock.

SANFORD—SAM, of Calgary, Alta. Born at Minneapolis, Minn., June 26, 1907. Educ.: B.A.Sc., Toronto, 1930; 1930-32, apprent. engr., Canadian International Paper Co., 1932 to date, partner, (metal and machinery), Alberta Equipment Co., Calgary and Canadian Junk Co., Calgary, Alta.

References: F. C. Tempest, J. F. Langston, J. H. Wilson, R. T. Hollies, P. F. Peel.

TRISCHUK—WILLIAM, of Edmonton, Alta. Born at Meacham, Sask., March 30, 1908. Educ.: B.Sc., (Civil). Sask., 1933; 1929-30-31-32, (summers), dftsman., instr'man., inspecn. on sewer & water constrn.; 1934-40 sec. treas. Rural Municip. of St. Philips and Cote Kamsack, Sask., (responsible position but not in line with civil engrg.); 1941-45, Works & Bldgs. Officer, R.C.A.F.; 1945-47, transitman. Canadian Pacific Rly.; at present Constrn. Engrg. Officer, with rank of F/L, North West Air Command, R.C.A.F., Edmonton, Alta.

References: C. L. Ingles, A. Michaelenko, R. A. McLellan, D. F. Hamelin, W. L. Foss.

WATERHOUSE—HENRY ANTHONY, of Edmonton, Alta. Born at Montreal, Que., Feb. 19, 1904. Educ.: Prov. Inst. Tech. & Art, Calgary, 1922-24; East Kootenay Power Co., Ltd., 1924-25, dftsman., 1925-27, operator. hydro plant, 1927-28, i/c elect. operation of new 13,000 k.v.a. steam plant; 1928-31, chief electrician, Hillcrest Collieries; with Dept. Trade & Commerce, 1931-46, inspecn. elect. & gas, 1946-48, dist. inspecn., 1948 to date, asst. regional engr., standards divn., Edmonton, Alta. (Asks for Affiliate).

References: J. E. B. Cranswick, J. T. Watson, H. J. McEwan, J. McMillian, P. F. Peele. M. W. Jennings, W. Smith.

WEDGWOOD—JIM ARMSTRONG, of Saskatoon, Sask. Born at Gull Lake, Sask., April 16, 1920. Educ.: B.Eng., (Mech.), Sask., 1941; 1941-45, Lt. Cdr. (E), R.C.N.V.R.; 1946 (part), asst. dist. supt., Saskatoon Power Commission, Swift Current, Sask.; 1946, (part), special lecturer, Univ. of Sask.; 1947-48, (summers), engrg. dept., Montreal Engineering Co., Ltd.; fall of 1948, asst. prof., Univ. of Saskatchewan, (permanent position).

References: I. M. Fraser, G. H. Thompson, J. T. Farmer, E. A. Goodwin, J. K. Sexton, W. R. Davis.

FOR TRANSFER FROM THE CLASS OF JUNIOR

CAVANAGH—JOHN RICHARD, of Toronto. Born at Winnipeg on Feb. 5, 1920. Educ.: B.A.Sc. (Civil), Toronto. 1944, R.P.E. Ont.; summer work as follows: 1941, Steel Co. of Canada; 1942, Vecyor Engineering; 1943, Massey Harris; 1944-46, Royal Canadian Engineers; 1946 to date, prof. engr. consultant in patent matters with Fetherstonhaugh & Co., Toronto. (St.1945, Jr.1946).

References: T. R. Loudon, E. A. Allcut, R. F. Legget, C. R. Young.

LUSCOMBE—WILLIAM CHARLES M., of Montreal. Born at Sarnia, Ont., on June 21, 1914. Educ.: B.Sc. (Elec.), Queen's, 1941, R.P.E. Que.; summer work as follows: 1932-36, radio operator & N.C.O.—R.C.S.; 1936-37, Dept. of Transport, N.C.O.; 1941-42, test engineer, Can. Gen. Elect. Co.; 1942-45, plant elect. engr. mtce. and constrn. dept., Aluminum Co. of Canada; with Dominion Textile Co. Ltd., as follows: 1945-46, purchasing agent, machinery—ACOC, resident elect. engr. i/c elect. mtce.; 1946-47, elect. mtce., asst. mech. supt. i/c plant mtce. & constrn.; 1947-48, elect. engr. i/c design, general elect. supvr. of company plants, Montreal. (St.1941, Jr.1944).

References: W. Pugh, A. D. Ross, F. L. Lawton, E. B. Jubien, H. S. Weldon.

NOBLE—WILLIAM LAWRENCE, of Windsor, Ont. Born at Winnipeg on June 9, 1921. Educ.: B.Sc. (Civil), Sask. 1941, R.P.E. Ont.; 1941, draftsman; 1942, estimator, Canadian Bridge Co. Ltd., Walkerville, Ont. (St.1941, Jr.1943).

References: J. M. Wyllie, W. R. Mitchell, W. G. Mitchell, G. G. Henderson, P. E. Adams, C. S. Neilson.

FOR TRANSFER FROM THE CLASS OF STUDENT

CARLYLE—ALLAN MATTHEW, of Montreal, Que. Born at Calgary on March 5, 1921. Educ.: B.A.Sc. (Mech.), B.C., 1948; summer work as follows: 1940-41, Alberta Nitrogen Products Ltd., Calgary; 1945 (7 mos.), Union Milk Co. Ltd., Calgary; 1946, Calgary Power Co. Ltd.; 1947, Western Canada Steamships, Vancouver; at present, engr., Canadian Car & Foundry. (St.1948).

References: J. N. Finlayson, H. J. MacLeod, H. B. LeBourveau, R. Lanctot, P. D. Mellon.

PATTERSON—HUGH JOHN TREVOR, of Montreal, Que. Born at Montreal, Que., May 20, 1922, Educ.: B.Eng., (Civil), McGill, 1948; R.P.E., Quebec; 1941, (summer), dftsman., Dominion Bridge; 1946, (summer), Dominion Structural; with Shawinigan Engineering Co., Ltd., Montreal, as follows: 1946-47, (10 mos.), instr'man., and at present, constrn. on hydro-electric development. (S.1946).

References: G. R. Rinfret, R. E. Heartz, J. A. Burke, I. D. MacKenzie, A. L. Patterson, R. A. Parsons, R. E. Jamieson.

REID—JAMES MACPHERSON, of Windsor, Ont. Born at Toronto on August 1, 1921. Educ.: B.Sc. (M.E.), Lawrence Institute of Technology, Detroit, Mich., 1945, (not accrediated ECPD), 1940-43, trade school, apprentice; 1943-47, engr. in plant engrg. dept., Ford Motor Co.; 1947 to date, field engr. plant No. 5, Ford Motor Co. (St.1944).

References: G. G. Walton, V. W. MacIsaac, C. Krassov, J. B. Dowler, J. F. Blowey.

LIBRARY NOTES

(Continued from page 512)

INDEX TO A.S.T.M. STANDARDS, December 1947.

American Society for Testing Materials, 1916 Race St., Philadelphia, Pa., 248 pp., 8½ x 5¾ in., paper, free upon request.

This index provides a ready reference for locating any of the some 1500 standards and tests issued by the A.S.T.M. It also serves those who wish to determine whether A.S.T.M. has issued standard specifications, test methods, or definitions covering a particular engineering material or subject.

INTRODUCTION TO AERODYNAMIC COMPRESSIBILITY.

J. Black. Bunhill Publications Ltd., 12 Bloomsbury Square, London, W.C.1, 1947. 115 pp., plates, illus., diagrs., charts, tables, 10 x 7 in., cloth, 18s.

Primarily intended for the student, this book serves as an introduction to problems, as yet but partially understood, of the fluid flow of air at high speeds. The author clarifies some of the many misconceptions and false premises at present current by both experimental and theoretical data. The book surveys the latest important results and should be of value to those who design streamline bodies, ducts, or turbines.

MANUAL OF STRUCTURAL DESIGN, 3rd ed:

J. Singleton. H. M. Ives & Son, 415 Kansas Ave., Topeka, Kansas, 1947. 336 pp., diagrs., charts, tables, 10¼ x 7 in., fabrikoid, $6.00.

Intended for the practising engineer, this book applies the fundamentals of structural design in the formulation of data that bear directly on specific cases. In order to keep the manual up to date, this edition contains the latest specifications of the American Institute of Steel Construction and other new material. The included data are presented chiefly in the form of tables or graphs for more effective use.

PREPARATION AND CHARACTERISTICS OF SOLID LUMINESCENT MATERIALS, Symposium held at Cornell University, October 24-26, 1946.

Sponsored by the Division of Electron Optics of the American Physical Society, edited by G. R. Fonda and F. Seitz. Published under the auspices of the National Research Council by John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1948. 459 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $5.00.

The twenty-nine papers that appear in this monograph are the outcome of a conference on luminescence held at Cornell University in October, 1946. The material is a survey of present researches and affords a comprehensive review of accomplishments of the War years. General characteristics and methods of preparation, recent developments in theory and experiment, factors affecting fluorescence characteristics, storage of luminescence energy, and miscellaneous aspects of fluorescence are considered.

PRINCIPLES OF INDUSTRIAL MANAGEMENT, 4th ed.

E. A. Allcut. Sir Isaac Pitman & Sons, Toronto, Canada, 1947. 308 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.00

Intended for use by students as a text, this volume does not attempt to describe the details of industrial administration. After a discussion of the general principles of management, the specific topics of organization, reports, purchasing, budgets, planning, work routing, and stockroom procedures are treated. A chapter on time and motion study is included as well as chapters on inspection, costs and cost keeping, industrial labor relations, and waste.

PRINCIPLES OF SERVOMECHANISMS, Dynamics and Synthesis of Closed-Loop Control Systems.

G. S. Brown and D. P. Campbell. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1948. 400 pp., illus., diagrs., charts, tables, 9¼ x 5¾ in., cloth, $5.00.

Of interest to the scientist, practicing engineer, teacher and student, this book offers a comprehensive treatment of closed-loop dynamics and synthesis. It describes the principles of the closed-loop automatic control, stressing actual system design, and offers a direct approach to system synthesis by interrelating the transient and frequency behavior. Techniques for laboratory studies are given as well as problems for student exercise.

S P I HANDBOOK.

Society of the Plastics Industry, Inc., 295 Madison Ave., New York, 1947. 451 pp., illus., diagrs., charts, tables 9¼ x 6 in., fabrikoid, $7.50 to non-members, $4.50 to members.

The results of six years of planning and four years of effort by 300 technicians in the plastics industry, this handbook covers the subjects of primary importance to good engineering of plastics. A classification of plastics molding materials is given. Molding processes, design of molded articles, cementing and assembling, testing, mold design, machining and finishing are covered. Included also are standards for the design of inserts, for tolerances on molded plastic parts, and for laminated products.

STEAM, AIR AND GAS POWER, 4th Ed.

W. H. Severns and H. E. Degler. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1948. 509 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.75.

This standard text gives the student of power engineering the basic information he will use in his daily work. It presents modern practice with sufficient technical detail and mathematical calculation. Clear discussions and illustrations show the underlying theory of the construction, application and performance of modern heat-power plants and their correlated equipment. New material on the gas turbine and other recent developments have been added to this edition including new problems.

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, recent graduate, required for position in Technical Department of a paper manufacturer in Eastern Ontario. Salary open. Apply to File No. 4181-V.

CHEMICAL ENGINEER, recent graduate, required for a junior position in the Research Department of a manufacturer in Central Ontario. Salary open. Apply to File No. 4183-V.

CHEMICAL ENGINEER with around two years experience required by large Pulp and Paper Mill in Province of Quebec. Salary $250 per month. Apply to File No. 4199-V.

CIVIL

CIVIL ENGINEER required for Consulting Engineer and Land Surveyor's office in Western Ontario. Must be able to make urban and rural surveys, layout of sewers, waterworks and pavements, etc. Will applicants please state qualifications and references. Salary open. Apply to File No. 4204-V.

CIVIL ENGINEER with considerable experience in structural steel and reinforced concrete design. Preferably bilingual. Required in Montreal. Must be veteran with overseas service. Applicant should state age, experience and salary expected. Apply to File No. 4205-V.

ELECTRICAL

ELECTRICAL ENGINEER preferably with some experience in paper industry required by large Pulp and Paper Mill to work under Electrical Superintendent. Salary $300 to $350 per month. Apply to File No. 4199-V.

MECHANICAL

MECHANICAL ENGINEER wanted for the position of Chief Engineer in large general Mechanical Engineering Plant in the Montreal area. Position covers supervision of mechanical product design also tool and process layout for manufacturing, preparation of estimates, shop drawings, bills of material and ordering of all material for contracts. Salary open. Apply to File No. 4066-V.

MECHANICAL ENGINEER, recent graduate, with some industrial background required for engineering department of a manufacturer in Central Ontario. Salary open. Apply to File No. 4183-V.

MECHANICAL MAINTENANCE ENGINEER with twelve to fifteen years experience required by Toronto office of Canadian firm. Must be between the ages of 35 and 40 and preferably located in the Toronto area. Salary open. Apply to File No. 4191-V.

MECHANICAL ENGINEER age 30 to 40 years required by a manufacturer of carpenters' and mechanics' tools in Province of Quebec for production supervision and methods engineering. Salary open. Apply to File No. 4202-V.

MECHANICAL ENGINEER, recent graduate, required by a manufacturer of carpenters' and mechanics' tools in Province of Quebec. One year training period in United States. Salary $225. Apply to File No. 4202-V.

GRADUATE MECHANICAL ENGINEERS for Sessional appointment as Instructors and Demonstrators for seven months from October 1st, 1948, required by Canadian University in Montreal. Apply giving qualifications and salary required to File No. 4207-V.

MISCELLANEOUS

STRUCTURAL DRAUGHTSMEN required by Alberta firm. One able to check all classes of structures and tanks. Another able to detail all types of structures and a third able to detail light structures and general handling machinery. Must be experienced. Salary open. Apply to File No. 4167-V.

PLANT MAINTENANCE ENGINEER, mechanical background, extensive experience in pulp and paper preferably kraft. Required to take charge of kraft mill maintenance in province of Quebec. Executive ability. Salary open. Apply to File No. 4179-V.

ARCHITECTURAL DRAUGHTSMAN required by large industrial concern. Must have 5 or more years on preparation of architectural working drawings, preferably on industrial type buildings. Age limit 30 years. Salary open. Apply to File No. 4185-V.

MAINTENANCE MANAGER required for large hospital in the Maritimes for maintenance and operation of power plant, buildings and equipment. Salary open. Apply to File No. 4186-V.

GRADUATE ENGINEER with not less than ten years experience in design and operations of hydraulic turbines, penstock valves and associated powerplant accessories. Position involves mechanical plant layout preparation of specifications, examination of manufacturer's drawings and inspection of equipment. Location Toronto. Salary open. Apply to File No. 4189-V.

GRADUATE ENGINEER between 28 to 30 years of age required for the following duties: Stream gauging, surveys, snow surveys, regulation and storage studies, hydraulic computations, power installation and economics. Salary open. Apply to File No. 4192-V.

INDUSTRIAL ENGINEERS with production experience required by a firm of industrial consultants in Montreal. Preferably with experience in time study, cost control, etc. Salary $400 up according to qualifications. Apply to File No. 4193-V.

PRODUCTION ENGINEER, required in Montreal by manufacturer of small machine parts. Must have some production experience. Salary according to qualifications. Apply to File No. 4195-V.

GRADUATE ENGINEER, required by manufacturer in Montreal, must be familiar with brake design and operation with particular reference to brakelining. Salary open. Apply to File No. 4196-V.

RECENT GRADUATES with mechanical or aeronautical background required in Montreal. Salary open. Apply to File No. 4197-V.

SALES ENGINEER, mechanical background, must be thoroughly experienced and capable of developing and maintaining connections of old established firm in road builders, contractors and industrial machinery equipment. Must possess executive ability and have command of the French language. Salary open. Apply to File No. 4203-V.

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

CHEMICAL

CHEMICAL ENGINEER with considerable mechanic and hydraulic experience or mechanical engineer with good chemical knoweldge and experience in hydraulics, required by a manufacturer in Ontario. Salary open. Apply to File No. 3928-V.

CHEMICAL ENGINEER, recent graduate is needed by a chemical manufacturing firm situated in the Province of Quebec. Some experience in oil refinery, pulp and paper, or synthetic resin manufacture would be useful. Salary open. Apply to File No. 3978-V.

CHEMICAL ENGINEER OR CHEMIST wanted by large manufacturers of bleached sulphate pulp for their Technical and Development Department. Several years experience preferably in the pulp and paper industry. Mill located in Northern Ontario. Salary open. Apply to File No. 3991-V.

GRADUATE CHEMICAL ENGINEERS OR CHEMISTS required by an industrial chemical plant in the Montreal area. Preferably with experience in production and the operation of chemical equipment such as filters, presses, etc. Must be able to organize work and direct workmen. Salary open. Apply to File No. 4071-V.

CHEMICAL ENGINEER for technical department of pulp and paper firm in the St. Maurice Valley. Applicant must have supervisory capacity and also be able to undertake investigational work involving the coordination of laboratory experiments and mill operations. Salary open. Apply to File No. 4130-V.

CIVIL

CIVIL ENGINEER required as Town Engineer of a town in the Maritimes. Required to supervise and layout work for Water and Sewerage Dept., Works Dept., also construction of a general nature for the Electric Light Dept. Salary open. Apply to File No. 3930-V.

JUNIOR ENGINEER, preferably with civil background required for sales and service by a Montreal manufacturer of waterproofing compounds. Salary open. Apply to File No. 3968-V.

CIVIL ENGINEER around 30 years of age required as Assistant City Engineer of small city in Province of Quebec. General duties eventually to replace City Manager. Salary $3,000 to $3,600 according to qualifications. Apply to File No. 4144-V.

CIVIL ENGINEER, qualified to take charge of all town services including water and electric (distribution system) utilities required by a Town in Nova Scotia. Population 4,000. Salary open. Apply to File No. 4147-V.

CIVIL ENGINEERS required in Eastern Ontario for employment as designers of service systems for housing and other building projects. Preferably men with at least 10 years experience in that line. Salary according to qualifications. Apply to File No. 4156-V.

CIVIL ENGINEER recent graduate with up to one year's experience since graduation. Preferably single man. Required by Northern Ontario Paper Mill. Salary around $250. Apply to File No. 4158-V.

CIVIL ENGINEER required for mechanical logging department. Recent graduate, single. Must be prepared to spend major portion of time in field work. Salary open. Apply to File No. 4168-V.

ELECTRICAL

PROFESSOR IN ELECTRICAL ENGINEERING required by a Canadian University in the Province of Quebec for fall 1948 semester. Preferably with teaching and practical experience in power, electrical machinery, lab., etc. Bilingual preferred. Attractive salary available for right man. Apply to File No. 3982-V.

JUNIOR ELECTRICAL ENGINEER required by a mining company in Northern Ontario. Salary open. Apply to File No. 4028-V.

GRADUATE ELECTRICAL ENGINEER required for position with large Northern Ontario Paper Mill. Preferably man with some paper mill or other industrial experience. Salary commensurate with qualifications and experince. Apply stating experience and qualifications. Apply to File No. 4032-V.

GRADUATE ELECTRICAL ENGINEER with a minimum of 2 years practical experience to assist in electrical engineering design work, field work on construction and maintenance of structures, service and installation of equipment required by Manitoba City. Salary $226 to $257. Apply to File No. 4069-V.

ELECTRICAL ENGINEER, age 30-40, required as Sales Engineer for Electrical Power Apparatus Company, manufacturing motors, transformers, rectifiers, switchgear, etc. Test course graduate specializing in switchgear preferred. Sales experience desirable but not essential. Location Toronto. Salary open. Apply to File No. 4128-V.

ELECTRICAL DESIGNING DRAUGHTSMEN for work with a firm of consulting engineers in Southern Ontario. Must be experienced. Salary up to $300. Apply to File No. 4133-V.

ELECTRICAL ENGINEER required for Toronto area for engineering and design of power transformers. Salary will be commensurate with ability and experience. Apply to File No. 4141-V.

ELECTRICAL ENGINEER required as Senior Transformer Draughtsman by Canadian Company in Ontario. Must be experienced in layout and design of high voltage power transformers also capable of assuming responsibility. Salary open. Apply to File No. 4146-V.

MECHANICAL

RECENT GRADUATES in Mechanical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 3981-V.

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for colliery plant, screening equipment, hoists, simple steel structures, etc. Salary $240 up, depending upon ability. Apply to File No. 4030-V.

MECHANICAL ENGINEER required in Montreal with considerable experience in machine shop practice and some administrative experience in shop work. Applicant should be around 35 years of age and bilingual. Salary depending on qualifications. Apply to File No. 4100-V.

JUNIOR MECHANICAL ENGINEER, age 25 to 27 years, preferably with three to four years experience required for general duties by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 4114-V.

MECHANICAL ENGINEER with at least ten years experience including plant maintenance and preferably in the pulp and paper industry required in New Brunswick. Salary open. Apply to File No. 4117-V.

MECHANICAL ENGINEER required as Plant Engineer by large Pulp and Paper Mill. Must have paper mill engineering experience. Permanent position. Salary between $475 to $550 depending on experience. Apply to File No. 4132-V.

MECHANICAL ENGINEER with knowledge of design and considerable experience with steam and diesel engines and refrigeration equipment. Required in Montreal. Preferably bilingual. Must be veteran with overseas service. Applicant should state age, experience and salary expected. Apply to File No. 4137-V.

MECHANICAL ENGINEER OR DRAUGHTSMAN with minimum of four or five years experience. Knowledge of paper mill engineering desirable but not essential. Required by large Pulp and Paper Mill for general engineering design and draughting. Salary up to $400 depending on qualifications. Apply to File No. 4138-V.

MECHANICAL ENGINEER, around 35 years of age required as Assistant to Project Engineer on construction of large pulp plant. Experience in design and piping essential. Duties in Montreal and British Columbia. Salary $5,000 to $6,000. Apply to File No. 4149-V.

MECHANICAL ENGINEER recent graduate required in Engineering and Servicing Department of Canadian Firm with Headquarters in Montreal. Duties include service work in connection with Railway, Pulp Mill and other Industrial Products. Salary open. Apply to File No. 4150-V.

MECHANICAL ENGINEER required for sales engineering by large engineering company. Age 25 to 30 years and preferably veteran. Salary around $275.00. Apply to File No. 4165-V.

MECHANICAL ENGINEER, recent graduate, required for manufacturing and related duties with well established reputable paper company. Salary open. Apply to File No. 4172-V.

MECHANICAL ENGINEER with three to five years experience required in Montreal by well established paper company for duties involving machine design, plant and general engineering. Salary open. Apply to File No. 4172-V.

MECHANICAL ENGINEER required for chief engineers department of pulp and paper company operating news and kraft mills. Must have at least 5 years experience in paper mill or with paper machinery manufacturing. Knowledge of Yankee and Fourdrinier special machines desirable. Salary open. Apply to File No. 4173-V.

METALLURGICAL

RECENT GRADUATES in Metallurgical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 3981-V.

MINING

MINING ENGINEERS with varied experience required by a firm in Quebec for general mine operation, exploitation and development work. Salary from $250. Apply to File No. 3818-V.

MINING ENGINEER with several years experience required by a Company engaged in large scale asbestos production in Quebec. Salary open. Apply to File No. 3935-V.

MISCELLANEOUS

GRADUATE ENGINEERS required by an industrial and chemical organization with headquarters in Montreal for all phases of research, design, operation, development, production and maintenance. Salaries open. Apply to File No. 3588-V.

METALLURGICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No. 3942-V.

MECHANICAL AND CHEMICAL ENGINEERS, interested in entering the Pulp and Paper industry required in Nfld. Vacancies in Technical Department and studying process work and improved methods of operation. Pulp and paper experience is not necessary. Salary open. Apply to File No. 4009-V.

POWER PLANT SUPERVISOR required for South America. Age 30-40, single preferred to supervise steam power plant including operating, boiler cleaning and minor repairs. Salary $375 U.S. currency. Apply to File No. 4011-V.

ARCHITECTURAL DRAUGHTSMAN experienced in industrial building construction, with natural aptitude for design work, wanted by large industry in Eastern Townships. Good salary, permanent position to the right man. Apply to File No. 4031-V.

SENIOR INDUSTRIAL ENGINEER required by Management Consultants in Montreal. Experienced in installations of production and cost control, wage incentives, etc. Free to travel, preferably bilingual. Salary open. Apply to File No. 4052-V.

SALES ENGINEER for popular line of Diesel Engines. Applicants must be specialists on Power Units and Generator Sets, required for permanent employment with well established organization. Apply to File No. 4055-V.

INDUSTRIAL ENGINEER with considerable manufacturing experience between 30 and 40 years of age required for plant surveys in Province of Quebec. Must be fluently bilingual. Permanent position. Salary according to qualifications. Apply to File No. 4064-V.

POWER STATION OPERATOR with about five years' experience principally in operation and maintenance of turbines and mechanical equipment of hydro-electric plants required by public utility in Brazil. Preferably not over 30 and single but will consider married man without minor dependents. Replies held in strictest confidence. Salary open. Apply to File No. 4073-V.

TOWN ENGINEER required by town in Ontario. Duties include the supervision of Board of Works and Sanitation Departments as well as acting in an advisory capacity to the telephone, electric and water utilities. Salary from $250 to $300. Apply to File No. 4087-V.

RECENT GRADUATE MECHANICAL OR ELECTRICAL background required by engineering firm in Montreal. Duties include training in Public Utility in Administration Department. Eventually for South America. Salary to start $225. Apply to File No. 4089-V.

JUNIOR ENGINEER preferably with a few years experience in production control and some knowledge of the textile industry required for Montreal area. Salary $250 to $275. Apply to File No. 4092-V.

SENIOR INDUSTRIAL ENGINEER with business administration and mechanical background, bilingual, with at least five years experience in production control, wage incentives and cost control required by an industrial engineering consultant in Montreal. Salary open. Apply to File No. 4092-V.

SENIOR DESIGNER with from five to ten years experience and a general knowledge of structural design in relation to buildings and bridges required by a steel company in Southern Ontario. Salary open. Apply to File No. 4093-V.

JUNIOR ENGINEER with from one to five years experience and at least a working knowledge of structural design of buildings required by a steel company in Southern Ontario. Salary open. Apply to File No. 4093-V.

SALES ENGINEER required by large manufacturer of Air Handling equipmet in Toronto area. Applicant should have either industrial or Public Building application and sales experience. Salary open. Apply to File No. 4101-V.

SALES ENGINEER required by Canadian Company in Ontario. Must have thorough knowledge of the preparation of tenders, propositions on Transformers, Motors and Switchgear equipment, also experience in the commercial side of the heavy electrical industry. Salary open. Apply to File No. 4102-V.

DRAUGHTSMEN with some experience in building design or architectural work required by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 4114-V.

MECHANICAL OR ELECTRICAL GRADUATE, age about 35 years with experience in building construction machinery maintenance and repair capable of taking over the engineering and maintenance services in a large textile mill in Province of Quebec. Salary open. Apply to File No. 4114-V.

SALES ENGINEERS, one experienced man also two juniors willing to learn required by an electrical and power house equipment manufacturer in Montreal. Salary open. Apply to File No. 4121-V.

GRADUATE ENGINEERS required as Assistant Professors, Lecturers and Demonstrators in Civil, Electrical and Mechanical Engineering by a Canadian University. Salaries dependent on experience and general qualifications. Apply to File No. 4127-V.

GRADUATE ENGINEER with engineering and sales experience required as a Street Lighting Specialist in Toronto area. Position involves direct sales engineering with municipalities and utilities also engineering and production problems directly concerned with the manufacture of street lighting equipment. Age under 35 years. Salary open. Apply to File No. 4141-V.

MAINTENANCE ENGINEER, under 30 years of age, required by Public Institution for Montreal area. Duties include maintenance of buildings, heating plants, electric services, etc. Salary open. Apply to File No. 4143-V.

TOWN ENGINEER required for town in Nova Scotia. Applicant must be qualified to take charge of all town services including electric (distribution system) and water utilities. Salary open. Apply to File No. 4145-V.

MECHANICAL OR CHEMICAL ENGINEER with Masters' or Doctors' degree and several years' experience in industrial or University research work required to head the Engineering Development Section of the National Research Council, Atomic Energy Project. Salary open. Apply to File No. 4148-V.

ENGINEER required in Montreal. Applicant should have railroad construction experience and a knowledge of welding technique also the ability to organize and carry out special track construction jobs. Salary open. Apply to File No. 4157-V.

CIVIL OR STRUCTURAL ENGINEER, 24 to 35 years, required for Northern Ontario Paper Mill. At least four years experience, 2 of which should be on construction and 2 on design. Opportunity to train junior personnel. Salary not less than $400 00. Apply to File No. 4158-V.

GRADUATE ENGINEER required by Pulp and Paper Mill in Province of Quebec. Must have extensive experience in general maintenance, design and development of pulp and paper mill equipment. Excellent future advancement. Salary $6,000 to $9,000 depending on qualifications. Apply to File No. 4161-V.

SALES ENGINEERS, one for Ontario and one for Quebec, required by tool and qualify steel Branch Sales Office. Applicant should have some metallurgical training, some experience in tool and die manufacture, good personality and should own car. Salary open. Apply to File No. 4170-V.

MECHANICAL OR ELECTRICAL ENGINEER, bilingual, experienced in standard investigations and observations. Time study training not necessary. Required by Montreal firm. Salary open. Apply to File No. 4174-V.

GRADUATE ENGINEER required by an oil company in the Maritimes must have sufficient experience in the oil business and the educational qualifications to enable him to determine the specifications of oils required for various industrial machinery. Salary open. Apply to File No. 4178-V.

CONSTRUCTION ENGINEER capable of supervising sundry engineering jobs and pipelines for oil company in the Maritimes. Salary open. Apply to File No. 4178-V.

GRADUATE ENGINEER required for veneer and plywood plant in the Maritimes. Must be fully qualified to assume responsibility for the management, production and general supervision of the plant. Salary open. Apply to File No. 4180-V.

RECENT GRADUATE required by a large National Organization. Must have the following qualifications: Good appearance, personality, leadership and initiative. Salary $2,400. Apply to File No. 4194-V.

Situations Wanted

MECHANICAL ENGINEER, M.E.I.C., P.Eng., Ont.; 36, married, now employed on top responsible position, desires position with Airlines, or connected with flying. Man with wide technical experience and knowledge. Pilot since childhood, and ex-instructor in power and glider flying. Speaks several foreign languages, good organizer, knows jet propulsion and safety of flying problems. Available for responsible, serious and permanent position with future on 6 months notice to the present employer. Will give priority for the position with available living quarters near work. Apply to File No. 140-W.

MECHANICAL ENGINEER, Jr.E.I.C., McGill University. Eight years experience Tool and Production Methods Engineer Age 38. Married. Presently employed. Desires employment as Production Manager or Materials Engineer for large company. Preferably Montreal area. Apply to File No. 551-W.

ELECTRICAL ENGINEER, M.E.I.C., Alberta 1931, P.Eng., Ontario, married. Experience in Engineering Department of large industrial plants and as Field Engineer on various plant and power construction projects. During the war was Sr. Engineer on design of Auxiliary Electrical equipment for Radar units and sub-contract work. Desire permanent position requiring initiative with good future prospects, preferably in Ontario. Apply to File No. 1249-W.

ENGINEER, M.E.I.C., P.Eng., Que., with Bachelor and Master Degrees, over twenty years diversified background of experience, interested in post on plant operations, administration, or general management. Service overseas in army. Now employed but available on short notice. Apply to File No. 1645-W.

CIVIL ENGINEER, M.E.I.C., Prof. Eng., Quebec, age 39, married. Fluently bilingual with a certificate in Municipal Public Works administration. Experienced in Municipal, Highway Engineering, design of sewer and aqueduct, construction and maintenance. Seeks position as executive, Town Engineer, Construction Superintendent, Sales Engineer. Available on short notice. Apply to File No. 1859-W.

INDUSTRIAL AND CIVIL ENGINEER, M.E.I.C., B.A.Sc., P.Eng., Quebec, age 39, married, fluently bilingual. Seeks position as Industrial Engineer, Executive, Town Engineer, Sales Engineer. Experienced in Motion and Time Study Methods, Process Development, Production Control, Costing, Plant Maintenance, Highway Engineering, Municipal Engineering, Sales. Available on short notice. Apply to File No. 2157-W.

PART TIME WORK: Senior Design Engineer, B.A.Sc., P.Eng., M.E.I.C., has available an experienced group of engineers and draughtsmen desirous of obtaining evening work. Experience in the group includes municipal, mechanical, mining and water-power engineering ranging from the initial layout to the final design, as well as structural steel and reinforced concrete design and layout. All members of this group are permanently employed. Apply to File No. 2463-W.

MECHANICAL ENGINEER, B.Sc. (Queen's), M.E.I.C., P.Eng. Age 33, married. Presently employed Montreal area is desirous of obtaining position in Ontario. Offers experience in Engineering department management and organization, plant layout, machine design, jigs and tools, sheet metal work and building trades. Available one month's notice. Apply to File No. 2682-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., Que., with more than 25 years experience in reinforced concrete design and construction, interested in position with responsible firm or partnership with consultant would also consider government or municipal position. Apply to File No. 2695-W.

CHEMICAL ENGINEER, Jr.E.I.C., McGill, age 28, married. Experience includes: control, research, development, production, supervision and sales. Synthetic resins, paints, varnishes, fermentation, detergents, acids, explosives. Organic and inorganic chemistry. Time study. Bilingual. Available immediately. Apply to File No. 2850-W.

GRADUATE ENGINEER, S.E.I.C., Man. '47. Presently engaged in plant layout and field supervision. Experienced in mechanical and electrical construction and maintenance. Responsible position desired in business and production engineering in progressive firm. Apply to File No. 2975-W.

EXECUTIVE ENGINEER, age 43, P.Eng., M.E.I.C., M.C.I.M., with Mechanical, Structural and Mining Engineering Background, desires contract for position in Executive or Management Field Apply to File No. 2982-W.

ENGINEER, M.E.I.C., B.Sc. (Honours) McGill '31, P.Eng. (Que.), M.A.S.L.E., married, 3 children, age 40. 9 years experience in general business field organizing sales, distribution and product servicing. 8 years mechanical engineering experience primarily in erection and installation of mechanical equipment and plant maintenance. Duties also included lubrication surveys and training of lubrication crews, as well as courses for foremen and mechanics, studies of cost accounting analysis for modifications. Last 3 years in charge of rehabilitation and reconditioning of plant, design and installation of new equipment and dust collecting installations. Perfectly bilingual. Desires position with future in a reliable firm. Location not important though British Columbia or Southern Ontario preferred. Apply to File No. 2987-W.

CIVIL ENGINEER, B.A.Sc., S.E.I.C., veteran, age 26, experience in surveying, industrial layout and inspection, construction of underground heating system. 1 year design and construction water and sewerage system. Presently employed in Ontario. Apply to File No. 2997-W.

CHEMICAL ENGINEER, B.Sc., Queen's, S.E.I.C., married, veteran. Employed at present. Experience in light metals industry; corrosion testing; production control; spectrographic analysis. Desires position in chemical or metallurgical process industry. Available on reasonable notice to present employer. Apply to File No. 2999-W.

MECHANICAL ENGINEER, Jr.E.I.C., B.Eng. (McGill), Master of Commerce, Toronto, '48, age 27, experienced in Aircraft Industry, Petroleum oilfield work on drilling, production, construction and design. Presently situated in West, but would locate anywhere. Apply to File No. 3006-W.

MECHANICAL ENGINEER, Ph.D., (London), A.M.I.M.E., with extensive mechanical and structural experience in Europe and England and post-graduate research in structures at London University. Age 34. Presently residing in England, arriving in Canada August, 1948, and available for employment September, 1948. Apply to File No. 3021-W.

MINING ENGINEER, M.E.I.C., B.Sc., Queen's '33, P.Eng., Que., married, age 37, eighteen years experience in mining exploration, and development work. Desires work in the Rouyn area of Quebec. Apply to File No. 3022-W.

MECHANICAL ENGINEER, B.Sc. (Eng.), A.M.I., Mech.E., wide experience in the aircraft industry. Presently residing in England, but interested in emigrating to Canada. Employed in Canada during years 1941 to 1945. Would consider any appointment in engineering world to start with the assurance of being able to speedily prove worth and ability. Apply to File No. 3023-W.

CHEMICAL ENGINEER, M.E.I.C., age 35, married, no children, graduate of University of Toronto. Ten years experience supervising production of organic chemicals. Presently employed by old established U.S. firm manufacturing fine organic and inorganic chemicals. Desires responsible position in Canada. preferably Ontario location. Present salary $5,100. Apply to File No. 3031-W

ENGINEERING EXECUTIVE, A.I.E.E., A.F.R.Ae.S., with outstanding record in England seeks position of scope and responsibility in Canada. First class academic qualifications and exceptional experience at high level in aircraft and precision mechanical engineering fields comprising design and development, works management, manufacturing methods, production control, administration and sales. Reply to File No. 3033-W.

CHEMICAL ENGINEER, M.E.I.C., B.Sc (Alberta). Married, age 28. 5 years experience in research and development and statistical quality control. Desires change in position preferably in process or engineering department of industry. Apply to File No. 3034-W.

MECHANICAL ENGINEER, A.M.Int.C.E., age 38, manager in charge of small works in England designing, building and servicing special agricultural machinery and tractors (crop-spraying), keen to emigrate to suitable administrative position. Well educated, heavy engineering (steam) experience, special ability for craftsman training and selection. Apply to File No. 3039-W.

GRADUATE CIVIL ENGINEER, Jr.E.I.C., Alberta '43, veteran, with experience in construction, purchasing, sales. Desires position of an engineering nature with responsible firm or with consulting engineer. Alberta or B.C. preferred but would accept elsewhere. Available on reasonable notice to present employer. Apply to File No. 3040-W.

CHEMICAL ENGINEER, Jr.E.I.C., B.E. (Chem.), Sask. '44, former P.Eng. (Ont.) and M.C.I.C., married, veteran, with experience in process development, desires position in that field. Engaged in post-graduate study at Mass. Inst. of Technology, leading to degree of S.M. (Chemical Engineering Practice). Available February, 1949. Apply to File No. 3041-W.

GRADUATE MECHANICAL ENGINEER, S.E.I.C., N.S.T.C., '48, desires part time employment in Heating and Ventilation —Ottawa area. Apply to File No. 3042-W.

Research Officer

A vacancy exists for a Research Officer on the staff of the Codes and Specifications Section, Division of Building Research, National Research Council, Ottawa. The salary range will depend on experience and qualifications.

Duties: To work in the Codes and Specifications Section of the Division of Building Research under the direct supervision of the Head of that Section. Work will consist mainly of the preparation of specifications concerned with textiles, leather, rubber and related commodities.

Qualifications: A degree from a recognized university, preferably in chemistry, chemical engineering or general science. Experience in the writing of specifications will be considered an asset, but is not essential, as training in this work will be provided.

Further particulars regarding this position can be obtained from Mr. David Wolochow, National Research Council, Ottawa, Telephone 9-2971.

Building Research

Engineers and Architects interested in the application of research to building and associated engineering problems are invited to enquire about employment possibilities with the newly formed Division of Building Research of the National Research Council. An enquiring mind is an essential; experience in building work in Canada is really necessary; bilingualism would be helpful. Salaries depend upon training and experience; opportunities for useful work are unlimited. Enquiries should be addressed to the Director, Division of Building Research, National Research Council, Ottawa.

McGill University

Requires

Graduate Mechanical Engineers for Sessional appointment as Instructors & Demonstrators for 7 months from 1st October, 1948 in THE DEPARTMENT OF MECHANICAL ENGINEERING. Apply to File No. 4207-V giving qualifications and salary required.

ENGINEERING INSTRUCTORS REQUIRED

The University of Toronto requires engineering instructors and demonstrators for its Ajax Division for the Session beginning September 20th, particularly in Electrical Engineering and in Engineering Problems and Drawing.

Apply to the Secretary, Faculty of Applied Science and Engineering, University of Toronto.

WANTED

Mechanical or Chemical Engineering Graduates

with five to ten years' experience on

MAINTENANCE AND ENGINEERING IN THE OIL INDUSTRY

APPLY: PERSONNEL DEPARTMENT,
BOX T.
SARNIA, ONTARIO.

Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

The Westinghouse Research Laboratories claim that they have developed an electronic detector which is so sensitive that it can ferret out metal impurities weighing less than one-tenth of a billionth of an ounce.

Designed to aid in the search for improved metals, this "electronic sleuth" can spot—within five to 15 minutes—a trace of material comprising as little as one millionth part of the total sample. Many important uses are anticipated.

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The United States Patent Office has granted a broad patent to the English Electric Co. of Canada Limited, St. Catharines, covering their basic type of high voltage transformer design. It is expected that a similar patent will shortly be issued by the Canadian Patent Office. Advantages claimed for this design include: reduced inherent reactance; ready adaptability to forced oil flow through the winding ducts; strategic distribution of voltage stress throughout the dielectric structure; simple and stable mechanical construction.

•

J. L. Demers, president of the Canadian Institute of Plumbing and Heating stated, at a recent meeting of the Institute in Quebec City, "The plumbing and heating industry is continuing to expand production beyond all previous records. However the increasing difficulty in obtaining supplies, particularly steel, may force some curtailment of production in the future. The industry is doing everything in its power to catch up to the demand but the uncertain steel picture in the United States may seriously affect production if allocations of raw materials are cut."

Commenting on the production during the first quarter of the year Mr. Demers said the industry had produced in three months 24,700 bathtubs, 35,000 sinks, 26,100 wash basins and 10,300 tons of cast iron, soil pipe and fittings and 30,800 tons of steel pipe and fittings. 12,300 warm air furnaces and 4,700 domestic heating boilers were also produced.

•

Canadian General Electric Company Limited, 212 King Street West, Toronto has produced a new series of dust explosion-proof motors to designs which have been listed by the Underwriters Laboratories as suitable for operation under dangerous dust conditions in grain elevators, flour mills, coal pulverizing plants and similar hazardous locations. Details may be obtained from the Company.

•

Shell Exploration New Brunswick Limited has completed preparations to drill a second test well in the Albert formation. The new well will be located two miles from Apohaqui in Kings County.

Drilling of the Albert formation, which is the present gas and oil producing formation in New Brunswick, was started by Shell in June. The first well, ten miles east of Sussex, is now down to a depth of 2204 feet.

According to a Company spokesman's statement "Two sandstone sections in the hole showed some porosity and have been tested without yielding any gas or oil. The fact that there are indications of oil having been present in the sandstone at one time is regarded as favourable to future prospects when the well drills deeper". It is anticipated that before a depth of 4000 feet is reached, the possibilities will be known.

•

The Steel Company of Canada Limited will hold an Open House at its steel mill in Hamilton on October 5 and 6. Visitors will be able to see the processes by which ore is converted to iron and steel, and steel ingots to sheets, bars, rods and other forms from which so many Canadian products are fabricated.

The management and employees are making preparations to play host to 30,000 people on the two days of the "Open House". Visiting hours will be from 9 a.m. to 4.30 p.m. each day.

Visits on the first day will be by invitation only and the visitors will be restricted to the families of employees in Hamilton, Brantford and Toronto. There will also be some specially invited guests.

On Wednesday, October 6, the plant will be open to the general public.

•

The development of a proportional current-input electronic pyrometer controller has been announced by the Bristol Company of Canada. The new instrument proportions the current input to electrically-heated furnaces, ovens, plastic molding machines, salt pots and other similar equipment to provide practically straight-line temperature control. It does this by time modulation of the input energy. The average energy supplied is proportional to the deviation of the temperature from the control point throughout a band width, which is adjustable from 0 to 2½ per cent of full scale reading.

Descriptive material may be obtained from the Company. The address is 71-79 Duchess Street, Toronto.

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The Canadian Broadcasting Corporation has announced the following plans for expansion. In addition to three new 50-kilowatt transmitters at Lacombe, Parmin and Toronto and a 10-kilowatt station at Chicoutimi, it is proposed to increase the power of CBR Vancouver and CBM Montreal from 5 to 50 kilowatts. A 10-kilowatt station is planned for Windsor, Ontario, and a one-kilowatt station for Sydney, N.S.

CBR and CBM will remain on their present frequencies. The power increases will insure the retention of these frequencies as Class 1-B clear channels for Canada.

•

Canadian Industries Limited has announced the forth-coming construction of a single storey warehouse, costing approximately $300,000 on a newly purchased Terminal Avenue site in Vancouver.

It will be built with reinforced concrete floors and exterior walls and will provide 30,000 square feet of open floor space, outside storage platforms and facilities for receiving and shipping by both rail and truck.

Construction is expected to begin within the next few weeks.

•

An important United Kingdom Engineering Mission is visiting Canada. The mission arrived in Montreal on August 27 and will tour the Dominion until mid-October. An announcement of the tour was made by the Secretary for Overseas Trade in the United Kingdom House of Commons, on July 19. Mr. Bottomley said "the objects of the Mission are to investigate market possibilities mainly for the heavier types of industrial engineering equipment; to obtain first-hand information on any difficulties in regard to trade with Canada in the engineering industry, and to advise on the most suitable methods to adopt to secure a greater volume of exports from this Country (the United Kingdom)."

The Mission consists of 12 members, and is sponsored by the Board of Trade. Its leader is, E. H. Gilpin, director of Messrs. Baker Perkins Ltd., and chairman of the British Food Machinery Manufacturers' Association. The associate organizer is Norman Neville, O.B.E., director of the B.F.M.M.A., and of the British Chemical Plant Mfrs.' Ass'n.

The following is a list of the names of the members of the Mission:

E. L. Gilpin, director of Baker Perkins, Ltd., Peterborough; Norman Neville, director of the British Food Machinery Mfrs.' Ass'n., and of the British Chemical Plant Mfrs. Ass'n.; D. Maxwell Buist, director of the British Electrical and Allied Manufacturers' Association; A. W. Berry, M.I.Mech.E., M.I.E.E., director of the British Engineers' Association; E. Bruce Ball, director of Glenfield and Kennedy Ltd., Kilmarnock; W. R. Beswick, director of Power Gas Corp., and Ashmore, Benson, Pease & Co. Ltd.; A. G. Grant, director of Whessoe Ltd., Darlington Co.; C. S. Robinson, director of Thomas Robinson & Son, Ltd.; H. V. Yorke, director of Bennett, Sons & Shears Ltd., and H. Pontifex & Sons, Ltd.; F. C. Fitzpatrick, Office of the Amalgamated Engineering Union; Mrs. K. Gwynn-Jones, British Food Machinery Manufacturers Association; C. Bennett, M.B.E., assistant secretary, Ministry of Supply; the party will be accompanied by P. S. Young, United Kingdom Trade Commissioner, Montreal, throughout the tour.

•

On August 20th, Canadian Johns-Manville, 199 Bay St., Toronto, announced the development of an entirely new type of electrical insulation.

Known as "Quinterra" it is described by G. D. Poole, industrial products manager of the Company, as "an asbestos-base, completely inorganic electrical insulation." In describing its properties, Mr. Poole stated "it possesses properties of thinness and electrical insulating strength never before attained in a flexible, inorganic, asbestos sheet. In appearance it resembles paper and is furnished in long lengths in roll or tape form.

Manufactured by a special paper making process it can be varied from tissue-thin 1.5 mils to 20 mils in thickness. The Company's plans call for the manufacture of a variety of thicknesses and laminates for other electrical insulating purposes.

For complete details communicate with the manufacturer.

Publications

The August issue of the "Bepco Journal" contains an article on "Underground Battery Charging". Copies are available on application to Bepco Canada Limited, 4018 St. Catherine West, Montreal 6.

•

The International Nickel Co., 25 King St. West, Toronto, 1, has available copies of a 24-page two-colour brochure in which is described a new Monel roofing sheet which has been developed by the Company. This material is rust-proof and corrosion resistant and many other outstanding qualities are claimed for it by the manufacturer.

•

Carbide and Carbon Chemicals Corporation, 30 East 42nd St., New York, 17, has released a very informative bulletin "The Physical Properties of Synthetic Organic Chemicals". A feature of the publication is the care taken in its layout to facilitate reference.

•

An 8-page two-colour catalogue describing the complete line of Eriez permanent non-electric magnetic separators, is now available. Many types of magnetic equipment are fully illustrated through the use of photographs and engineering drawings. Ask for Catalogue No. 12. Address enquiries to Eriez Manufacturing Co., 69 East 12th St., Erie, Pa.

•

The Bristol Co. of Canada Limited, 71 Duchess St., Toronto, offer bulletin No. P1235 in which are described the Company's Thermocouple and Pyrometer equipment and auxiliaries.

For those interested in industrial relations, perusal of the Steel Company of Canada Limited, 1947 report to employees is recommended. Simple copy and charts and extensive use of photographs explain to employees the company's financial and production situation. Send requests to W. A. Bates, The Steel Co. of Canada Limited, 525 Dominion St., Montreal.

•

Heise Bourdon Tube Co. Inc., Newton, Conn., offer a well produced catalogue entitled "Heise Gauges". The Gauges described are for recording pressure up to and above 10,000 p.s.i.

•

The August issue of the "Dominion Engineer", produced by the Dominion Engineering Co. Ltd., Lachine, Que., is devoted to the third part of a series of articles on electric mine hoists. For copies of this issue and the two preceding numbers, address enquiries to the Company at P.O. Box 220, Montreal.

•

The United Kingdom Trade Commissioner Service, 1111 Beaver Hall Hill, Montreal, has informed the editor that copies of a brochure are available in connection with the Public Health and Municipal Engineering Congress and Exhibition, to be held in London, England, from November 15th to 20th.

Almost every type of municipal appliance and public works contracting plant will be demonstrated at the exhibition as well as equipment, stores and supplies used by local authorities in the very wide range of public health activities.

Copies of the brochure "A Century of Public Health" 1848-1948" will be forwarded to readers of the *Journal,* by the Trade Commissioner on request.

•

Catalogue No. 48-18 recently released by the Chain Belt Co., of Milwaukee, describes the Rex 34E Single and Double Drum Pavers which differ in many respects from former models produced by the Company.

The catalogue outlines the major features of the Pavers in detail. It is well illustrated, attractively designed, and contains 30 pages printed in four colours.

•

The Canadian Fairbanks-Morse Company Limited, 980 St. Antoine St., Montreal, P.Q., offers illustrated literature on strong steam traps of the open and inverted bucket types.

Appointments and Transfers

Westeel Products Limited has opened an office at 232 Botsford Street, Moncton, N.B.

W. A. Rozen has been appointed Maritimes manager and will make his headquarters at the newly-opened office.

•

Douglas O. Durkin has been appointed director of public relations and advertising of John Inglis Co. Ltd., Toronto. Mr. Durkin was formerly in charge of public relations for the Goodyear Rubber and Tire Co. of Canada, Limited. He is chairman of the Public Relations Committee of the Association of Canadian Advertisers and a member of the Education Committee of the Canadian Manufacturers Association.

•

Gutta Percha & Rubber Co. Ltd. has appointed C. A. Sellers manager of the Winnipeg Branch, embracing Manitoba and the Lakehead district.

Mr. Sellers was formerly stationed at London, Ontario. He succeeds the late R. A. McClellan.

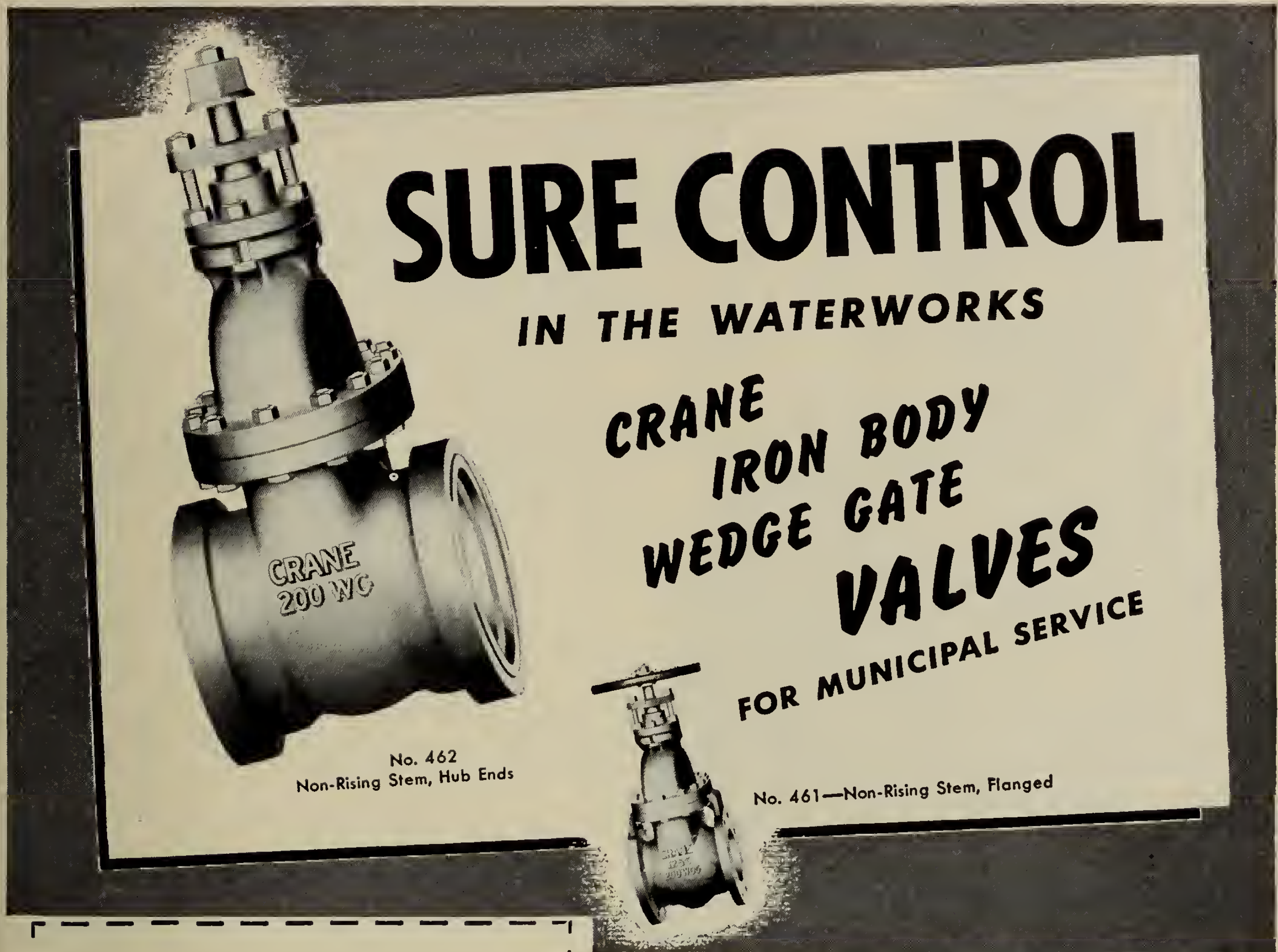
•

C. B. Sewell has been appointed a director and treasurer of LaSalle Builders Supply Limited, Montreal.

•

C. O. Monat & Company Limited, 6520 Park Avenue, has been appointed Canadian agent for Welin Lifeboats, Davits, and Winches and associated marine life-saving equipment.

Sales and distribution will be under the direction of E. R. Lambert, marine sales manager.



ONE SOURCE OF SUPPLY STANDARD OF QUALITY RESPONSIBILITY

Time and trouble are saved on every piping job when all materials are supplied by Crane. The complete Crane line—valves, fittings, fabricated piping, and accessories—offers many advantages:

Specifying and buying are simplified—one order to Crane covers everything.

Undivided responsibility for all materials helps get a better installation.

Crane quality in every part means uniform dependability throughout the piping system.

P-25

DESIGNED to operate precisely, ruggedly built to endure, Crane Valves are dependable public servants in the waterworks and sewage plants of hundreds of Canadian municipalities.

They can be relied upon for the efficient control which is essential in safeguarding public health. Their sturdy construction and unusually long life reduce maintenance, repair and replacement costs to a minimum.

The complete Crane line includes quality valves for every service requirement, ranging in sizes from the smallest up to 48-inch. Crane Iron Body Wedge Gate Valves, for example, are available either brass-trimmed or all-iron—Non-Rising Stem or Outside Screw and Yoke—screwed, flanged or with hub ends. Sturdy and well proportioned, they incorporate latest developments in modern valve design.

For complete information, see the Crane 41 Catalogue, or ask your Crane Branch.

CRANE LIMITED, General Office: 1170 Beaver Hall Square, Montreal
18 Branches in Canadian Cities and Newfoundland

1-8076

CRANE

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES, WHOLESALERS and PLUMBING AND HEATING CONTRACTORS

he applies

CANADA'S NO. 1 ROOFS

He's a Barrett Approved Roofer

This is the man who applies your Barrett Specification* Roof. He is a Barrett Approved Roofer, selected for his business integrity and his thorough knowledge of the roofing business. You can count on him to live up to Barrett standards.

Approved Roofers were established by Barrett in 1916. First, as a guarantee that "SPECIFICATION" Roofs would be applied according to rigid Barrett standards. Second, in order to pass on to the applicators themselves the "know-how" gained from Barrett experience in the roofing business since 1854. Selected roofers play an important part on the Barrett team.

A Barrett Approved Roofer applied the first bonded built-up roof in Canada. It was Barrett "SPECIFICATION" Roof Job No. 1, a roof that outlived its bond by many years without maintenance or repair. This was the first of the famous line of "SPECIFICATION" Roofs now in service in every province . . . roofs whose outstanding performance records have earned them the name of "Canada's No. 1 Roofs." Each was applied by a Barrett Approved Roofer.

Barrett* Specification* Roofs

*Reg'd. Trade Mark

For proven, dependable built-up roofing, insist on a Barrett "SPECIFICATION" Roof.

The built-up felt, pitch and gravel roof, as supplied by Barrett in the record-making "SPECIFICATION" Roof, incorporates these special features:

1 Barrett "SPECIFICATION" felt—carefully processed from selected stock . . . must pass rigid tests for tensile strength and durability.

2 Barrett "SPECIFICATION" pitch—specially refined, straight-run, coal-tar pitch . . . mopped between layers of felt; *heavy-poured* on top.

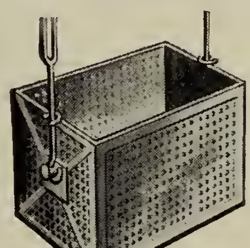
3 Gravel or slag armoured top, embedded in hot pitch, protects roof against elements, mechanical damage, wear and tear. It interposes a surface of fireproof rock between building and flying embers.

Only these materials, applied by a Barrett Approved Roofer in accordance with time-tested Barrett requirements, and examined by a Barrett Inspector, make the Barrett "SPECIFICATION" Roof.

THE BARRETT COMPANY, LIMITED

Montreal • Toronto • Winnipeg • Vancouver

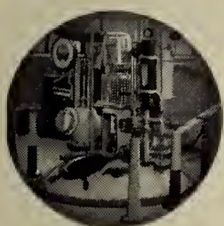
"CANADA'S No. 1 ROOF"



3 WAY LEADERSHIP

RESEARCH

Sherwin-Williams' Chemists and Research Experts have made steady progress through the years in helping to solve the industrialist's maintenance and finishing problems . . . to-day they have the answer in colors and new products which speed up production, reduce industrial accidents and add beauty and durability to whatever surface they are applied.



EQUIPMENT

More than two million dollars have been spent in converting research and manufacturing facilities to produce the new products which modern science has made possible. New Sherwin-Williams plants have been erected, equipment of the very latest design has been installed, and old methods have given way to new.

PRODUCTS

A Sherwin-Williams' quality product for every painting purpose! And to our list of paint products have been added new and revolutionary paint finishes, waxes, polishes and cleaners—each a leader in its field. Sherwin-Williams products will solve all your painting and finishing problems.

COVER THE EARTH

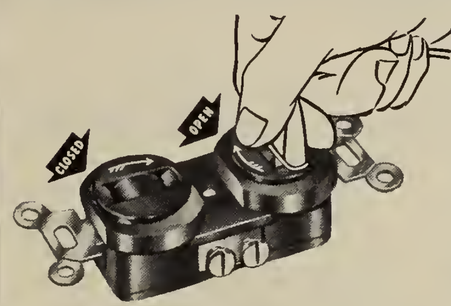
Let us help you solve your maintenance and industrial finishing problems. Write to: Industrial and Transportation Sales Department, The Sherwin-Williams Company of Canada Limited, Box 489, Montreal.

Look for the "Cover The Earth" trade mark. It is your guarantee of quality.

SHERWIN-WILLIAMS PAINTS

SW-36

"NO-SHOK" DUPLEX RECEPTACLES



No Short Circuits • No Shocks • No Burns

Face Alway Closed

When plug is removed the face is closed tight with a snap-back spring action which prevents foreign particles from entering receptacle.

Lifetime spring action . . . firmer plug grasp . . . positive contact always.

NO-SHOK duplex receptacles are ideal for farms and industries, especially where dust, dirt and water are major hazards. Recommended for use in factories, flour mills, grain elevators, barns, etc. Closed cap keeps terminals dry and dust free.

It's a safeguard for children while playing at home and it may be the means of saving a life due to protection from shock.

Distributed through Leading Wholesalers

VERD-A-RAY ELECTRIC PRODUCTS LTD.
MONTREAL

"DELORO STELLITE"

Outwears steel up to 25 times

DELORO STELLITE

Resistant to wear, abrasion, erosion, corrosion and is hard at red heat. Stellited parts supplied promptly.

Deloro Smelting and Refining Company Limited
DELORO, ONTARIO

Professional Cards

11,025 COPIES

OF THIS ISSUE

PRINTED

FOR *YOU!*

The advertisers who use the *Journal* have prepared their advertisements for your personal attention.

In less than ten minutes all the advertisements in this issue can be read. If you require further information any advertiser will be pleased to send you additional data in booklet or letter form.

•

Please mention

THE ENGINEERING JOURNAL

ASBESTOS makes a big difference in Johns-Manville Electrical Materials. It makes them tough and long-lasting — keeps them maintenance-free. But, most important, Asbestos electrical materials are *safer* because they're fireproof, rot-proof and corrosion-resistant!

Shown here are but a few of the J-M Electrical Materials that today serve industry by helping to avoid waste, save fuel and cut costs. If you are building a new plant or plan to expand existing facilities it will pay you to get the facts on dependable Johns-Manville Electrical Materials. For complete details write for Catalogue GI-6A. Canadian Johns-Manville, Toronto, Montreal, Winnipeg or Vancouver.

I-745

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville ELECTRICAL MATERIALS

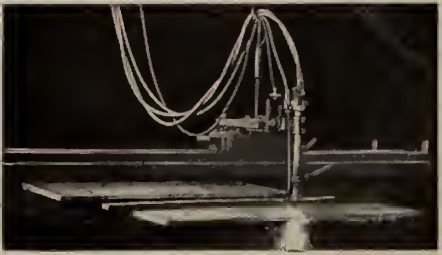
J-M INDUSTRIAL INSULATIONS ★ J-M PACKINGS AND GASKETS ★ J-M REFRACTORIES
J-M INDUSTRIAL FRICTION MATERIALS ★ J-M PIPE COVERINGS ★ J-M TRANSITE
PIPE FOR WATER AND SEWER LINES ★ AND *OTHER POWER PRODUCTS* FOR INDUSTRY

"Tailored steel" becomes a regular steel warehouse commodity when an Oxweld shape-cutting machine is used.

DOC process service cuts production corners

You may be taking advantage of all of the more apparent economies of DOC methods. Yet, through the broader and more comprehensive experience of the DOC service organization, important additional savings may be made.

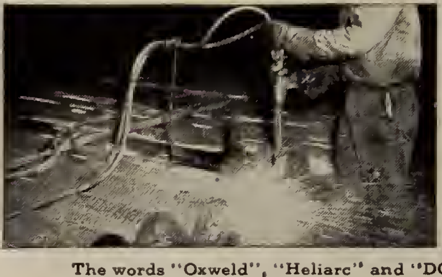
DOC Process Service is available to all DOC customers through any DOC office.



Stainless steel plate, difficult to oxygen-cut by usual methods, can be quickly cut to size and shape by powder-cutting.

Scrubbing steel with a brush of flame removes scale, rust, and surface moisture prior to painting. This is flame-priming, a DOC development.

Heliarc welding makes strong, clean welds in stainless steel tubing because the weld zone is protected from oxidation by a protecting envelope of argon or helium gas.



The design of a simple jig for centering cold rounds—or the design of a completely mechanized flame-conditioning installation—are examples of DOC Process Service.

DOC

The words "Oxweld", "Heliarc" and "DOC" are trade-marks.

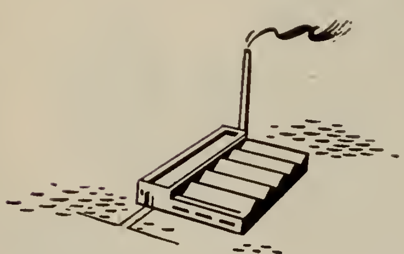
DOMINION OXYGEN COMPANY, LIMITED

DOC

159 BAY STREET, TORONTO 1, ONTARIO

MONTREAL WINNIPEG VANCOUVER

The DEPARTMENTAL STORE for CANADIAN INDUSTRY



The vast industrial growth of Canada has been closely paralleled by the growth and expansion of this Company. Moving apace with the needs of Canada, now fourth in the industrial nations of the world, Fairbanks-Morse has anticipated trends and developed services which, in turn, have enabled the Company to serve you better. This far-sighted policy will continue to shape the plans of the Company in the years ahead.

From giant Diesel engines to small portable pumps . . . from massive scales that weigh loaded freight cars to tiny screws and bolts . . . you'll find them all at Fairbanks-Morse . . . *the departmental store for Canadian industry!*

Forty-eight years of continuous service has placed this Company in an enviable position to advise you on any problem involving large or small industrial equipment. Besides its head office and warehouse in Montreal and its factory at Sherbrooke, P.Q., the Company maintains 15 strategically placed branch offices and warehouses throughout the Dominion, staffed by experts in their own divisions, to give you dependable Fairbanks-Morse service.

F M

The CANADIAN
Fairbanks-Morse
COMPANY *Limited*

STEEL AND THE "NEW LOOK"

With the ever-increasing use of arc-welding, structural steel has developed a "new look" which is well demonstrated in the highway bridge pictured above.

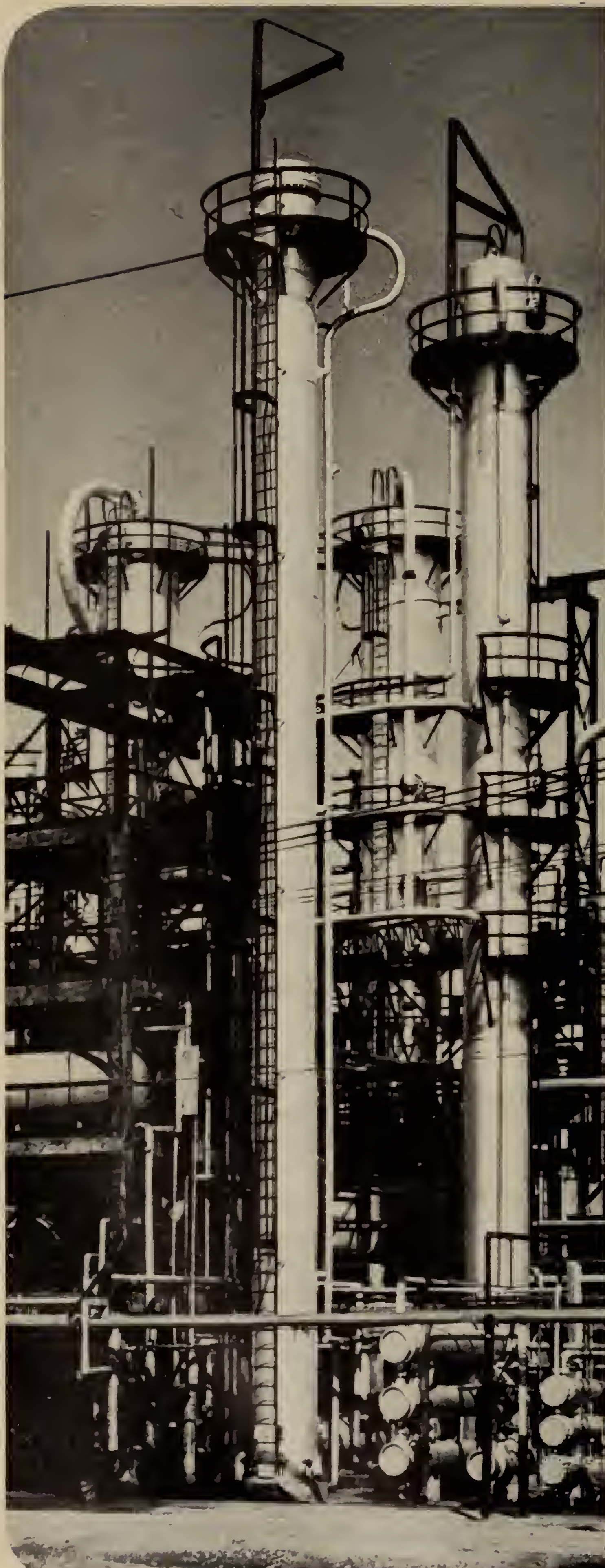
Here the accent is on shallow, sweeping curves which are so pleasing to the eye. In addition to its aesthetic qualities, this all-welded bridge is economical, both in material and maintenance.

Modern arc-welding procedure, which made possible this 1550 foot continuous structure, is an effective tool in the hands of modern architects and engineers.

THIS ADVERTISEMENT IS ISSUED BY

THE CANADIAN INSTITUTE OF STEEL CONSTRUCTION INC.

124 BLOOR STREET WEST, TORONTO, ONTARIO



Index to Advertisers

The revenue derived from the sale of advertising space enables the Institute to publish the *Journal* on a regular monthly basis. Listed below are the names of the Companies and Individuals whose advertisements appear in this issue.

SEPTEMBER 1948

HERE IT IS!

THE CARSET JACKBIT

The Carset Jackbit is a revolutionary, new Jackbit set with cutting edges of tungsten-carbide, the hardest known metallic substance. We believe this new bit is the answer to many drilling problems. It is the fastest drilling and longest wearing rock drill bit we have ever developed.

Carset Jackbits are used with the Patented Jackstud Attachment, and either Carbon or Alloy Steel Jackrods.

THINK WHAT THESE ADVANTAGES MEAN:

- Drill continuously with one size bit.
- Use longer steel changes.
- Increased drilling speeds — 20% and higher.
- Changing of bits practically eliminated.
- Adaptability to all rock drills.
- Drill small-uniform diameter holes.
- Drill the hardest rock.
- More footage per round.

Carset Jackbit cutting edges, after long service, can be resharpened for additional footage.

Order Carset Jackbits and Jackrods now and determine the economics of their use in your operation.

Canadian Ingersoll-Rand Company Limited

HEAD OFFICE: MONTREAL, QUE. ..... WORKS: SHERBROOKE, QUE.

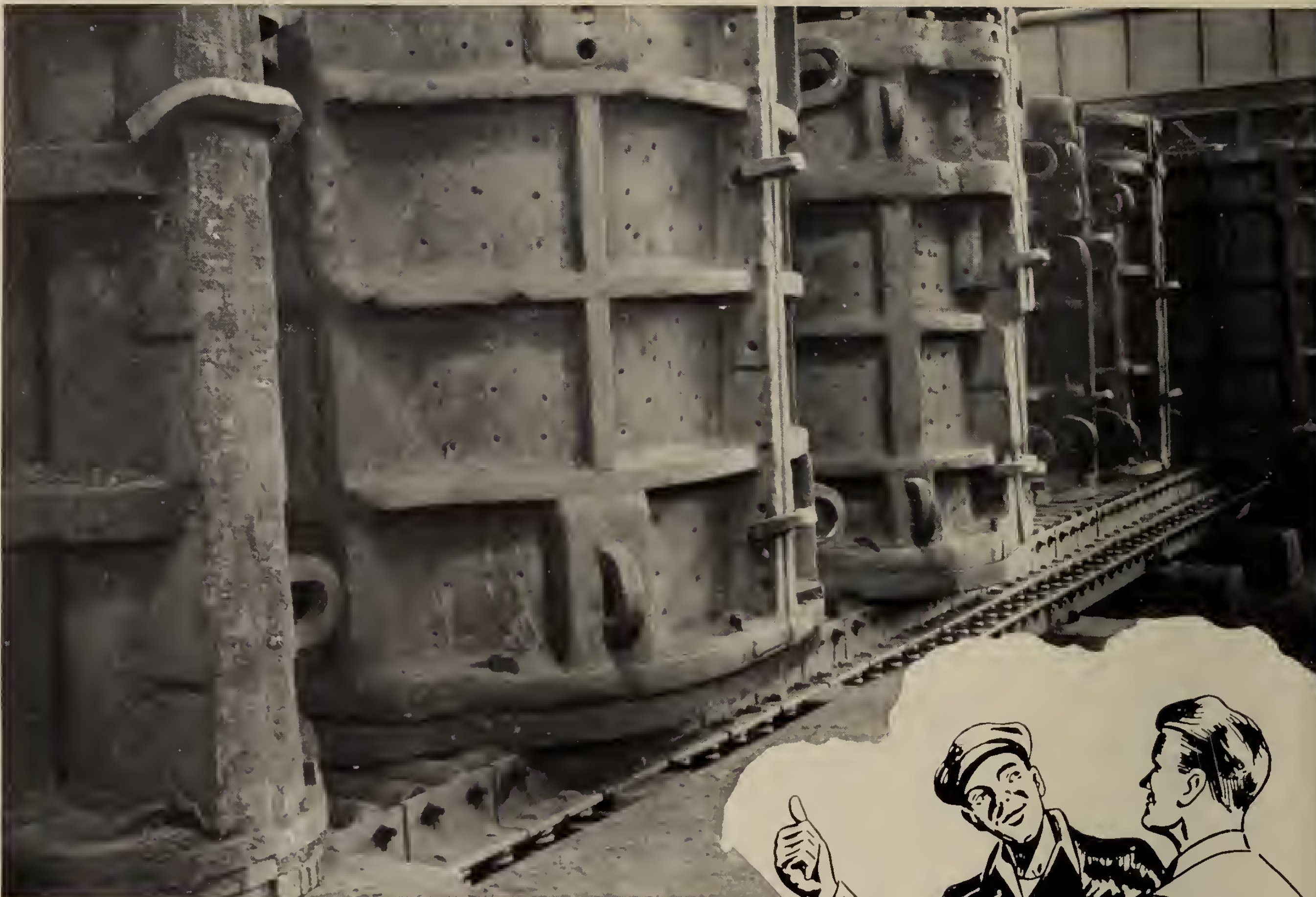
BRANCH OFFICES · SYDNEY · SHERBROOKE · MONTREAL · TORONTO · KIRKLAND LAKE · TIMMINS · WINNIPEG · CALGARY · NELSON · VANCOUVER

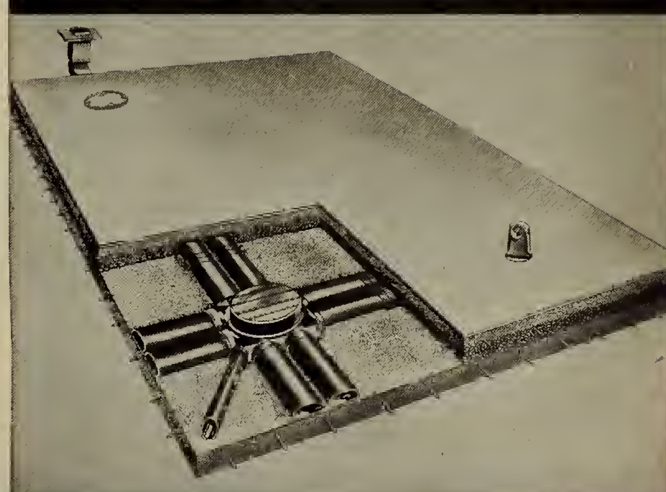
H-31

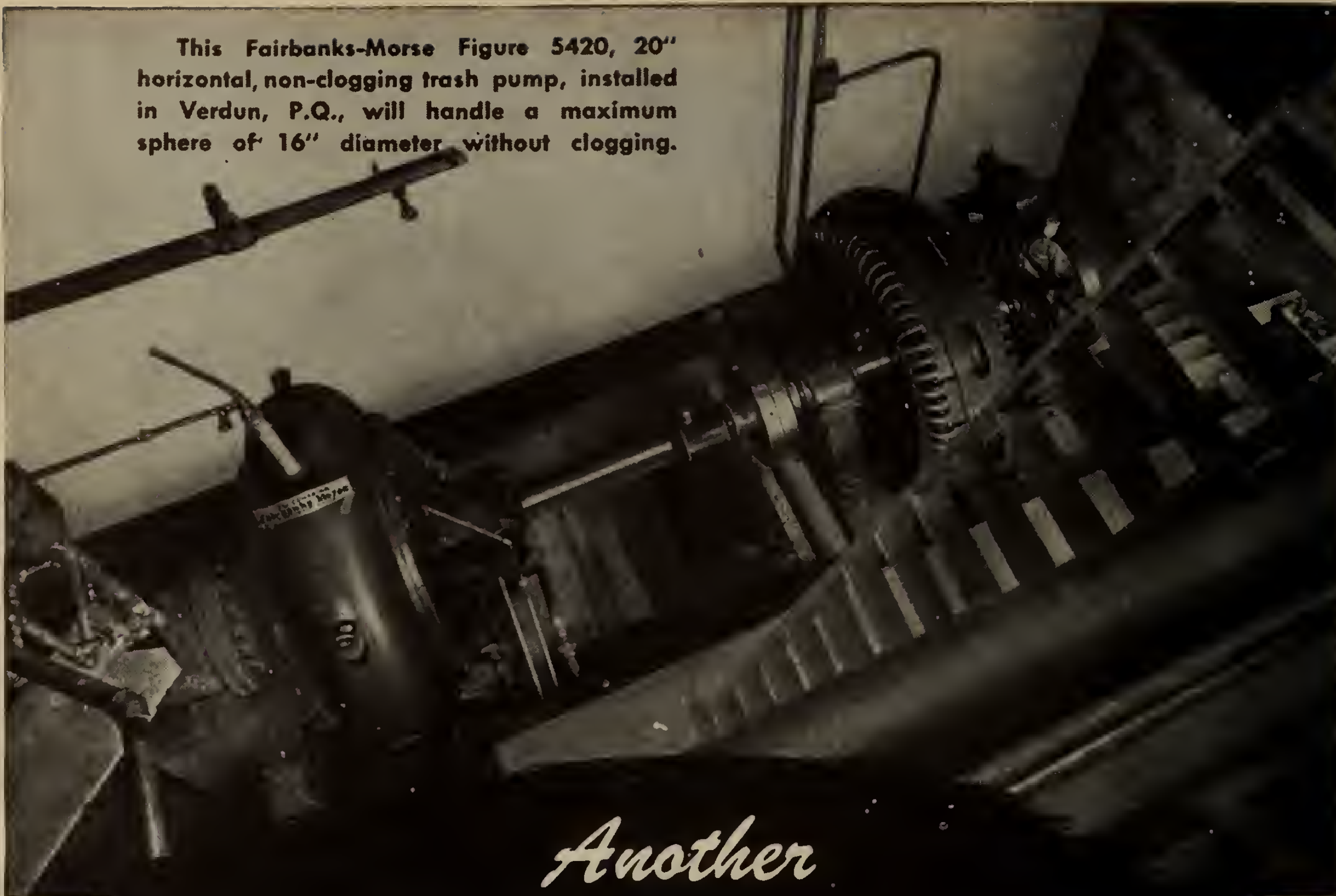
THE ENGINEERING JOURNAL

VOLUME 31 NUMBER 10
OCTOBER 1948

PUBLISHED MONTHLY BY
THE ENGINEERING INSTITUTE of CANADA







Another FAIRBANKS-MORSE PUMP for Verdun, P.Q.

Emphasizing the efficient performance and dependable service of Fairbanks-Morse Pumps, Verdun, P. Q., has installed a second F-M horizontal non-clogging trash pump to handle unscreened sewage. A third unit of the same size, but of the vertical type, has also been ordered by the city. The first unit was installed in 1937.

Fairbanks-Morse Pumps offer three important advantages in addition to fine performance:

Combined Responsibility — Designed and built in one factory, pump and driver are perfectly matched and covered by a single guarantee.

Successful UNIT Performance — Tested in one plant under expert engineering supervision, pumps and drivers assure superior results to the buyer.

Service from One Source — One engineer is familiar with the entire installation — no question of who makes repairs and adjustments.

Whatever the application, there is a Fairbanks-Morse unit to give the kind of service required. One of our Pump Engineers will gladly discuss any installation that you have in mind. Just call or write our nearest office.

Unit illustrated has a capacity of 19,000 U.S.G.P.M. against a total dynamic head of 12 feet operating at 225 R.P.M. Direct connected to a 125 H.P. low-speed engine type synchronous motor. The motor has a 5KW belted type exciter.

The CANADIAN Fairbanks-Morse COMPANY Limited

HALIFAX SAINT JOHN QUEBEC MONTREAL OTTAWA TORONTO WINDSOR
FORT WILLIAM WINNIPEG REGINA SASKATOON EDMONTON CALGARY VANCOUVER VICTORIA


Outdoor Circuit Breakers
Illustrated is a 46 K.V. low oil-content circuit breaker having a rupturing capacity of 2,000,000 K.V.A. Our outdoor breakers are available up to 138 K.V., 2,500,000 K.V.A.
Consult us regarding your requirements — we will be pleased to help you.
BEPCO CANADA LIMITED
BEPCO
TORONTO
MONTREAL
VANCOUVER

Two 15 ton Dominion Bridge cranes combine to lift a tank at the Dominion Works of Canadian Car and Foundry Company, Limited.

Moving X *from* A *to* B

This is an everyday problem in industry—a problem which is easy to solve *provided* the right equipment is available. To move loads efficiently a fraction of an inch or several hundred feet it is essential that the equipment be built for the job. Dominion Bridge Company has been building cranes and other handling equipment for over half a century and maintains a large design staff for this purpose. You are invited to make practical use of our experience in the handling of bulk materials and single units.

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.

CANADIAN GENERAL ELECTRIC CO LTD

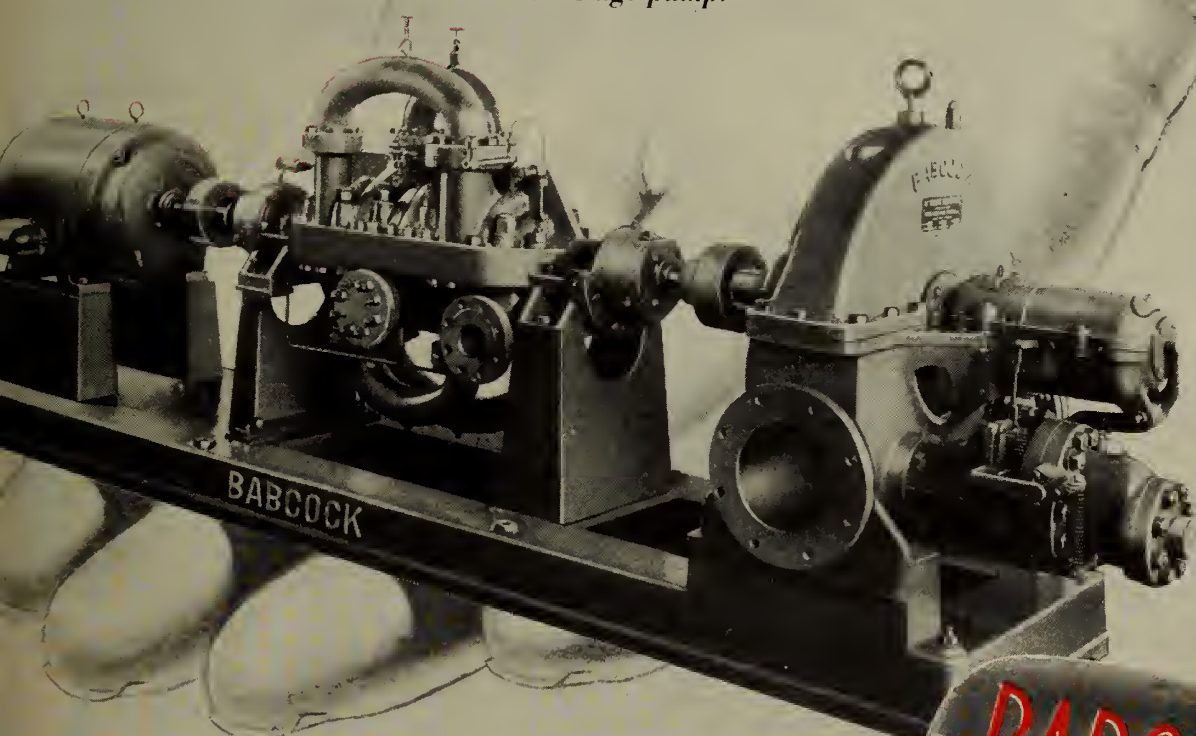
HEAD OFFICE — TORONTO

TAKE OUR NEW SIX-STAGE BOILER FEED PUMP...

IT HAS THESE ADVANTAGES:

- **EFFICIENT SEALING** Double V-groove bushings and rings provide long life and efficient interstage sealing.
- **MINIMUM PRESSURE DIFFERENTIAL** The stages of pumps are so arranged that only one stage pressure differential is allowed at each sealing point.
- **EASILY ACCESSIBLE** Volute type impellers allow full inspection of rotating element on removal of top casing. The V-groove casing rings and interstage bushings are split and therefore may be replaced without removal of rotating element from pump casing.
- **VIBRATIONLESS BALANCE** Complete axial and radial balance is maintained due to arrangement of impellers and volutes, resulting in steady, vibrationless operation.
- **EFFECTIVE STUFFING BOXES** Low pressure end of pump subjected to suction pressure only. At high pressure end, a leakage is bled to suction. V-groove pressure breakdown bushings are provided adjacent to stuffing boxes.
- **CHROME STEEL SLEEVES** All shaft sleeves are made of Chrome steel. End sleeves hardened to resist wear.
- **ANTI-FRICTION BEARINGS** Water-cooled, anti-friction type bearings are provided with circulated oil lubrication.

Illustrated below is a shop view of 6-stage BABCOCK Boiler Feed Pump. Motor and turbine-driven, mounted on unit base. These advantages are also incorporated in the 4-stage pump.

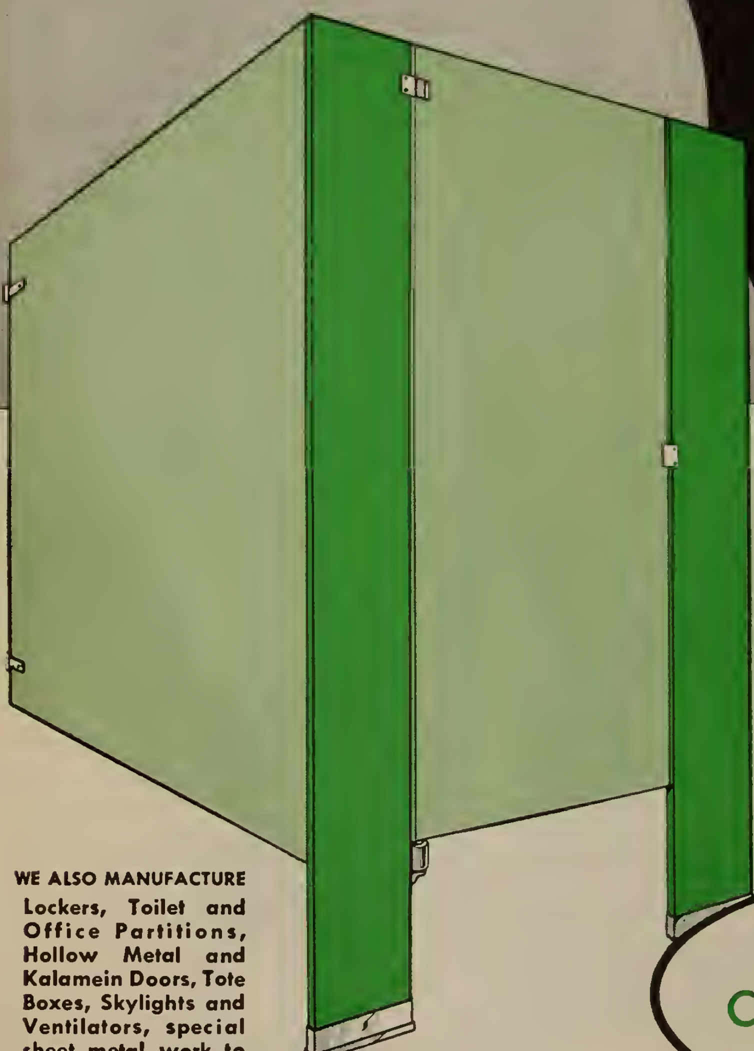


hen you have to move liquids, consult BABCOCK. We ave the engineers, equipment and experience to supply e pumps you need.

ABCOCK-WILCOX & GOLDIE-McCULLOCH LIMITED
GALT, ONTARIO
Branches: Montreal Toronto Calgary Vancouver

BABCOCK Centrifugal PUMPS

Employees value sanitation and privacy as much as YOU do!



STEEL
TOILET PARTITIONS
ARE
Easy to keep immaculate
Smartly styled
Pleasingly private

Westeel Toilet Partitions — in both Sheet Steel or Aluminum— provide a smart, sanitary toilet room environment . . . easily kept clean, entirely private! Economical to install, impervious to moisture or vermin, these toilet partitions will not warp or sag, will give years of maintenance-free service.

WE ALSO MANUFACTURE
Lockers, Toilet and Office Partitions, Hollow Metal and Kalamein Doors, Tote Boxes, Skylights and Ventilators, special sheet metal work to detail.

ASK FOR CATALOGUE

WESTEEL PRODUCTS LIMITED

MONTREAL • TORONTO • WINNIPEG
REGINA • SASKATOON • CALGARY • EDMONTON • VANCOUVER

STRUCTURAL STEEL
BACKBONE OF INDUSTRY ★★★

Steel construction adapts itself to all-glass exteriors as shown. The greatest amount of natural light aids the workmen and is an important factor in modern production.

STEEL IS ADAPTABLE

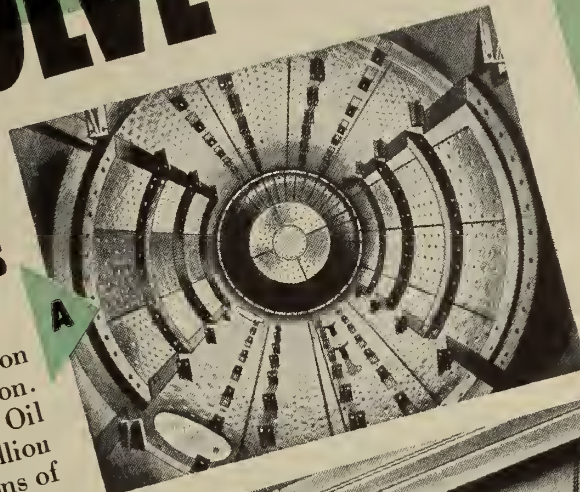
The above foundry extension provides another example of the adaptability and economy of steel for all types of plant extensions and alterations. Speed of erection also means a saving of time and labour.

The service of our design department with their accumulated experience is at your disposal.

808

STRUCTURAL STEEL BY

HAMILTON BRIDGE
COMPANY LIMITED
HAMILTON ONTARIO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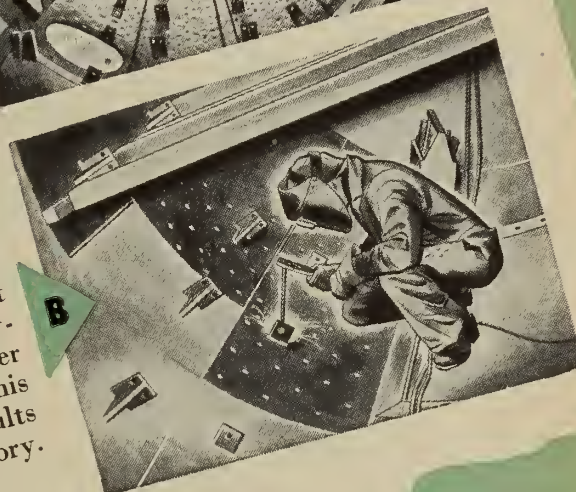
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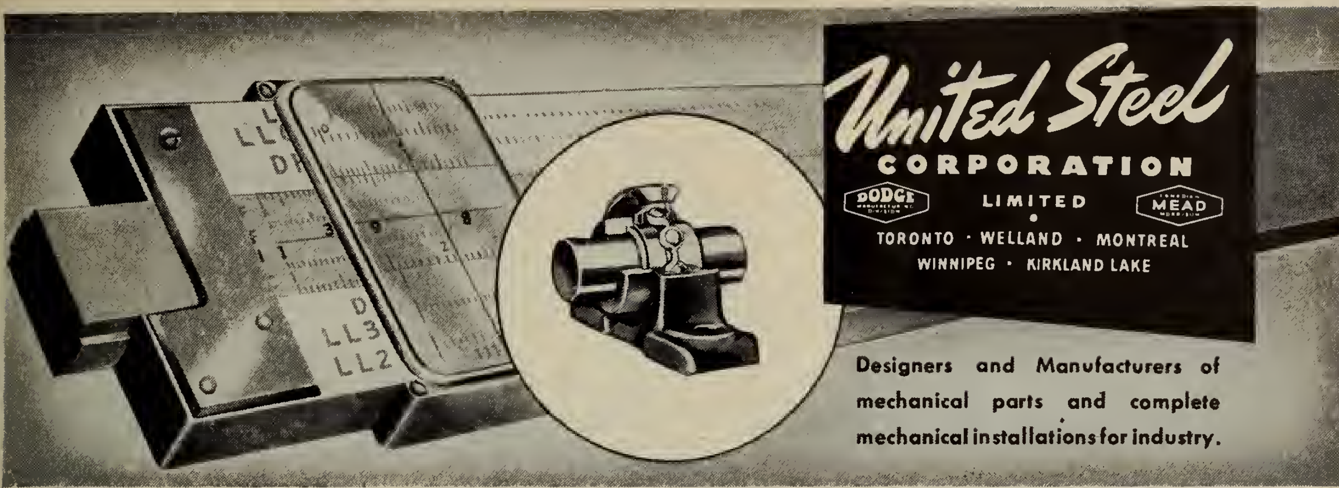
United Steel
CORPORATION
DODGE
LIMITED
MEAD
TORONTO · WELLAND · MONTREAL
WINNIPEG · KIRKLAND LAKE
Designers and Manufacturers of mechanical parts and complete mechanical installations for industry.


COGHLIN SPRINGS
FOR QUALITY AND SATISFACTION
With seventy-nine years' Canadian reputation and experience, you can safely specify COGHLIN'S for all your spring requirements.
B.J. COGHLIN CO. Limited
3320 ONTARIO STREET EAST
MONTREAL, CANADA
Established 1869
Agents:
Filer-Smith Machinery Co., Ltd Winnipeg Gordon & Belyea Ltd. Vancouver


SKF
BALL AND ROLLER BEARINGS
ALL TYPES
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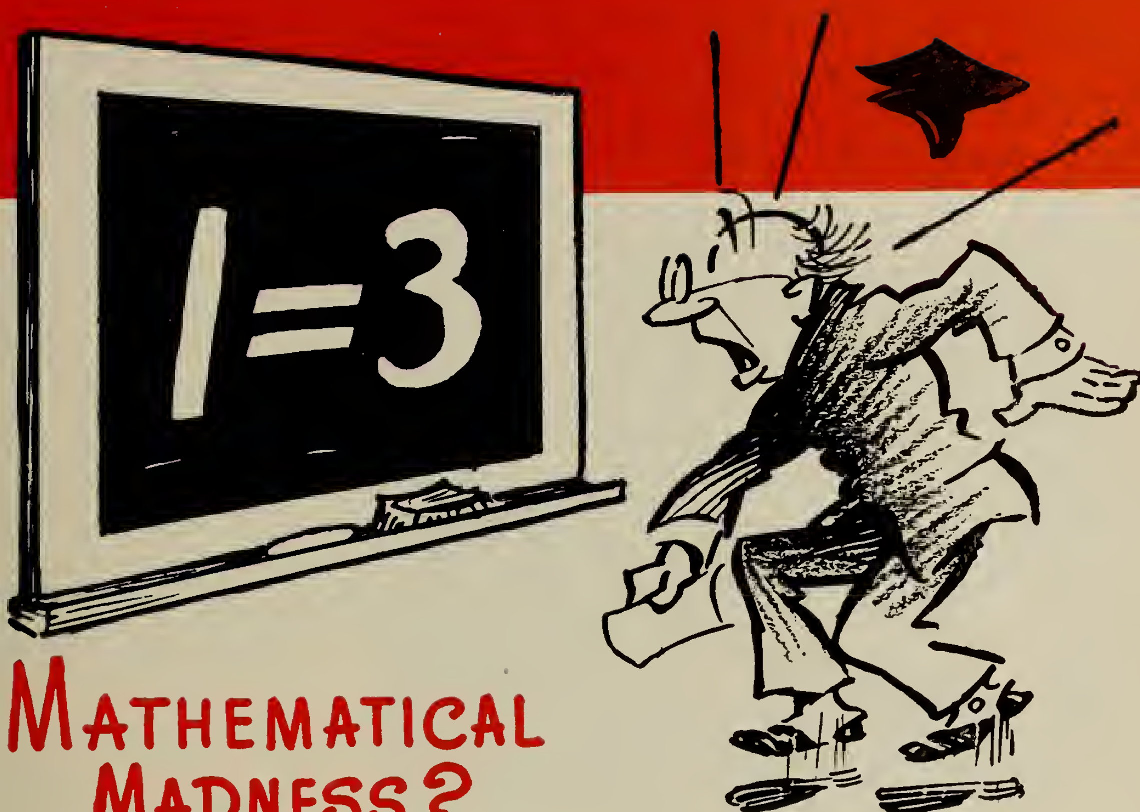

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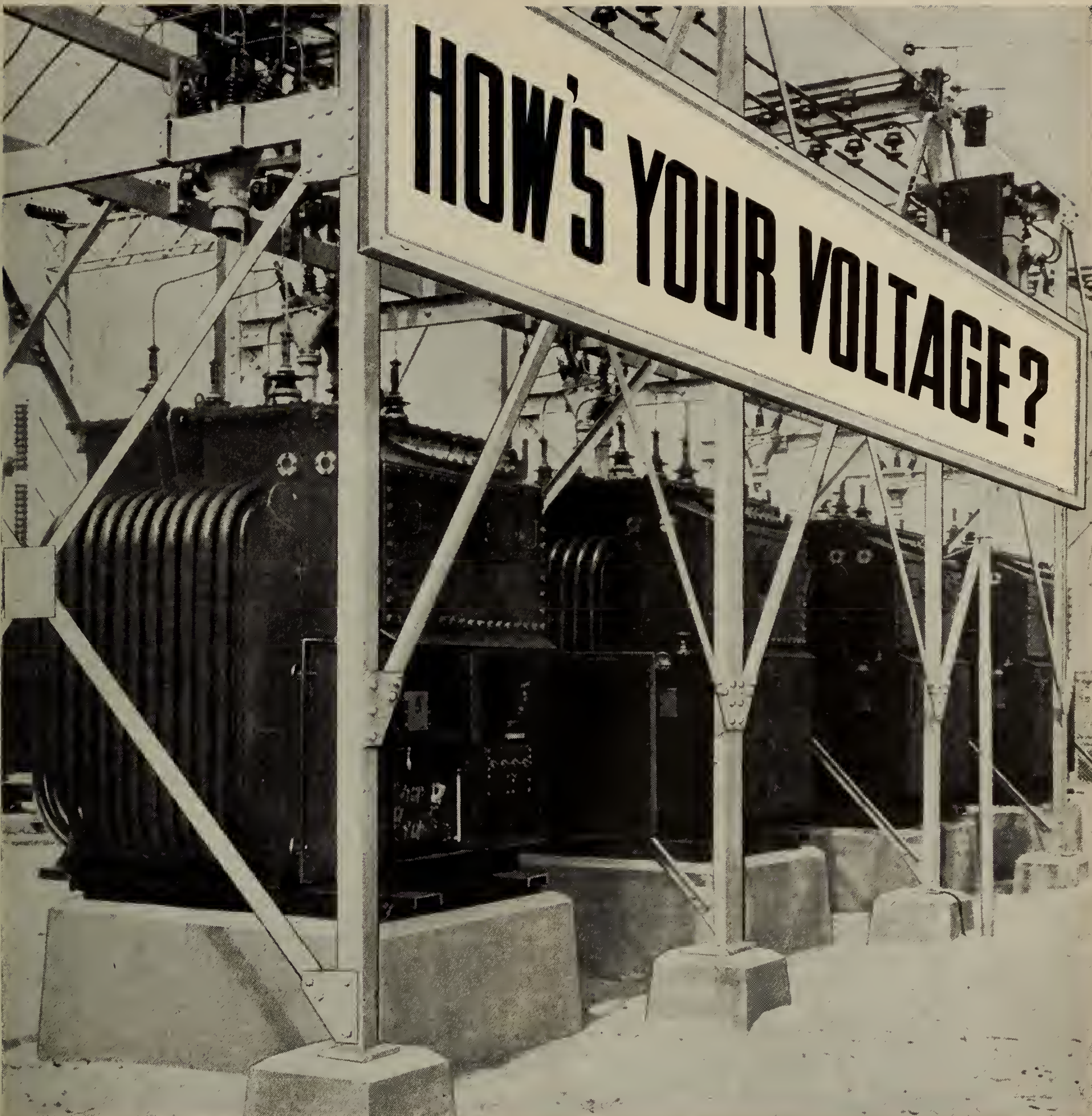
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CONTENTS

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COVER PICTURE

The illustration on this month's front cover was taken at Canadian Industries Limited Nylon Plant, Kingston, Ontario. Nylon salt concentrate from the evaporator is polymerized in an autoclave and extruded on to a chilled revolving surface where it rapidly sets into an ivory-like, tough white ribbon. The chipper shown in the illustration breaks this substance into flakes.

The engineer has played a great part in the development of nylon. Here again is a typical example of the practical application of a scientific chemical process.

The Institute is indebted to Canadian Industries Limited for the illustration.

OIL, AIR-BLAST & MAGNETIC-BLAST CIRCUIT BREAKERS

by

G. R. Langley, M.E.I.C.

Chief Engineer, Canadian General Electric Co. Ltd., Peterborough, Ont.

A paper presented at a combined meeting of the American Institute of Electrical Engineers and The Engineering Institute of Canada, Montreal, Que., November 20, 1947

This paper on a-c Power Circuit Breakers has been prepared with the thought in mind that the majority of the audience may only have a casual acquaintance with breakers—yet would be interested in some of the thinking back of the design features of this important protective device. It is hoped that those who already have a broad and comprehensive knowledge of breakers, will excuse references to points with which they are already thoroughly conversant.

Power circuit breakers are divided into two classes:

(1) Low arc resistance interrupters, i.e. interrupters whose arc resistance is maintained at a low value till current zero,—at which point the arc products are suddenly replaced by a high resistance dielectric. Oil breakers and air blast breakers fall in this class.

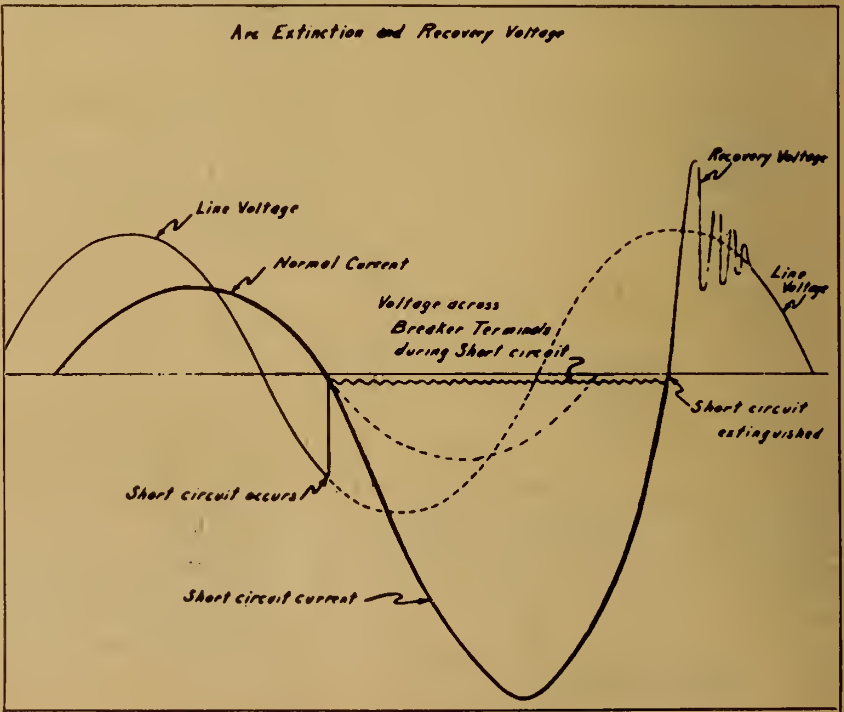
(2) High arc resistance interrupters, i.e. interrupters whose arc resistance is gradually increased to such a high value prior to current zero that arc re-establishment is easily prevented. This type of breaker acts in a very similar manner to a rheostat gradually cut into the circuit in series with the fault. Magnetic blast breakers fall in this class.

There is of course a third type of interrupter that deserves some mention. This is the type where no arc occurs when the contacts part. This vacuum breaker operates on the principle of removing neutral atoms from the path of the negative electrons driven off by the potential difference between electrodes. Some

The author defines the two main classes of circuit breakers in use today: low resistance interrupters and high resistance interrupters. Oil circuit breakers belong in the first of these categories; a discussion is presented of the many effective devices in use today for arc control. Pointing out that "a chain is as strong as its weakest link", the various components of a breaker that may cause failure are enumerated.

Requirements of a satisfactory oil are mentioned. Arc splitters are analysed, as well as their component parts. Solenoid, pneumatic and motor mechanisms used for circuit breakers are discussed at some length. In closing, a few tips are given regarding breaker maintenance.

Fig. 1. Curve illustrating the condition surrounding the interruption of a circuit by a low arc resistance breaker.



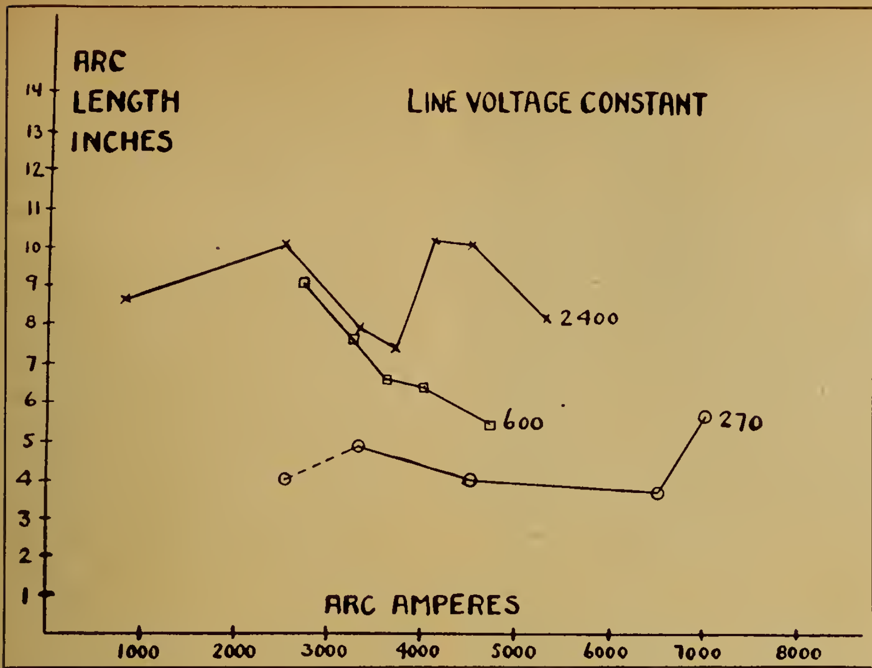


Fig. 2. Diagram illustrating the effect of the rate of rise of recovery voltage on the length of arc.

small vacuum breakers are available, but practical difficulties appear to have discouraged their development for large power. To-day all efforts are being directed towards breakers of the low or high arc resistance types.

Since the oil circuit breaker antedated the air blast and magnetic blast breaker for high voltage a-c circuits, we will discuss it first. A noted European Engineer, Prof. Bierman, once said, "It is amazing that such an illogical piece of equipment as an oil circuit breaker that extinguishes fires by oil, has been brought to such a degree of perfection." The accepted definition of successful circuit-breaker operation calls for the breaker to be in condition to be closed following a duty cycle, and to carry load till such time as maintenance is possible.

Of all the oil circuit breaker components contributing to successful operation, the tank structure ranks at the top, in that its failure to withstand the explosive pressures generated while closing or opening on a fault, would be disastrous. The tank of an oil circuit breaker is essentially an explosion container, since extremely rapid rates of pressure rise may occur either from gases generated by the hot arc during circuit interruption, or from the ignition of oil vapour and air in the air cushion above the oil level. While rectangular tanks are used (and quite legitimately, even on heavy duty breakers and of course on most lighter duty breakers) the round tank is generally preferred — due to its approach to the sphere—the ideal pressure container.

Fig. 1 illustrates the conditions surrounding the interruption of a circuit by a low arc-resistance breaker. Immediately following the current zero, the voltage across the contacts begins to rise towards the system generated voltage, which for a zero P.F. fault would be at its crest at that instant. Due to the energy stored in the circuit, the actual voltage appearing across the contacts will overshoot to probably twice the system voltage crest, and oscillate about it, as shown. It is generally recognized that the rate at which the recovery voltage rises is one measure of the severity of the interrupting duty imposed on a breaker.

Figure 2 was made up some time ago from field tests on a 138 kv. breaker, with what we would now call old fashioned explosion pots. It is an excellent example, however, of the effect that the rate of rise of recovery voltage has on the length of the arc. The longer arc and the longer duration of the arc both contribute to higher pressures and greater breaker distress.

Fig. 3. Interrupting chamber of air-blast circuit breaker with shunt resistor.

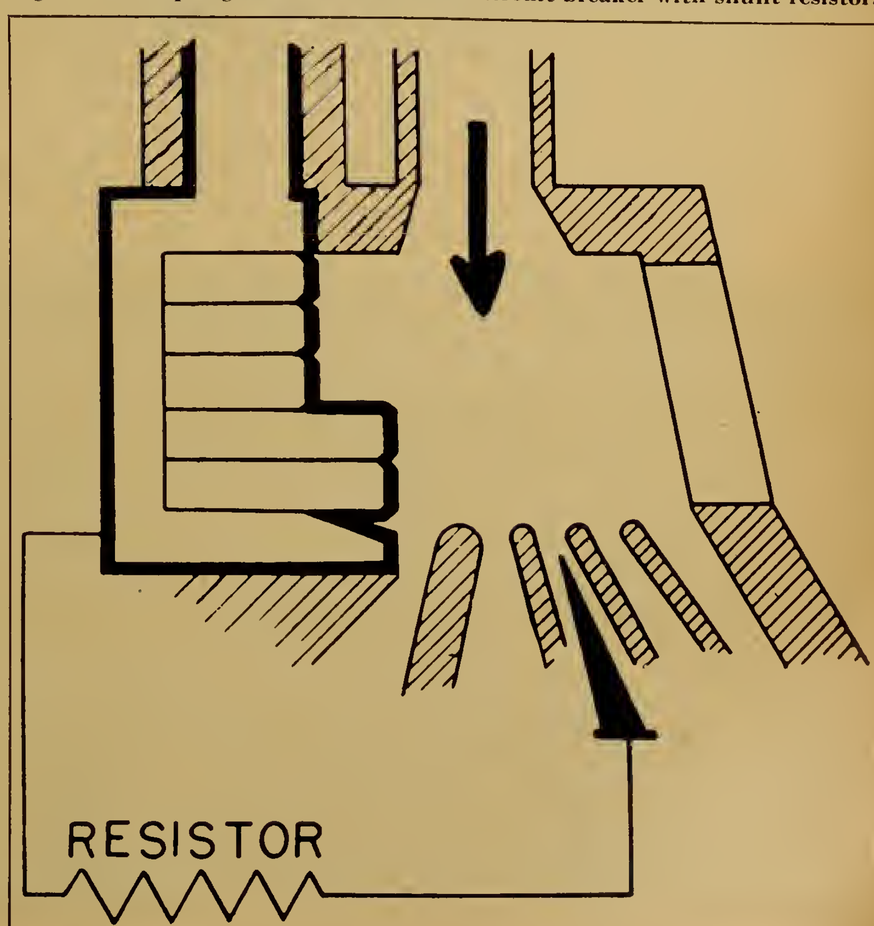


Figure 3 may be a little out of place, since we are dealing with oil breakers. It shows an interesting arrangement on an air blast breaker, where an auxiliary resistor is inserted into the circuit following current zero, to limit the rate and amplitude of the recovery voltage. Following current zero, if the recovery voltage restrikes, it restrikes to the resistor probe, but the current through the resistor is small and in phase, and is easily interrupted. Resistors such as this, shunted into the circuit in parallel with some portion of the contact break, absorb the energy of the transient voltage oscillations.

Figure 4 is an oscillogram of a high power make-break test on a 15 kv., 150,000 kva. oil blast breaker, at 4.1 volts, 23,000 rms. amps. Following are the symbols shown and what they stand for: *A*—trip coil current; *B*—alternator voltage; *C*—pressure above oil; *D*—current; *E*—arc voltage; *F*—pressure below oil; *G*—breaker travel (each dash = 1/10 ins.); *R*—shows normal 60 cycle recovery voltage associated with 1st phase to clear (i.e. 50 per cent over normal).

It is not an uncommon occurrence to have a system's capacity grow, or to have interconnections made that result in *calculated* fault currents far beyond the ratings of the installed breakers, and at the same time continue to have operating records show first class breaker performance. This is not

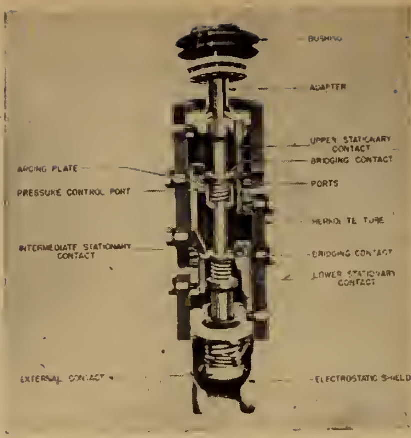


Fig. 5. Multi-break interrupter as used on 138-kv. oil blast circuit breaker.

surprising when one considers the conditions upon which fault current calculations are usually predicated and compares them with probable service conditions.

It is usually assumed that all generators are in operation at full voltage, rated kva. and 80 per cent power factor. This could occur, but it will be more likely that some generator or some station will be operating at less than full load, in order to provide a margin for regulation. It is also usual to neglect the shunt impedance of the loads on parallel feeder circuits. It is also usual to assume a zero impedance fault on the terminals of the feeder breaker. If such a fault actually occurred, the parallel load impedances could of course be rightfully neglected. The probabilities strong favour an imperfect fault with part of the feeder circuit in series, and since to have full load on the systems obviously calls for the condition of minimum feeder impedances, these may appreciably detract from the fault current.

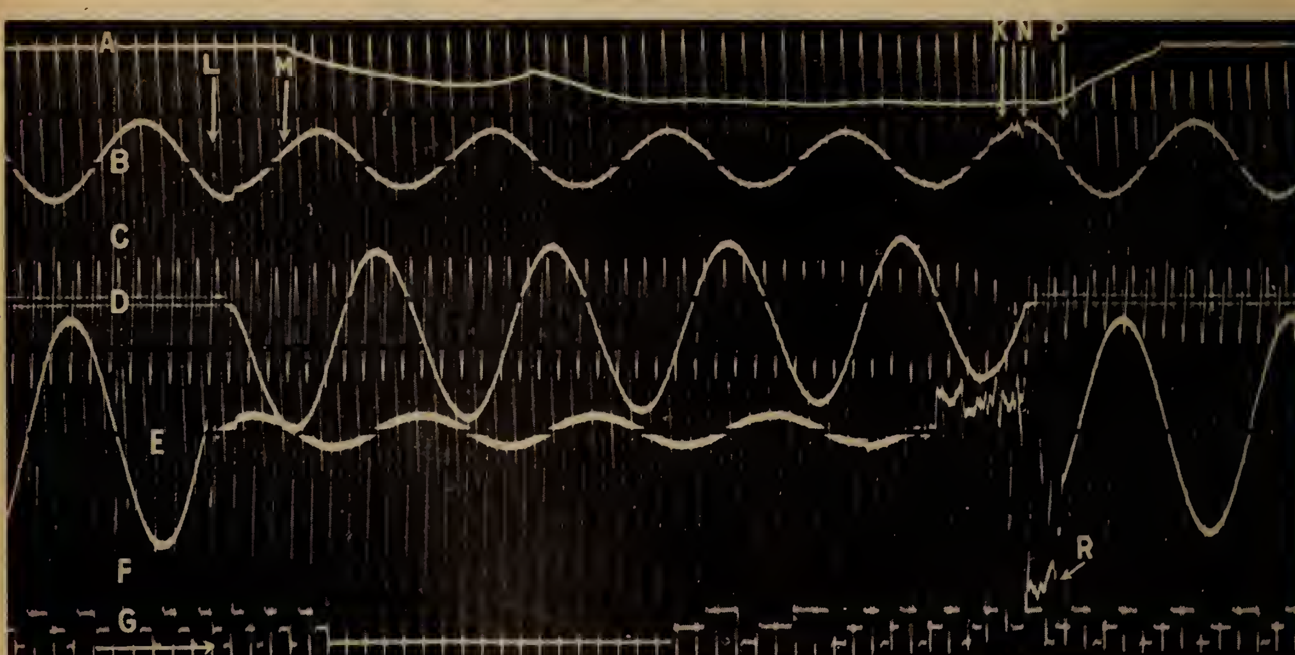
An MB duty cycle, especially on circuits up to 15,000 volts, is far more severe than straight breaking duty. The typical heavy duty utility feeder, or industrial feeder, is closed almost continuously. Hence the probability of simple break duty is far greater than the probability of an MB cycle. The rate of recovery voltage rise in high power testing laboratories is usually greater than the recovery rate met in the field. Hence a breaker that meets the high power lab. tests gains a safety factor in this regard in service.

These points in a sense constitute the safety factor of an accurately rated breaker. They also explain why some over-optimistically rated breakers may have long and successful operating records. Please do not take anything here said as advocating taking a chance on the probability of continually meeting favourable fault conditions.

Arc Control

In the plain break breaker, contacts are merely immersed in oil. The introduction of adequate insulation to the contact gap follow-

Fig. 4. Oscillogram of make-break test on 15-kv. 150-m.v.a. oil blast breaker.



ing a current zero, is largely a matter of chance. There are likely to be a number of restrikes before final extinction takes place. I believe it is correct to credit Mr. E. M. Hewlett of the G.E. Co. with the invention of the first correct arc-control scheme. The idea he used in the first H breakers more than 40 years ago is almost identical with the principal of the modern explosion chamber. This is a notable tribute to the logical thinking of the early pioneers who entirely lacked facilities for power testing or field testing for their ideas.

There are a number of effective arc control devices in use to-day, and a corresponding number of theories on why they are effective. This subject could of itself provide material for a series of discussions, and therefore only a small part will be touched on.

The original G.E. high voltage explosion pot was essentially the old low voltage H breaker pot turned upsidedown and fastened to the bottom of the high voltage bushing. Bayonets and segmental contacts of the male and female type were used, and 18 cycle interrupting time was obtained up to 69 kv. and 20-22 cycles for higher voltages.

Figure 5 shows what we term a " multibreak interrupter ", with 4 breaks in series as used for 5- and 3-cycle operation, or fast reclosure up to 154 kv. circuits. For higher voltages 6 breaks are used. A resistance not shown is connected in shunt with these contacts, and serves to equalize the recovery voltage across the two contacts, and also to damp the recovery voltage rate and oscillations, and assist in handling line charging current interruption.

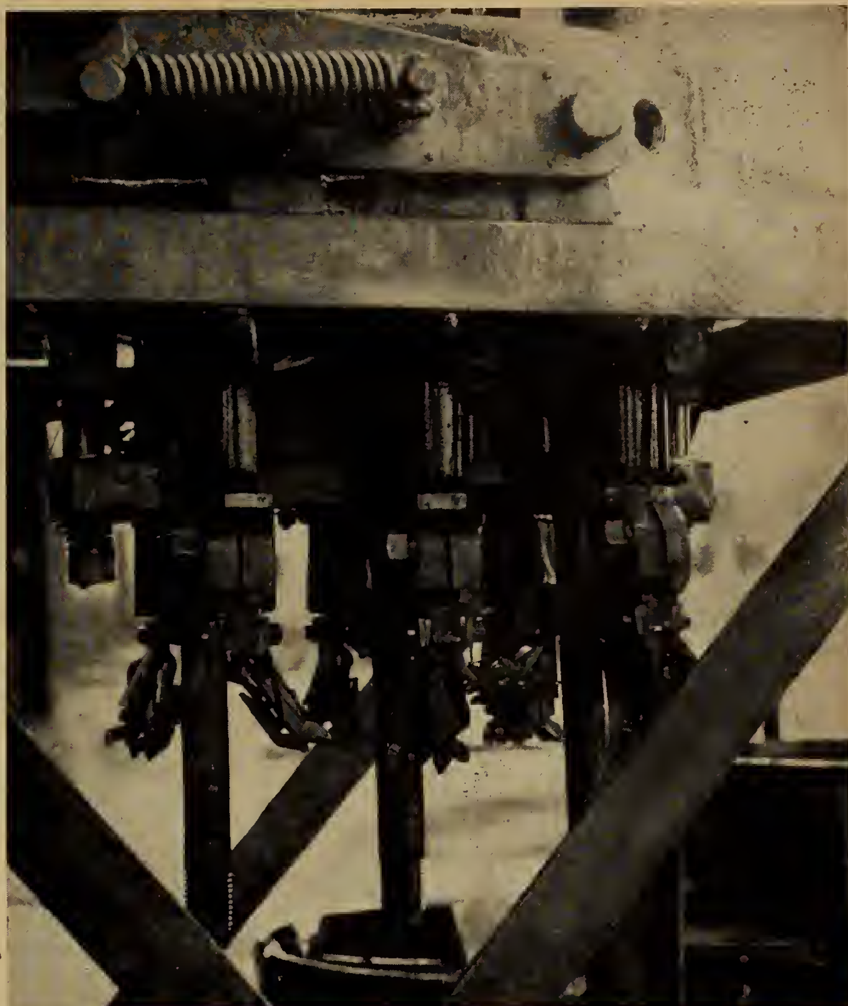


Fig. 7. Breaker tested to destruction in high power testing laboratory.

Fig. 6. Contact structure as used in 7.5- and 15-kv. breakers to withstand heavy fault currents.

The design of the interrupter is only partly responsible for the gains in speed. The time required for unlatching a mechanism and accelerating it to the break point is an increasingly important portion of the total time at the higher speeds.

The old saw:—" A chain is no stronger than its weakest link ", applies very strongly to circuit breakers. We will describe a few of these breaker links. In making the circuit against a fault on a high voltage circuit, the arc will strike slightly before the contacts touch. If finger contacts are used, the fault current will be in the same direction in both fingers. If the design is faulty, the fingers may be forcibly pulled together before the blade has had a chance to enter, giving what is known as a " stubbing effect, that will distort the fingers and possibly break bushings or lift rods.

A contact structure as used in 7.5 kv. and 15 kv. breakers, to withstand heavy current on closing, is illustrated in Fig. 6. A pin in the finger support passing through a slot in the finger, limits the distance that the finger can be pulled inward. A second danger that must be cared for lies in the possibility that the gas bubble due to heavy current may overcome the electro-magnetic inward pull and blow them apart. With this type of contact heavy spring pressure is applied at the tip of the finger to guard against this contingency. Design features such as these are subjected to numerous power tests in course of their development. These finger springs necessarily greatly increase the power required in closing the breaker. This is one of the reasons why heavy current breakers cannot be manually operated.

Figure 7 shows definite evidence that the risks just mentioned are not imaginary. The damage shown occurred on a duty cycle within the published rating of the breaker. It also demonstrates the need for dash pots to cushion the opening stroke. Typical no load or normal load opening speeds are in the range 4 ft. to 10 ft. per second, but with the added impetus supplied by the magnetic loop, corresponding to a fault current of say 40,000 amps., the speed will jump to several times normal.

Even at normal current the dash pots are usually necessary to prevent undue rebound, but at heavy fault currents their absence may well be disastrous, as indicated by this figure. One may well wonder if some university engineering course failed to drive home to the engineer who designed this breaker the practical applications of such fundamental formulæ as

$$F = \frac{\text{mass } (V_1\text{-}V_2)}{\text{Time}}.$$

The electromagnetic kick back is the main reason why manual operation of heavy duty breakers is inadvisable. The same magnetic loop that interferes with closure against heavy current faults, and accelerates breaker opening speeds, also puts a severe strain on the insulators tending to push them apart. Fig. 8 is particularly interesting in that the insulators show no distortion yet they have clearly moved sufficiently to break the wooden brace. It clearly demonstrates the need for bracing, and the value of high power testing in showing when a stronger brace is needed.

Fig 9. shows what can happen a tank lining that is not properly designed. Cylindrical tank linings made of material such as herkolite (paper with shellac or bakelite binder) have little ductility. If they do not fit in the tank tightly, fast pressure rises under the oil may burst them. A tight fit is hard to obtain, hence a covered vertical slit is the more usual design. At points where arcs may frequently touch the lining, it is usual to use fibre, due to its non charring properties.

A contact finger of British invention that is coming into frequent use in Canada is illustrated in Fig. 10. This finger not only provides a shorter path for the current from the blade to the stud, but introduces only two contacts in the path, whereas conventional fingers have the same two main contacts, plus a number of multiple contacts in the flexible conducting laminations. Silver gives the lowest initial contact drop and lowest rate of deterioration of any commercial material. Generous use of silver plating on joints is therefore one of the " hall marks " of a good breaker. Silver plating is of course not used on arcing contacts.

Fig. 8. High power testing demonstrates the necessity of adequate bracing.

Oil

Satisfactory oils have been available for many years past. They are usually bought to rigid specifications, not at all like a specification received some few years ago that stated " The oil on this requisition must be capable of withstanding a dielectric test of 40,000 volts between two ½-in. brass discs placed 200 miles apart ".

Typical switch oil has a pour point of – 40 deg., but at this temperature it is pretty viscous. For reliable breaker operation, it should never be allowed to fall below – 25 deg. C. When immersion heaters are used. they should be kept energized all through the cold period, (not the whole winter) since experience shows that carbonization is thus minimized. When oil has been subjected to arcing, its non-sludging properties are impaired, even though it is cleaned. This is not very important from the breaker standpoint, but it does point out the risk of mixing switch and transformer oils in a common storage tank. Breaker developments in recent years have notably shortened arcing time and hence oil deterioration.

Fig. 9. Tank linings must be properly designed to withstand pressure.

The search for a non-inflammable substitute for oil has, I believe, been abandoned. Substitutes investigated all showed one or all of the following faults: a—high cost; b—excessive deterioration under the influence of the arc; and c—objectionable reactions with other insulations used in the breaker.

Speaking in terms of modern, well designed and power tested oil circuit breakers, applied to circuits where fault currents are within the breaker rating, there is negligible danger of oil fires. There has been a regrettable number of oil fires however, in cases where the system

Fig. 10. Bushing and contact structure.

has outgrown the breaker, or where the breaker has been over-rated or poorly maintained. These unfortunate cases have created a trend toward oilless breakers, particularly for low voltage (up to 15 kv.) circuits.

For circuits 600 volt and below, the air circuit breaker is already quite standard. For 2500 to 15,000 volts the air blast breaker and the magnetic blast breaker are invading the field, and if the war had not interfered with the Canadian development of these types, the low voltage air blast breaker would unquestionably be in much more general use to-day.

For high voltage circuits the situation is rather different. The great majority of high voltage oil breakers are located outdoors, and their operating record has been excellent. Primary insulation for both current transformers and capacitance voltage dividers already exists in the oil circuit breaker. Availability of high permeability alloys makes it possible to obtain pretty much all the output required from the ring type, single primary current transformer.

This is not the case with air blast breakers. Especially in the case of higher voltages (110 kv. and up) the air blast breaker plus conventional current transformers, potential transformers and automatic disconnecting switches is inherently more costly to build than the corresponding oil circuit breaker. This has been the experience in England and on the Continent as well as on this side of the water. It is therefore at least doubtful if the high tension air blast breaker will make large inroads into the high tension field. The advent of a cheap high voltage current transformer could of course change the picture. The cost comparison may prove more favourable to the air blast breaker — in the case of three and five cycle breakers of 5,000,000 kva. and over.

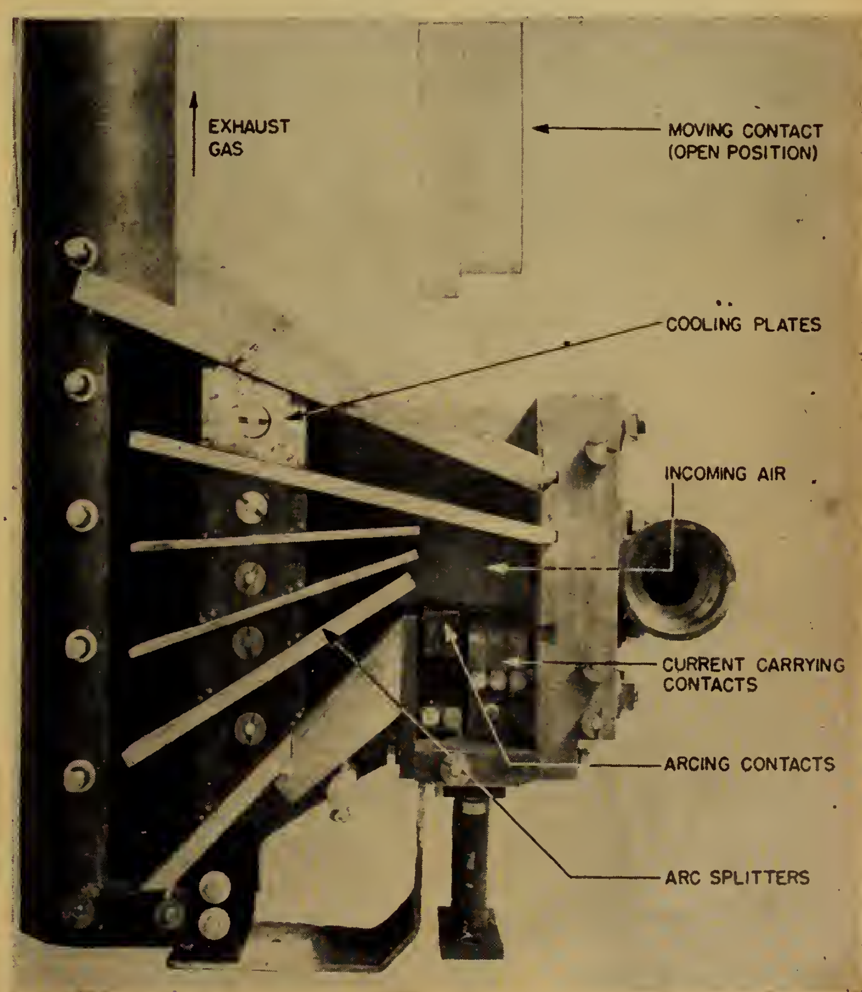
The purpose of the arc splitter shown in Fig. 11 is to permit the arc which is formed between the separating contacts to be blown into a series of loops. Except at current zero the arc path is continuous, but at current zero no energy is available to further ionize gas. Consequently the high velocity air parts the arc products at the forward edge of the barriers, and sweeps the arc products away into the exhaust structure. As the arc products are swept away they are replaced by fresh dielectric. For successful operation, this fresh dielectric must be inserted by the air stream at a rate that will be faster than the rate of rise of recovery voltage. In general an increase in the number of splitters increases the rate of recovery voltage that can be handled. Changes in air flow due to configuration of the arc chute, and the air pressure itself, also have an important bearing.

The use of gas-forming insulating barriers in the arc splitter is universal practice, in fact it is essential to the proper functioning of the splitter. Hard fibre is the material usually chosen. Non-gas-forming barriers of ceramic material would become conducting under the heat of the arc, whereas the gas forming material performs three functions:

(1) It provides thermal protection for the insulation surface.

(2) It forces the arc and arc products away from the barrier

Fig. 11. Interrupting chamber for 15-kv. air-blast breaker.



and into the region of high air velocity.

(3) It acts as a low viscosity, low density lubricant, making possible rapid insertion of a wedge of dielectric at current zero.

A different explanation of the beneficial action of the fibre barriers is given based on the assumption that it is important to approach the current zero with a highly turbulent atmosphere surrounding the arc core. If the barriers were of refractory material, there would be turbulence only on the air stream side of the arc, whereas with a gas generating barrier, the gas gives turbulence on the barrier side also, thus mixing the maximum amount of un-ionized air and gas with the arc products to promote rapid de-ionization. Regardless of theory, the gas forming barriers are definitely effective.

It will be noted that the type of breaker shown in Fig. 12 lends itself to an arrangement that gives no electromagnetic stress tending to prevent the full closure of the breaker, whereas the reverse is the case with the usual dead tank oil circuit breaker. Another interesting advantage lies in the possibility of using air across the contacts on closing as well as on opening, thus decreasing the distance through which the arc strikes, correspondingly increasing the circuit closing ability and reducing contact deterioration when closing against heavy faults. The oil and air blast breakers so far discussed were all low arc resistance interrupters.

The high arc resistance interrupter builds up a high arc resistance prior to the current zero, thereby modifying the circuit current and achieving an early interruption by advancing the current zero to, or near to, the recovery voltage zero. The rate of rise of recovery voltage is held to a low value, which permits the build up of insulation across the electrodes at the moderate rates achieved by rapid cooling of the arc products.

The obvious advantage compared to air blast, low arc resistance breakers lies in the avoidance of a high pressure air supply with all its auxiliaries. Due to this, this type of high arc resistance breaker can be made to conform to the

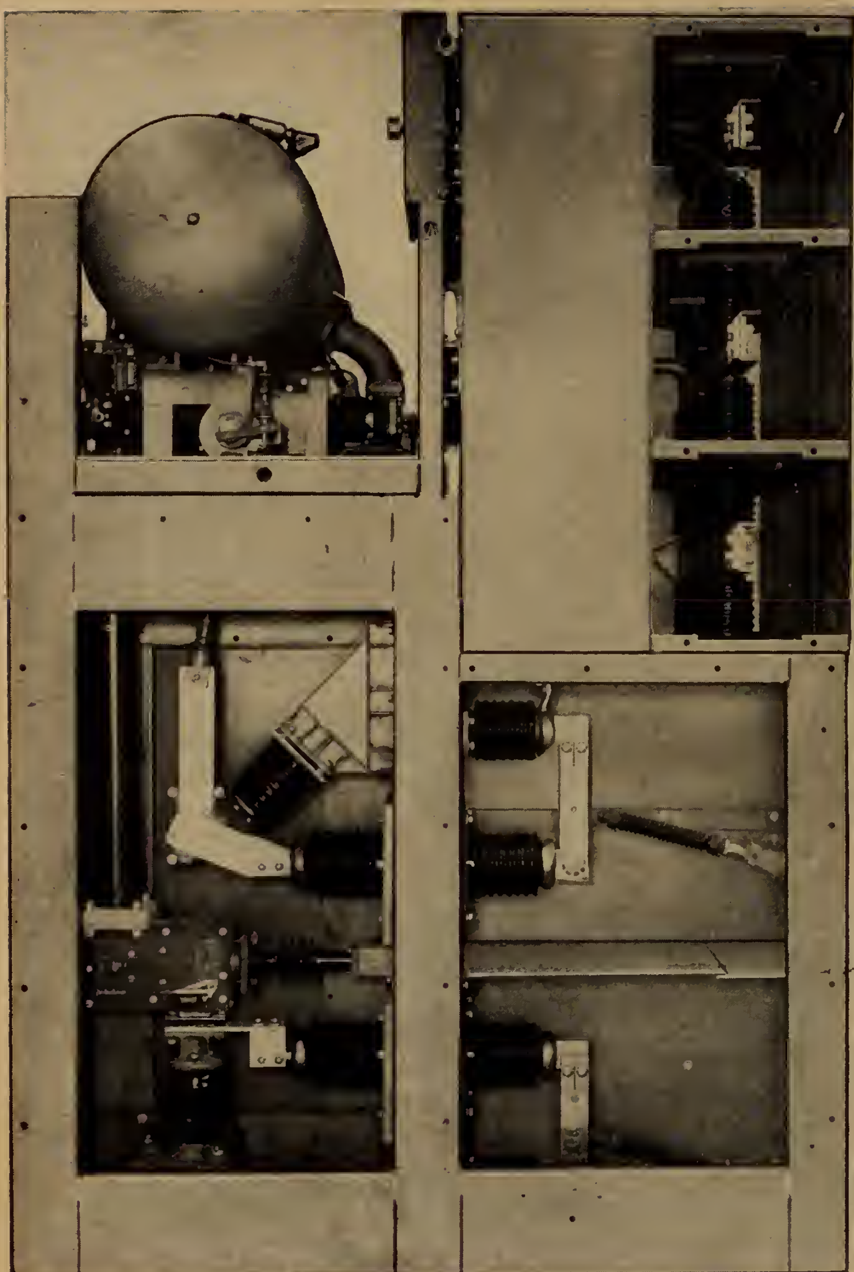
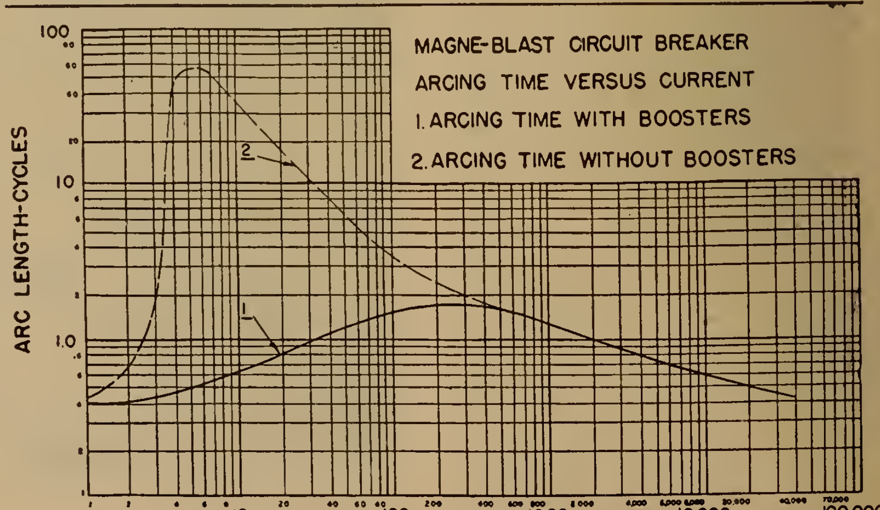


Fig. 12. 15-kv. air-blast breaker complete with interlocked disconnecting switches and bus.

Fig. 13. (Below) Amperes interrupted. Comparison of arcing time vs. arc-chute current with piston booster (solid line) and without piston booster (dotted line).



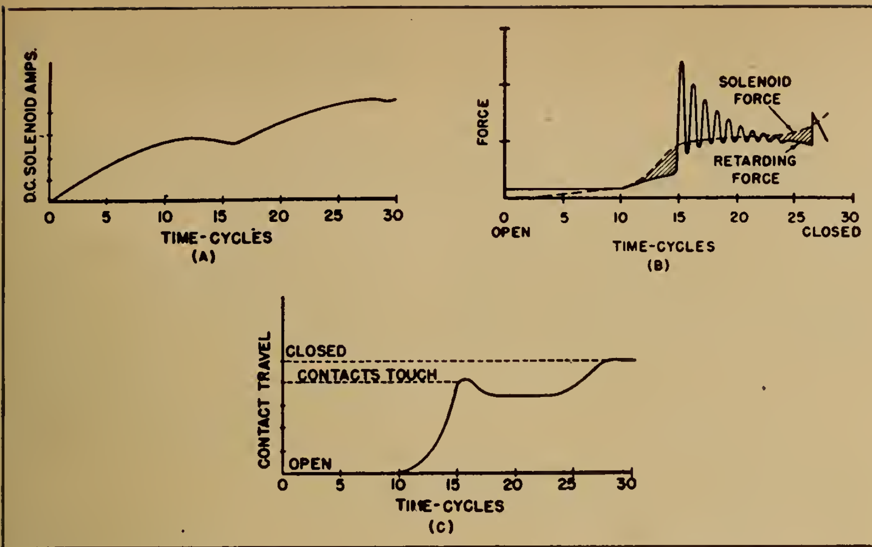


Fig. 14. Conventional solenoid current build-up, dynamic output force and stalling when closing 80,000 amp. short circuit.

general pattern and size of correspondingly rated oil circuit breakers, and it can therefore be readily applied in metal clad equipments.

Magnetic blow-out coils are used to drive the arc along arc runners and through an arc chute, elongating it, cooling it, and increasing its resistance and reducing the current. At low currents the magnetic field strength is weak, which would result in low arc speeds and long arc durations if this magnetic field were the only driving force. Simple air pistons supplement the magnetic field with a blast of air as the contacts part and effectively take care of this light current condition. Fig. 13 shows how effective these air pistons are in reducing arcing time.

Mechanisms

Little need be said about manual mechanisms. Their use is confined to light duty breakers. The finger pressures that are required for heavy duty breakers, combined with the retarding effect of electromagnetic forces and gas bubble formation, all combine to rule out the manual mechanism.

Solenoid, pneumatic and motor mechanisms are the types used for medium and heavy duty breakers. Of these the solenoid mechanism is the one most frequently used. In common with all other mechanisms, the solenoid must provide smooth and effective closing performance, even though it is closed against fault current and is thereby subjected to strong electromagnetic retarding forces during the final portion of the closing stroke. These retarding forces increase as the square of the current, and therefore may vary from ounces at normal load to thousands of pounds at high fault currents. If these retarding forces are not overcome by the instantaneous mechanism output plus the forces from kinetic energy in the moving parts, stalling may occur or the closing motion of the contacts may even be momentarily reversed.

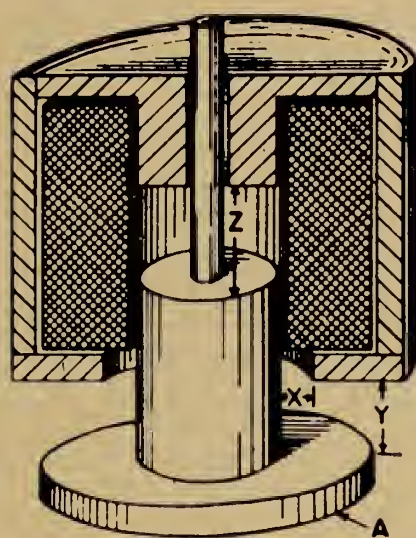
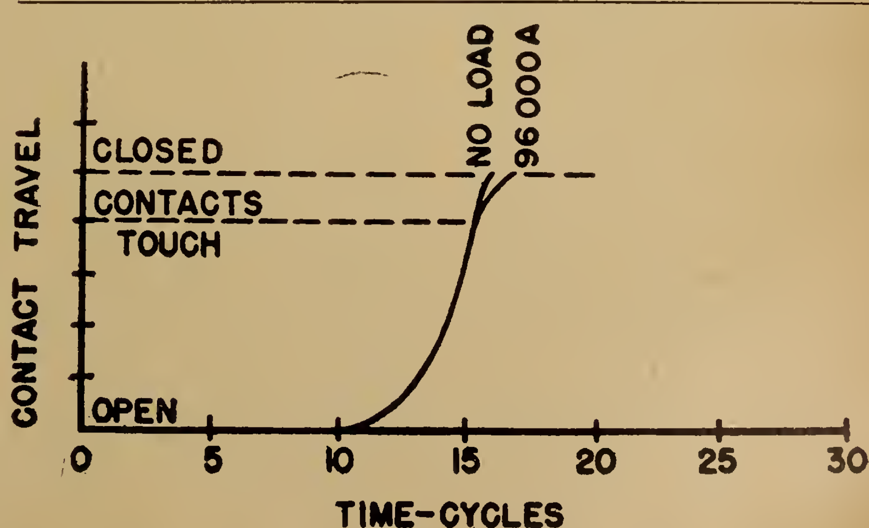


Fig. 15. Improved flux shifting closing solenoid coil design with bottom plate on plunger. "X" — air gap around circumference of plunger. "Y" — Air gap to bottom plate which shorts out gap "X" as plunger closes. "Z" — normal air gap at top of plunger.

Fig. 14 shows conventional solenoid current build-up, dynamic output force and stalling when closing an 80,000 Amp. short circuit. *"C"* shows the stalling that can occur while the solenoid current is building up to a sufficient value to complete the stroke. *"B"* illustrates what occurs. The solid line represents the retarding force and in the first 10 cycles is due to the mass of the moving parts, in the next 5 cycles acceleration is added and in the next 10 cycles the electromagnetic forces. The shaded portions represent the margin of solenoid power over retarding forces. It is of course only in these shaded portion periods that the contacts can be moved towards the closed position.

The stalling would of course be worse when control voltage is below normal, and severe damage or failure of the breaker may result. When there is any danger of stalling, it is imperative that high speed instantaneous overcurrent relays be used. These relays need only be operative during the closing cycle, thereby largely avoiding interference with selective relaying. Such relays merely limit the stalling time and it is much more desirable to eliminate the stalling altogether.

Fig. 16. (Below) Improved flux shifting solenoid closing against 96,000 amp. 3 phase circuit.



One way to handle this would be to change the toggle action to require more input force at the commencement, with a faster decrease as the stroke progresses. This plan calls for higher force all through the stroke, increasing acceleration and speed, so that abnormal dashpots or closing buffers may be required to absorb the impact when closing at no load or normal load.

An ingenious plan to avoid this excess energy, and yet have the necessary power to prevent stalling, is illustrated in Fig. 15. A plate "*A*" has been added to the conventional solenoid plunger. In the open position the initial flux is across the annular gap " *X* ", — up through the plunger to the pulling gap " *Z* ". As the plunger closes in to the point where the breaker contacts touch, the added bottom plate approaches the bottom of the magnetic return circuit, so that the gap " *Y* " becomes shorter than " *X* ", and flux correspondingly shifts from the non pulling gap " *X* " to the pulling gap " *Y* ". Therefore, with no increase in total flux, this flux shifting scheme exerts a stronger pulling force during the latter part of the stroke.

Figure 16 shows that the stalling has been eliminated, and a close relation obtained between times required for full closing under no load and under heavy fault conditions.

Going back to Figure 14, it will be noticed from curve *A* that there is a distinct lag in the build up of solenoid current. This is of course mainly due to the inductance, which increases with the closing movement of the plunger. Well designed large solenoids usually include an auxiliary switch, mechanically connected to the plunger to de-energize the solenoid control relay immediately the full stroke is completed, thus preventing further growth of solenoid current, and correspondingly cutting down on battery drain.

The solenoid mechanism is rather restricted in its application to modern high voltage high-interrupting-rating breakers, inasmuch as the time lost (10 to 15 cycles) in building up magnetic flux rules it out for high speed closing or high speed reclosing duty.

There are several types of motor mechanisms: (1) Direct acting; (2) Centrifugal; and (3) Cam. In the direct acting type the motor is connected by a worm, pinion, and clutch directly to the breaker operating linkage. In the centrifugal type, the motor spins a pair of flyballs and the energy of the balls is used to close the breaker. This is a fast starting mechanism but slow and unsatisfactory if retarding forces are encountered when contacts make. In the cam type the motor drives a cam through a gear train, and the cam operates against a linkage to actuate the breaker contacts. All these motor mechanisms have a common characteristic in that they all require very careful and accurate adjustment.

The high closing speeds and high contact forces of modern breakers demand a large amount of closing power for a short interval of time. Some breakers require as much as an average of 15000 lbs. from the operating mechanism for a distance of 4 to 5 inches for 20 or 30 cycles during closing. Such a demand can best be supplied from accumulated energy located close to the breaker. Such energy can be economically and practically stored at each breaker in the form of compressed air or stressed springs.

With a pneumatic mechanism energy is accumulated through a standard fractional horsepower motor and standard air compressor, in a reservoir of sufficient capacity to give several operations of the breaker without any replenishment of the air supply. Furthermore the closing power is released and controlled through a low energy, direct - current - operated air valve.

Opening the air control valve admits air to a cylinder assembly, and movement of the piston actuates a linkage. This linkage is provided with a latching means and may or may not be provided with a tripping means. By means of an orifice in the air cylinder, or by suitable air pressure, the breaker contacts can be closed with desirable velocity and force characteristics. Compressed air has low inertia, and therefore it is a desirable means for high speed closing, since little time elapses from operation of the closing switch until the air pressure has built up to its nominal value in the cylinder.

The problems peculiar to compressed air mechanisms for circuit breakers include reliable air storage and freedom from air stoppages, due to freezing of accumulated moisture. With these in mind piping must be simplified as much as possible with a minimum number of joints. An after-cooler generally may be used consisting of several turns of copper tubing. This is usually located in the air line between the compressor and the air storage tank, and a sump is usually located at the lowest point in the system with a hand valve to blow off the sump.

If the equipment is indoors, or in an adequately heated weatherproof housing, no additional dehydrating is necessary. For outdoors, the usual plan is to compress to above the operating pressure and then pass the air through a dehydrating agent (such as silica-gel) and a throttle valve to the storage tank.

Pneumatic mechanisms are contained in a weatherproof housing for outdoor applications. Heaters are required for Canadian climates, and may be either spot heaters for critical parts such as check valves, control valves, etc., or strip heaters to keep the air temperature within the housing above freezing. With the latter arrangement for heating, pneumatic mechanisms have been in operation in one of the severest climates in Canada with satisfactory results.

Operating mechanisms may be classified as " non-trip-free " or " trip-free ". With a non-trip-free mechanism as long as the closing circuit is energized the breaker will remain closed. If as the result of an emergency, such as a short circuit on the line, the tripping means is energized, the breaker will remain closed until the closing force is removed.

To eliminate this objection most modern mechanisms are designed to trip free of the closing force. This is accomplished in some by having a linkage interposed between the closing member and the breaker mechanism which will collapse whenever the trip circuit is energized. Others, known as pneumatically trip-free, obtain equivalent action by quickly exhausting the air from the closing cylinder thus allowing the breaker to open. This elimination of the collapsible linkage greatly simplifies the mechanism.

In one form of pneumatically trip-free mechanism the release of air is controlled by a dump or release valve placed in the air line between the control valve and cylinder. It is closed when the control valve is open, the piston then closing the circuit breaker. If during the closing cycle the control

(Continued on page 544)

Wartime Aeronautical Research & Development in Germany

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EDITOR'S NOTE

Late in 1945 a group of Canadian Scientists and Engineers visited Germany to investigate scientific and technological achievements of our former enemies. The authors of this paper, at that time on the staff of the National Research Council, were assigned to the field of aeronautics.

The report submitted by these scientists was long and comprehensive, but, in spite of heavy demands on their time, they have prepared a condensation specially for the JOURNAL. Even in this condensed form the report is of necessity being published in four instalments. When all four parts have been published it is hoped a consolidated reprint will be available for those interested in preserving the report in its entirety.

In this, the opening instalment, the Authors deal with the Hermann Göring Aeronautical Research Establishment, including the Institute for Aerodynamics, Wind Tunnels, Materials Laboratory, Weapons Institute and Engine Research. The Institute Graf Zeppelin at Munich and the High Speed Tunnel of the D.V.L., are also discussed.

Part I

In the latter part of 1945, the authors spent nine weeks in Germany as members of a group of Canadian scientists and engineers engaged in an investigation of German scientific and technological achievements. The information presented here was gathered by us during this visit. Apart from the time required, the condition of many of the establishments rendered it most difficult to secure details of all the work undertaken. In addition to the destruction in many cases by Allied bombing, most establishments bore eloquent testimony to the efficiency of the looting carried out by the armed forces, released slave labourers, and probably by the Germans themselves. Coupled with this disorder was the disappearance in many cases of drawings and documents, and the complete absence of the personnel who operated the plant. A word of praise is due to the British Scientific Officers who took charge of the establishments in the British Zone, restored some order, repaired equipment to make it serviceable and managed to collect the more important scientific personnel to assist them with the restoration and the recovery of missing equipment and documents wherever possible. As a result, much valuable experience with the very advanced experimental techniques employed by the Germans was gained and many important monographs containing unreported research were prepared by the German personnel themselves.

All German aeronautical research during the War had been under the control of a body known as the Forschungsführung (research directorate), which had begun as a small department under the German Air Ministry (Reich Luftfahrt Ministerium—R.L.M.). As the War developed, this small department was removed from the direct control of the R.L.M., became considerably expanded and acted in an advisory capacity to the R.L.M., reporting directly to General Milch. It coordinated the work of all the aeronautical research establishments.

The co-ordination of the large research centres was said to be very good although it frequently appeared to us that the liaison was not as good as it might have been. On several occasions scientific staff were interrogated and found to be completely unaware of the fact that others in Germany were working along identical lines. Liaison between the research establishments and the aircraft firms was only mediocre, despite the fact that the firms had direct access to the re-

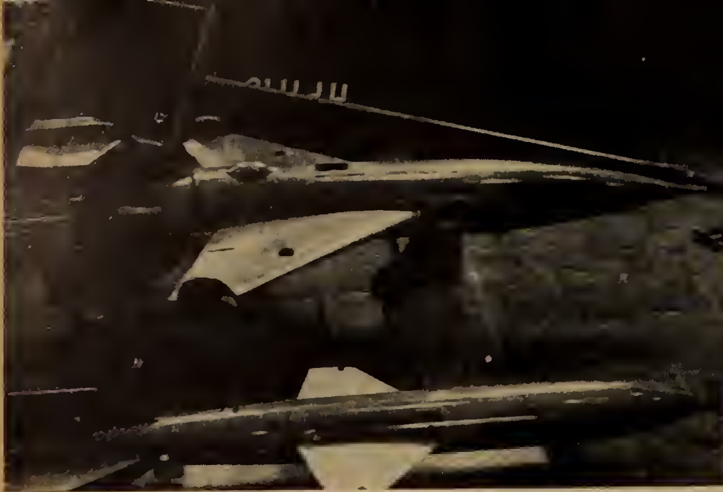

Fig. 1. Wind tunnel models of guided missiles "Feuerlilie" (upper) and "Wasserfall" (lower).

Fig. 3. The Hermann Göring wind tunnel (A.3) at L.F.A., showing nozzle and wing model in place.

Fig. 2. (below) High-speed wind tunnel. A.2. Entry door in roof.

search establishments. Still more surprising is the fact that the liaison and co-operation between the research establishments and the German Luftwaffe was practically non-existent. Knowing the excellent co-operation which existed between the Air Forces, the manufacturers and the research establishments of the Allies, one cannot but wonder how Germany, caught in a life and death struggle which she herself initiated at her own time and convenience, allowed such a state of affairs to persist, in an era when the waging of successful warfare depends so much upon the developments and application of scientific research. Truly the much vaunted German passion for organization must have been a blind passion.

The explanation for this peculiar myopia was not hard to find. Technical leadership was completely absent among the highest ranks of the German Air Ministry. All over Germany the luxury, style and permanence of the Luftwaffe stations bears evidence of the status of this service in the eyes of the German people. In the early months of the War the successes of the Luftwaffe gained them immense popularity. It is quite possible that their belief in their own invincibility may have gone to their heads and convinced them that they could get along without reliance on factory workers and the scientists. This suggestion may not be too far-fetched. General Udet, although not a technical man himself, was head of the technical branch of the R.L.M. and had

Fig. 4. (left) The collector of wind tunnel A.3.

collected together groups of civilian engineering personnel at the main flight-testing establishments. After his death these men were all replaced by service personnel and we were told that the establishments deteriorated from that time on. Another indication of this attitude is illustrated in the standardizing by the Luftwaffe on 1938 designs for quantity production reasons. It was the effect of this stagnation in development that lost them the Battle of Britain in 1940 and, when they finally realized their error, they frantically turned to their fantastic guided missiles to regain for them the air superiority their bombers and fighters had been unable to retain.

Most of the establishments had great difficulty in securing suitable staff. At A.V.A., for instance, there had been no new appointments for nearly ten years. In contrast, money for new equipment at new laboratories sponsored by the R.L.M. seemed to flow freely. Salaries paid by the research establishments were less than those received in industry and the latter was given a higher priority in the assignment of manpower. The larger research establishments were organized as incorporated bodies with boards of directors which included representatives of the universities, science, industry and of course the Nazi Party. The main reason for such an organization was to avoid control by the Civil Service and to allow the Director some leeway in the salaries he could pay his staff. The German Government set up the basic scales of salaries and these were dependent on training and experience, ability, marital status and number of children (up to five).

Of the extent and brilliance of

German research itself there is no doubt. The failure lay in its timing and in its gearing to the needs of the military machine. Too little and too late might best describe this failure which stemmed from the lack of a streamlined organization for long-range planning of requirements and the provision of close control and co-ordination of the work as it progressed from the basic research stages, through the development and production stages and even to the final operational use of the weapons involved.

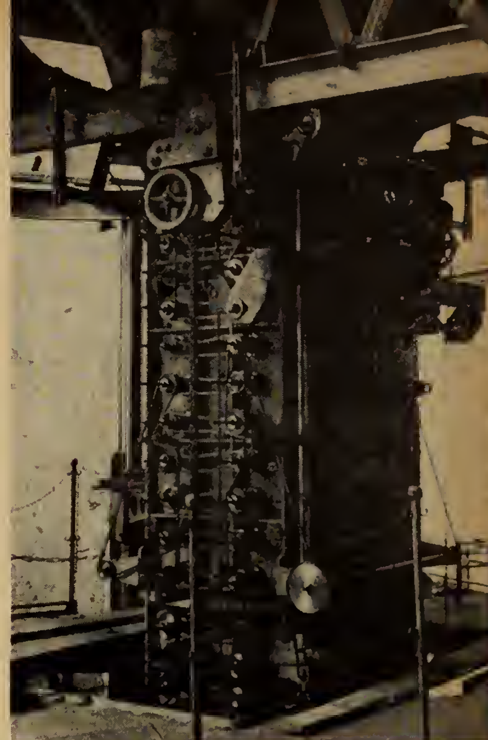

Fig. 8. (right) Closed working section of supersonic wind tunnel A.9b at L.F.A.

The Hermann Göring Aeronautical Research Establishment

Luftfahrtforschungsanstalt Hermann Göring, generally referred to as the L.F.A., was the most spectacular and impressive establishment seen in Germany. Together with its aerodrome, it occupied an area of approximately four square miles, with a total of some sixty buildings. The majority of the buildings were completely hidden in a forest and those that were exposed were cleverly camouflaged. The laboratories were invisible, as such, from the air even at low altitudes and the aerodrome itself was well camouflaged. Although the existence of such an establishment was known or suspected by the Allies, its precise location at Volkenrode, a few miles from Brunswick, was not discovered during the War. We can now feel rather pleased that it was not, for it has contributed extensively to our knowledge of German research equipment, methods and results. The large Herman Göring Wind Tunnel was too high to be hidden completely by the trees of the forest. Dummy pine trees were added around it and the roof was covered with a considerable depth of soil on which were growing a number of shrubs and bushes and a cover of long grass. Park benches completed the effect.

If the discovery of the establishment was a surprise, the realization of the scope and lavishness of its equipment was dramatic. Comparisons may be odious, but the L.F.A. has been described as the most magnificent aeronautical research establishment the world has ever seen. Certainly the planning and conception and the extravagant expenditure of money on the buildings, their equipment and supplies was most impressive.

The construction of the L.F.A. was approved in 1933 and commenced in 1935. The intention, when first conceived, was that the L.F.A. should concern itself with basic research, more so even than the world-famous research estab-

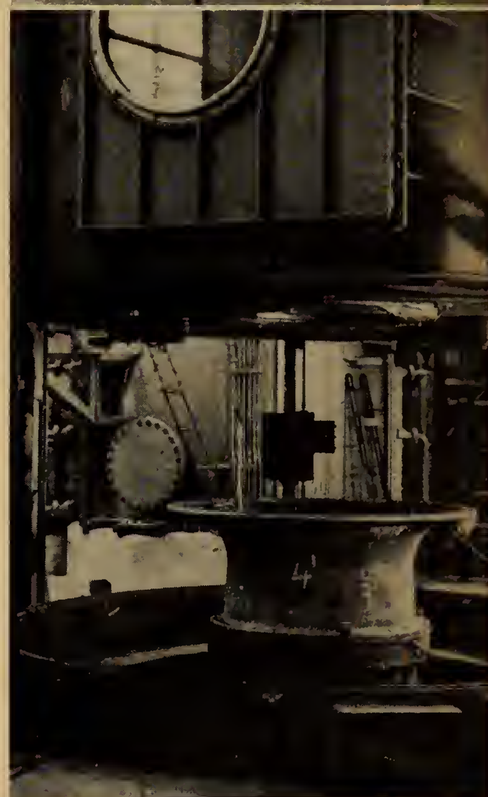

Fig. 7. (right) Open-jet working section of high-speed wind tunnel A.9a at L.F.A.

Fig. 5. High-speed wind tunnel A.6 at L.F.A.

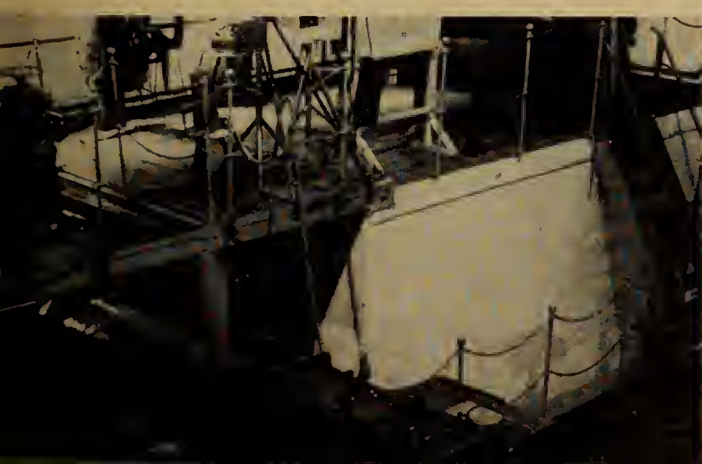

Fig. 6. Supersonic wind tunnel A.7 at L.F.A.

lishments of the D.V.L. (Deutsche Versuchsanstalt für Luftfahrt — German experimental establishment for flying) Berlin, and the Aerodynamic Research Establishment at Göttingen. L.F.A. employed about 1500 persons, of whom 150 were university graduates, but Professor Blenk, the Director, considered that only about 50 of them were good research men.

Institute for Aerodynamics

This was equipped with seven wind tunnels as follows:

Wind Tunnel A.1

This was a small, low-speed tunnel having a working section 8.2 ft. in diameter and an operating speed of 180 ft. per sec. The tunnel had been used for a long-term basic research on aircraft controls and had also contributed to the development of "Feuerlilie", an air to air flying rocket and "Hecht", a ground to air rocket. The Germans claimed that these rockets were originally developed for aerodynamic research at supersonic speeds and that their military application against hostile bombers was an afterthought. Fig. 1 shows wind tunnel models used in the development of "Feuerlilie" (upper) and "Wasserfall" (lower), another supersonic guided missile. Wind Tunnel A.1 had also been used in tests of low-drag wings and wings with swept back and swept forward plan forms. Other work included tests on conventional aircraft and on models of submarines and barrage balloons. The Blohm and Voss asymmetric aircraft had also been model-tested here.

Wind Tunnel A. 2

This was a high-speed tunnel with a 9.2 ft. diameter working section, in which Mach numbers of 0.8 to 0.95 were obtainable at maximum power of 12,000 kw. It was in this tunnel that the power plant for the V-1 flying bomb had been developed in co-operation with the Argus and Fieseler firms. A view of this tunnel is shown in Fig. 2. It was also in this tunnel that Dr. Zobel developed his interferometer method for the study of high-speed air flow. This in essence consists of the production of interference fringes by the optical interference of two beams of light, one of which passes through the wind tunnel working section and the other passes around it.

Changes in density of the air as it flows past the model under test are equivalent to a change in optical path length, which results in a change in the interference fringe pattern. The pattern can therefore be used to determine density and hence velocity distribution in the field of flow. This tunnel was used also for investigation of the cooling drag of radial engine installations, measurement of the drag of streamlined bodies and the thrust and drag of jet propulsion units. Some complete aircraft models, of types powered by jet engines were also tested in the tunnel.

Wind Tunnel A.3

This was the large Hermann Göring Tunnel with a 26.2 ft. diameter working section and an operating speed of 270 ft. per sec. Fig. 3 shows the nozzle with a wing model in the test position and Fig. 4 shows the collector of this tunnel. The peculiar flaps around the nozzle, the ring surrounding the collector and the gaps inside the collector are all for the purpose of suppressing the pulsating flow which is sometimes experienced with this type of open-jet tunnel.

About 90 per cent of the work done in this tunnel was for the aircraft industry and particularly on engine installations. By means of an air interchange system it was possible to do tests on aircraft engines in operation, without contaminating the air inside the building with excessive carbon monoxide. The aerodynamics of engine installations was studied with engines running and driving propellers, including cooling and exhaust system tests. A flutter model of the Junkers Ju 162, made from "Vinidur" plastic, was tested in this tunnel.

Submarine models were tested in this tunnel for stability and controllability. Full size torpedoes, both with and without engines running, also came in for study. Systematic tests on the effect of forward and backward sweep of wings were also in hand here.

Wind Tunnel A.6

This was a small high-speed subsonic tunnel operated from an evacuated sphere of 35,300 cu. ft. capacity. Speeds up to Mach number 0.9 could be obtained. Fig. 5 shows this tunnel in the foreground. Running time of the tunnel was only 25 seconds, after which the sphere had to be re-evacuated, which the compressor could do in 3½ minutes, driven by a 1000 kw. motor. The tunnel had been used to test the stability of projectile models and measurements of lift, moment and pressure distribution on aerofoils had been made for the industry.

Wind Tunnel A.7

This was a supersonic tunnel designed for continuous operation, as opposed to the intermittent operation of Tunnel A.6, and powered by the same compressor which was used to evacuate the sphere for Tunnel A.6. The working section was 25 cms. square and a Mach number of 1.0 could be reached. By employing shaped wooden blocks, to provide a Laval nozzle, supersonic speeds up to Mach number 3.9 were attained. The tunnel had been used for some work on gas turbine blades. Figure 6 is a general view of this tunnel, showing the interferometer mounted near the working section (right centre).

Wind Tunnels A.9 and A.9b

These were a sub-sonic, open-jet and a supersonic closed-jet tunnel, respectively, both of return circuit type and housed in the same building. Each was actuated by a single-stage centrifugal blower having a double-sided impeller driven by a 4500 kw. motor (6000 kw. peak load) and delivering 412,000 cu. ft. per minute. Both motors could be coupled together to drive either of the two compressors, thus giving 9000 kw. (12,000 kw. for 5 minutes) to provide the higher Mach numbers. Figure 7 shows the open jet of Tunnel A.9a, which was 1 metre in diameter. The tunnel had been used for pressure distribution measurements on aerofoils and drag measurements by surveys of the wake. The drag of jet motors and rocket projectiles had also been studied here. Fig. 8 shows the working section of Tunnel A.9b and Fig. 9 shows a corner of the tunnel, which is typical of the construction employed. The Germans were concerned with the corrections which would have to be applied to wind tunnel results in the transsonic region to obtain the correct values for free flight. It was hoped that free flight values would lie somewhere in between the values for the open Tunnel A.9a and the closed Tunnel A.9b.

Water Tunnel A.12

Figure 10 shows a view of the water tunnel. This had a working section about 8 ins. by 10 ins. and a maximum speed of 25 ft. per sec. Powdered amber, with particles about 0.035 ins. long, was used to render the flow visible. Such water tunnels seem to have been popular instruments for both basic and "ad hoc" research in Germany and some excellent work appears to have been done with them. This one had been used mainly for preliminary flow studies for radiator ducts, air intakes, nacelles, slots, etc.

Materials Laboratory

A ceramics section was devoted primarily to the measurement of the structural strength properties of commercial products over a very wide temperature range and to the development of temperature resistant materials for gas turbines. The structures laboratory was mainly equipped for basic investigations on fatigue. One interesting discovery was the adverse effect of chromium plating on fatigue strength in bending. Another study was the effect on fatigue of the super-position of small oscillations with simple harmonic motion. This is of great importance to fatigue, as the effects are not explained by the simple addition of amplitudes.

Some experimental and theoretical investigations had been made on wooden construction. The theoretical work included a study of stabilized panels, scale factors of wood in bending and the calculation of stress distribution for triangular plates with a compressive load at the apex, for comparison with experimental results using brittle lacquer.

Weapons Institute

The elaborate equipment for ballistic study at L.F.A. included the following important items:

Firing Range

This was some 330 ft. long, having a refrigerated firing chamber to enable the effects of low temperature on gun operation to be studied.

Evacuated Shooting Tunnel

This was 1300 ft. long and about 22 ft. in diameter, built of reinforced concrete, with an external seal of aluminum sheathing covered with bitumen. This tunnel could be evacuated to the equivalent pressure of 100,000 ft. altitude, an operation which took three hours. Projectiles up to 88 mm. calibre could be fired in this tunnel, their motion being studied by photographing them in two planes, at a number of stations, as they traversed the tunnel. Studies of projectile stability were carried out, including the influence of muzzle velocity and the effect of variation of gas pressure in the barrel.

Cross-Wind Tunnel

This was for the study of the ballistics of bullets fired sideways from aircraft. A large cylindrical chamber was evacuated. This chamber was connected to the working section of the tunnel by means of openings closed by thin aluminum panels. Around the periphery of these panels were explosive cords which instantaneously ruptured the panels when required. The gun was fired when conditions became steady so that as the bullet traversed the tunnel it was subjected to a strong side wind over almost 100 ft. of its path, the wind flowing across the working section from a trumpet-shaped intake, into the evacuated chamber. Wind speed could be roughly varied by choking the flow downstream from the working section, with rollers spaced across the tunnel. The behaviour of the bullet was recorded photographically.

Centrifuge

This was a 35 ft. diameter whirling arm, built in the open, for testing the operation of aircraft guns under accelerations up to ten times gravity, as might be experienced during sharp pull-outs in dog fights.

Additional buildings included a chemistry laboratory almost entirely devoted to the study of explosives and rocket fuels, an explosion chamber with a spherical dome, in which explosives were tested, a shell and bullet charging building and an electronic laboratory in which an oscilloscope was being developed for studying the stability of gyro controls for rockets, under yaw and spin conditions. The development of mixing nozzles for bi-fuel rockets was in progress in still another building, using predominantly, hydrazine hydrate (N_2H_4OH) and T-Stoff (80% H_2O_2). The main problem was to achieve efficient mixing of the two liquids and good ignition with freedom from explosion. Efficient mixing usually rendered the mixture safer and increased the ignition troubles. The nozzle designs aimed at providing relative rotation of the liquid streams, the mixture then impinging on small radial baffle plates disposed around the circumference of the nozzle chamber. Test pits were available for measuring thrust from these nozzles, using hydraulic rams. Thrusts were of the order of 200 lbs. per lb. of fuel consumed per second.

Institute for Applied Mathematics

This building contained offices, draughting rooms and photographic dark rooms, all in some disorder. The work of the institute appeared to have been mainly devoted to the study of ballistics. The major item of equipment was a Zeiss Kinétheodolite. This instrument has a 10 cm. lens and provision for manual operation of the altitude and azimuth controls by two observers. Associated equipment for it included two Zeiss stereo-comparators, a Zeiss plotting table and a Lytax projector for enlarging or tracing 35 mm. film.

Engine Research Institute

This Institute was well equipped for the testing of jet engines and reciprocating engines, two buildings being devoted to this work. In one of the buildings were three large Brown Boveri turbine type exhausters and two Jaeger vane type pumps for simulating altitude conditions at the exhaust and intake, respectively. Power absorption was by water - brake dynamometers made by Krupp and Junkers. For jet engines, thrust was measured by simple mechanical linkage. A supersonic wind tunnel had been planned for one of these buildings for the study of gas dynamic problems.

A large building containing a refrigerated chamber (40 ft. by 15 ft. approximately) had been used for cold starting tests on tanks and vehicles for the Russian campaign. In the machine-shop a medium-size interferometer was seen for the study of flow in combustion chambers and a rig for cooling tests on single stage water-cooled gas turbines. In another building, conductivity measurements were being made on glycol and lubricating oils at various temperatures and pressures, using more or less standard equipment and methods. Refrigerated decompression chambers were available, for tests on instruments down to − 60° C., one of which contained a small wind tunnel in which a small liquid type cabin heating radiator was set up for test.

Still another building was devoted to basic scientific research on gas turbines. The air flow past blade cascades and heat transfer

Fig. 9 (left) Construction detail of supersonic wind tunnel A.9b at L.F.A.

Fig. 10. (above) Water tunnel at L.F.A.

from blades, simulating gas turbine conditions, was being studied in a simple wind tunnel equipped with an interferometer. Care was taken to secure dynamic and thermodynamic similarity. The central blade of the cascade, on which the tests were made, was heated by steam, surface temperature measurements being made by thermocouples. Some very fine interferometer pictures were seen for various types of blade which revealed the velocity distribution, separation of the boundary layer and the blade wake.

A testing tunnel for measuring the air flow through stators and rotors at room temperature was also seen. The effect of varying blade pitch, axial velocity and spacing between stator and rotor was studied, measurements being made of the components of the airstream velocity. A special set-up was employed for the investigation of problems arising from the liquid cooling of turbine blades and for the determination of internal heat transfer coefficients. Some fundamental tests on heat transfer in long tubes carrying liquids and gases were also being done here, including the effects of turbulence, created by internal beads.

Aircraft power plant developments were the prime interest of a fourth Canadian Investigator. A rough outline of the Engine Institute has been given here in order to round out the picture of the L.F.A. Most of the Institutes at L.F.A. had their own well-equipped machine-shops in addition to the large central workshops. Figure 11 shows a mammoth planing machine, typical of the scale and lavishness of the workshop equipment.

Fig. 11. Large planing machine in central workshops at L.F.A.

Flight Testing

Very little important flight test work appears to have been done on aerodynamic matters. Flight tests on an Me. 109 had been made with spoiler type aileron controls ventilated to give instantaneous response. Most of the work of the Flight Test Section appears to have been done for the Weapons Institute. It was the opinion in Germany that they had engaged in far too little flight testing. Up to 1942 the aerodrome at Volkenrode had operated as a flying school for flugbaumeisters (civil engineer pilot) and the closing of this school was much regretted by the scientific staff.

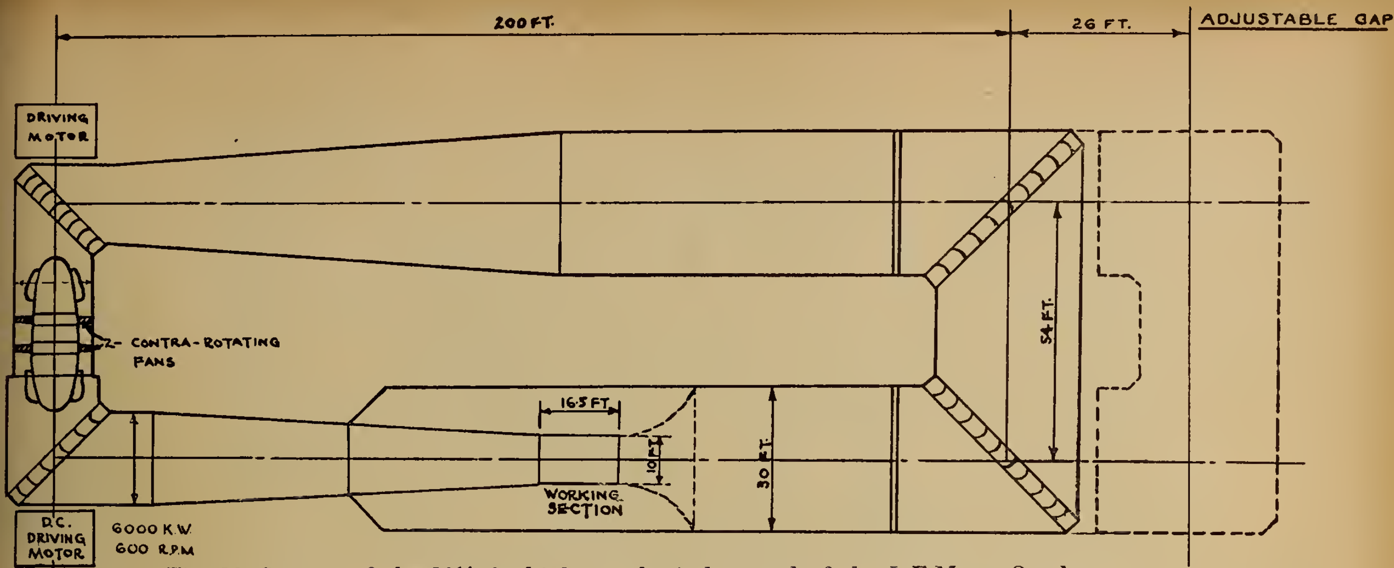

Fig. 12. Layout of the 10½-ft. high-speed wind tunnel of the L.F.M. at Ottobrun.

Luftforschungsinstitut Graf Zeppelin

This establishment, referred to as the L.G.Z., near Stuttgart, specialized in the study of the aerodynamics of bombs, torpedoes and parachutes. Some work was also concerned with the assisted take-off of aircraft using flywheels, falling weights, rockets and the type of take-off assister intended to be used for the V-1, in which successive charges are ignited in a long barrel traversed by a piston attached to the aircraft.

Four wind tunnels were seen, all of which operated in the sub-sonic range. No balances were available for any of these tunnels and none of them appeared to be of any particular interest.

The work done at L.G.Z. on parachutes was of the greatest interest. The developments in this field were directed to the stabilization of bombs, the provision of suitable supply-dropping parachutes and the braking of aircraft both in dives and in landings. The ribbon type of parachute developed here was of considerable interest and importance. This was designed to give high porosity and strength with great stability and only a 5 or 6 per cent increase in diameter over the conventional parachute of the same drag. The prototype parachute had the ribbons disposed radially and circumferentially, but this was expensive to fabricate. The final type had the ribbons disposed in an orthogonal grid arrangement, the complete parachute being of rectangular form. In order to prevent "squidding" (partial opening of a parachute with no tendency to open fully) small tapes were attached between the gores, externally, around the edge of the canopy, to control the material at the periphery and restrict its movement. This was

Fig. 13. (right) Detail of open section of the L.F.M. Ottobrun tunnel, showing cooling tubes in return passage.

Fig. 14. (below) 100,000 hp wind tunnel of the L.F.M., in the Ötztal Alps, with direct water power drive.

claimed to ensure full opening for any type of parachute.

A second interesting form of parachute, of great stability, was somewhat similar in shape to the conventional lobe parachute, except that the shape below the maximum diameter was made conical, with the virtual apex well above the attachment point of the shroud lines to the body. The shroud lines were conducted under the canopy by internal webs such that the lines assumed the form of a conventional canopy of slightly smaller diameter. With a parachute of this form its diameter need only be 75 per cent of that of the bomb it stabilizes. To control the opening of parachutes used for aircraft braking, both in dives and in landings, and to permit the closing and retraction of braking parachutes, a method of reefing was developed, requiring a pull of 2 per cent or less of the total load on the parachute.

Luftfahrtforschungsanstalt Munich

This establishment, referred to as L.F.M., was the most recent to be provided through the interest and enthusiasm of Herr Baeumker and he, in fact, was its Director. Construction had only begun in 1942 and it was far from complete.

At Ottobrun, just outside of Munich, were three of the wind tunnels of this establishment. The first tunnel, which had been looted from France, was being used for stability tests on projectiles and guided missiles. The second tunnel was a 6.6 ft. diameter open-jet one, giving a speed of 230 ft. per sec. from the 700 kw. drive. The most interesting of these tunnels was only just nearing completion, the layout being shown in Fig. 12. It had a closed working section and was powered by two 6000 kw. motors driving individual fans, which allowed a Mach number of 1.0 to be reached with the tunnel empty. The fans were located in the transverse section downstream from the working section, whilst the motors driving them were situated outside the tunnel and on either side thereof. Speed control was by variation of fan blade pitch. The working section was enclosed in a chamber which could be held at a pressure below that of the working section, to prevent leakage of air into the tunnel, which would disturb the flow. Pressure in the tunnel could also be lowered to 1/10 atmosphere if desired. Cooling of the air in the tunnel was effected by a large number of elliptical water tubes disposed axially in four vertical banks in the long return passage.

The entire transverse section upstream from the working section and including the two sets of corner vanes, was mounted on rails and could be displaced by an electric motor, to permit the tunnel to be operated as an open return tunnel for jet engine tests. It also permitted air exchange when operating as a closed return tunnel, by partial opening of this section. Fig. 13 shows the tunnel partially opened and gives a view of the banks of cooling tubes in the return passage. It was intended to install a six-component hydraulic balance. This tunnel had only run for five hours but had not been used for any tests. It was constructed entirely from welded steel and was of impressive dimensions. At Ottobrun was also seen a small sphere about 25 ft. in diameter intended for driving an intermittent supersonic tunnel with a working section about 16 ins. by 24 ins., which would give a Mach number of about 1.5 for 20 secs. duration.

At Ötztal, in the Alps south of Munich, L.F.M. was constructing a magnificent 26 ft. diameter open or closed working section tunnel, which was to have been used primarily for tests of jet engines. A Mach number 0.8 to 0.9 was anticipated. The tunnel (Fig. 14), was to be powered directly by water power driving two pelton wheels connected to counter-rotating fans. An artificial lake provided a head of water of 1300 ft. The water passages were tunnelled through the solid rock. The tunnel was of all-welded steel construction.

The High-speed Tunnel of the D.V.L. (Deutsche Versuchsanstalt für Luftfahrt)

The D.V.L. or German Experimental Establishment for Flying was the largest and possibly most important of all the aeronautical research organizations in the Reich, and was located in Berlin. During the latter part of the War it was dispersed to various places in Germany and an attempt was made to remove some of the smaller items of equipment to the dispersal sites. The original site of the D.V.L. falls within the Russian Zone and was not visited by us. However, we did have an opportunity of interrogating Dr. Göthert, who was in charge of the D.V.L. High-Speed Tunnel. This important piece of equipment was completed in 1939 and contributed very valuable information. The tunnel had a closed working section just under 9 ft. in diameter in which a Mach number of 1.0 could be reached. With the tunnel empty, this required only 60 per cent of the available power of 13,000 kw. Perhaps the most important work done here was the systematic series of tests carried out on some sixty different aerofoils. Force measurements, pressure distribution measurements and surveys of the wake were made. Except in the force measurements, end-plates were normally used on the models. The aerofoils tested included symmetrical sections with thickness/chord ratios ranging from 6 up to 21 per cent. At a later stage some cambered sections were tested in order to investigate the effect of camber at high speed. The models were all tested over a wide speed range and over a range of angles of attack. The results showed the superiority of the symmetrical sections for high speed.

The effect of wing leading edge radius was studied. With sharp leading edges the formation of a shock wave at high speed did not lead to separation of the flow. With such aerofoils there was a very considerable range of speed between the co-called critical speed, at which the air passing over the model reaches the speed of sound, and the speed at which the drag coefficient of the aerofoil begins to rise steeply. Over this speed range the drag coefficient is constant and in a few cases there was even a marked reduction in the drag coefficient, explained by a rearward movement, at the critical speed, of the point at which the boundary layer flow changed from laminar to turbulent. Separation of the flow occurred only at the speed where the drag coefficient began to increase.

Experiments were also conducted

(*Continued on page 545*)

Texas City fire.

THE ENGINEER & FIRE INSURANCE

by

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The author begins by defining the duties of an insurance inspector; telling how he goes about making an inspection; what points he watches for, such as general indications, electrical and wiring, inflammables, protective devices, water supply and alternatives, and buildings. Underwriting is explained. Inspection experience is seen as essential for sound rate making and underwriting.

The Standard Fire Policy is discussed; physical loss is covered by the Property Damage Policy, while loss of earnings and other contingent expense, is covered by the "Use and Occupancy" form. Endorsements found necessary in various provinces to qualify limitations set by statutory conditions, are discussed. The paper concludes by telling what the Standard Policy really covers.

Dr. L. F. Grant, Past President of the E.I.C., has suggested it would be of interest to Members to hear from some of the engineers whose work is no longer strictly of an engineering character. This paper will attempt to show how engineering is applied in connection with the insurance of large industrial plants.

In any business, service is what recommends a Company's product to the buyer, whether it be a tangible or intangible article. The insurance business seeks to provide the kind of protection an industrial property requires. It must endeavour by engineering advice and inspection to prevent losses occurring in those establishments. To that end, the company with which the author is associated maintains a staff of field engineers and inspectors throughout the United States and Canada. These assist in any problems that may arise, due either to new construction, changes in occupancy or process. They interpret the wording of the insurance policy, as well as the general arrangement of all the insurance the company requires to safeguard its balance sheet.

Duties Of Inspectors

The work of the regular and resident inspectors is confined to routine quarterly and special inspections of insured properties. This work is co-ordinated by the insurance company's Field Engineer, who, usually at some time in his career, has had experience as an inspector.

Any Inspection Bureau must be staffed with graduate engineers of the engineering school of a recognized university if it is to fulfil its proper function. Its duties are entirely of an engineering character, and it takes two to three years to give adequate training to a new employee after a few years in any industrial job. The finished Insurance Inspector, if there be such a person, must be a "jack-of-all-trades". He must have a sound knowledge of what each insured property does, the inherent hazards of the processes, and what protection is available to eliminate whatever the hazards may be. He must know something of building construction and hydraulics, and have a working knowledge of electrical equipment.

Almost any physical loss involves some loss of earnings, which in some cases, may be more serious than the property damage. The inspector should, therefore, also know something about the availability of materials and the volume of production of the article or goods the particular plant is manufacturing. He is supplied with a great deal of information in condensed form, but it does require a considerable time to assimilate the knowledge he needs and to learn where to find it. Let us therefore outline briefly some of the items an inspector must consider during a regular inspection. Let us assume that the inspector has received training in his first few years with the Inspection Bureau in all the various engineering subjects that are applicable.

He carries with him a copy of the previous inspection report, and a plan of the property. The report form is designed to give both the Insurance Company and the Assured a concise story of conditions at the plant. It contains any recommendations the inspector feels would minimize the possibility of loss. For brevity and clarity the general characteristics of the plant are rated as "excellent", "good", "fair" or "poor" as applicable, by underscoring the appropriate word on the form. The only writing necessary is to convey to the plant management suggestions for improvement, or to amplify poor rating of any item.

Making An Inspection

The insurance plan is an accurate plan and elevation of the buildings, indicating the type of construction, number of storeys, occupancy, fire protection provided, and water supplies. It is usually drawn on a scale of 50 ft. to the inch, and shows the surrounding properties as well. These plans are coloured and a variety of symbols are employed to denote fire walls and fire doors, elevators, valves, pumps, tanks, occupancies, etc.

The final advice given to the inspector before he is sent to the field is that his recommendations must be practical, and that he must discuss any suggestions for improvement, or faults that he has found, with the Management on completion of his visit. With a copy of the last report, the plan, and any other information concerning changes to be made that may affect the quality of the risk, the inspector starts out on his inspection with particular emphasis on the following items—

General

(a) Order and Neatness — This is the most important single item on the report. It indicates to the underwriting official in the insurance company office whether the risk is desirable business or not. This item covers the condition of the plant and all property covered by the policy. It is also a guide to the moral hazard which is associated with each insured property.

(b) Watchman's Service—There are a number of standards for watchman's service, depending on the size of the plant. In large properties hourly rounds are necessary, whereas in smaller properties watchmen can be dispensed with entirely if the sprinkler alarm is connected to a supervisory service. The inspector must check the clock cards and satisfy himself that the rounds are being made as intended.

(c) Water Flow Alarms — All water flow alarms are tested at each inspection. The inspector must therefore be familiar with the various types of alarm check valves and dry valves in use in modern sprinkler systems.

(d) General Construction — The insurance plan gives the inspector the percentage of each general type of construction used in the property. Reinforced concrete, non-combustible or mill type construction is desirable from the insurance point of view. Inferior types, such as boards on joists, are rather frowned on. This is reflected in the basic rate for fire insurance. The inspector checks whether there has been any new construction. If so, he makes a suitable sketch so the plan may be amended.

(e) Fire Doors and Floor Cut-Offs — Going through the plant, the inspector must notice the major fire walls, and determine whether the various floors in a multi-storey building are suitably cut off by proper stairway enclosures, with fire doors at the necessary openings. This also applies to elevators. If a new elevator or stairway is to be installed, it is of course proper for him to indicate that fire doors are needed, and that the enclosure around the stairway or elevator should be of equal fire resistance to the floors themselves. Much work has been done in the protection of conveyor openings through various fire walls and floors. The most recent practice is to protect these openings with spray nozzles where the conveyor is so arranged that an automatically closing door cannot be provided.

The inspector must also give consideration to the largest fire area that is found in the plant. Obviously in machine shops and similar industries much larger areas and values can be underwritten with safety than in cotton mills for example, where the combustibility and value per square foot would normally be high. If in the inspector's judgment, the area appears too large, or has an exceedingly high value, it is in order for him to recommend some practical rearrangement.

Electrical And Wiring

(f) Electrical Equipment — The average inspector is not an electrical engineer. Yet his training should enable him to judge whether the electrical equipment, for both power and lighting, is installed in accordance with the Electrical Code. If there are any parts of the installation that appear hazardous he should mention this on his report. He should, also, be familiar with the type of electrical equipment needed for hazardous locations. Of course it is not necessary that he should have any knowledge of the interrupting capacity of circuit breakers and the short circuit currents that

might be expected. Special engineers are available in the Inspection Bureau Office for consultation and advice.

He should consider what kind of a loss could occur in any part of electrical equipment containing oil, and whether there is sufficient oil to cause a serious fire. Generators, whether steam or water-wheel driven, should in certain cases be provided with special fire protection. If the unit is of such importance that the plant cannot operate without it, a recommendation for the necessary protection is in order. This has particular reference of course to "Use & Occupancy Insurance," where the destruction of a generator worth perhaps $10,000 or $15,000 could shut down a plant whose earnings may total that value per day.

Insurance companies in general have no objection to open wiring, so long as it is properly supported on insulators. Nor do they object to a certain amount of temporary wiring as long as it does not become permanent. They are, however, concerned about the destruction of combustible and lead-covered cables, and it is usual to advocate a wrapping of asbestos tape on such cables behind switchboards or in manholes.

(g) Special Hazards. — All inspection bureaus devote considerable study to the protection of ovens, flammable liquids and gases. The proper recommendations usually request adequate ventilation, oven controls, a proper storage of flammable liquids and the protection of dip tanks and spray booths by special extinguishing equipment.

Protective Devices

(h) Sprinklers — The inspector must also, in his travel through the plant watch for and report any locations where sprinklers have not been installed, and recommend them if they are deemed necessary. Most important in this category is the unprotected shed out in the yard, where the inspector may be told that it contains nothing of value, and on its destruction, the insurance company finds itself in for about a thirty or forty thousand dollar loss.

The inspector must be familiar with all the various types of sprinklers found in mill buildings and their weakness if any. Cold flow of the soldered link due to the proximity of a unit heater may cause premature operation, and the inspector should keep an eye open for this condition. He must also make sure the sprinkler piping is unobstructed by small stones or gravel, and if necessary some of the piping should be dismantled to see that it is clean.

(i) Valve Supervision — All industrial plants should institute a weekly inspection of all sprinkler control valves and other fire protective equipment. The valves are normally sealed open, but the inspectors do from time-to-time find a main control valve that has been shut to effect repairs never reopened. It is surprising how many major losses occur because of a shut valve which perhaps controls four to five hundred sprinklers. It is important to make sure the control valve is located where it is accessible, and outside of the area whose sprinklers it controls. In our survey of industrial properties in 1947, a total of three hundred and thirty-five valves were found shut during regular inspections. The inspector should therefore check the written weekly report made by the plant. During his visit he must test all valves, hydrants, first aid equipment and hose.

Water Supply

(j) Water Supply—Obviously no sprinkler system is effective unless it is supplied with ample water. This is usually supplied from two sources, the first usually being the public mains from the water department of the city where the plant is located; the second from either a gravity tank or fire pump and reservoir. Flow tests are made each year during the summer months, to make sure all valves are open, and that the supply for the sprinkler system remains adequate. Industrial development near the site of the plant may over a period of years so deplete the public water supply that it is no longer adequate for the plant which is being inspected.

A number of years ago a city in Canada found itself without any water. The cause is not important for this illustration, but as a service to the local industry, one of the Inspecting Bureaus made a complete survey of the pump house, distribution system and all other factors which had to be considered. It was determined that the maximum pumping capacity was inadequate to supply the anticipated volume of water which might be required in the heart of the business district, and also that the pipe sizes could not carry the volume of water recommended.

Alternate Supplies

Subsequently additional pumps and other improvements were carried out. But the cost of relaying the distribution mains was considered too high by the City Council. Sometime later, a major fire burned out of control for eighteen hours because of insufficient water to extinguish the blaze. There are many other examples in all provinces where much needed improvement is desirable, and in most of these cases industry has provided independent water supplies for its plants while paying taxes for adequate water supplies that it does not receive.

The secondary supplies are checked by the inspector who makes sure that the gravity tank is full and watertight, and the supporting tower in good condition. Fire pumps are tested during the summer inspection and are always turned over during regular inspections. If electrically driven, the inspector must decide whether the power supply is reliable, and if steam driven, that steam is available all the year round. When taking suction from a river or pond, he must satisfy himself that the suction supply is adequate, and, if under a lift, that priming facilities are available.

Having determined the volume of water available from both sources, the inspector must then satisfy himself that the supply is ample for the sprinkler systems and the largest fire area. For a small plant, a minimum supply of seven hundred and fifty gallons a minute at fifteen pounds on the highest sprinkler is usually considered adequate. For large plants, supplies of three to four thousand gallons a minute at fifty pounds pressure may be necessary. In paper mills and log yards even larger volumes are necessary. Finally, the inspector rates the total supply and extent of sprinklers as a guide to the chief underwriting officer of the Insurance Company.

Buildings

(k) Maintenance and Repairs—This item is rated by each inspector after a plant visit. He rates it, principally, according to the way in which the plant management takes care of the plant generally. Particular emphasis is placed on fire doors, whether floors are overloaded, or the condition of the roof and any advertising signs, and on

Windstorm loss.

the secure fastening of corrugated iron on buildings.

(l) Exposure — The final item is the exposure of the plant to damage from other properties nearby. Severe losses have occurred because fire walls have unprotected openings, permitting adjoining buildings, because of their occupancy, to present a serious potential hazard. A recent example of this in Montreal was the destruction of a gasoline station and several adjoining stores where two firemen lost their lives. Damage in an adjoining property was less than $500 because in this instance a twelve inch brick fire wall afforded good protection and stopped the spread of fire through the whole block.

Special Inspection Reports

In addition to the regular inspections of insured properties, each inspector must be able to make a first inspection, giving full description of the plant buildings, its occupancy, and all other factors which must be considered from the underwriting point of view. He must also be able to write loss reports, the principal object of which is to determine the cause of the loss and to suggest any needed improvements. Loss reports must also contain an estimate of the amount of loss. The inspector must be able to make a " use and occupancy " inspection, during which he considers the supply of essential materials, adequacy of the power supply for the plant, and adequacy of the protection provided for vital pieces of plant equipment in cases where the destruction of one piece of equipment could conceivably shut the entire plant down.

Explosion in cotton mill tanks.

Underwriting

On completion of the inspection, the report is duplicated. Together with any sketches it is then forwarded to the Insurance Company for study by the Chief Underwriting Officer. In the case of a first inspection it is used as a basis to determine the rate at which the insurance should be written.

It is the contention of the companies with which the author is associated that it is a short jump from insurance engineering to sound underwriting and that the reverse is impractical. Consequently, almost all officers of the companies are graduate engineers, and most of them have started with the Inspection Bureau, which serves as a training ground for company employees.

On leaving the Inspection Bureau, the employee's duties broaden. From this point, in addition to discussion of engineering details at an insured property, he must be able to discuss policies, their intent and wording, rates, the financial structure of the insurance company and safe underwriting limits. In soliciting new business, he must not submit for approval risks where the company may expose itself to a loss of such magnitude that its financial structure may be endangered. Good judgment becomes a very necessary attribute in both inspection and underwriting problems, just as it does in any other business, and this may take a long time to develop.

It may be of interest here to discuss briefly the protection provided by a standard fire policy. Very few executives seem to be familiar with this subject, but it is of great importance whenever a loss occurs. The intention of the insurance business is to provide industry in general with all the protection it requires for plant properties, to the end that financial compensation may be obtained no matter what the loss.

The " Fire or Property Damage " Policy pays for the physical loss, while the " Use & Occupancy " or " Loss of Profits Form " covers the accompanying consequential loss of earnings and other continuing expenses. In general, competing forms are nearly the same, although there are differences in the wording of various clauses, as well as minor differences in what it is intended to cover. It is not the intention to discuss this aspect, but to give a rather general outline and indicate the perils that are covered

Wrapping electrical cables.

by Fire and "Use and Occupancy" Policies.

Endorsements to Qualify Statutory Conditions

In Canada, we have two sets of statutory conditions: (a) Those of

(above) Hotel fire.

(right) Transformer fire.

the Province of Quebec and, (b) Those of the rest of the country.

These conditions, set up by the insurance departments of the Provincial Legislatures, are primarily intended to give protection to the small insurance buyer. They are badly in need of revision and are usually amended by the various insurance companies by endorsement to give greater freedom of action, while the restrictive conditions are modified. This endorsement waives the statutory conditions and also includes the additional perils other than fire that it is intended to cover. These are:

(a) Sprinkler Leakage — Obviously, if a property is protected by automatic sprinklers, serious water damage may result from operation of the sprinkler system. In practice we find sprinklers use water more economically than a public fire department. Water damage, therefore, is usually less when sprinklers have been installed throughout a property once a fire occurs. The policy also covers the premature operation of a sprinkler system and pays for damage caused by the discharge from any part of the fire protective system.

(b) Windstorm—While this subject is not of major importance in Canada, we do occasionally experience winds of high velocity during local thunderstorms. The policy provides protection for losses of this type.

(c) Lightning — Damage to any part of the plant, its electrical equipment, chimneys, etc., is covered by the policy.

(d) Explosion — This clause is usually limited and excludes the explosion of pressure vessels, boilers and other equipment for which the assured may or may not have obtained specific insurance. The explosion of unconsumed fuel in a boiler is covered by this clause, but the destruction of the boiler because of an inoperative safety valve would not be covered.

(e) Riot and Civil Commotion—Damage may be caused by strikers, rioters or by a single disgruntled employee. Protection against any of these conditions is available but the intent, under the policy, is to assure the policyholder that if fire, sprinkler leakage or other peril occurs during a strike or riot that the policy is still in force.

(f) Aircraft and Other Vehicle

Damage—This clause is to provide protection for damage which may be done to the plant by an unowned truck or railway car, or even by aircraft should it land on the property.

(g) Smoke Damage—This clause pays the damage caused by smoke resulting from unusual or faulty operation of a stationary furnace. It does not cover any cumulative damage or depreciation.

Standard Policy Covers Replacement Less Depreciation

It should be noted that the standard policy is usually written for the actual cash value or sound value of the property. This figure is the replacement value less what the insurance companies call normal depreciation. This depreciation is not that permitted by the Government for tax purposes, but contemplates good maintenance of equipment and buildings. A recent development is that a policy may now be written for the full replacement value, but this involves the placing of additional insurance, which in total represents the normal depreciation of the property.

Payment is effected in two parts, first, the actual cash value after the loss, and secondly, the depreciation when the destroyed plant is rebuilt. Such a policy should only be written when an appraisal of the property is available so accurate figures are obtainable, since it involves a co-insurance agreement. A co-insurance clause bluntly is protection for the Insurance Company against the dishonest insurer who does not purchase sufficient insurance. It states that the Insurance Company is liable only for that part of the loss that the amount of insurance in force bears to whatever percentage of the actual cash value is stipulated in the form. The actual cash value is determined by an appraisal.

Rates Must Pay Losses Plus Profit and Building Reserve

Finally a word should be said concerning the charges made for insurance. The business is unique in that it pays large sums of money in case of loss, for very little premium income. The basic rate for any property in cents per hundred dollars of insurance is dependent on the construction of the buildings, what they are used for, and the degree of fire protection provided. The rate varies in fully protected properties from four cents per hundred to perhaps twenty cents per hundred, although there are sprinklered rates higher than the maximum figure given. In unprotected properties they run from about twenty-five cents to a maximum of six per cent. In the final analysis, the rate must be such that the premium income from all properties, in any classification, will provide sufficient funds to pay losses, run the business, contribute to catastrophe reserve, as well as provide the company's profit and agents' commission if doing business as a Stock Company.

When one considers that one million dollars insurance a year costs as little as $500, underwriting judgment and rates must be sound if the company is to survive. The increasing amount of fire damage year by year has forced rates upward. It is to be hoped that the appalling waste which one reads about in the daily press will be reduced in the future. This needs education of all citizens in the elementary subjects of good housekeeping, safe installation of equipment, the use of good types of construction and provision of adequate fire protection. The revision of Building Codes in large and small cities is also a requirement.

OIL, AIR-BLAST & MAGNETIC CIRCUIT BREAKERS

(*Continued from page 530*)

valve is closed, the sudden loss of pressure on the control valve side of the release or dump valve moves it to the open position, exposing a port and exhausting the air in the main cylinder. With this sudden loss of pressure and closing force, the circuit breaker contacts return to their open position. Actual operating speeds equal or may exceed those of mechanically trip free mechanisms using collapsible linkages.

This type of mechanism is also ideally suited to high speed reclosing, since there is no " collapsible linkage " to reset before the closing operation can be started. Reclosing time becomes merely a matter of the size of the power unit and the operating pressure.

The speed of circuit breaker contacts is usually about 8 ft. per sec. as they approach the closed or open position. Means must be provided to decelerate the moving parts smoothly and not too quickly, so as to keep the resultant stresses within reason. This does not present a problem in bringing the contacts to rest in the open position, since an appreciable distance can be used for decelerating. An oil dashpot consisting of a cylinder with a snug-fitting piston and orifice-holes in the piston to restrict passage of oil is the usual type of opening buffer.

Deceleration on approaching the closed position is a different problem, since the usual type of contact does not permit much overtravel beyond the normally closed position, and the normally closed position must be reached finally within fairly close tolerances. This problem has been simplified in recent years by the trend to shorter breaker strokes, consequently smaller breaker mechanisms, and by the use of lighter weight, higher strength materials.

A spring type of buffer is usually used to operate against the end of the levers carrying the lift rods. Reduction of linkage masses has in some cases permitted deletion of this buffer and in these cases sufficient retarding force is supplied by the springs backing up the stationary contacts. In England a number of rather unique mechanisms are in use—operated by the energy derived from the explosion of a powder charge.

Maintenance

Speaking in a general way, maintenance of today's oil circuit breakers is chiefly in connection with contacts. Some years ago bushings would have had to be included, especially in the case of outdoor breakers. In the case of air blast breakers maintenance appears to be chiefly concerned with the mechanism and air supply.

Metal clad switchgear has several advantages over open type gear. One that perhaps does not get the emphasis it deserves lies in the fact that by carrying a spare breaker, a regular maintenance schedule can be carried out. This allows each breaker in turn to be thoroughly inspected and tuned up at regular intervals.

Designers are divided into two schools on the subject of adjustments, and both have good reasons for their position. Both schools favour making as complete adjustments as possible at the factory. One, however, leans towards permanently fixing these factory adjustments, whereas the other favours supplying adjustment instructions and making it possible to alter the adjustments in the field. Today's maintenance crews are in general so competent that the latter course appears the better one.

It may be well to mention the possible effects of a couple of typical maladjustments.

(1) Closing buffers, out of adjustment, may allow overtravel that could result in breaking of parts such as the lift rod, or in sharp rebound that may prevent consistent latching.

(2) An auxiliary switch, used to open the trip circuit when the breaker opens, could be the cause of a disaster, if out of adjustment, so that it did not close before breaker contacts touch, when closing on a fault capable of stalling the mechanism.

Breakers in Parallel for High Currents

When air circuit breakers, or knife switches, are required for heavy current circuits, it is the accepted practice to use two or more breakers or knife switches in parallel. This not only avoids the necessity for expensive, low production designs, but also decreases skin effect problems and simplifies the connections. It would be quite logical to use oil breakers in a similar way, but their actual use in this manner is rather infrequent, possibly due to space requirements.

WARTIME AERONAUTICAL RESEARCH & DEVELOPMENT IN GERMANY

(*Continued from page 538*)

on the value of sweepback in delaying compressibility effects. In practice, only about half the theoretical gain in speed at which compressibility effects occur was achieved, mainly because the centre section of swept back wings is devoid of the beneficial effect and this region becomes the critical one. The situation can be improved by employing large spans. It should also be possible to avoid trouble in this region by the use of special fuselage shapes and some work had been done on this at the D.V.L., but since the experiments had not been concluded no results were available. This tunnel appears to have been used on a 24-hour basis. Its work was not confined to basic research, and it seems to have been used extensively for manufacturers' tests on complete aircraft models.

(To be continued)

What the War Has Done to Engineering Education

DR. HARRY S. ROGERS

President,

Brooklyn Polytechnic Institute

The following is a portion of an address delivered at the 1946 Annual Meeting. Unfortunately Dr. Rogers spoke only from notes and a manuscript was not available at the time. The general theme of the address is still as poignant and as important as it was when delivered and should be of considerable assistance to many who are still pondering the problems of engineering education. At the time, Dr. Rogers was president of the American Society for Engineering Education.—Ed.

It is a great pleasure for me to be here today, for more reasons than one. First of all I am not on a busman's holiday, which I suppose one might call the attending of meetings of another society, but I come as president of the American Society for Engineering Education, which belongs as much to you as to the United States. Many members of your Institute have always belonged to the A.S.E.E. and we have held our convention in this delightful hotel.

We have now a larger registration in engineering than perhaps at any time in our history and that brings many problems to us. I am not going to discuss the problems of staff, facilities, conditions and enrollments because engineers always meet such practical problems as they come but I am going to discuss some of the problems in the programmes of engineering education which the war has brought to an hour of decision.

It is too early to appraise with certainty what the final form of new programmes may be, but developments are beginning to take shape and the prospect is that progress can be expected in some measure, if it has not already been determined. Following the practice of engineering educators since the 1940 report of the American Society for Engineering Education, I am going to divide these developments into two classifications, scientific-technological and humanistic-social. In the scientific-technological field we shall continue to emphasize the fundamentals but build our programmes at higher levels and we may expect to see continuing developments accompanied by expanding research. Along with such developments in technical programs we shall have developments in our humanistic-social studies.

The insistent needs of the war brought large research projects into many of our institutions. These projects have developed not alone in the basic fields of mathematics, physics and chemistry but also in the fields of technology, in aerodynamics, airplane structure, electronics, metallurgy, applied mechanics, measuring devices, machine design, servomechanisms, and in instrumentation; in x-ray and industrial radiography, vibration and dynamic machines.

The results of these developments in research are already beginning to find a place in our organized curricula and are advancing some curricula to higher levels in technology and in science. The watchwords of our nations have been "speed" and "high"—high speed for airplanes, high frequencies in communicating and detection devices, high polymers in rubber and plastics and also in textiles, high temperature steels, high tension alloys, and high speed production. The use of these two words over and over again emphasizes what the revisions in engineering education must be. They must carry that education on to higher levels.

Some schools are already preparing their new offerings. New curricula in electronics, both at the under-graduate and graduate levels, have been announced. Many schools are planning advanced work in aeronautics at the graduate level. Others are strengthening their programmes in metallurgy and a few organizing courses in gas turbines. Two of which I know are organizing curricula in applied mechanics. Practically all are looking forward to the continuation of research and to the further development of graduate instruction.

These developments together with the continuing programme of research, will give the student bodies of our institutions advancing programmes of technology at the higher levels. The engineering schools well recognize these needs and the demands and in most instances are well prepared to take care of them.

On the other hand, the question may well be raised: Do they understand the needs and demands in the humanistic—social field with equal clarity? We have laboured long under the scorn and derision of the liberally educated. The epitaphs with which they have labelled us are well known to most of you. We are familiar with the definition of a technically educated man as one who is prepared for earning a living in contradistinction to one who is prepared for living. We have listened to such criticisms at times without looking at them critically and making our own appraisal as to their accuracy. Having grown up in a family of boys who have had liberal educations, I have been unable to discover that they live differently from my friends trained in engineering. The students we have on our campi cannot be differentiated according to the various schools, when gathered together in our social assemblies.

We have been told that the educated man is one who, being in strange places, nevertheless does not feel strange. Now that sounds plausible until you test it to see whether it applies to those educated in various fields, as for instance other professional people as well as engineers. Then you raise the question: Does the mining engineer who travels all over the world feel strange when he is in strange places? Why of course he does not. Nor did the pirates (there is no analogy here) of former periods feel strange in strange places. Most statements to which we have listened for years are sheer nonsense.

To meet the acknowledged need for a wider perspective we have, however, endeavored to broaden our curricula by adding this and that from the liberal arts programme. We have added history that we might prepare our students better for citizenship. We have added psychology so that they might be better prepared for personal adjustment. Have we succeeded in achieving our objectives by such additions? Some of us have always been somewhat sceptical about the merits of such an approach.

The *New York Times*, a couple of years ago, brought out a great campaign to have more history taught in the schools. No one pointed out that the youngsters in school who seem to know most about history are the young communists.

Our boys have been told that, to understand human relationships better, they should take a course in psychology. I don't see how anyone could learn much about human relationships from the introductory courses in psychology given in most schools. They deal with brain physiology, the nervous system and the senses. It certainly would be more appropriate for one to read " How to Win Friends and Influence People " than to study elementary psychology. At least such a reading would call attention to the fundamental art of human relationships.

We have not understood general education, yet we cannot be criticized for it because general education has not understood itself. I always had a suspicion that such was the case and now I know, since the writing of the Harvard Report on education, that suspicion is true. If the general educators, however, will speak frankly and realistically as they did in that report we will be able to get something worthwhile from our associations with them.

We can, however, get some understanding of general education, if we review its history and if we make a critical examination of its present status. I should like to review this history briefly in the period prior to the revolutionary war, through the early period of American history, and through the industrial period up to the World War. Let us contrast the purposes in these periods with the purpose of training for responsible citizenship in a free society, where the obligations to contribute to social cohesion, as one develops his personal talents, are recognized by all.

The Harvard Charter of 1636 says the purpose of the College was " to advance learning and perpetuate it to posterity; dreading to leave an illiterate ministry to churches when our present ministers shall lie in the dust ". The purpose of Yale College was " to train youths for public employments both in Church and State ". The purpose of Dartmouth College was " to entertain as a primary objective the conversion of the Indian to Christianity ".

This form of churchism and classicism came directly to our country from Oxford and persisted up to the revolutionary war. Then Benjamin Franklin in speaking of the American spirit in education said, " the history of commerce, of the invention of arts, rise of manufacture, progress of trade, change of its seats, with the reasons and causes, may also be made entertaining to youth, and will be useful to all. And this, with the accounts of the prodigious force and effect of engines and machines used in war will naturally introduce a desire to be instructed in mechanics, and to be informed of the principles of that art by which weak men perform such wonders, labor is saved, and manufactures expedited ". We did not develop the type of education advocated by Franklin until almost a hundred years later but we did, with the turn of the eighteenth century, begin to get away from the form of education dominated by the Church and to develop secular influences in the early American period of the 19th century.

There is a long and interesting history of the change from religious to secular education which I shall have to omit.

Our next great change in education came with the passing of the Morrill Act in 1862, under which the aim was, " without excluding other scientific and classical studies and including military tactics, to teach such branches of learning as are related to agriculture and mechanic arts in such a manner as the legislatures of the States may respectively prescribe in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life". This new form of education was pretty much that advocated by Benjamin Franklin a hundred years earlier.

We may now take our present programmes of higher education and divide them into three primary functional types, (1) That which is directed toward the abstract, intellectual, moral and esthetic; (2) That which is directed toward personal and professional training, such as law, medicine, dentistry and architecture (I leave out engineering. Do not throw your hands up in horror. I think we are bound to say that our under-graduate studies provide a junior professional training, not a professional one. Our students cannot be admitted to the profession upon graduation. They are required to secure experience in the field before they can be admitted); (3) That which is directed toward the broad economic and social functions of society such as, agriculture, business, industry, home-making and education.

Under the Morrill Act, educators sought to give a liberal and practical education of this last type; it was desired to carry on the liberal aspects of general education in these technical programmes. However, the liberal got crowded out rather rapidly up to the turn of this century. Since that time we have been struggling to get it re-introduced but we have not known how to secure the objectives we hoped to attain. We have inserted courses of history and psychology, which are good enough but which are certainly not designed for the purposes for which we introduced them.

Now I can stand up here and tell you this with great courage because the Harvard Report on Education in a Free Society sustains me in it 100%. For the first time we have had such an acknowledgment from the liberal educators. In that report they say that our schools of liberal arts are really schools in which a great variety of specialties are taught and they say of these specialties that "Specialism is the means for advancement in our mobile social structure; yet we must envisage the fact that a society controlled wholly by specialists is not a wisely ordered society. We cannot, however, turn away from specialism. The problem is how to save general education and its values within a system where specialism is necessary."

Now I have never thought we needed Harvard to tell us that the boy who takes a major in psychology in the liberal arts school comes out just as much a specialist as the engineer. The boy who majors in economics likewise is just as much a specialist as an engineer. The boy who graduates in medicine and who has two, three or four years of liberal arts before his admission to medicine is just as much a specialist as an engineer.

There was a move in New York a few years ago to pass a law that those who sought admission to the practice of engineering must have a liberal arts training before they could be admitted to engineering training. This was predicated on the assumption that such a programme would parallel the programme in medical education. No one who has ever had an opportunity to examine a file of credentials of medical students could make such an assumption or hold such a belief. This is just another idea about general education which is not true. Such an examination will show most premedical students specialize in biological science. To say that the engineer should, therefore, have pre-professional training of a similar type is an entirely false line of reasoning.

In the Harvard Report it is suggested that the cultivation of certain abilities such as the ability to think effectively, to communicate ideas, to make relevant judgments and to discriminate among values should be the goals of general education. If you read the 1944 report of the American Society For Engineering Education you will find that we said the same thing in somewhat different words regarding the humanistic-social stem of engineering education. However, we did not clearly define how those objectives should be attained. We know in general that we seek for a better sense of responsibility among our citizens, that we seek a better foundation for a personal philosophy of life, that we seek an ability of expression and an ability to solve problems in the humanistic-social field with the same dispatch or facility with which we solve them in the scientific-technological field but we are not certain of the methods for developing these.

It is easier to state our objectives than it is to outline the manner in which they can be achieved. The achievement of objectives is the big problem before us in the development of the humanistic-social side of engineering education. Only now have the liberal arts colleges begun to recognize we cannot use the formal courses in history of western civilization, nor the formal courses in elementary psychology. We need new courses in democratic citizenship, new courses in psychology that have as their objective some functional achievement and ability on the part of the individual, courses that look forward to conduct, behavior and action and not solely information.

It will be some time before the progress of instruction in these fields will make it possible for us to obtain what we should have in engineering education. Meantime I think it is encumbent upon us to look at these problems realistically and to stop listening to the nonsense about the lack of culture on the part of the engineer.

We must try to define our objectives in general education more clearly and to determine how they can be achieved. This, I regard as the big task in engineering education, along with the other technological developments which I have mentioned. One of our institutions has inaugurated a five year programme to which new types of courses will be added in the social field. Another has inaugurated a five year programme into which more of these specialized courses of the liberal arts will be added. Another has announced a five year programme which is sort of a cross between the two. What we get out of these developments remains to be seen.

In general, I do not think there will be a great swing toward five-year courses. Only when we have a clearer understanding of our objectives of citizenship and personal development than we now have, will there be such a development. To attain that understanding we need the help of all the engineers in the profession and of the most able leaders in general education.

British Gas Turbine Development

From a report issued by The British Ministry of Information

The use of gas turbines as the power plants of jet-propelled aircraft is now widely known, but few, even in Britain, are aware of the developments which are taking place in other fields of gas turbine applications in the United Kingdom. The gas turbine is the only known type of prime mover which has applications over the whole range of power generation, from high speed aircraft to electric power stations. In the near future we can expect to see this new type of engine at work in locomotives, ships and power stations, as well as in industrial processes.

During the war years industry in Britain was directed towards the immediate aim of victory, to the exclusion of all else. As a result, work on the gas turbine was concentrated on development of the turbo-jet engine for aircraft, where the advantages to be gained in aircraft performance were immediate and obvious. The wisdom of this policy is shown by the fact that at the end of the war, Britain, alone among the allies, had gas turbine jet-propelled fighter aircraft in operation on the Western front. Nations whose fighting forces are now equipped with either Rolls-Royce or De Havilland engines include the U.S.A., Canada, Australia, Argentine, Sweden, Holland, Belgium, France, Switzerland, and Turkey.

Research Centres

The main centre for research on this new type of power plant is the National Gas Turbine Establishment at Whetstone, Leics., and Pyestock, Hants., where all aspects of the gas turbine are studied. Subjects under investigation include the basic problems of airflow, combustion, behaviour of materials at high temperature, compressor and turbine design, stresses in working components including vibration effects, and methods of manufacture. The manufacturing department makes experimental components of new design for test purposes and the results of these fundamental investigations are continually being passed on to industry. Technical assessment of new industrial designs and testing of complete engines is also undertaken.

The Establishment grew from the fusion of Air Commodore Whittle's team of engineers at Power Jets Limited with the gas turbine branch of the Royal Aircraft Establishment, but equally as much time is now devoted to industrial applications as to aero engines. Recent developments include, for example, an improved axial flow compressor and a combustion chamber having a pressure loss less than half that of previous designs; both of these developments are applicable to gas turbines in general. The aim is always to first obtain an understanding of fundamentals through research work, and then to apply this understanding to the design of components of the engines; in other words, to find out " why " before deciding " how ".

Patenting Arrangements

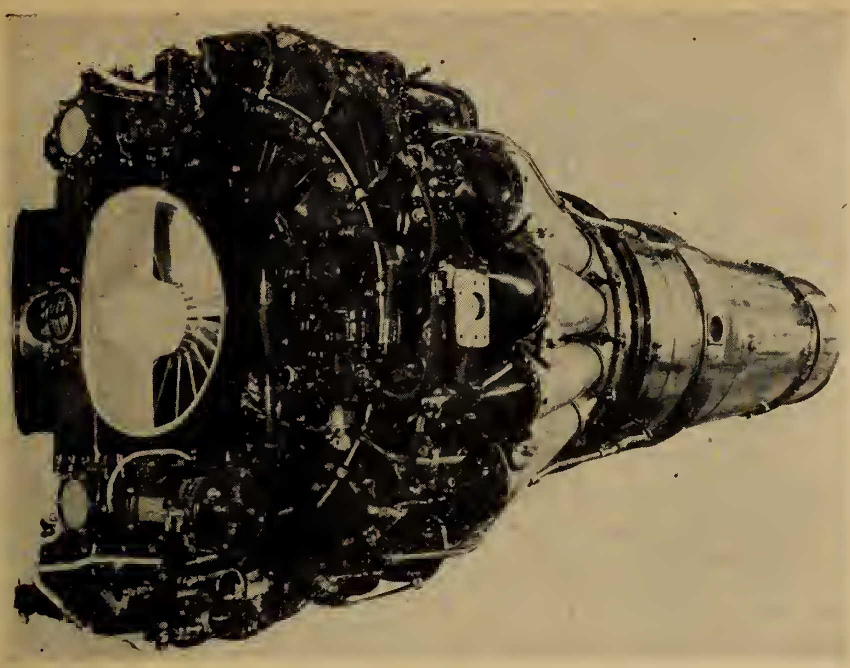
It is the policy of the Government to patent and exploit inventions of commercial importance made in their research establishments. To this end Power Jets (Research & Development) Limited now is a wholly government-owned company, responsible for holding and exploiting in the national interest, patents resulting from Government research and development in the gas turbine field. The Company possesses about 1,700 U.K. and foreign patents. These are based on some 250 inventions covering the early work of Air Commodore Whittle and his associates, and later activities of Power Jets (Research & Development) Limited and the National Gas Turbine Establishment.

To attract foreign manufacturers of gas turbines to British technology the company has recently held two courses at a school at Lutterworth near Rugby. These courses were attended by representatives of about a dozen foreign countries. Lectures were given on all aspects of gas turbine technology, and representatives of British industrial concerns gave talks on special aspects of the problem. Similar courses are also given at the school, for British engineers of the aircraft industry and engineers from marine, railway, and power station concerns.

Marine Applications

In addition, research into marine applications of the gas turbine is carried out in an experimental station on Tyneside under the Parsons and Marine Engineering Turbine Research and Development Association (PAMETRADA). This association has been set up by a number of shipbuilding and marine engineering firms engaged in the manufacture of turbine engines. The work is supported by the Department of Scientific and Industrial Research, and both the firms and the Admiralty advise on the programme to be carried out.

In the marine field the gas turbine scores by its low weight and volume compared with other forms of prime mover. It should offer higher efficiency than steam, combined with cheapness of first cost. Its reliability should be high when elimination of the boilers of the steam plant is considered. Engine room staff will be correspondingly reduced. A number of projects for marine purposes are being developed by British firms. The first marine craft in the world powered by a propeller-driving gas turbine was taken to sea by the Royal Navy in mid-summer 1947. Preliminary trials have been completed satisfactorily. The gas turbine used was developed by Metropolitan-Vickers Electrical Co. Ltd. from the Beryl aircraft engine and has



A British gas turbine achievement of particular interest in Canada. Pictured above is the De Havilland Goblin jet engine which powers the Vampire aircraft recently placed in service by the Royal Canadian Air Force. In contrast to the conventional piston engine which weighs something over 1 lb. per hp. the Goblin weighs only 1,550 lb. and delivers a static thrust of 3,000 lb.—equivalent to 3,000 hp. at speeds between 500 and 600 m.p.h. which are normal for jet engined fighter aircraft.

The single-sided centrifugal compressor and its driving turbine turn at 10,200 r.p.m. for take-off. At this speed, the engine consumes air at the rate of 108 tons per hr. and the jet leaves the tail pipe at 1,100 m.p.h. At this maximum performance the extreme temperatures of the flame tubes approach 2,000°C and the single turbine wheel only 27 ins. in diameter delivers almost 6,000 hp. with blade temperatures close to 800°C.

Engineers familiar with compressor and turbine design will appreciate the magnitude of the problems involved in obtaining such performance as these figures indicate.

been installed in H.M. Motor Gun Boat 2009, a triple-screw craft.

The basis of the engine is an aircraft jet propulsion engine which consists of an axial flow compressor. This supplies air to an annular combustion chamber where diesel fuel is burnt, followed by a two-stage turbine which drives the compressor. The exhaust gases, which would normally constitute the jet, are further expanded through a four-stage turbine coupled to the propeller shaft through gearing. The exhaust from this turbine then escapes to the air through a funnel. The propeller shaft power output is about 2,500 hp. As a next step the Admiralty has ordered larger gas turbine machinery from Rolls-Royce Limited, for installation in a vessel of the escort type, and a unit is also being built by the English Electric Company for a Royal Naval frigate.

Interest in the gas turbine for marine purposes is also shown by private companies. The Anglo-Saxon Petroleum Company intend to carry out gas turbine experiments in the 8,200-ton motor tanker 'Auris' and to this end have ordered from the British Thomson-Houston Co. a 1,200 hp. gas turbine. This company was associated with Power Jets Limited in the early days of gas turbine development. The 1,200 hp. unit is to replace one of the four diesel engines in the 'Auris'. Yet another firm active in the marine application of gas turbines is John Brown & Co., the Clydebank shipbuilders.

Railway Applications

The gas turbine has particular advantages, both actual and potential, in each field of application. For example, in the locomotive field, its advantages over the steam engine lie in its higher efficiency, cleanliness, independence from water, and less maintenance. By comparison with the diesel locomotive it should be cheaper in first cost and considerably less size and weight, thus effecting a great saving in locomotive size and thereby power. In addition, the gas turbine should in future be able to burn either heavy oil or powdered coal, and therefore has a further potential advantage over the diesel. The British railway companies are alive to these possibilities. Last year the Great Western Railway ordered from Metropolitan-Vickers a 2,500 hp. gas turbine locomotive. This engine will soon be on trial, when running experience will be built up. There is little doubt that the next few years will see a growing use of the gas turbine on the recently nationalized British Railways.

Applications to Power and Industrial Processes

In the field of electricity generation, the Central Electricity Board have already ordered from Metropolitan-Vickers a 15,000 kw. gas turbine generator to be installed at the Trafford Power Station of the Stretford and District Electricity Board. The plant should have an efficiency at least as high as, and probably rather higher than, the most efficient steam turbine plant in existence (26 per cent) and will probably be used for peak load duties, where the gas turbine shows to the best advantage by reason of its low capital cost, small volume, quick starting, and other favourable characteristics. A wide use of gas turbines can be envisaged in this field. In the generation of base load power, the gas turbine should be able to offer considerably higher efficiency than the best steam plant. But its use in this field will depend on its ability to burn cheap fuels such as boiler oil or powdered coal, and experiments to this end are proceeding at present. Other possible uses, include the provision of compressed air for industrial processes where large quantities of hot gases are available.

Government and Industry Co-operating

The initiative of private firms, co-operation of the engineering and chemical industries, research sponsored by Government departments including the Ministry of Supply and the Admiralty—all these are making their contribution to progress in the application of the gas turbine. Britain's acknowledged leadership in this field is a good augury both for advancement at home and for the success of the export drive.

Discussion of

Community Planning Standards

The paper "Some Standards and Procedures for Community Planning", which appeared in the May issue of the *Journal* was delivered by the author, J. Alexander Walker, M.E.I.C., at the Annual Meeting in Banff. These discussions were not available for the printing of the May *Journal* and are published at this time because of their valuable contribution to the subject.

W. G. Swan, M.E.I.C.[1]

I have read Mr. Walker's article with considerable interest and am generally in accord with his comments. I was a member and Vice-Chairman of the Vancouver Town Planning Commission from its inception, for a period of six years. Mr. Walker's thinking and my own on this subject are pretty much alike. I might, in fact, be said to be one of his pupils.

Under "Conditions Affecting Townsite Design" Para. (a), "If the townsite is situated on a harbour . . . the business district will be fixed for all time . . . etc." I believe it is impossible to foresee the ultimate growth which will occur on any townsite which is geographically advantageously located. It would therefore be impossible to foresee the final requirements of the business district. In the course of time, as a community continues to grow, there must necessarily be some re-zoning, particularly as between business and residential districts, to accommodate the need of the community for more places of business.

Under the same main heading, Para. (c) "Highways", "In spite of the usual protests from merchants . . . the trunk highway should be located to one side of the townsite." With this, I am entirely in accord, as tourist associations have found that the bypassing of through traffic means a very small loss indeed to any community. Purchases by tourists of any substantial value are made at over-night stops or at the turnaround point of the journey.

Under "Types of Street Patterns", there is reference to the fact under "Rectangular Layout", that no provision is made for any diagonal flow of traffic. This has been found to be true in some parts of Vancouver, particularly in the old South Vancouver area. At least one diagonal highway could have been used to advantage, was subsequently planned and adopted by the City as part of its major streets report and recommendation. It was found later, however, that it involved the acquisition of too much private property and had to be abandoned.

Under "Types of Street Patterns"—the author states that at "angled lots which the radials create, expensive construction results." It is my experience that engineers and architects go to undue lengths to avoid acute and obtuse angles in their building construction. There is no objection to obtuse angles, and unless the acute angles are extreme and wasteful of space, there is practically no difference in the square foot cost of such buildings.

Under "Street Widths", para. 2, "parking should be permitted on one side only." There is always resentment from the owner who is prevented from parking in front of his property. Minor streets should have at least 40 feet between curbs, though it is unnecessary to pave the entire width. This would answer the objection noted above and avoid a good many accidents.

Under "Relationship to Highways", "Others require that . . . from 100 to 150 feet . . . intervening land be dedicated as a park buffer." Unless the railway line passes through a residential area, the best buffer would seem to be an industrial area which is not only economical because of rail service but in addition, the industrial buildings place a damper on the noise created by the railway traffic.

Under "Transportation", reference is made to street services to the waterfront properly co-ordinating harbour and railway activities. This is one phase of the planning which has been given inadequate consideration. It should be the aim of every harbour development to provide a waterfront roadway of ample width between the service lines of the railway and the waterfront structures so that intercommunication between various points can be accomplished with a minimum of interference and delays, interrupted only by switching. Even these can be controlled in the matter of periods of switching. The most effective regulation of switching is that it shall be done after ordinary working hours, and where urgent during the noonhour period.

[1]Consulting engineer, Vancouver, B.C.

Stewart Young, M.E.I.C.[2]

In approaching Mr. Walker's excellent paper several points of view are possible—enlargement of content, criticism of the views expressed, benefit to the engineering profession. Mr. Walker is to be commended on his brief yet comprehensive presentation. From time to time, expression is given of a desire among members of the Engineering Institute for a reliable handbook on Community Planning. I suggest that Mr. Walker's paper sets a worthy pattern for such a handbook.

[2]Director of Community Planning Saskatchewan Government, Regina.

Yet there are details with which one may disagree or at least be critical. For example, the terms 'radial thoroughfares', 'secondary and minor streets', are commonly applied expressions. In reality there should be but one prime breakdown into (1) access streets and (2) trafficways; the last mentioned subdivided into various categories according to the nature and volume of traffic.

A good example of the compulsory type of access street is the dead-end or cul-de-sac. Notwithstanding public opinion and demand for the continuous or through street, much can be said in favour of the closed end street for residence purposes. As long as there are children they will play on our streets, regardless of all laws, controlled playgrounds and whatnot; and the sooner we realize and recognize this condition, the nearer will be the solution of traffic problems in residence areas. Mention is made of maximum gradients of 8 per cent on major streets and 12 per cent on minor streets. Without giving detailed reasons for thinking otherwise, strong exception may be taken to these figures which at least should be reduced to 5 and 8 respectively.

It is agreed that the provision of lanes in residence areas is highly controversial. But when one takes into account the objections, it is possible to classify them in terms of climatic conditions in relation to permissible use of rear yards, fuel consumption and ash disposal and removal. In many areas, rear yards from the point of view of privacy are useless for about nine months in each year, whereas fuel consumption in these months is high. This is the reverse of the conditions obtaining in areas of equable climatic conditions.

Mention is made of the usual size of business lots being 25 feet. For the smaller urban community this is too narrow, 30 feet being the considered desirable minimum for the Prairie Provinces.

Ross L. Dobbin, M.E.I.C.[3]

I would like to discuss Mr. Walker's paper from the viewpoint of an engineer who has to do with the supply of Utilities to the community.

Mr. Walker recommends rounded corners at street intersections. This is a good thing to do; it makes it much easier for traffic, and if known in advance the location of utilities can be made to suit. I would go farther, and not allow any buildings or other structures within ten feet of a corner. This would give good visibility when approaching these corners.

All intersections should be at right angles unless there is a good reason for any variation. Such an arrangement provides for lower costs of utilities, and also makes for the best use of the land.

Streets on the side of a hill should follow the contours as much as possible, and the grade of the roadway should not be too pronounced or there will be difficulties in severe winters. Mr. Walker's statement about grades is very much to the point. Dead-end streets should not be allowed except in special cases. They are hard to serve and tend to become neglected areas. Railway crossings should be kept to a minimum, and railways should not be allowed to use streets as a right of way. Lanes or alley-ways should be at least twenty feet wide, and should be owned by the municipality. They should be paved and cleaned by the city in the same manner as the other streets.

Mr. Walker has something to say about the length of city blocks. The width should not be more than 250 feet and not less than 200 feet. Mr. Walker's suggestions on this subject are very much in order. Width of lots will vary with the type of structure to be erected on them. Certainly a width of forty feet should be the minimum. If the minimum were increased to fifty feet the cost of utilities would be correspondingly higher.

Mr. Walker makes a good suggestion regarding water front properties. These should not be alienated and should belong to the public in perpetuity. A wide roadway should parallel the water front and buildings should be allowed only on the side away from the water. In conclusion I would congratulate Mr. Walker on the excellent common sense with which he has approached his subject.

[3]General Manager, Peterborough Utilities Commission.

List of Nominees for Officers

The report of the Nominating Committee, as accepted by Council at the meeting held on October 2nd, 1948, is published herewith for the information of all corporate members as required by sections 19 and 40 of the by-laws:

President	J. E. Armstrong	Montreal
Vice-Presidents:		
*Zone "A" (Western Provs.)	H. N. Macpherson	Vancouver
*Zone "B" (Prov. of Ont.)	W. J. W. Reid	Hamilton
*Zone "C" (Prov. of Que.)	R. E. Heartz	Montreal
Councillors:		
†Halifax Branch	E. C. O'Leary	Halifax
†Saint John Branch	L. O. Cass	Saint John
†Saguenay Branch	Name to be submitted later.	
†St. Maurice Valley Branch	F. W. Bradshaw	Grand'Mère
‡Montreal Branch	R. N. Coke	Montreal
	E. B. Jubien	Montreal
†Kingston Branch	R. D. Bennett	Kingston
†Ottawa Branch	J. L. Shearer	Ottawa
†London Branch	V. A. McKillop	London
§Toronto Branch	E. A. Cross	Toronto
†Border Cities Branch	Name to be submitted later.	
†Lakehead Branch	Name to be submitted later.	
†Saskatchewan Branch	J. G. Schaeffer	Regina
†Edmonton Branch	J. E. Cranswick	Edmonton
†Kootenay Branch	J. V. Rogers	Trail
†Vancouver	W. N. Kelly	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.

From Month To Month

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

First Report of the Committee on Conservation

Editor's Note:-

At a meeting in Halifax on October 11 of last year, Council asked Dr. A. E. Cameron, M.E.I.C., president of Nova Scotia Technical College to head a committee which would investigate ways and means of implementing the Institute's interest in conservation of the natural resources of the Dominion. At the Annual Meeting in Banff, Dr. Cameron presented the first report of his Committee.

Origin

Section 1 (b) of the By-laws of The Engineering Institute of Canada specifies that one of the objects of the Institute is "to encourage original research, and the study, development and conservation of the Resources of the Dominion". This is a logical objective for the Institute because probably no other single body of Canadian citizens is more intimately concerned with, or responsible for, these important phases of Canadian life. The engineer, by virtue of his training, should be, in fact must be, a conservationist. We take pride in the definition that "an engineer is one who can do for one dollar what anyone else can do for more". Obviously that objective cannot be realized properly if we look only at the immediate dollar. True economics and proper development of natural resources must be founded as much upon the objective of maximum service as that of minimum cost. There is no economy if we denude the headwater areas of a stream of the timber reserves for a quick profit in lumber or pulp, and then are faced with costly problems of flood control or soil erosion. There is no economy in the rapid extraction of the near surface mineral wealth and then high cost development through abandoned workings to recover the additional wealth from depths below the surface. Planning of all these operations, be it cropping of forests, control of floods, irrigation of arid lands, or extraction of mineral wealth, is the work for engineers. Upon us lies the responsibility of the orderliness of development and the maximum use of the products of that development, and these are conservation.

A Committee on Conservation was officially authorized at a meeting of the Council of the Institute at Halifax, October 11, 1947 at which meeting Council unanimously resolved;—

> "that a committee be appointed to explore the situation and advise Council as to the action it should take in order to assist in this important work of conservation and protection of Canada's natural resources".

The Council asked the writer to be Chairman of this committee.

Organization of the Committee

Consideration of the terms of reference of the committee made it obvious that Council had in mind the question of ways and means by which the support of the members of the Institute can be enlisted for a rational and informed programme of conservation. The questions of development and conservation of natural resources, of course, cannot be left to the committee. Each and every one of us must play a part and for obvious reasons the part that each can play must be restricted to his own locality. The prime function of the committee, therefore, must be to keep alive interest in problems of natural resources conservation in each locality and in each phase of the industrial development that is based upon the local resources. In other words, although the committee may be a "headquarters" committee, nevertheless, its work cannot lie at headquarters, but must lie within the branches of the Institute. The make-up of the committee, therefore, has been planned from a regional as well as a resources point of view.

Resources development and conservation are of vital importance to many societies and organizations outside The Engineering Institute of Canada, and the problem of educating Canadians, and particularly Canadian engineers and scientists, to the need of conservation is one which cannot be tackled without the support of all the scientific minds of Canada. There are in existence similar committees in many other organizations. Dominion and Provincial authorities have set up Research Foundations and

Research Councils to study specific problems within the resources development. It appeared that a proper concept of the committee would envisage a membership which would automatically make available the work of those other bodies even though membership of the committee was not exclusively membership in the Institute.

The committee, as finally organized, is composed of the following personnel:—

A. E. Cameron, Nova Scotia (coal mining), Chairman.

H. W. McKiel, New Brunswick (education and research).

Fraser Keith, Quebec (forestry).

Gilbert C. Monture, Dominion (economic).

G. B. Langford, Ontario (metal mining).

Donald M. Stephens, Manitoba (settlement).

G. W. Worcester, Saskatchewan (ceramics and soils).

John A. Allen, Alberta (exploration and prospecting).

William N. Kelly, British Columbia (fisheries).

These make up the committee. Although each is responsible for a specialty within the general problem, their interest will lie well beyond their specialty and will include all phases of development and conservation within their geographic limits.

It is important to note that the committee can act only as a nucleus for the Institute's study of the problems of conservation. Proper Institute approach to the subject must be at branch level and it is to be expected that in time each branch will set up a sub-committee, if convenient, under the chairmanship of a member of the "headquarters" committee, and it will be the responsibility of those branch committees to keep the topic as a live and progressive subject at all meetings of the Branch.

Every technical paper presented at a general meeting of the Institute, at a Branch meeting, or through the pages of the *Journal*, will involve problems of conservation. As has been said, engineering is economics. True economics considers the long range view as well as the short view, and the long range view is conservation.

The Institute Committee on Conservation is set up as a continuing committee. Its objective is the simple one of enhancing the consciousness of members of the Institute in conservation as a vital factor in natural resources development and exploitation. The committee can only function through the branches and therefore can only function with sub-committees within the branches. Dr. John A. Allen addressed the Annual Meeting at Banff upon the problems of conservation within Alberta. It is to be hoped that he established a precedent and that at each general session of the Institute, the local member of the committee will present to the Institute sessions, a general picture of the local situation. Such action alone, however, will not suffice. Every paper presented before the Institute, or in the *Journal*, should emphasize the conservation features of the topic. Discussion on each paper should include consideration of the conservation features of the topic. In that way, we will all become conservation conscious to the benefit of ourselves, the project upon which we are working, the province within which we live, and this Dominion which we love.

Interesting Research in Reinforced Concrete

Creation of a Council to carry out studies and experimental research in reinforced concrete, under sponsorship of the Engineering Foundation, and to interpret the results in the form of a code for the design of concrete structures, was announced recently by Dr A. B. Kinzel, chairman of the Foundation's board. It is anticipated that such a code may permit the use of reinforced concrete in longer span structures than now considered possible and should eliminate much of the uncertainty in design.

The research will be undertaken with approval of The American Society of Civil Engineers, one of the four engineering societies that established the Foundation. It is one of two new projects receiving support from the Foundation this year.

In working with concrete, Dr. Kinzel pointed out, the engineer is dealing with a material in which deformation is not proportional to the stress. In the past, concrete and steel have been combined and the design was based on the incorrect assumption that the strain in the concrete is, as in steel, proportional to the stress.

The Committee on Masonry and Reinforced Concrete, of the American Society of Civil Engineers, has been studying reinforced concrete for several years, Dr. Kinzel explained. This Committee concluded that carefully planned laboratory tests are necessary as a guide to further study and recommended to the Engineering Foundation that the entire theory of reinforced concrete be studied critically with a view to evolving a workable scientific theory for the design of concrete structures.

"Until recently the methods used for the design of reinforced concrete were essentially empirical," Dr. Kinsel continued. "On the basis of results obtained from an extensive set of tests conducted by the University of Illinois and Lehigh University, rational procedures have been established for the design of centrally loaded reinforced concrete columns. These tests demonstrated the inadequacy of the old theory.

Two investigations have been recommended by the A.S.C.E. committee for immediate consideration by the Council.

The first is to be carried on at Ohio State University. Its purpose is to determine the shape of the stress block in reinforced concrete in the compression zone by means of photoelastic methods. This proposed study is a continuation of pilot tests which have already been made at the University.

The second investigation is to be conducted by Professor Richart and associates at the University of Illinois. It will be concerned with reinforced concrete members subject to combined bending and direct stress. It is proposed to build and test 126 eccentrically loaded specimens with varying eccentricity ratios, varying percentages of steel, and for three different strengths of concrete.

More About Ecole Polytechnique's Anniversary

In the " Month To Month " section of our April issue, on page 231, was reported briefly a gathering held at the Windsor Hotel, Montreal, April 15th to 18th, to celebrate the occasion of the seventy-fifth birthday of the Ecole Polytechnique. Following are the highlights of addresses presented by five principal guest speakers.

Dean Ignace Brouillet, of Ecole Polytechnique, saw the engineer as possessing marked aptitude for adaptability. His faculty was striving to prepare students more adequately for jobs in industrial production and in administration of industry. He felt more graduates should take positions with industrial organizations. He concurred with advocates of less specialization in undergraduate training. Engineering fields are so many and diverse today that the young engineer cannot be expected to decide what narrow path he desires to follow after graduation. Sound basic training is of value to him, whatever he may specialize in later.

Dr. Arthur Surveyer divided engineers roughly into two main groups; employees, and consulting engineers and contractors. Employees comprise by far the larger of these two groups. Two major careers open to them today are in industrial production and administration, and in industrial scientific research. Engineering curricula cannot adequately cover all phases of training for both these careers. Young engineers must take up post-graduate work in increasing numbers. Their ultimate success calls for continued self-training through reading and study.

Dean C. R. Young, of the faculty of applied science and engineering, University of Toronto, warned that as dependence of engineering on new extensions and development of scientific knowledge increased, training would become more rigorous, and higher qualifications would be needed for entering students. Pre-university training should be good in *all* subjects, not merely in maths and science. A student with little taste for the " humanities " would not develop it later, nor would he attain marked eminence in the engineering profession. Special opportunities should be accorded the ablest ten per cent of students, to fit them for the creative work on which industry primarily rests. More students should proceed beyond the B.Sc. degree. Ten per cent of all undergradutes should be registering for post graduate work, and undergraduates should get a preview of research methods in their final year.

Dean Adrien Pouliot, of Laval University, traced back in history the great men who have shown their ability to build works comparable in design and performance with those of actual professional men; philosophers, military engineers, artist engineers, scientists like Pascal, Newton, Descartes, Liebnitz and Vauban. All these were definitely imbued with the culture of the past. He expressed the hope that all engineers will understand the value of humanistic-social culture in literature, arts, history and philosophy.

Dr. Augustin Frigon, president of the Board of Directors of Ecole Polytechnique, the speaker at the annual dinner, pointed out that the term "scientific research" is loosely applied today to research for every purpose; actually it means the development of fundamental extensions to the realms of pure and applied science. Though fundamental research is of prime importance, industrial or applied science research must not be overlooked if we are to contribute to the Province's industrial development.

Few industrial firms can afford good research laboratories. Most States, and most of the other Provinces of Canada have established laboratories for the benefit of industries that cannot afford them. A year ago the Polytechnique Centre of Research was set up. It operates independently from the teaching organization, under a chemical professor who had spent a lifetime in chemical research. It is hoped this centre may be the nucleus of a large organization subsidized by public funds. Material and staff used for teaching is an excellent foundation on which to build a scientific research effort.

Changes in Architecture at Toronto

The University of Toronto announces that after fifty years as a department of the Faculty of Applied Science and Engineering, the subject of architecture is to be treated in a separate division. Starting this Fall the School of Architecture will be under the guidance of Professor H. H. Madill, himself a graduate of the Faculty and long associated with the department.

It is proposed that the new school will have a greater freedom in the design of its curriculum, and a greater scope in the integration of those courses which are peculiarly architectural with those in engineering and the humanities.

Meetings of Other Societies

The **American Institute of Chemical Engineers** has arranged a regional conference to be held in Montreal, September 19 to 22, 1949.

The Montreal Conference Committee of the Institute will make details of this meeting available at a later date.

The 18th National Exposition of Power and Mechanical Engineering will be held at Grand Central Palace, New York City, from November 29 to December 4, 1948, during the Annual Meeting of the **American Society of Mechanical Engineers.**

Among the exhibits will be a 2000-hp. fluid drive, a new " Robot-Eye " combustion control, a steam generator featuring provision for quick change-over of fuels, a recently developed method for sterilizing water without heat or chemicals, and extensive exhibits of instruments for control and recording of power plant performance.

The Annual Meeting of the **Society for Experimental Stress Analysis** will be held at the Hotel Commodore, New York, N.Y., on December 2, 3, 4, 1948.

Inquiries should be addressed to the Society, P.O. Box 168, Cambridge, 39, Mass.

Changes of Address

The efficiency of the service which members have a right to expect from Headquarters depends on the accuracy of the members' records.

Have you advised headquarters of your latest addresses and occupation?

Personals

Notes of the Personal Activities of Members of the Institute

Colonel E. C. Thorne, M.E.I.C., of the Export Division, Foreign Trade Service, is travelling in Mexico, Colombia, Venezuela and Cuba. Chief of the machinery, metals and chemicals section of the Export Division, Colonel Thorne is making a survey of the industrial requirements of those countries and discussing details of Canadian machinery and industrial equipment with businessmen in that area.

Col. E. C. Thorne, M.E.I.C.

G. C. Tollington, M.E.I.C., is chairman of the Peterborough Branch of the Institute. He is from Claresholm, Alberta, a graduate of University of Alberta, class of 1932, with the degree of B.Sc. in electrical engineering. He went to Canadian General Electric Company in 1934, followed the test course, and has remained with the Company, where he is now assistant induction motor engineer.

J. W. Millar, M.E.I.C., arrived in August in North Bay, Ont., to take up his duties as chief mechanical officer of the Ontario Northland Railway. Previously, at Squamish, B.C., he had been superintendent of the Pacific Great Eastern Railway. He joined the Canadian Pacific Railways after obtaining a degree in mechanical engineering from the University of British Columbia, and then went to Winnipeg where he worked in the draughting offices. Until four years ago, he served C.P.R. in various supervisory capacities throughout the West, and as far east as Kenora, Ont. He then joined the British Columbia Department of Railways as an inspector, with headquarters at Vancouver. In 1947 he was loaned by the Department to the Pacific Great Eastern Railway.

Dr. R. W. Boyle, M.E.I.C., director of the physics division of the National Research Council retired in October from that position.

Dr. Boyle, who was the Flavelle Medallist of the Royal Society of Canada in 1940, graduated in electrical engineering from McGill University in 1905. He worked under Lord Rutherford in Montreal and in Manchester where he held an "1851 Exhibition" scholarship. He did research on radioactivity, and ultrasonics, for which McGill University granted him both M.Sc. and Ph.D. degrees.

At the close of the first great war, he was in charge of the development of asdics, working in the anti-submarine division of the Admiralty Board of Inventions and Research. Modern submarine detection methods are a straight evolution of that early work. Dr. Boyle was assistant professor of physics at McGill University in 1912. He was then appointed professor of physics at the University of Alberta. He was overseas for three years and after his return was made dean of the faculty of applied science in Alberta. He was appointed to his Research Council post in 1929.

Major A. L. Maclean, of the R.C.E.M.E., returned to Canada, in July, from a tour of duty at Aberdeen Proving Ground, in Maryland, U.S., and was then appointed associate professor of mechanical engineering at the Royal Military College, Kingston, Ont. Graduating from University of Toronto in 1941 with the degree of B.A.Sc., he joined the R.C.O.C. as a lieutenant. Then, a captain in the R.C.E.M.E. he went overseas in 1942. Back in Canada in 1946, he was made officer commanding the R.C.E.M.E. workshop at London, Ont.

C. C. Simpson, M.E.I.C., of Northern Electric Company, was transferred from Montreal to Vancouver in July last. He is manager of power apparatus sales for Alberta and British Columbia. He was in power apparatus sales in Montreal from 1942, when he was transferred by the Company from Edmonton, Alta. He joined the Northern Electric upon graduation in electrical engineering from University of Alberta in 1937.

John E. Boyle, M.E.I.C., who was general manager of the Back River Power Company, left in August for St. Louis, Missouri, to take over the management of the mill of the Western Fibre Company just outside St. Louis at Caseyville, Illinois. Mr. Boyle received the degree of B.A.Sc. from University of Toronto in 1932, and studied business administration at University of Western Ontario.

W. W. Graham, M.E.I.C., of The Shawinigan Engineering Co. Limited, Montreal, has been appointed project engineer, and will be responsible for the design of several of the Company's larger projects. Mr. Graham joined the Company upon graduation from McGill University in mechanical engineering in 1925. He was the engineer representing the Company in the construction of the recently completed Shawinigan Building in Montreal.

J. A. Burke, M.E.I.C., of The Shawinigan Engineering Co. Limited, Montreal, is now general superintendent of construction in charge of all construction work undertaken by the Company. A graduate of University of Alberta in electrical engineering and later in civil engineering in 1937, Mr. Burke has been with the Company since that time, and has been intimately associated with the construction phases of the Company's work.

A. S. Poe, M.E.I.C., of The Shawinigan Engineering Co. Limited, Montreal, has been named project engineer, and will be responsible for the design of several of the Company's larger projects. Mr. Poe graduated from McGill in civil engineering in 1917, saw service in the First World War, and joined the Company on demobilization. For the past several years he has acted as office engineer in charge of design.

G. A. Nicholson, M.E.I.C., accepted the position of town engineer for the Town of New Glasgow, N.S., several months ago. He had been municipal engineer at Pictou, N.S.

T. M. Moran, M.E.I.C., of the British Columbia Electric Railway Company Limited, Vancouver, B.C., was appointed, in July, vice-president with jurisdiction over the gas and transportation divisions, B.C. Motor Transportation Limited, urban and interurban operations, shops and maintenance and the general freight and passenger agent's department. He is also retaining duties with respect to cost control. His former position was vice-president and assistant to the president. He went to British Columbia in 1946, from Toronto, where he was vice-president of Stevenson & Kellogg, Ltd.

T. M. Moran, M.E.I.C.

W. J. W. Reid, M.E.I.C., was appointed, in July, president of the Otis-Fensom Elevator Company Limited, Hamilton, Ont. He is a graduate in engineering of Toronto University and has served in various managerial positions with the Company since 1921. He is a member of the Senate of Toronto University, vice-president of the Association of Professional Engineers of Ontario, and actively interested in affairs of the Canadian Standards Association, and of the Engineering Institute. He was councillor of the Institute representing the Hamilton Branch in 1942-43.

Mr. Reid was with the Royal Canadian Engineers during the first World War, and was widely known as manager of the extensive Bofors Ordnance Plant operated by Otis-Fensom for the Crown during World War II.

F. A. Hunt, M.E.I.C., is at St. Catharines, Ont., an assistant engineer on the Niagara, St. Catharines and Toronto Railway. He was formerly at Toronto, assistant engineer in the Toronto Terminals Division of the Canadian National Railways.

J. E. Sears, M.E.I.C., Ontario Land Surveyor, has opened an office in Toronto. Specializing in summer resort properties, Mr. Sears also has a branch at Huntsville, Ont.

D. A. G. Smith, M.E.I.C., was recently engaged as mining engineer for the Winnipeg Supply and Fuel Company in Winnipeg, Man. He was previously with International Uranium Mining Company, at Edmonton, Alta., and at Yellowknife, N.W.T.

J. L. Halter, JR.E.I.C., was appointed recently as acting electrical superintendent for the Brompton Pulp and Paper Company Ltd., at Red Rock, Ont., with responsibility for all electrical maintenance and installation in the mill and town site. He had been an electrical designer with the Company for over a year. He was employed previously as electrical engineer in the mechanical department of Massey Harris Company, Toronto, after graduating from the University of Manitoba in 1946.

Rex Ford, JR.E.I.C., is chairman of the Junior Section of the St. Maurice Valley Branch of the Institute this year. Mr. Ford is a civil engineer with the Shawinigan Chemicals Co. Ltd., Shawinigan Falls, Que. He was graduated in 1944 from McGill University, Montreal, with the degree of B.Eng., and was a lieutenant in the active service forces from 1944 to 1946.

J. E. Kennedy, JR.E.I.C., is assistant design engineer with English Electric Company of Canada, St. Catharines, Ont. He was previously at Peterborough, Ont., an electrical engineer with Canadian General Electric Company. He graduated in 1946 from University of Toronto, with a B.A.Sc. degree in electrical engineering.

Flight Lieutenant C. E. F. Underwood, S.E.I.C., is now at the R.C.A.F. Station at Edmonton, Alta. He graduated this year from the University of British Columbia with the degree of B.A.Sc. in civil engineering.

W. J. W. Reid, M.E.I.C.

L. J. Debly, S.E.I.C., after graduating in 1947 from University of New Brunswick, with a B.Sc. degree in civil engineering, was employed by the Canadian Bridge Company, Walkerville, Ont., as a structural detailer. In July this year he was sent on loan to the International Nickel Company of Canada, Copper Cliff, Ont.

J. Harris Turner, JR.E.I.C., is with the Singer Manufacturing Company, Thurso, Que., where he is works engineer for the Company. A graduate of Toronto University in 1946, with the degree of B.A.Sc. in metallurgy, he was an engineer with Canadian Liquid Air Co. Ltd., Montreal, until his recent change.

Jean Carpentier, S.E.I.C., is now with the Shawinigan Water and Power Company, Montreal. He received the degree of B.A.Sc. from Laval University this year. He was vice-president of the faculty of science at the University, and president of the electronics club.

Paul R. Brown, S.E.I.C., is with Canadian Westinghouse Company, Hamilton, serving as an engineering apprentice. He obtained his degree in electrical engineering from Nova Scotia Technical College this year.

A. F. Chisholm, S.E.I.C., is now assistant professor of engineering at Dalhousie University, Halifax, N.S. He received the degree of B.Eng. (Civil), from Nova Scotia Technical College this year.

A. H. Boker, S.E.I.C., is secretary-treasurer of the Junior Section of the St. Maurice Valley Branch of the Institute this year. A graduate in mechanical engineering from Queens University, Kingston, in 1947, he is now with Canadian Industries Limited, Shawinigan Falls, Que., as development engineer.

J. D. Kean, S.E.I.C., has been county engineer and road superintendent for Peterborough, Ont., since June last. He attended University of Toronto, his engineering studies being interrupted by service in Canada and overseas with the R.C.E. In 1947 he received his B.A.Sc. degree in civil engineering, and then served as a junior engineer in the East York township of Ontario for a time. He was engineer for East Whitby township before going to Peterborough.

Obituaries

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

J. Lorn Allan, M.E.I.C., whose death on September 1st has been reported from Dartmouth, N.S., had been a member of the Institute from 1899. He had been ill for some time and had retired from the position of city engineer for Dartmouth two years ago.

Born in Toronto in 1878, Mr. Allan graduated in civil engineering from the School of Practical Science of University of Toronto in 1900. He also attended Dalhousie University in Halifax. For one year he was assistant to the town engineer at Sydney and later was a draughtsman associated with the American Bridge Company in Trenton, N.J. Between 1902 and 1910 he was assistant to the provincial engineer for the Province of Nova Scotia.

Mr. Allan also played a big part in the development of the Halifax and Eastern Railway between Dartmouth and Musquodoboit between the years 1910 and 1916. He was office engineer for the railway at Dartmouth.

For the last three years of World War I he served as adjutant with the Royal Canadian Artillery in the Halifax Fortress. Following the war he became managing director of the Dartmount Development Company.

There followed some service with the Halifax Harbour Commission in 1929, and it was some time later that he received his appointment as town engineer at Dartmouth.

A Life Member of the Institute, he had joined it in 1899 as a Student. He transferred to Associate Member in 1904 and to Member in 1913. He served as chairman of the Halifax Branch in 1931. Mr. Allan was prominent in the Association of Professional Engineers of Nova Scotia, an honourary life member and past-president of that body.

W. H. Powell, M.E.I.C.

W. H. Powell, M.E.I.C., of Vancouver, B.C., engineer of the Greater Vancouver Water Board, passed away in Hospital on August 11, 1948, after a short illness. He had worked until three weeks before his death in the position which he assumed in 1928.

Twice an Institute prize winner, Mr. Powell was born in Pictou County, N.S., in 1884, and studied at St. Frances Xavier University, and McGill University, Montreal, graduating from the latter in 1909 with a B.Sc. degree. He qualified as a Dominion Land Surveyor, while serving as first assistant and articled pupil to B. J. Saunders, on base line surveys in Alberta in 1909. He served at the beginning of 1910 with the Maritime Bridge Company, New Glasgow, N.S., and later he went west to be assistant on the Dominion Hydrographic Service at Prince Rupert, B.C. During this time he qualified as a B.C. Land Surveyor. He headed a subdivision survey in Saskatchewan for the Department of the Interior the same year, and after miscellaneous surveying practice he entered the service of the city of Vancouver as city surveyor in 1912. He remained in that position for many years, working also as field instructor and lecturer in geodetic surveying and astronomy at the University of British Columbia.

He joined the Greater Vancouver Water District as engineer in 1928. He also served as engineer for the Vancouver & District Joint Sewerage & Drainage Board.

In 1934 Mr. Powell was awarded the Gzowski Medal of the Institute for a paper on the "First Narrows Pressure Tunnel" and three years later he received the Past President's prize for one dealing with "The Need of the Engineer's Participation in Public Affairs."

Mr. Powell, who joined the Institute in 1907 as a Student, transferred to Associate Member in 1913 and to Member in 1918. He represented the Vancouver Branch as Councillor of the Institute in 1928. He was also a member of the Corporation of B.C. Land Surveyors and a trustee of the American Waterworks Association.

Alan H. Munro, M.E.I.C., died on August 30th, 1948, at his home in Peterborough, Ont., where he was born in 1889. He was a graduate of the School of Practical Science, University of Toronto, and had, in the course of a lengthy career, done surveying and construction work in many parts of Canada.

On graduation in 1911 he was with Smith, Kerry & Chace on construction work. In 1912-1914 he was an instrumentman on the Trent Canal, and he returned to this project in 1919, after service overseas with the Canadian Engineers as a sapper and as a lieutenant.

He was connected with various projects thereafter, largely in the hydroelectric power development field. Among them were the construction of hydro-electric power plant of the Ontario Paper Co. Ltd. at Outarde Falls, Que., in 1927; design of a new development for Alcoa Power Company on the Saguenay River, Que., in 1928; projects of the Foundation Company of Canada Ltd. at Cochrane, Alta., in 1929; projects of the Ontario H.E.P.C. in Toronto, in 1930.

Later, with the Ontario Department of Highways, he was located at Hearst, at Bancroft and other points. He was with Polymer Corporation, Sarnia, in 1945.

Mr. Munro joined the Institute as a Student in 1911, transferring to Associate Member in 1920 and to Member in 1940. He was also a member of the Association of Professional Engineers of Ontario.

W. Robert Worthington, M.E.I.C., of Toronto, passed away on August 2nd, 1948, after a two-month illness.

The head of the W. R. Worthington Construction Co. Ltd., which he founded some years ago, Mr. Worthington was born in Toronto in 1881.

A lifelong resident of Toronto, he was a graduate of the School of Practical Science of University of Toronto, receiving the degree of B.A.Sc. in 1905. He had been employed during vacations by the City of Toronto, and on graduation he was made assistant engineer of the Sewer Section. In 1912 he was appointed chief engineer of that section of the city's Works Department, and among the various works designed and constructed under his supervision were the West Toronto drainage system and the Earlscourt & Moore Park Drainage System.

In his younger years Mr. Worthington had been active in track sports and was a keen bowler. He was a member and warden of the Church of St. Alban the Martyr and of the executive committee of the General Synod of the Church of England in Canada. He had been prominent in work with the West End and North Toronto Y.M.C.A.

He joined the Institute as an Associate Member in 1916 transferring to Member in 1940.

Harry L. Dowling, M.E.I.C., Toronto structural engineer, who died in hospital there on August 27th, was born at Bolton, Ont., in 1893.

An engineering graduate of Toronto University, class of 1919, Mr. Dowling had already some structural engineering experience with Dominion Bridge Company Limited, Toronto, when he went to Detroit in 1919 to be structural engineer for Albert Kahn, architect, in that city. In 1920 he was with the Solvay Process Company, Detroit.

Returning to Toronto in 1921 he was structural engineer for Barber, Wynne-Roberts and Seymour, but two years later he joined the Canadian & General Finance Co. Ltd., Toronto. He had been with the Canadian Brazilian Services for many years before his death, serving as a structural engineer.

Mr. Dowling joined the Institute in 1919 as a Student, transferring to Associate Member in 1922, and to Member in 1940.

N. M. Waddell, M.E.I.C., of Fort Garry, Man., a long-service employee of Canadian National Railways, died in hospital in Winnipeg on September 2nd, 1948. He was district engineer at Winnipeg for the Railway.

Born in Glasgow, Scotland, in 1887, he served an apprenticeship in engineering while studying at Technical College. He came to Canada in 1911 and worked at Winnipeg for C.N.R. as a draughtsman on maintenance of way. During the First World War he served with the R.C.E.C. in France and Belgium. On his return to Canada and to C.N.R., he was named resident engineer at Port Arthur, and in 1917 was given a similar position at Brandon, Man., later being named divisional engineer. He was assistant division engineer at Winnipeg for some years before being appointed district engineer there in 1945.

Mr. Waddell joined the Institute in 1919 as an Associate Member, transferring to Member in 1940.

F. H. Cothran, M.E.I.C., of Charlotte, N.C., who was well known for many years in Quebec, passed away at his home on September 1, 1948. He was president of the Piedmont & Northern Railway and the Durham & Southern Railway.

Born at Millway, S.C., in 1879, he studied at Clemson College, South Carolina, and did engineering work for a time in the U.S. Army. He began his engineering career in 1899, and was one of a group gathered to direct the Duke industrial enterprises in the United States and Canada.

During the First World War he directed field surveys for the Quebec Development Company and was in charge of construction on the Saguenay River projects. In 1923 he became vice-president and general manager of the Alma and Jonquiere Railway, the Duke-Price Power Company and the Quebec Development Company. Then for a time he was chief engineer of the Piedmont and Northern Lines. Later, in 1929, he headed hydro-electric projects for the Beauharnois Construction Company. After doing consulting engineering at Charlotte, N.C., for some years, he accepted the presidency of the aforementioned railroading organization in 1937.

Mr. Cothran joined the Institute in 1926 as a Member.

Robert N. Wornock, M.E.I.C., president of Charles Warnock & Co. Ltd., Montreal, died suddenly on August 23, 1948.

Mr. Warnock was born in Montreal in 1909. After graduating from Royal Military College, Kingston, Ont., he entered McGill University, receiving the degree of B.Sc. in civil engineering in 1931.

He entered the firm of inspection engineers founded by his father and was first occupied on inspection and office duties. He became secretary-treasurer in 1932 vice-president in 1936 and finally president, upon the death of his father.

Mr. Warnock joined the Institute as a Student in 1931, became a Junior in 1936, an Associate Member in 1938, a Member in 1940.

P. P. LeCointe, M.E.I.C., of Montreal, passed away May 3, 1948.

Born in Paris in 1882, Mr. LeCointe studied engineering at the Ecole National des Points et Chaussees in his native city, graduating as a civil engineer in 1908.

He did railway work in France, but came to Montreal in 1911 and was assistant designing engineer for Montreal Water Works for a time, before being named technical assistant to the superintendent of the Works. In 1916 he joined the Road department of the City of Montreal, as office engineer. The next year, however, he became professor of Industrial Chemistry at Ecole Polytechnique, Montreal, and remained until 1930. He then established a consulting engineering practice, retaining it until 1946, when he became engineer for the Jean Bonnel Societies in Montreal.

Mr. LeCointe joined the Institute as a Member in 1938. He also held membership in the Corporation of Professional Engineers of Quebec and in the Societe des Ingenieurs Civils de France.

Dow Vernon Conning, M.E.I.C., who was chairman of the board of education of Peterborough, Ontario, passed away on August 16, 1948, after a short illness. A graduate of McGill University, Montreal, Mr. Canning had been connected with Canadian General Electric since 1921.

He was born at Brockville, Ontario, in 1899. He received the degree of B.Sc. from McGill in 1921 and then entered C.G.E.s test course. He then served for 7 years as a switchboard engineer, and in 1931 was made chief design engineer on industrial control equipment. For the past year he was manager of the Company's Industrial Controls Division.

Active in civic affairs, Mr. Canning was elected to the Peterborough Board of Education in 1942 and was a member up to the time of his death, having served as chairman in 1947 and being re-elected to that post for 1948. For four years he was chairman of the Board's Property Committee. He was also a member of the Board of Health, and had been working on a plan of amalgamation of the city's health services.

Mr. Canning had become a Member of the Institute in 1939.

G. A. L'Hoir, M.E.I.C.

Georges A. L'Hoir, M.E.I.C., who was director, manager and owner of L'Hoir Aluminum & Stainless Steel Products, Inc., at Levis, Que., died on June 12, 1948.

Mr. L'Hoir was born in Jemappes, Belgium, in 1880. After finishing his studies and obtaining his certificate as an engineer of mines at the University of Mons, he obtained a degree as electrical engineer from the University of Louvain, completing these studies in 1903. Then, until 1914 he directed a metallurgical industry at Bouillon, Belgium, the "Ferronnerie Bouillonnaise." He installed the central hydro-electric plant at Bouillon, and was consulted on electrical work.

Volunteering for war service in 1914, he was taken prisoner at Namur but, escaping, rejoined the English forces. Back in France he entered the service of the Belgian general command at Paris and was sent as engineer to the Schneider Works at Le Creusot, France, war material and munitions factories. He was delegated by that organization to the United States as consulting engineer on the construction of a plant at Philadelphia, Pa., for the fabrication of a French-type shell.

Returning to France he participated in the Yser campaign. After the war he concerned himself with the aluminum and steel industries, owning and operating the Cie. d'Aluminum at Liege, Belgium; and the Societe Anonyme L'Aluminum du Nord, Salesmes Nord, France. It was in 1939 that he founded the plant at Levis.

Mr. L'Hoir joined the Institute as a Member in 1945.

Gerord Rousseau, S.E.I.C., student at Ecole Polytechnique, Montreal, died on August 22nd, 1948. He was in his 22nd year.

Born in Montreal, Mr. Rousseau was in his final year of engineering, having entered the Ecole from Plateau Academy, Montreal.

News of the Branches

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented at their meetings

Montreal

In response to the demand for more plant visits, the following visits have been arranged for this Autumn:

October 16th: Canadian Tube & Steel Co.

November 27th: Imperial Oil Company.

The Entertainment Committee is making plans for a Dance to be held on February the 11th. It is hoped that the members will give their support to this event and ensure the same success as last year.

Members are reminded that membership certificates and badges are available at E.I.C. Headquarters and can be obtained upon application.

Junior Section

Leo Scharry
Secretary-Treasurer

On September 7, 1948, there was held an important meeting to adopt the programme of activities for the fall session of 1948. As lined up by the Papers Committee chairman, it was unanimously adopted. This fall, a diversified programme is offered to all members of the Montreal Branch, and is listed in detail as follows:

October 4th: (Opening Meeting)—**Effective Speaking** by Mr. Kurt Swinton. Refreshments served.

October 18th: (Technical: Mechanical)—**Magic of Heating Controls** by Mr. W. J. Robinson of Minneapolis Honeywell Co.

October 29th: (Social) — Oyster party. Preston Hall, Drummond and Dorchester St., at 8 p.m.

November 1st: **Services of a Bank** by Mr. J. L. Davignon, Assistant-General Manager of Banque Canadienne Nationale.

November 15th: (Non-Technical) — Students' Night and Film Night.

November 29th: (Technical: Civil)— **Building Materials for the Modern Home** by Mr. Paul Lapointe, Architect.

December 3rd: 4th Annual Dance at the Ritz-Carlton.

December 13th: (Social)—Ladies' Film night. Light refreshments served.

PUBLIC SPEAKING CLASSES

On Opening Night the subject of Mr. Swinton's talk will be—**How to Speak in Public.** This talk was purposely placed on this date because the executive wishes to organize a public speaking class. At present, Mr. Morrison has consented to be the monitor of such a class if the attendance on the part of members of the Junior Section warrants such a step.

RESIGNATIONS

Bob Killam who had been McGill University Staff Representative for the last three years has tendered his resignation as such. It was regretfully accepted by the Executive.

J. N. Galli who had offered his services to organize the Public Speaking group last spring has sent in his resignation. He is presently stationed at Iroquois Falls doing construction work. His resignation was accepted by the Executive.

OYSTER PARTY

The Executive of the Junior Section has set up a committee to organize an Oyster Party which will be the first in the annals of the Montreal Section.

Date: October 29th, 1948; Place: Preston Hall, Drummond and Dorchester St.; Time: 8 p.m.; Price: $3.00 per person. Members of the Senior Section are most cordially invited.

The hall is not large and the committee does not wish to overcrowd it. A limited number of tickets only is available, and late-comers must regretfully be turned away.

Tickets may be obtained by contacting: Bill Smith, Northern Electric Co. (WI. 3131, Loc. 461); Léo Scharry, Wagner Electric Co. (LA. 8193); or at the Institute Headquarters.

POST-GRADUATE COURSES

Would anyone interested in evening courses in Electrical Engineering (Power Section), leading to a Master's degree in Electrical Engineering, please get in touch with Jack Hahn, 2101 University St. (BE. 6298 after 6 p.m.) Such courses could possibly be arranged if enough interest is shown.

DANCE

November 29th, 1948.

Arrangements for the 4th Annual Dance are completed, and tickets may be obtained at the Institute Headquarters, or by contacting: John Bateman (BE. 3913); Léo Scharry (LA. 8193), or any councillor.

Saguenay

J. E. Dyck, M.E.I.C.
Secretary-Treasurer

On Friday, August 27, the Saguenay Branch was host to the presidential party which included President and Mrs. J. N. Finlayson of Vancouver, Vice-President and Mrs. R. S. Eadie of Montreal, Vice-President and Mrs. W. L. Saunders of Ottawa, Vice-President A. Larivière of Quebec, and General Secretary L. Austin Wright of Montreal.

The party was conducted on an industrial inspection tour of the Arvida Works of the Aluminum Company of Canada, Limited and the Shipshaw Power Development. This was followed by a dinner meeting of the Branch in the evening.

Addressing the Branch, Dean Finlayson advocated a maximum of co-operation between the Institute and other professional organizations and added that this would be discussed at the Annual meeting to be held at Quebec City in May, 1949.

In the matter of helping the young engineer starting out in his profession, Dean Finlayson said that he feels a great deal of responsibility falls on the Institute and that it is intended to place particular emphasis on this phase of its work.

Vice-President A. Larivière of Quebec, stated that the next Annual Meeting will be held in Quebec City, and he hopes that a large representation from the Saguenay Branch will be able to attend. He assured the Branch that those attending will find the meeting both profitable and enjoyable.

Vice-President W. L. Saunders of Ottawa discussed highways he had inspected in the Saguenay District. Having driven from Quebec to Chicoutimi on the old highway, he felt that the new highway under construction was definitely needed. He added that the new road, when completed, would be one of the best in Canada and would increase tremendously the tourist traffic into this district.

Vice-President R. S. Eadie of Montreal stated that he was disappointed in the lack of papers submitted for the Phelps Johnson prize and hoped that young engineers would become more interested in writing technical papers for submission to headquarters. Mr. Eadie also discussed briefly the fixed-arch Aluminum bridge to be erected over the Saguenay river at Shipshaw. Its erection, he said, will probably start in the spring.

Dr. Wright discussed the growth of the Institute, to over 10,000 members, making it the largest professional organization in Canada. He added that half the membership is made up of Student and Junior members who should have a definite voice in the policies of the Institute. He assured the Branch that any suggestions and opinions submitted to Headquarters are seriously considered. Dr. Wright reminded the Branch of the Annual Meeting to be held in Quebec in May, 1949, and stated that a paper would be given on the Aluminum Bridge at Shipshaw.

Chairman H. R. Fee expressed the appreciation of the Branch to the members of the presidential party before closing the meeting.

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Some World Problems, was the topic of an address given by Dr. R. C. Wallace, principal of Queen's University, to the Saguenay Branch of the Institute on September 8, 1948.

Dr. Wallace pointed out that Canada is in a favourable position in that she possesses the natural resources necessary to make her economically strong. The war had made money available for the development of these resources, which condition still exists. He added that, to carry any weight in world conferences, a nation must be strong economically as well as in a military sense. Canada is becoming an industrial nation since large quantities of cheap power so necessary for such development are available in this country.

In connection with industrial research, Dr. Wallace stated that, where large corporations such as the metal and chemical industries have carried on extensive research programmes, they have prospered, while those who have neglected to do this, as in the case of some coal mining concerns, have experienced economic difficulties.

Dr. Wallace pointed out the need for industrial research for small concerns who, in many cases, can not afford to set up research departments. He cited a case in England where a large number of companies in the same field had set up a common research section. This development work was financed jointly by the Government and the companies concerned. The idea of combining with one's competitors in a common research programme was not agreeable to some at first, but results in England have been very favourable.

Dr. Wallace, in speaking of Britain, said she is still in a poor position economically, but that he feels optimistic about her ability to work out her difficulties. As far as nationalization of industry is concerned, he believes that Britain will not go much farther along this line. In a world where different political ideologies are being tried, Dr. Wallace professed his belief in a true democracy, and defined the democratic way of life as one in which people abide by the majority decision, freely given by an intelligent people.

In connection with the effect of world conditions on our young people, Dr. Wallace said that a tendency toward unrest, and an attitude of living for the present instead of the future, are being created. He believes that since the future of the world depends upon the younger generation, they should be made to see the true values in life that do not change with the times, and taught to meet the future with courage and optimism.

C. J. Tanner thanked the speaker on behalf of the Branch.

Vancouver

Alan M. Eyre, Jr.E.I.C.
Secretary-Treasurer

Stuart Lefeaux, Jr.E.I.C.
Branch News Editor

On Wednesday, August 18th, members of the Vancouver Branch were guests of the B.C. Sugar Refining Company for a plant inspection tour and luncheon. Seventy-five members gathered for the occasion and were divided into eight parties to tour the eleven-acre plant.

The parties were first shown the main bulk storage bin where approximately thirteen million pounds of raw sugar can be stored for processing. The raw sugar arrives at the refinery wharf in jute bags from Fiji, British West Indies, and other plantation centres. The refining process is carried on largely by gravity flow in the nine-story main building. The separation of the pure sugar crystals from the sticky film of raw sugar syrup is accomplished with centrifugal machines; the raw sugar is then filtered through cloth and allowed to percolate through " char ", an animal charcoal, to remove the last trace of color. The white liquor is then concentrated under vacuum to form crystals of granulated sugar. The wet sugar is dried and screened to size and then packed by machinery for marketing. Other products such as brown sugar and syrup are obtained by the blending of syrups in the processing. Molasses is obtained as an end product; it is the final syrup containing all the impurities not removed in the refining process.

The refinery has its own steam electric plant consisting of two 1250-kw. turbo-generators and two coal-fired boilers of 72,500 lbs. per hour capacity at 475 p.s.i. and 650 degrees Fahrenheit total temperature. Approximately 450 people are employed steadily to meet the constant demand for the products. The refinery capacity averages 600 tons daily to supply Western Canada markets.

After developing huge appetites on the inspection tour the members were treated to an excellent luncheon at the plant cafeteria. The Chairman introduced the company executives responsible for the trip; Fred Ballou, M.E.I.C., chief engineer; Don Stewart, assistant chief engineer, Bill Perry, plant superintendent; Bill Blankenbach, chief chemist.

George Allan, vice chairman of the branch, was congratulated on arranging the most enjoyable outing for the Vancouver Branch.

LIBRARY NOTES

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEWS

INDUSTRIAL ENVIRONMENT AND ITS CONTROL:

J. M. Dallavalle. London, Toronto, Pitman, 1948. 225 pp., illus., 9¼ x 6 in., cloth, $5.00.

Reviewed by L. C. A. Walford*

The opening sentence in the preface to the book reads "This book is intended chiefly for engineers interested in controlling those factors of the industrial environment which affect the health and welfare of workers". Gathering as it does, between two covers, a great deal of information which is otherwise obtainable only by searching through many books and periodicals, the book should be of value to a much wider field than the comparatively restricted one of the engineer; both management and union organizations could profit by the reading of it and the student should find it useful not only as a text, but also as a work of reference.

The first chapter is most interesting; the author has attempted to indicate the scope of industrial hygiene and in doing so leads the reader to the conclusion that whilst industrial hygiene is a very laudable objective and one which can be of great benefit to the community, it should also be considered only as one small aspect of a virile public-health programme. This chapter merits careful and thoughtful reading.

Taking the reader through the elements of Psychrometry in Chapter 2, the author discusses industrial air contamination in the form of dusts, gases and vapours; tables indicating permissible tolerance of these are included.

Separate chapters are devoted to Illumination and Radiant Energy—to Noise, Vibration and Fatigue and to the Thermal Environment.

The last six chapters treat of the practical methods which may be undertaken to eliminate or reduce air contamination. Much of the subject matter of these chapters will be recognized as having appeared in other publications during recent years. The value of it here is that a mass of material has been brought together in one place and presented in a clear straightforward manner with an adequate number of tables and illustrations. The discussion concerning filter efficiency is provocative and reflects dissatisfaction with the manner in which data applicable to filters is currently presented.

An appendix is a reiteration of the basic principles of Industrial Sanitation and an outline of the basic requirements for a safe and healthful environment for the workers. At the end of each chapter will be found a useful bibliography from which it will be seen that the author of the book under review has also produced a number of other books and articles.

Mr. Dallavalle, for many years an engineer in the U.S. Public Health Service, has indicated what is desirable and what is safe practice in the field of Industrial Environment.

**Wiggs, Walford, Frost, and Lindsay, Consulting Engineers.*

ABSTRACTS

INSTITUTION OF ELECTRICAL ENGINEERS

Summaries of Papers to be Read in London, first half Session 1948-49.

Aids to Training—the Design of Radar Synthetic Training Devices for the R.A.F.

G. W. A. Dummer.

Seventy types of ground synthetic trainers were designed during the war. Their scope varies from the provision of simple artificial echoes to the reproduction on the ground of a complete AI Night Fighter Interception.

Fixed Resistors for use in Communication Equipment, with Special Reference to "High-Stability" Resistors.

P. R. Coursey.

Begins with a history of the development of resistors for use in telecommunication equipment, and outlines the construction and properties of eight differing types of resistors, the differing characteristics of which determine uses for which they are most suited.

Protection of E.H.T. Overhead Lines against Lightning.

H. M. Lacey.

Object of this paper is to present, as briefly and simply as possible, the available knowledge relating to the protection of overhead lines, and of apparatus connected to overhead lines, against the effects of lightning.

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Aeronautica Nacional al Servicio del Pais:

Republica Argentina Secretaria de Aeronautica de la Nacion, Buenos Aires, 1948. 345 pp., illus., paper.

Alcoa Structural Handbook:

Aluminum Company of America, Pittsburgh, Pa., 1945. 215 pp., illus., fabrikoid.

Alternating-Current Circuit Theory:

Myril B. Reed. New York, Harper, 1948. 603 pp., illus., cloth

Atomic Energy; being the Norman Wait Harris Lectures delivered at Northwestern University:

Karl K. Darrow. New York, Wiley, 1948. 80 pp., illus., cloth.

Combustion Engineering; a Reference Book on Fuel Burning and Steam Generation:

Otto de Lorenzi, editor. New York, Combustion Engineering Company, 1947. illus., cloth.

Diesel Engine Design, 5th ed:

H. F. P. Purday. London, Constable, 1948. 545 pp., illus., cloth.

Fan Engineering; an Engineer's Handbook on Air, its Movement and Distribution in Air Conditioning, Combustion, Conveying and other Applications employing Fans, 5th ed:

Richard D. Madison, editor. Buffalo, Buffalo Forge Company, 1948. 808 pp., illus., leather.

Fatigue des Metaux, 3rd ed.:

R. Cazaud. Paris, Dunod, 1948. 318 pp., illus., paper.

Introduction to Highway Engineering; a Textbook for Students of Civil Engineering, 5th ed.:

John H. Bateman. New York, Wiley, 1948. 538 pp., illus., cloth.

Machine Tool and Engineering Exhibition, London, 1948:

Machine Tool Trades Association. London, Machinery Publishing Company. 1948. 432 pp., illus., paper.

Nature of Patentable Invention; its Attributes and Definition, 2nd ed.:

John E. R. Hayes. Cambridge, Mass., Addison-Wesley, 1948. 187 pp., cloth.

Public Health Engineering; a Textbook of the Principles of Environmental Sanitation, Volume I—Air Contact and Water Contact:

Earle B. Phelps and others. New York, Wiley, 1948. 655 pp., illus., cloth.

Symposium on Internal Stresses in Metals and Alloys:

Institute of Metals, London, 1948. 485 pp., illus., fabrikoid. (Institute of Metals Monograph and Report Series No. 5).

Year Book of the Heating and Ventilating Industry, 1948:

Technitrade Journals, London, 1948. 206 pp., illus., cloth.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

Canadian Institute of Mining and Metallurgy and the Mining Society of Nova Scotia:

Transactions, Volume 50, 1947.

Institution of the Rubber Industry:

Annual Report on the Progress of Rubber Technology, Volume 11, 1947.

U.S. Highway Research Board:

Proceedings of the 27th Annual Meeting, 1947.

TECHNICAL BULLETINS, ETC.

Engineering Societies Library. Bibliographies:

No. 1—Filing Systems for Engineering Offices; a Selected List of References.

Forest Products Research Society. Preprints:

Application of Dielectric Heating to the Seasoning of Wood, D. G. Miller.—Studies on the Chemical Composition of Bark and its Utilization for Structural Boards, L. P. Clermont and H. Schwartz.

Illinois. State Water Survey. Bulletin:

No. 38—Hydrology of Five Illinois Water Supply Reservoirs, Wyndham J. Roberts, editor.

Institution of Mechanical Engineers. Advance Copy:

Preliminary Report of Developments in Interrupted Surface Finishes, L. S. Martz.

International Civil Aviation Organization. Publications:

Abbreviations of Place Names (Doc 4937 COM/502). — Abbreviations of Place Names, Supplement No. 1 (Doc 4937 COM/502 Supplement No. 1). — Airport Economics (Circular 3-AT/1). — Crash Fire and Rescue Equipment at Aerodromes (Circular4-AN/3). —ICAO Regional Manual Amendments No. 18, August 15, 1948, and 19, September 1, 1948. — Resolutions and Recommendations of the Second Assembly, June 1-21, 1948 (A2-P/37 21/6/48). — U.S.A. Omni Range Improvements (Circular 5-AN/4).

Manitoba. Dept. of Mines and Natural Resources. Mines Branch. Bulletin:

No. 48-1—Peat Moss in Manitoba, E. Lee Cameron.

...Preliminary Report:

No. 47-7—Geology of the Pembina Valley, Deadhorse Creek Area, W. M. Tovell.

National Research Council. Information for the Press. Release:

No. 12—Dominion Standard Pound.

Princeton University. Industrial Relations Section. Selected References:

No. 23—Handicapped Worker in Industry.

Queen's University. Dept. of Industrial Relations. Bulletin:

No. 12—Seniority Problems Arising in the Administration of Seniority Regulations.

U.K. National Physical Laboratory. Publications:

Inclusion of Equivalent Metric Values in Scientific Papers.

U.S. Bureau of Standards. Building Materials and Structures Report:

No. BMS112—Properties of Some Lightweight-Aggregate Concretes with and without an Air-Entraining Admixture, Perry H. Petersen.

University of Connecticut. Engineering Experiment Station. Publications:

No. 3—Some Aspects of Heat Absorption by a Ground Coil, Charles H. Coogan, Jr.

STANDARDS, SPECIFICATIONS, ETC.

American Standards Association. Standards:

ASA C57.10-1948 — C57.18-1948, C57.22-1948, C57.23-1948, C57.28-1948, C57.31-1948 — C57.36-1948 — American Standards for Transformers, Regulators, and Reactors.

American Welding Society. Rules:

D3.3-48 — Rules for Welding Piping in Marine Construction.

British Standards Institution. Standards:

BS 138:1948 — Portable Fire Extinguishers of the Water Type (Soda Acid). —BS 740: Part 1: 1948 — Portable Fire Extinguishers of the Foam Type. — BS 1170: 1947 — Treatment of Water for Marine Boilers. — BS 1377: 1948 — Methods of Test for Soil Classification and Compaction. — BS 1382: 1948 — Portable Fire Extinguishers of the Water Type (Gas Pressure). — BS 1441: 1948 — Galvanized High Tensile Steel Wire for Armouring Submarine Cables. — BS 1442: 1948 — Galvanized Mild Steel Wire for Armouring Cables. — BS 1452: 1948 — Grey Iron Castings.

...Code of Practice:

CP(B)769 — Telephones and Telegraphs, Public Services. — CP(B)773 — Cork Tile Flooring. — CP(B)775 — Rubber Flooring (Tentative). — CP(B)776 — Cement Rubber Latex Flooring.

Canadian Standards Association. Specifications:

CSA B97-1948 — Specifications for Limits and Fits for Engineering and Manufacturing.

PAMPHLETS, ETC.

Difficulties Young Men Contend With; a Suggested Program in Support of Post-College Engineering Training:

Clarence E. Davies. Evanston, Ill., American Society for Engineering Education, 1948.

Handbook of Scientific and Technical Societies and Institutions of Canada:

S. J. Cook and J. R. Kohr. Ottawa, National Research Council, 1948.

Heat Convection from Finned Tubes:

E. Harrison. Manchester, Emmott, 1948. (Mechanical World Monographs No. 46).

High Speed Ball Bearing Lubrication:

Texas Company, New York, 1948. (Lubrication, volume 34, number 9, Sept. 1948).

Role of Ceramic Products in our Engineering Economy:

John D. Sullivan. Columbus, Ohio, Battelle Memorial Institute, 1948.

Use of Wood for Heating Logging Camps:

J. H. Jenkins. Montreal, Canadian Pulp and Paper Association, 1948.

Widening Uses for Wood Waste:

T. A. McElhanney. Montreal, Canadian Pulp and Paper Association, 1948.

LIBRARY REGULATIONS

Hours

	Oct-May	June-Sept
Mon-Fri	9–6	9–5
Thurs (Oct-Mar)	9–8	9–5
Sat (closed Jy-Aug)	9–12	9–12

Bibliographies and Extensive Literary Searches

Short subject bibliographies will be compiled on request.

Extensive searches will be made at a charge per hour of $1.50 to members, and $2.50 to non-members.

Indicate which required
Be specific

Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

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

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

A.S.T.M. STANDARDS INCLUDING TENTATIVES, 1947 Supplement, 5 Parts.

Part I-A, Ferrous Metals, 403 pp.
Part I-B, Non-Ferrous Metals, 319 pp.
Part II, Nonmetallic Materials—Constructional, 463 pp.
Part III-A, Nonmetallic Materials—Fuels, Petroleum, Aromatic Hydrocarbons, Soaps, Water, Textiles, 437 pp.
Part III-B, Nonmetallic Materials—Electrical Insulation, Plastics, Rubber, Paper, Shipping Containers, Adhesives, 305 pp.

American Society for Testing Materials; 1916 Race St., Philadelphia, Pa., 1947-1948. illus., diagrs., charts, maps, tables, 9 x 6 in., paper, $4.00 each.

These supplements give in their latest approved form some 330 specifications, tests, and definitions which were either issued for the first time in 1947 or revised since their appearance in the 1946 Book. The five separate parts correspond to the division of the triennially published complete Book of A.S.T.M. Standards: ferrous metals; non-ferrous metals; nonmetallic materials constructional; and two parts covering other nonmetallic materials, such as fuels, soaps, textiles, insulation, plastics, rubber, paper, etc.

BRITISH STANDARDS INSTITUTION. STANDARDS:

London, The Institution, 1948.

BS 381C: 1948 — British Standard Colour Card for Ready Mixed Paints.

Provides range of ninety-three colours. Large size specimen cards of each colour will soon be available from the Institution.

BS 720: 1948 — British Standard for Calibration of Carburettor Jets.

Applied to jets for all types of engines. Maximum fuel flow dealt with is 15,000 miles per minute. Defines and describes standard reference jets.

BS 904: 1948 — British Standard for Instrument Jewels.

Includes three types of compass jewels, and V-jewels, ring stones and end stones.

BS 1170: 1947 — British Standard for Treatment of Water for Marine Boilers.

Stresses need for training in control of treatment by testing. Deals with maintenance of boiler plant at full availability. Principles of chemical treatment are explained. Appendices give specifications for chemicals and reagents, detailed accounts of testing, methods recommended, and other data.

BROADCAST OPERATORS' HANDBOOK:

Harold E. Ennes. N.Y., Rider, 1947. 265 pp., illus., 8¾ x 5¾ in., cloth, $3.30.

This book covers the engineering development of broadcast equipment and its practical operation. The first four parts of the book cover operating practice in control rooms, the master control, remote controls, and the transmitter. The fifth and sixth sections discuss technical data for operators and technicians, including comprehensive preventive maintenance instructions; operational data for transmitter meters and indicators are included in the appendix, which is followed by a bibliography and index.

CONSTRUCTIVE LABOUR RELATIONS; EXPERIENCE IN FOUR FIRMS:

R. A. Lester and E. A. Robie. Princeton, N.J., Princeton University, Industrial Relations Section, 1948. (Research Report No. 75). 115 pp., 9¼ x 6 in., paper, $2.00.

The purpose of this report is an intensive study of a number of specific operating situations in which union-management relations were considered to be successful. Four companies, representing four different industries, are discussed in relation to the union with which each is associated. In each case the factors considered are labour relations in general, economic factors, company organization and administration, union organization and administration, and union-management relations.

DIESEL ENGINEERING HANDBOOK, rev. ed., 1946-47:

L. H. Morrison, editor. N.Y., Diesel Publications, 1947. 962 pp., illus., 9½ x 6 in., fabrikoid, $8.00 (in Canada).

The book opens with a discussion of the principles of combustion in general, going on to the evolution of diesel engines and descriptions of the various types of diesel engines. A chapter is devoted to each part of the engine, with detailed descriptions of its functions and operation. The last chapter is devoted to an outline of engineering fundamentals for diesel operators. There are many detailed illustrations.

FLOW THROUGH STANDARD NOZZLES, ORIFICE PLATES AND VENTURI TUBES:

J. R. Finniecome. Manchester, Emmott, 1948. (Mechanical World Monographs No. 39). 84 pp., illus., 7½ x 5 in., paper, 3/-.

This booklet is a survey of the general theory and test data relating to the rounded nozzle, the sharp-edged thin plate orifice, and standard types of venturi tubes. General formulae, standard dimensions, standard measuring devices and other such data are given, as well as information on such factors as the compressibility of air and steam; the variation of the critical pressure ratio for nozzles, etc. Formulae and graphs on the flow through measuring devices; graphs on kinematic viscosity; and charts on the Reynolds Number of air, steam, and water flowing in pipes, are included. Numerous charts and graphs are used throughout.

INCOMES OF PROFESSIONAL ENGINEERS IN PUBLIC EMPLOYMENT:

Arthur Richards. Chicago, American Association of Engineers, 1947. 24 pp., illus., 8½ x 5½ in., paper, $1.00.

The purpose of this pamphlet is to assist engineers and their employers in arriving at just agreements regarding salaries of engineers. Some of the subjects discussed are a classification of engineering positions; suggestions for beginning salaries; a comparison of salary increases to the cost of living; the salaries in different types of organizations. Illustrations and charts are used.

INTERNATIONAL CIVIL AVIATION ORGANIZATION. PUBLICATIONS:

Montreal, ICAO, 1948.

Air Mail Study (Doc 5348-AT/654). *50c.*

The purchaser of the air mail service rendered by an airline is invariably a government agency, and for that reason the airline, even if privately owned, becomes in a sense a government instrumentality; this raises a number of special problems in the international field, which are discussed here.

Final Report of the Personnel Licensing Division, Third Session. (Doc 5408-PEL/535). *50c.*

Gives a report on working arrangements; and recommendations for international standards and recommended practices. Discusses licences for pilots in all capacities, and other flight crew members.

Minutes and Documents of the Legal Committee, First Session (Doc 4635-LC/71). *75c.*

Includes the constitution of the Legal Committee, a summary of the documentation submitted at the first session, and the proposed agenda for the first session, as well as the minutes and documents of the meetings.

LITERATURE SEARCH ON THE SOLVENT EXTRACTION OF OLEAGINOUS MATERIALS, WITH ADDITIONAL REFERENCE TO BY-PRODUCTS FROM THE SOLVENT EXTRACTION OF PEANUTS:

B. H. Weil, Marjorie Bolen, and Nathan Sugarman. Atlanta, Georgia School of Technology, 1948. (Special Report No. 26). 190 pp., 8¾ x 5½ in., fabrikoid, $4.00.

This bibliography on the solvent extraction of oil from oily materials, and primarily from oilseeds, was prepared in an effort to gather together an indexed, annotated, expanded bibliography of the pertinent literature. The references included deal with the preparation of the seeds for extraction, solvents used, processes and apparatus involved, methods for separation of the various constituents following extraction, and uses of by-products from the process.

RADIO AMATEUR'S BEAM POINTER GUIDE:

John F. Rider, N.Y., 1948. 30 pp., illus., 11 x 8½ in., paper, $1.00.

This is a book of tables which show the direction — in degrees clockwise from the north—that an antenna should be oriented so that the radiated beam will go to any location on the earth. The tables are for nineteen cities in the United States and three foreign cities, but they can be used practically in any location in the United States. Detailed explanation of the tables is given.

RUBBER IN TEXTILE FACTORIES:

Colin Macbeth. London, British Rubber Development Board, 1948. 135 pp., illus., 8½ x 5¼ in., paper, apply.

This book deals with power transmission in textile factories, but what is said applies to any works wherein power is used. Some of the subjects treated are solid woven, cord constructed and accessory belts in cotton mills; V belt drives and vulcanised joints for belts; rubber in bleaching, printing, dyeing, and finishing of piece goods; its use in factories dealing with yarns in hank form; the manufacture of various utensils and garments, buckets, jugs, ladles, boots, and sheet rubber, as well as rubber bonded metal.

The following notes on new books appear here through the courtesy of The Engineering Societies Library of New York. The books are available at the Institute Library.

APPLIED PLASTIC PRODUCT DESIGN.

R. L. Davis and R. D. Beck. Prentice-Hall, Inc., New York, 1946. 285 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.00.

Special design considerations are emphasized in this outline of fundamentals for those who wish to take full advantage of the possibilities. Mold practice, thread formation, inserts, decoration of molded parts, extrusion methods, laminated parts, and parts made from sheets, rods, and tubes are dealt with in separate chapters. Economic aspects and the properties of plastics are briefly discussed, and there is a glossary of technical words.

BATTLEFRONTS OF INDUSTRY, Westinghouse in World War II.

D. O. Woodbury. John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London, 1948. 342 pp., illus., 9¼ x 6 in., cloth, $3.50.

This book which shows how American industry worked during the last war is primarily the story of Westinghouse's contributions. Such products as electric torpedoes, jet propulsion units, and atom bomb manufacturing equipment are considered. Two chapters on fissionable materials are included.

DIARY AND SUNDRY OBSERVATIONS OF THOMAS ALVA EDISON.

Edited by D. D. Runes. Philosophical Library, 15 East 40th St., New York, 1948. 247 pp., illus., 9 x 5½ in., cloth, $4.75.

Presents some of Edison's social and philosophical views by including a section of his diary of 1885 and other selections from his writings during the period 1921-1930. These include Edison's comments on the social effect of some of his inventions such as motion pictures and the phonograph and on such general topics as prevention of war, life after death, music, and education. The editor does not indicate the source of the material.

HEATING, VENTILATING, AIR CONDITIONING GUIDE 1948, 26th Edition.

American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York, 1948. 1280 pp., plus Roll of Membership, 144 pp., illus., diagrs., charts, maps, tables, 9¼ x 6 in., fabrikoid, $7.50.

This standard manual constitutes both a textbook and handbook on the design and specification of heating, ventilating and air conditioning systems. The technical data section has been substantially revised to include present knowledge and engineering practice. A new chapter on corrosion and water-formed deposits, their cause and prevention, has been added. In the catalog section 230 manufacturers are represented. A convenient cross-index provides access to the more than 900 pages of technical information.

INTRODUCTION TO COLOR.

R. M. Evans. John Wiley & Sons, New York; Chapman & Hall, London, 1948. 340 pp., coloured plates, diagrs. charts, tables, 9¾ x 7 in., linen, $6.00.

This book covers the combined effects of the physical properties of light, the properties of vision itself, and the action of the mind in interpreting colour. It is a completely non-mathematical text, and only a knowledge of the first principles of physics and psychology is assumed. There are sections which are of interest to photographers, artists, designers, engineers, and manufacturers of paints, textiles and coloured papers. The technical data are presented mainly in the form of graphs for more effective use.

QUALITY CONTROL.

N. L. Enrick. Industrial Press, New York; Machinery Publishing Co., Ltd., National House, West St., Brighton 1, England, 1948. 122 pp., diagrs., charts, tables, 9¼ x 6 in., fabrikoid, $3.00 (38c postage to Canada).

This book intended for the practical man explains statistical quality control in generally understandable terms. The author has confined himself to the essential methods and has purposely omitted all unnecessary refinements and formulas. The two concluding chapters show where and how statistics and probability enter into modern inspection.

REINFORCED CONCRETE DESIGNER'S HANDBOOK.

C. E. Reynolds. 4th ed. Concrete Publications, Ltd., 14 Dartmouth St., London, S.W.1, 1948. 351 pp., charts, tables, 9¾ x 6½ in., cloth, 15s.

Of interest to the designer and engineer, this volume considers the factors of design of reinforced concrete structures and describes numerous applications. Loads and pressures; calculations of bending moments and forces generally, and with reference to particular structures; and determination of stresses and the design of members are considered. No attempt is made to deal with construction except in so far as the work on the site affects that of the designer. The procedures recommended are in agreement with the 1948 British Standard code of practice for reinforced concrete buildings.

ROTARY VALVE ENGINES.

M. C. I. Hunter. John Wiley & Sons, New York, 1946. 216 pp., illus., diagrs., charts, tables, 8½ x 5¼ in., cloth, $5.00.

This book, now available from an American publisher, is a reprinting of a British book previously reviewed as follows: The author describes the general principles and applications of the rotary valve in detail, and draws comparisons between it and the poppet valve for use on internal-combustion engines. The development of the rotary valve up to the present time is also discussed with descriptions of various rotary and semi-rotary systems applied to various types of old and modern engines—steam, gas, and gasoline. A brief final chapter presents the author's conjectures on the future development of the rotary valve.

SUBSTRUCTURE ANALYSIS AND DESIGN.

P. Andersen. Irwin-Farnham Publishing Company, Chicago, Illinois, 1948. 305 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.50.

Emphasizing solutions to the problems of the designing engineer, this text deals exclusively with the analyses and designs of those portions of a structure which are located below the surface of the ground, water, or both. The first chapters are devoted to methods for evaluating lateral earth pressures with direct applications of these theories to the design of flexible bulkheads. The material on soil bearing power deals with allowable soil pressures. Another chapter discusses the current practice in footing design. Piles and groups of piles are considered at length. The last seven chapters present specialized phases of substructure analysis, extending into the fields of pier, dock and breakwater design.

SURVEY OF PERSONNEL PRACTICES IN LOS ANGELES COUNTY as of August 1, 1947, Bulletin No. 14.

Compiled by R. O. Sensor and M. F. Martin. California Institute of Technology, Industrial Relations Section, Pasadena 4, California. 45 pp., tables, 11 x 8½ in., paper, $2.50.

This condensed study covers work schedules, premium pay, incentive pay plans, wage schedules, job evaluation plans, holiday pay, shift differentials, and union representation. The information is presented in the form of detailed tables, and directions for the effective use of the data are given in the introduction.

SYMPOSIUM ON LOAD TESTS OF BEARING CAPACITY OF SOILS

(Special Technical Publication No. 79). 50th Annual Meeting, American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 1948. 148 pp., illus., diagrs., charts, tables, 9 x 6 in., paper, $3.00; to A.S.T.M. members, $2.25.

This volume is a compilation of recent information on the subject of load tests. The seven papers presented deal with applications of load test results to airport pavements and runways, pavement design, and cyclic load-test procedure. There are illustrations and much discussion. Also included is a bibliography of 76 references in addition to author's references.

Although the following new books are not available in the Institute's library, inquiries concerning them may be directed to the library or to the publishers.

ARGONARC WELDING (Collected Papers on Argonarc Welding presented to the LM.3 Committee on Fusion Welding of Magnesium-rich Alloys).

British Welding Research Association, 29 Park Crescent, London, W.1, May, 1947. 44 pp., illus., diagrs., charts, tables, 11 x 8½ in., paper, 7s. 6d.

The four papers collected in this publication give the results of certain investigations on the welding of magnesium alloys using the inert gas, argon, for shielding the arc. Diagram and tabular data are effectively used to illustrate and supplement the text.

AUDEL'S HOUSE HEATING GUIDE including Ventilating and Air Conditioning.

F. D. Graham. Theo. Audel & Co., 49 West 23rd St., New York, 1948. 966 pp., illus., diagrs., charts, tables, 6¾ x 4¾ in., fabrikoid, $4.00.

In simple question and answer style this manual covers in detail all aspects of operation, control and maintenance. Over 900 diagrams and photographs illustrate not only such mechanical characteristics sa internal constructions, piping, covering, etc., but also an elementary treatment of the thermal physics of water, steam and air. The book is designed to provide self-instruction for the house owner, building superintendent, maintenance man, and practical engineer. (*Continued on page 565*)

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

October 20th, 1948

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

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

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

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

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

The Council will consider the applications herein described at the November meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

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

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

FOR ADMISSION

BILODEAU—RODRIGUE JACQUES, of Toronto, Ont. Born at Bienville, Que., April 23, 1921. Educ.: B.Eng., (Mech.), McGill, 1948; R.P.E., Quebec; 1941-42, dftsman., Davie Shipbuilding & Reprg. Co., Ltd., Lauzon, Levis, Que.; 1948 (May) to date, sales engr., Toronto dist., Canadian Ingersoll-Rand Co., Ltd., Toronto, Ont.

References: C. N. Danks, G. M. Dick, F. G. Ferrabee, D. C. Crothers, C. A. Robb.

DAVIS—HENRY AUSTIN, of Calgary, Alta. (Lt.-Col., O.B.E., R.E.) Born at Toronto, Ont., May 27, 1904 Graduate, R.M.C., 1926; School of Military Engineering, Chatham, Eng., 1926-28; 1928, asst. engr., Dept. Public Highways, Ontario; 1929-31, Dept. Public Works, India; 1931-39, supt., East Indian Rly., Calcutta, India; 1941-42, asst. dir. transport'n., (Develop'ts. to supply Russia), Persian Railways; 1942-43, asst. dir. of transport'n., Chief Instructor of Tech. Training, rly. troops, India; 1943-44, inspr. genl. of transport'n.; 1945-47, divn. supt. & deputy chief operating supt., (develop't. of post war facilities), East Indian Railway; at present, district inspectr., Board of Transport Commissioners for Canada, Calgary, Alta.

References: G. R. Turner, W. F. M. Bryce, A. W. Haddow, W. L. Saunders, L. F. Grant.

DOBESCH—RICHARD RUDOLPH, of Montreal, Que. Born at Celjo, Austria, July 27, 1918. Educ. B.Sc., (Elect.), Manitoba, 1944; 1942, Dominion Water Power Bureau, hydrographic, (surveys, Dom. Gov't.); 1945, T.C.A., dftsman.; 1944-45 (19 mos.), Elect. Lieut., R.C.N.V.R., radar, elect. mtce. & fire control equipt.; 1945-47, sr. engr., elect. & instrument mtce., Trans Canada Airlines; at present, sales and project engr., T. C. Chown Ltd., Montreal, Que.

References: E. P. Fetherstonhaugh, N. M. Hall, J. T. Dyment, D. R. Taylor.

FORREST—TOM, of Hull, Que. Born at Leicester, Eng., Oct. 16, 1880. Educ.: London Univ., 1897-03; Thames Iron Works & Shpbldg. Co., 1921-23; 1904, asst. engr., Boston & Maine Rly; 1904-05, asst. engr., Ormond & Crook, contractors, on Denver & North Western R.R.; 1906-07, design engr., American Bridge Co., Minneapolis; 1908-20, travelling, mining, surveying occupations; 1920-23, travelling in North West Territories; 1923-25, built & managed The Pas Canoe Co.; 1925-30, private practice in Vancouver & Calgary; 1930-31, topo. dftsman, Manitoba Gov't.. Dept. Mines & Natural Resources; 1932-33, not working; 1934-35, Lac Seul Delimitation Project; 1935-36, Greater Wpg. Sanitary Dist.; 1937-39, private practice in Toronto, structl. work for mining interests; 1939-41, structl. engr., National Research Council; 1941-42, structl. engr., Aluminum Co.; 1944, Dominion Structural Steel Ltd.; 1942-to date, chief structl. engr., (nominally, Associate Research Officer), National Research Council, Ottawa, Ont.

References: J. H. Parkin, W. L. Pugh, S. R. Banks, D. G. Elliot, J. C. D. Taylor.

OLES—JOHN EVERETT, of Montreal, Que. Born at Vancouver, B.C., Jan. 9, 1921. Educ.: B.A.Sc., (Chem. Engrg.), B.C., 1944; 1942 & 1943 (summers), operator, sulphuric acid plant, Consolidated Mining & Smelting; with McColl-Frontenac Oil Co., Ltd., as follows: 1944-46, asst chemist, refinery lab., Toronto; 1946 to date, design engr., refining engr., refining dept., Montreal, Que.

References: G. W. Jarvis, A. G. Farquharson, W. N. McCann, J. N. Finlayson, A. Peebles, E. H. Brooke.

RENSHAW—KENNETH WILLIAM, of Bigras Island, Que. Born at Montreal, Que., Jan. 8, 1920. Educ.: B.Sc., Sir George Williams College, 1948; 1941-46, dftsman., Canadian Marconi Co.; 1946-47, dftsman, Jenkins Bros.; with Howard Smith Paper Mills Ltd., 1947, dftsman., at present, sr. dftsman., working on development of new lignin recovery bldgs., at Windsor Mills and Cornwall, Ont.

References: W. H. Wharton, J. A. Bardsley, W. G. Scott, G. E. Brooker, G. M. McLennan.

SELLARS—SAMUEL WILCOX, of Montreal, Que. Born at Western Bay, N'fld., June 25, 1907. Educ.: B.Sc., (Chem. Engrg.), Queens, 1941; 1940, (summer), experimental work, lab., Stern's, Brantford, Ont.; 1941-43, supvr., Defence Industries Ltd.; 1943-46, res. process engr., British American Oil Co., Ltd.; 1946 to date, engrg. staff, design, layout, contrn., McColl-Frontenac Oil Co., Ltd., Montreal, Que.

References: D. S. Ellis, R. W. Kraft, R. F. A. Smith, G. W. Jarvis, F. A. Davis.

WEEGAR—GRAHAM ROSS, of Montreal, Que. Born at Chesterville, Ont., April 18, 1910. Educ.: B.Sc., (Elect.), Queens, 1933; R.P.E., Quebec; 1933-35, mtce., instlns., etc., elect. dept., Howard Smith Paper Mills, Cornwall, Ont.: 1935-39, associated with Claude Neon Advertising, genl. illumination: 1939 to date, with T. Pringle & Son Ltd., industrial engrs., Montreal; responsible for power and lighting designs and layouts for ind. plants, supervising dftsmen and field engrs., co-op. with mech., structl and arch.depts., writing specifications, etc., also elect. designs for various types of industries in liaison with clients and contractors.

References: G. M. Wynn, A. L. Harkness, E. B. Jublen, H. Weldon, R. B. Jennings, R. N. Coke, A. D. Ross, A. Farquharson.

For transfer from the class of Junior

MACNAUGHTON—JOHN WILLIAM of Quebec. Born at Amherst, Nova Scotia on March 12, 1919. Educ.: B. Eng. (Mech.) McGill, 1941; R.P.E. Que.; with Canadian Car & Foundry Co. Ltd., Mtl. summer work as follows: 1937 machine shop helper; 1938, pattern shop helper; 1939, machinist; 1940, mech. lab. asst.; 1941-46, Canadian Army; 1946-47, Can. Armament Research and Devlopt. Establishment, Armament Asst. Research Scientist, employed as design officer; 1947 chief dftsman, C.A.R.D.E.; 1948, design engr. Royal Can. Artillery, C.A.R.D.E. Quebec. (Jr. 1946).

References: P Gagnon, C. B. Bate, B. O. Baker, J. T. Woolsey, E. D. Gray-Donald, G. Templeman.

For transfer from the class of Student

KORCZ—JOHN W., of Montreal, Que. Born at Smielowice, Poland on July 19th, 1925. Educ.: B.Eng. (Mech.) McGill, 1947; R.P.E. Que.; summer work 1943, bench fitter, apprent. Canadian

Vickers Ltd.; 1944 and 1945, junior jig designer, industrial engrg. div., Fairchild Aircraft Ltd.; 1946, machinist, Can. Car & F'dry.; 1947 mech. engr., now acting plant engr., Dominion Foils (Canada) Ltd., Cap de le Madeleine, Que. (St. 1945).

References: C. A. Robb, E. Brown, R. F. Jamieson, K. J. Dewhirst, R. E. Killam.

L'ECUYER—FERNAND of Montreal. Born at Montreal on March 12, 1924. Educ.: preparation course, 1942-43, Ecole Polytechnique; I.C.S. Mech. Engrg.; 1943-46, mech. dftsman, detail design of structural steel, machine parts, piping and layout work, Dominion Rubber Co. Ltd.; 1946-47, asst. plant engr. designing machines, supervising installns.; 1947-48, tool designer (10 mons.) designing of jigs, dies, machine for production of washing machine Engineering Products of Canada Ltd.; at present, design engr. McGruer, Fortier, Meyers Ltd., Mtl. (St. 1944).

References: F. H. Ross, W. G. Hamilton, C. R. Timm, J. C. Leahey.

LIBRARY NOTES

(*Continued from page 563*)

CHEMICAL ENGINEERING ECONOMICS, 3rd ed.

C. Tyler. McGraw-Hill Book Company, New York, Toronto, London, 1948. 321 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.00.

The purpose of this book is to assist the chemical engineer in dealing with the economic aspects of his work. This thoroughly revised edition contains material from fourteen contributing authors. It considers research, process development, plant location and design, plant operation and control, marketing, and general management. The essential aspects of cost accounting and patent law are also included. An outstanding feature of the chapter on market development and research is a selected bibliography on methods and sources of information.

CHEMICAL FORMULARY, Volume VIII.

Edited H. Bennett. Chemical Publishing Co., Brooklyn, N.Y., 1948. 448 pp., diagrs., tables, 8½ x 5½ in., cloth, 7.00.

This eighth volume contains new formulas which extend and bring up-to-date the first seven volumes. Many German formulas received from the Allied Intelligence Corps, and just released, have been included. Another feature is the enlarged directory of sources of chemicals and supplies.

COPPER AND COPPER ALLOYS.

O. W. Ellis. American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio, 1948. 184 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $3.50.

This series of lectures presented at the 1947 National Metal Congress begins with a short historical development followed by a general consideration of the metallurgy of copper. Succeeding chapters deal with the melting of copper and its alloys, with the complex alloys of copper and zinc, and with complex bronzes and other alloys of copper. Over 100 references, 28 tables and some 50 figures supplement the text.

EFFICIENT USE OF STEAM, written for the Fuel Efficiency Committee of the Ministry of Fuel and Power.

O. Lyle. His Majesty's Stationery Office, London, England, 1947. 912 pp., diagrs., charts, tables, 10 x 6 in., cloth, 15s.

This comprehensive work, a companion volume to the previously published "Efficient Use of Fuel", discusses the design, operation, control and maintenance of equipment for the use of heating, power, and process steam. The necessary minimum of theory is given, accessories are covered in detail, necessary tables and formulas are appended for quick reference, and a detailed index is provided. The book is designed not only for the steam specialist but also for the factory manager and any other non-technically trained persons who are concerned with steam.

ELECTRIC POWER STATIONS, Volume 1, 3rd ed.

T. H. Carr, with a foreword by Sir L. Pearce. Chapman & Hall, Ltd., London, 1947. 513 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, 36s.

The opening chapters deal briefly with the fundamentals of station design and construction. Succeeding chapters give detailed information on the following major topics: circulating water systems; cooling towers; coal-handling plant; ash-handling plant; pipework; turbines; and a large section covering the boiler plant. A bibliography accompanies each chapter.

ELECTRICAL SOIL STERILIZATION BY IMMERSION HEATERS. Technical Report, Reference W/T14.

C. A. Cameron Brown and P. Wakeford. British Electrical and Allied Industries Research Association, 15 Savoy St., London, W.C.2, 1947. 17 pp., illus., diagrs., charts, tables, 11 x 8½ in., paper, 6s.6d.

This report describes an experimental investigation into the conditions governing the sterilization of soil for horticultural purposes by insulated heating tubes. Working details are given of actual sterilizers made up and worked successfully for several seasons.

ETUDE DE L'ETAGE AMPLIFICATEUR A RESISTANCES.

J. Schérer, préface E. Fromy, Dunod, Paris, 1947. 124 pp., diagrs., charts, tables, 9¼ x 6 in., paper, 480 frs.

This study considers analytically and functionally the stages of resistance-coupled amplifiers, taking into account the action and effects of the various included elements. The respective importance of these elements is taken into consideration, and certain approximations are worked out for the simpler aspects of the problems involved.

FRACTURE OF METALS.

M. Gensamer and others. American Welding Society, 33 West 39th St., New York, 1947. 84 pp., 9 x 6 in., paper, $1.00.

This booklet is a summary of review of the literature and direct interviews with outstanding men in the field. It is divided into two parts. Part I includes the original survey of the literature and an analysis of the theories of fracture and applications of principles. Part II considers a selected group of the more important and basic new results of research. In addition to a bibliography of over 300 references, a recommended research program is outlined.

HYDRAULIC MACHINERY.

S. R. Beitler and S. J. Lindahl. Irwin-Farnham Publishing Co., Chicago, Ill., 1947. 217 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $3.50

Based on a course in hydraulic machinery for upper class students in mechanical engineering, this volume describes briefly the theory and practice of a variety of apparatus. Following a review of the fundamentals of the subject are chapters dealing with pipes, meters, weirs, flumes, pumps and turbines. Compressible fluid flow and fluid drives are also considered. Problems are found at the end of each chapter.

METHODS-TIME MEASUREMENT.

H. B. Maynard, G. J. Stegemerten and J. L. Schwab. McGraw-Hill Book Co., New York, Toronto, London, 1948. 292 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $3.75.

In practical language, this manual shows how to develop production standards without the use of the stopwatch, both in the shop and office. It describes the procedure involved in determining the motions required to perform an operation and it shows how to assign predetermined time standards to each limiting motion. Valuable in methods improvement, it enables the methods engineer to handle many types of engineering work with greater facility than ever before.

MICROWAVE TRANSMISSION CIRCUITS. (M.I.T. Radiation Laboratory Series, Vol. 9.)

Edited, G. L. Ragan. McGraw-Hill Book Co., New York, Toronto, London, 1948. 725 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $8.50.

The problems of the transmission of power from one place to another at microwave frequencies are fully discussed from a practical point of view. The elementary theory of operation and the complete design procedure are described for many essential components of transmission lines. Consideration of power-handling capacity, loss, and convenience of use are discussed in relation to the best choice of the type of transmission line for a given application. Methods for extending the frequency range for good operation are also treated.

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

RECENT GRADUATE, preferably civil, with some construction experience required for construction inspection work by large oil company in the west. Work will involve extensive travel and long periods absent from headquarters. This position provides opportunities for advancement. Salary open. Apply to File No. 1005-V.

CIVIL ENGINEER, construction experience, Bailey Bridging in the army preferred, to supervise erection and inspection of Bailey structures on projects in Ontario. Salary open. Apply to File No. 1007-V.

CIVIL ENGINEER with extensive experience in the use and design of Structural Steel. Duties primarily Public Relations with Architects, Engineers and Public Bodies and he will be required to act as Secretary of a Dominion Association. Headquarters Toronto. Salary $4,800 up. Apply to File No. 4201-V.

CIVIL ENGINEER required for South America. Must be single and between the ages of 25 and 40 years. Duties include: Supervise field survey parties doing triangulation and control work, perform drafting and layout work for construction projects as well as miscellaneous minor and major construction projects. Salary $390 U.S. currency. Apply to File No. 4221-V.

ELECTRICAL

RECENT GRADUATE in electrical engineering required by an industrial organization in Montreal. Salary open Apply to File No. 4214-V.

ELECTRICAL ENGINEER recent graduate, required as Assistant Professor in Electrical Engineering and work would be largely supervision of Laboratory classes. Salary $2,500 to start, summers free to take other employment. Location Maritimes. Apply to File No. 4218-V.

ELECTRICAL ENGINEER required by consulting office. Should have at least seven years experience in layouts for substations, switching, and motor distribution. Permanent position and good salary for right man. Location Northern Ontario mining district. Apply to File No. 4220-V.

ELECTRICAL DRAUGHTSMAN required by consulting firm. One capable of making detailed plans and diagrams from preliminary drawings prepared by designers. Work consists of layouts for substations, switching and motor distribution systems. Permanent position. Location Northern Ontario. Salary open. Apply to File No. 4220-V.

ELECTRICAL DISTRIBUTION SUPERVISOR required for South America. Preferably single and 35 years of age or more, with 10 years industrial experience. Duties include direct supervision of all power transmission and distribution lines, transformer stations, lighting installations, etc. Must have ability to direct and lead other skilled personnel. Salary $450 U.S. currency Apply to File No. 4221-V.

* Filled since appearance in Employment Bulletin.

MECHANICAL

MECHANICAL ENGINEERS with 3 to 5 years experience in mechanical design and general plant engineering, as well as field work required by firm in Quebec. Salary open. Apply to File No. 1001-V.

MECHANICAL ENGINEER required by firm in Province of Quebec to work mostly on mill design and layouts of new mill and improvements to others. Salary open. Apply to File No. 1001-V.

MECHANICAL ENGINEER required as assistant Superintendent for small establishment employing 60 men. Must have complete knowledge of machine shop methods in precision work, capable of making accurate estimates machines' times preparatory to bidding. Salary open. Apply to File No. 1002-V.

MECHANICAL ENGINEER, for design and development work, in large Montreal food industry. Must have 5 to 10 years experience, including some structural work. State age and full experience. Salary open. Apply to File No. 1008-V.

MECHANICAL ENGINEER, with considerable experience in all kinds of Brass-Valves (including foundry work) required as Production Manager in Ontario. Must be alert and aggressive. Salary open. Apply to File No. 1009-V.

MECHANICAL ENGINEER with about five years experience in the design of tractors and related accessories required as Automotive Engineer by one of Canada's leading manufacturers of heavy mechanical equipment. Salary open. Apply to File No. 4206-V.

MECHANICAL ENGINEER with at least ten years experience in general mechanical design in heavy engineering required by a large manufacturer in Montreal. Salary open. Apply to File No. 4206-V.

MECHANICAL ENGINEER with a minimum of five years experience in the design of hydraulic turbines, penstocks, surge tanks and associated hydraulic equipment. Required by well established firm in Montreal. Salary open. Apply to File No. 4206-V.

GRADUATE MECHANICAL ENGINEERS required by Canadian University in Montreal for Sessional appointment as Instructors and Demonstrators for seven months from October 1st, 1948. Apply giving qualifications and salary required. Apply to File No. 4207-V.

*MECHANICAL ENGINEER recent graduate, required by a Montreal firm handling heavy construction equipment, for general duties. Salary $225 up. Apply to File No. 4217-V.

JUNIOR MECHANICAL ENGINEER required by Canadian manufacturer in Toronto for general duties. Must be highly competent. Salary open. Apply to File No. 4219-V.

SENIOR MECHANICAL ENGINEER required in Toronto by Canadian manufacturer must have at least twenty years experience and would be responsible for all mechanical work in General Engineering Division. Salary open. Apply to File No. 4219-V.

MINING

MINING ENGINEERS for design and layout work also some field work required by firm in Province of Quebec. Salary open. Apply to File No. 1001-V.

MISCELLANEOUS

SALES ENGINEER required by well known manufacturer's representative, long established, handling electrical and engineering equipment including power and lighting transformers, to take charge of Montreal office. Bilingual preferred. Salary in accordance with experience. Apply to File No. 1006-V.

HEATING AND VENTILATING ENGINEER, graduate, required for Montreal Head Office of a Canadian Company for design, specification, and layout of Air-conditioning, ventilating, fan and duct work for industrial processes, factories, offices, and dust removal collecting systems, etc. Supervision of field installations, testing and making estimates. At least five years experience with the above. Must be familiar with all kinds of heating systems and relative apparatus equipment and with sheet metal, air duct work. Salary open. Apply to File No. 1015-V.

MECHANICAL OR CIVIL ENGINEER with four to five years experience in stress analysis of mechanical and structural equipment required by a large manufacturer in Montreal. Salary open. Apply to File No. 4206-V.

*MECHANICAL OR CHEMICAL ENGINEERS with five to ten years experience on maintenance and engineering in the oil industry required by a manufacturer in Central Ontario. Salary open. Apply to File No. 4208-V.

INSTRUCTORS AND DEMONSTRATORS required by a Canadian University for session beginning September 20th, 1948, particularly in Electrical Engineering and in Engineering Problems and Drawing. Salary open. Apply to File No. 4209-V.

SENIOR STAFF MEMBER required by Canadian University. Must have degree and industrial experience to teach Fluid Mechanics, Internal Combustion Engines, Refrigeration and Heating and Ventilation, all at IV year level. Salary open. Apply to File No. 4210-V.

SALES ENGINEER, mechanical background, required for sales engineering also general duties by a Montreal firm. Must be bilingual. Salary around $300. Apply to File No. 4212-V.

VILLAGE ENGINEER required by Village of Crystal Beach, Ontario. Applicants state qualifications and salary expected. Apply to File No. 4215-V.

SENIOR DRAUGHTSMAN with from 3 to 5 years experience required by an oil company in the Montreal area. Preferably under 35 years of age. Salary $250 to $300 per month. Apply to File No. 4216-V.

DRAUGHTSMAN required by manufacturer in Toronto. Standard draughting training is essential with a minimum of five years of actual paper mill machinery experience in the development and layout of the mill and its equipment. Salary open. Apply to File No. 4219-V.

HYDRAULIC ENGINEER at least 30 years of age with experience in hydraulic turbine design, Pelton Wheel design, hydraulic valve design and preferably with experience in river control required in Toronto by Canadian manufacturer. Salary open. Apply to File No. 4219-V.

GRADUATE ENGINEER with broad experience is required by manufacturer in Toronto must have experience in the design of small and large steam boilers together with their associate equipment, plate work and pressure vessel experience are essentials. Salary open. Apply to File No. 4219-V.

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

CHEMICAL

CHEMICAL ENGINEER with considerable mechanic and hydraulic experience or mechanical engineer with good chemical knowledge and experience in hydraulics, required by a manufacturer in Ontario. Salary open. Apply to File No. 3928-V.

CHEMICAL ENGINEER, recent graduate is needed by a chemical manufacturing firm situated in the Province of Quebec. Some experience in oil refinery, pulp and paper, or synthetic resin manufacture would be useful. Salary open. Apply to File No. 3978-V.

CHEMICAL ENGINEER OR CHEMIST wanted by large manufacturers of bleached sulphate pulp for their Technical and Development Department. Several years of experience preferably in the pulp and paper industry. Mill located in Northern Ontario. Salary open. Apply to File No. 3991-V.

CHEMICAL ENGINEER for technical department of pulp and paper firm in the St. Maurice Valley. Applicant must have supervisory capacity and also be able to undertake investigational work involving the coordination of laboratory experiments and mill operations. Salary open. Apply to File No. 4130-V.

CHEMICAL ENGINEER, recent graduate required for position in Technical Department of a paper manufacturer in Eastern Ontario. Salary open. Apply to File No. 4181-V.

CHEMICAL ENGINEER with around two years experience required by large Pulp and Paper Mill in Province of Quebec Salary $250 per month. Apply to File No. 4199-V.

CIVIL

CIVIL ENGINEER required as Town Engineer of a town in the Maritimes. Required to supervise and layout work for Water and Sewerage Dept., Works Dept., also construction of a general nature for the Electric Light Dept Salary open. Apply to File No. 3930-V.

CIVIL ENGINEER around 30 years of age required as Assistant City Engineer of small city in Province of Quebec. General duties eventually to replace City Manager. Salary $3,000 to $3,600 according to qualifications. Apply to File No. 4144-V.

CIVIL ENGINEER, qualified to take charge of all town services including water and electric (distribution system) utilities required by a Town in Nova Scotia. Population 4,000. Salary open. Apply to File No. 4147-V.

CIVIL ENGINEERS required in Eastern Ontario for employment as designers of service systems for housing and other building projects. Preferably men with at least 10 years experience in that line. Salary according to qualifications. Apply to File No. 4156-V.

CIVIL ENGINEER recent graduate with up to one year's experience since graduation. Preferably single man. Required by Northern Ontario Paper Mill. Salary around $250. Apply to File No. 4158-V.

*CIVIL ENGINEER required for mechanical logging department. Recent graduate, single. Must be prepared to spend major portion of time in field work. Salary open. Apply to File No. 4168-V.

CIVIL ENGINEER required for Consulting Engineer and Land Surveyor's office in Western Ontario. Must be able to make urban and rural surveys, layout of sewers, waterworks and pavements, etc. Will applicants please state qualifications and references. Salary open. Apply to File No. 4204-V.

CIVIL ENGINEER with considerable experience in structural steel and reinforced concrete design. Preferably bilingual. Required in Montreal. Must be veteran with overseas service. Applicant should state age, experience and salary expected. Apply to File No. 4205-V.

ELECTRICAL

PROFESSOR IN ELECTRICAL ENGINEERING required by a Canadian University in the Province of Quebec for fall 1948 semester. Preferably with teaching and practical experience in power, electrical machinery design, lab. etc. Bilingual preferred. Attractive salary available for right man. Apply to File No. 3982-V.

*JUNIOR ELECTRICAL ENGINEER, required by a mining company in northern Ontario. Salary open. Apply File No. 4028-V.

GRADUATE ELECTRICAL ENGINEER required for position with large Northern Ontario Paper Mill. Preferably man with some paper mill or other industrial experience. Salary commensurate with qualifications and experience. Apply stating experience and qualifications to File No. 4032-V.

ELECTRICAL ENGINEER, age 30-40, required as Sales Engineer for Electrical Power Apparatus Company, manufacturing motors, transformers, rectifiers, switchgear, etc. Test course graduate specializing in switchgear preferred. Sales experience desirable but not essential. Location Toronto. Salary open. Apply to File No. 4128-V.

ELECTRICAL DESIGNING DRAUGHTSMEN for work with a firm of consulting engineers in Southern Ontario. Must be experienced. Salary up to $300. Apply to File No. 4133-V.

ELECTRICAL ENGINEER required for Toronto area for engineering and design of power transformers. Salary will be commensurate with ability and experience. Apply to File No. 4141-V.

ELECTRICAL ENGINEER required as Senior Transformer Draughtsman by Canadian Company in Ontario. Must be experienced in layout and design of high voltage power transformers also capable of assuming responsibility. Salary open. Apply to File No. 4146-V.

ELECTRICAL ENGINEER preferably with some experience in paper industry required by large Pulp and Paper Mill to work under Electrical Superintendent. Salary $300 to $350 per month. Apply to File No. 4199-V.

MECHANICAL

MECHANICAL ENGINEER required by a manufacturer in Ontario for the plant operation staff. Salary open. Apply to File No. 3833-V.

MECHANICAL ENGINEER with six to ten years experience in maintenance and engineering work required by alkali manufacturers in Ontario. Salary open. Apply to File No. 3833-V.

RECENT GRADUATES in Mechanical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 3981-V.

MECHANICAL DESIGN DRAUGHTSMAN with experience in re-inforced concrete and structural steel required by a mining company in Northern Ontario. Housing available. Salary open. Apply to File No. 3994-V.

*MECHANICAL ENGINEER required in Ontario by a firm specializing in machine tools. Applicant must be experienced in production control. Salary open. Apply to File No. 4026-V.

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for colliery plant, screening equipment hoists, simple steel structures, etc. Salary $240 up, depending upon ability. Apply to File No. 4030-V.

MECHANICAL ENGINEER wanted for the position of Chief Engineer in large general Mechanical Engineering Plant in the Montreal area. Position covers supervision of mechanical product design also tool and process layout for manufacturing, preparation of estimates, shop drawings, bills of material and ordering of all material for contracts. Salary open. Apply to File No. 4066-V.

MECHANICAL ENGINEER required in Montreal with considerable experience in machine shop practice and some administrative experience in shop work. Applicant should be around 35 years of age and bilingual. Salary depending on qualifications. Apply to File No. 4100-V.

JUNIOR MECHANICAL ENGINEER, age 25 to 27 years, preferably with three to four years experience required for general duties by a textile manufacturing concern near Montreal. Salary open. Apply to File No. 4114-V.

MECHANICAL ENGINEER with at least ten years experience including plant maintenance and preferably in the pulp and paper industry required in New Brunswick. Salary open. Apply to File No. 4117-V.

MECHANICAL ENGINEER with knowledge of design and considerable experience with steam and diesel engines and refrigeration equipment. Required in Montreal. Preferably bilingual. Must be veteran with overseas service. Applicants should state age, experience and salary expected. Apply to File No. 4137-V.

MECHANICAL ENGINEER OR DRAUGHTSMAN with minimum of four or five years experience. Knowledge of paper mill engineering desirable but not essential. Required by large Pulp and Paper Mill for general engineering design and draughting. Salary up to $400 depending on qualifications. Apply to File No. 4138-V.

MECHANICAL ENGINEER, around 35 years of age required as Assistant to Project Engineer on consrtuction of large pulp plant. Experience in design and piping essential. Duties in Montreal and British Columbia. Salary $5,000 to $6,000. Apply to File No. 4149-V.

*MECHANICAL ENGINEER recent graduate required in Engineering and Servicing Department of Canadian Firm with Headquarters in Montreal. Duties include service work in connection with Railway, Pulp Mill and other Industrial Products. Salary open. Apply to File No. 4150-V.

MECHANICAL ENGINEER required for sales engineering by large engineering company. Age 25 to 30 years and preferably veteran. Salary around $275.00. Apply to File No. 4165-V.

MECHANICAL ENGINEER, recent graduate, required for manufacturing and related duties with well established reputable paper company. Salary open. Apply to File No. 4172-V.

*MECHANICAL ENGINEER with three to five years experience required in Montreal by well established paper company for duties involving machine design, plant and general engineering. Salary open. Apply to File No. 4172-V.

*MECHANICAL ENGINEER, recent graduate, with some industrial background required for engineering department of a manufacturer in Central Ontario. Salary open. Apply to File No. 4183-V.

MECHANICAL MAINTENANCE ENGINEER with twelve to fifteen years experience required by Toronto office of Canadian firm. Must be between the ages of 35 and 40 and preferably located in the Toronto area. Salary open. Apply to File No. 4191-V.

MECHANICAL ENGINEER recent graduate, required by a manufacturer of carpenters and mechanics' tools in Province of Quebec. One year training period in United States. Salary $225 Apply to File No. 4202-V.

GRADUATE MECHANICAL ENGINEERS for Sessional appointment as Instructors and Demonstrators for seven months from October 1st, 1948, required by Canadian University in Montreal. Apply giving qualifications and salary required to File No. 4207-V.

METALLURGICAL

METALLURGICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No. 3942-V.

RECENT GRADUATE in Metallurgical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 3981-V.

MINING

MINING ENGINEER with several years experience required by a Company engaged in large scale asbestos production in Quebec. Salary open. Apply to File No. 3935-V.

MISCELLANEOUS

SALES ENGINEER with wide engineering experience, wanted by a company in Toronto for the sale of textile machinery and construction equipment. Salary open. Apply to File No. 3639-V.

STRUCTURAL STEEL DETAILER AND CHECKER with considerable experience required for checking shop details by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

* Filled since appearance in Employment Bulletin.

DETAILER AND DESIGNER for reinforcing steel with considerable experience required by a steel fabricating firm in Montreal. Salary open. Apply to File No. 3740-V.

STRUCTURAL STEEL DRAUGHTSMAN, qualified to detail and check all classes of structural steel and to supervise draughtsmen in a large drawing office on the West Coast. Salary open. Apply to File No. 3777-V.

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open. Apply to File No. 3811-V.

*STRUCTURAL STEEL CHECKER AND ONE DETAIL CHECKER wanted for large fabricating plant in Vancouver, B.C. Age between 30 to 40 years preferred. Must be experienced. Give full information and references. Salary open. Apply to File No. 3862-V.

STRUCTURAL ENGINEER required by a Steel Company in Montreal for the design of reinforced concrete frame. Salary open. Apply to File No. 3931-V.

SALES ENGINEER required by well known manufacturer of mechanical equipment to solicit industrial accounts throughout the Province of Quebec. Applicants must reply giving full details, age, training etc. Salary open. Apply to File No. 3951-V.

JUNIOR ENGINEER, preferably with civil background required for sales and service by a Montreal manufacturer of water-proofing compounds. Salary open Apply to File No. 3968-V.

ARCHITECTURAL DRAUGHTSMAN experienced in industrial building construction, with natural aptitude for design work, wanted by large industry in Eastern Townships. Good salary, permanent position to the right man. Apply to File No. 4031-V.

SENIOR INDUSTRIAL ENGINEER required by Management Consultants in Montreal. Experienced in installations of production and cost control, wage incentives, etc. Free to travel, preferably bilingual. Salary open. Apply to File No. 4052-V.

SALES ENGINEER for popular line of Diesel Engines. Applicants must be specialists on Power Units and Generator Sets, required for permanent employment with well established organization. Apply to File No. 4055-V.

INDUSTRIAL ENGINEER with considerable manufacturing experience between 30 and 40 years of age required for plant surveys in Province of Quebec. Must be fluently bilingual. Permanent position. Salary according to qualifications. Apply to File No. 4064-V.

POWER STATION OPERATOR with about five years' experience principally in operation and maintenance of turbines and mechanical equipment of hydro-electric plants required by public utility in Brazil. Preferably not over 30 and single but will consider married man without minor dependents. Replies held in strictest confidence. Salary open. Apply to File No. 4073-V.

SALES ENGINEER required by well known engineering supply company doing business with Mining and Pulp and Paper companies. Excellent opportunity for advancement. Travelling not extensive. No experience necessary but desirable. Salary open. Apply to File No. 4079-V.

RECENT GRADUATE MECHANICAL OR ELECTRICAL background required by engineering firm in Montreal. Duties include training in Public Utility in Administration Department. Eventually for South America. Salary to start $225. Apply to File No. 4089-V.

JUNIOR ENGINEER preferably with a few years experience in production control and some knowledge of the textile industry required for Montreal area. Salary $250 to $275. Apply to File No. 4092-V.

SENIOR INDUSTRIAL ENGINEER with business administration and mechanical background, bilingual, with at least five years experience in production control, wage incentives and cost control required by an industrial engineering consultant in Montreal. Salary open. Apply to File No. 4092-V.

SENIOR DESIGNER with from five to ten years experience and a general knowledge of structural design in relation to buildings and bridges required by a steel company in Southern Ontario Salary open. Apply to File No. 4093-V.

* Filled since appearance in Employment Bulletin.

JUNIOR ENGINEER with from one to five years experience and at least a working knowledge of structural design of buildings required by a steel company in Southern Ontario. Salary open. Apply to File No. 4093-V.

SALES ENGINEER required by large manufacturer of Air Handling equipment in Toronto area. Applicant should have either industrial or Public Building application and sales experience. Salary open. Apply to File No. 4101-V.

SALES ENGINEER required by Canadian Company in Ontario. Must have thorough knowledge of the preparation of tenders, propositions on Transformers, Motors and Switchgear equipment, also experience in the commercial side of the heavy electrical industry. Salary open. Apply to File No. 4102-V.

MAINTENANCE ENGINEER required in Quebec City to do installation work in heating, ventilating, refrigeration and air-conditioning, gas and diesel motors. Must be bilingual. Salary open. Apply to File No. 4104-V.

JUNIOR ENGINEER required in Quebec City. Preferably with three to five years experience in heating, ventilating and air-conditioning. Salary open. Apply to File No. 4104-V.

DRAUGHTSMEN with some experience in building design or architectural work required by a textile manufacturing concern near Montreal. Salary open Apply to File No. 4114-V.

MECHANICAL OR ELECTRICAL GRADUATE, age aout 35 years with experience in building construction machinery maintenance and repair capable of taking over the engineering and maintenance services in a large textile mill in Provivnce of Quebec. Salary open. Apply to File No. 4114-V.

SALES ENGINEERS, one experienced man also two juniors willing to learn required by an electrical and power house equipment manufacturer in Montreal. Salary open. Apply to File No 4121-V.

RECENT GRADUATE preferably mechanical or civil background required by Maritime branch of large industrial Canadian firm. Duties of general engineering nature. Salary open. Apply to File No. 4125-V.

GRADUATE ENGINEERS required as Assistant Professors, Lecturers and Demonstrators in Civil, Electrical and Mechanical Engineering by a Canadian University. Salaries dependent on experience and general qualifications. Apply to File No. 4127-V.

JUNIOR ENGINEERS required as assistant engineers on construction work at Saint John Harbour. Salary $200 to $250 depending on training and experience. Apply to File No. 4131-V.

MECHANICAL OR CIVIL ENGINEER with shop experience required in Montreal. Duties include design on railway equipment. Salary open. Apply to File No. 4135-V.

GRADUATE ENGINEER with engineering and sales experience required as a Street Lighting Specialist in Toronto area. Position involves direct sales engineering with municipalities and utilities also engineering and production problems directly concerned with the manufacture of street lighting equipment. Age under 35 years. Salary open. Apply to File No. 4141-V.

HEATING AND VENTILATING ENGINEER with considerable experience in mechanical equipment for buildings is wanted for office work on heating, ventilating and air conditioning by a firm of consulting engineers in Montreal Salary open. Apply to File No. 4142-V.

MAINTENANCE ENGINEER, under 30 years of age, required by Public Institution for Montreal area. Duties include maintenance of buildings, heating plants, electric services, etc. Salary open. Apply to File No. 4143-V.

TOWN ENGINEER required for town in Nova Scotia. Applicant must be qualified to take charge of all town services including electric (distribution system) and water utilities. Salary open. Apply to File No. 4145-V.

ENGINEER required in Montreal. Applicant should have railroad construction experience and a knowledge of welding technique also the ability to organize and carry out special track construction jobs. Salary open. Apply to File No. 4157-V.

*CIVIL OR STRUCTURAL ENGINEER, 24 to 35 years, required for Northern Ontario Paper Mill. At least four years experience, 2 of which should be on construction and 2 on design. Opportunity to train junior personnel. Salary not less than $400.00. Apply to File No. 4158-V.

GRADUATE ENGINEER required by Pulp and Paper Mill in Province of Quebec. Must have extensive experience in general maintenance, design and development of pulp and paper mill equipment. Excellent future advancement. Salary $6,000 to $9,000 depending on qualifications. Apply to File No. 4161-V.

STRUCTURAL DRAUGHTSMEN required by Alberta firm. One able to check all classes of structures and tanks. Another able to detail all types of structures and a third able to detail light structures and general handling machinery. Must be experienced. Salary open. Apply to File No. 4167-V.

SALES ENGINEERS, one for Ontario and one for Quebec, required by tool and qualify steel Branch Sales Office. Applicant should have some metallurgical training, some experience in tool and die manufacture, good personality and should own car. Salary open. Apply to File No. 4170-V.

MECHANICAL OR ELECTRICAL ENGINEER, bilingual, experienced in standard investigations and observations. Time study training not necessary. Required by Montreal firm. Salary open. Apply to File No. 4174-V.

GRADUATE ENGINEER required by an oil company in the Maritimes must have sufficient experience in the oil business and the educational qualifications to enable him to determine the specifications of oils required for various industrial machinery. Salary open. Apply to File No. 4178-V.

CONSTRUCTION ENGINEER capable of supervising sundry engineering jobs and pipelines for oil company in the Maritimes. Salary open. Apply to File No. 4178-V.

PLANT MAINTENANCE ENGINEER, mechanical background, extensive experience in pulp and paper preferably Kraft. Required to take charge of Kraft mill maintenance in Province of Queoec. Executive ability. Salary open. Apply to File No. 4179-V.

GRADUATE ENGINEER required for veneer and plywood plant in the Maritimes. Must be fully qualified to assume responsibility for the management, production and general supervision of the plant. Salary open. Apply to File No. 4180-V.

MAINTENANCE MANAGER required for large hospital in the Maritimes for maintenance and operation of power plant, buildings and equipment. Salary open. Apply to File No. 4186-V.

GRADUATE ENGINEER with not less than ten years experience in design and operations of hydraulic turbines, penstock valves and associated power-plant accessories. Position involves mechanical plant layout preparation of specifications, examination of manufacturer's drawings, and inspection of equipment. Location Toronto. Salary open. Apply to File No. 4189-V.

*GRADUATE ENGINEER between 28 to 30 years of age required for the following duties: Stream gauging, surveys, snow surveys, regulation and storage studies, hydraulic computations, power installation and economics. Salary open. Apply to File No. 4192-V.

INDUSTRIAL ENGINEERS with production experience required by a firm of industrial consultants in Montreal. Preferably with experience in time study, cost control, etc. Salary $400 up, according to qualifications. Apply to File No. 4193-V.

RECENT GRADUATE required by a large National Organization. Must have the following qualifications: Good appearance, personality, leadership and Initiative. Salary $2,400. Apply to File No. 4194-V.

GRADUATE ENGINEER, required by manufacturer in Montreal, must be familiar with brake design and operation with particular reference to brake-lining. Salary open. Apply to File No. 4196-V.

RECENT GRADUATES with mechanical or aeronautical background required in Montreal. Salary open. Apply to File No. 4197-V.

SALES ENGINEER, mechanical background, must be thoroughly experienced and capable of developing and maintaining connections of old established firm in road builders, contractors and industrial machinery equipment. Must possess executive ability and have command of the French language. Salary open. Apply to File No. 4203-V.

Situations Wanted

MECHANICAL ENGINEER, M.E.I.C., P. Eng., Ont.; 36, married, now employed on top responsible position, desires position with Airlines, or connected with flying. Man with wide technical experience and knowledge. Pilot since childhood, and ex-instructor in power and glider flying. Speaks several foreign languages, good organizer, knows jet propulsion and safety of flying problems. Available for responsible, serious and permanent position with future on 6 months notice to the present employer. Will give priority for the position with available living quarters near work. Apply to File No. 140-W.

MECHANICAL ENGINEER, Jr.E.I.C., McGill University. Eight years experience Tool and Production Methods Engineer. Age 38. Married. Presently employed. Desires employment as Production Manager or Materials Engineer for large company. Preferably Montreal area. Apply to File No. 551-W.

CIVIL AND MECHANICAL ENGINEER, M.E.I.C., age 42, B.Sc. Civil Graduate work in Industrial Engineering at McGill University. Seventeen years experience in following field: Manufacture of welding rod and hardfacing alloys, installation of incentive bonus systems. Production planning on the manufacture of shells and shell parts. Design and construction of explosive proving equipment. Superintendent during construction of shell filling plants. Other experience covering oil refining, contracting, and installation of pulp and paper mill equipment. Interested in position with responsible firm or partnership with Consultant. Home in Montreal area. Apply to File No. 981-W.

PRODUCTION ENGINEER, M.E.I.C., McGill '33, (Electrical) P.Eng. Age 38, married. Experience includes all phases Production Engineering, Standard Costs, Budgetary Control, Time Study, Method Improvements, Financial Reports, Sales and General Engineering. Desire position pertaining to foregoing fields. Available immediately. Location Quebec or Ontario. Apply to File No. 1186-W.

ELECTRICAL ENGINEER, M.E.I.C., Alberta 1931, P.Eng., Ontario, married. Experience in Engineering Department of large industrial plants and as Field Engineer on various plant and power construction projects. During the war was Sr. Engineer on design of Auxiliary Electrical equipment for Radar units and sub-contract work. Desire permanent position requiring initiative with good future prospects, preferably in Ontario. Apply to file No. 1249-W.

INDUSTRIAL AND CIVIL ENGINEER, M.E.I.C., B.A.Sc., P.Eng., Quebec, age 39, married, fluently bilingual. Seeks position as Industrial Engineer, Executive, Town Engineer, Sales Engineer. Experienced in Motion and Time Study Methods, Process Development, Production Control, Costing, Plant Maintenance, Highway Engineering, Municipal Engineering, Sales. Available on short notice. Apply to File No. 2157-W.

MECHANICAL ENGINEER, Jr.E.I.C., is interested in short term projects, duration one month or more. Location anywhere. Production works, Incentives, Redesign, Surveys, Layouts, Job Evaluation, Methods and Materials Handling. Salary desired $500 per month. Apply to File No. 2338-W.

GRADUATE MECHANICAL ENGINEER, M.Sc.Eng., M.E.I.C., seventeen years of experience in design, development, research and production engineering. Proven executive ability and excellent references. At present employed in Montreal, desires permanent position requiring background, initiative, drive (and languages). Apply to File No. 2502-W.

MECHANICAL ENGINEER, B.Sc. (Queen's), M.E.I.C., P.Eng. Age 33, married. Presently employed Montreal area, is desirous of obtaining position in Ontario. Offers experience in Engineering department management and organization, plant layout, machine design, jigs and tools, sheet metal work and building trades. Available one month's notice. Apply to File No. 2682-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., Que., with more than 25 years experience in reinforced concrete design and construction, interested in position with responsible firm or partnership with consultant would also consider government or municipal position. Apply to File No. 2695-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B. Eng. (Honours), McGill, 1943, P.Eng., Que., desires position in Montreal or Ontario. Willing to travel. Interested in Commercial Aspects and Sales Engineering. Apply to File No. 2727-W.

CHEMICAL ENGINEER, Jr.E.I.C., McGill, age 28, married. Experience includes: control, research, development, production, supervision and sales. Synthetic resins, paints, varnishes, fermentation, detergents, acids, explosives. Organic and inorganic chemistry. Time study. Bilingual. Available immediately. Apply to file No. 2850-W.

ELECTRICAL ENGINEER, M.E.I.C., P. Eng. Graduate '44, age 27, single, presently employed near Montreal. 8 years of engineering experience, machine tool engineering on Batch production. Fabrication and Assembly methods. Production supervision, Research, methods improvement in power transmission equipment. Layout estimating and installation of power apparatus and auxiliaries. Am seeking more exacting and progressive position with expanding organization located anywhere. Apply to File No. 2876-W.

ENGINEER, M.E.I.C., P.E., Queen's '37. Varied experience in Mining and Industrial work; 4½ years with R.C.A.F. as engineer officer. Desires position with progressive firm offering responsibility and opportunity. Interested particularly in mining, manufacturing, and processing of chemicals and industrial minerals. Location in B.C. or Alberta preferable. Apply to File No. 2892-W.

MECHANICAL ENGINEER, Jr.E.I.C., McGill '45, age 24, single. Experienced in tool design and stress analysis also spent one term as demonstrator in Mechanical Engineering, desires permanent position in industry, preferably Montreal area but willing to travel. Available at once. Apply to File No. 2903-W.

GRADUATE ELECTRICAL ENGINEER, McGill '24, M.E.I.C., Prof. Eng., Que.; over 20 years experience in high voltage transmission lines, design and construction. Interested in part time or temporary position in general engineering or transmission line work. Location preferably Montreal or in B.C. At present residing in Montreal area, due to certain physical defects the type of work that can be undertaken is limited. Available at once. Apply to File No 2918-W.

MECHANICAL AND INDUSTRIAL ENGINEER, Ph.D. (Engineering) (London), M.E.I.C., A.M.I. Mech.E., P.Eng., age 36, eleven years' diversified industrial experience, desires position with duties involving: methods studies, research, development, engineering economics, management techniques, advisory service to the Board of Directors and similar. Apply to File No. 2929-W.

CHEMICAL, B.A.Sc., Toronto '46, ex-Signal Corps, age 24. Reliable, diligent, conscientious, aggressive, bilingual. Experience in the rubber, distilling and heavy chemical fields; in such phases as process and product control, design and engineering, and industrial research Presently employed but seeks an opening with a progressive company wherein he will have more scope in engineering work. Apply to File No. 2936-W.

EXECUTIVE ENGINEER, age 43, P.Eng., M.E.I.C., M.C.I.M., with Mechanical, Structural and Mining Engineering Background, desires contract for position in Executive or Management Field. Apply to File No. 2982-W.

CIVIL ENGINEER, M.E.I.C., B.A.Sc., P.Eng. (Ont.). Age 44. Single. Past experience includes administrative, executive and sales engineering in metal products, building materials and sub-contract work in construction industry. Also held responsible position in personnel administration. Desires permanent position requiring initiative with good future prospects. Apply to File No. 2983-W.

MECHANICAL ENGINEER, Jr.E.I.C., B.Eng. (McGill), Master of Commerce, Toronto, '48, age 27, experienced in Aircraft Industry, Petroleum oilfield work on drilling, production, construction and design. Presently situated in West, but would locate anywhere. Apply to File No. 3006-W.

SALES ENGINEER, Jr.E.I.C., graduate B.Sc., textile chemist, age 32 years, married. Four years of lab. research work, five years of technical sales experience in textiles, coated fabrics, yarns, textile machinery, machine tools, plastics and chemicals. Office and plant management experience. Capable of running business office, efficient correspondent, bilingual, drive own car. Apply to File No. 3019-W.

MECHANICAL ENGINEER, Ph.D., (London) A.M.I.M.E., with extensive mechanical and structural experience in Europe and England and post-graduate research in structures at London University. Age 34. Available for employment. Apply to File No. 3021-W.

MINING ENGINEER, M.E.I.C., B.Sc., Queen's '33, P.Eng., Que., married, age 37, eighteen years experience in mining exploration, and development work. Desires work in the Rouyn area of Quebec. Apply to File No. 3022-W.

MECHANICAL ENGINEER, B.Sc. (Eng.), A.M.I., Mech.E., wide experience in the aircraft industry. Presently residing in England, but interested in emigrating to Canada. Employed in Canada during years 1941 to 1945. Would consider any appointment in engineering world to start with the assurance of being able to speedily prove worth and ability. Apply to File No. 3023-W.

CHEMICAL ENGINEER, M.E.I.C., age 35, married, no children, graduate of University of Toronto. Ten years experience supervising production of organic chemicals. Presently employed by old established U.S. firm manufacturing fine organic and inorganic chemicals. Desires responsible position in Canada, preferably Ontario location. Present salary $5,100. Apply to File No. 3031-W.

ENGINEERING EXECUTIVE, A.I.E.E., A.F.R.Ae.S., with outstanding record in England seeks position of scope and responsibility in Canada. First class academic qualifications and exceptional experience at high level in aircraft and precision mechanical engineering fields, comprising design and development, works management, manufacturing methods, production control, administration and sales. Apply to File No. 3033-W.

CHEMICAL ENGINEER, M.E.I.C., B.Sc. (Alberta). Married, age 28. 5 years experience in research and development and statistical quality control. Desires change in position preferably in process control or engineering department of industry. Apply to File No. 3034-W.

MECHANICAL ENGINEER, A.M.Int.C.E., age 38, manager in charge of small works in England designing, building and servicing special agricultural machinery and tractors (crops-spraying), keen to emigrate to suitable administrative position. Well educated, heavy engineering (steam) experience, special ability for craftsman training and selection. Apply to File No. 3039-W.

GRADUATE CIVIL ENGINEER, Jr.E.I.C., Alberta '43, veteran, with experience in construction, purchasing, sales. Desires position of an engineering nature with responsible firm or with consulting engineer. Alberta or B.C. preferred but would accept elsewhere. Available on reasonable notice to present employer. Apply to file No. 3040-W.

CHEMICAL ENGINEER, Jr.E.I.C., B.E. (Chem.), Sask. '44, former P.Eng. (Ont.) and M.C.I.C., married, veteran, with experience in process development, desires position in that field. Engaged in post-graduate study at Mass. Inst. of Technology, leading to degree of S.M. (Chemical Engineering Practice). Available February, 1949. Apply to File No. 3041-W.

GRADUATE MECHANICAL ENGINEER, S.E.I.C., N.S.T.C., '48, desires part time employment in Heating and Ventilation —Ottawa area. Apply to File No. 3042-W.

MECHANICAL ENGINEER, M.E.I.C., Prof. Eng. (Quebec). 15 years of shop practice in maintenance and locomotive repair; 5 years machinery design, including welded vessels, process piping and pulp mill layout. Seeking responsible position, preferably in Montreal area. Available on short notice. Apply to File No. 3045-W.

SENIOR METALLURGIST, M.E.I.C., graduate, age 36. Fifteen years diversified experience in heavy steel mills, production, research and quality control. Practical experience of departmental management. Desires supervisory position of responsibility, preferably with progressive firm. Married, two children. Apply to File No. 3046-W.

PART TIME WORK: Graduate Chemical Engineer, B.Sc. (Chem.Eng), Jr.E.I.C., M.C.I.C. Now doing graduate work in Montreal. In Royal Canadian Engineers since graduation with experience in legal investigations, stores, and works. Desirous of obtaining part time work conducting Technical literary research or other technical work within limitations. Suggest could be useful to small out of city firms desiring advantages of Montreal libraries and Montreal Representative. Apply to File No. 3049-W.

Business & Industrial Briefs

A Digest of Information received by The Editor

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 Landers-Segal Color Company, 78 Delevan Street, Brooklyn 31, N.Y., will furnish, on request, a colour card for their limeproof cement colours. The Company recommends these dry colours for cast stone, cement stucco, terrazzo, cement and lime paints, cement brick and tile, cement floors and sidewalks, ornamental plaster and ready mixed concrete.

●

Webster and Sons Limited, Canada Cement Building, Montreal, has issued a revised specification R.A.I.C. No. 37A & B for Zonolite Insulating Concrete for Structural Roofs and Roof Insulation.

●

International Nickel Company of Canada Limited, 25 King Street West, Toronto 1, Ontario, recently published a bulletin "Nickel Alloy Steel Castings in Industry". An attractive two-colour publication, it deals with uses of these castings in various industrial and construction fields and also covers processing of such castings and selection of alloy compositions.

●

"Pittsburgh" gas unit heaters, Series "C" are illustrated and described in a folder recently published by Automatic Gas Equipment Company, 301 Brushton Avenue, Pittsburgh 21, Pa.

●

Hagan Corporation, 323 Fourth Avenue, Pittsburgh 19, Pa., claims that its engineers have developed a simple method for selecting proper sizes of orifices and flow nozzles for the measurements of liquids, steam or gas flow in pipe lines. The method is described in bulletin T-100-M "Capacity Data for Concentric Orifices & Flow Nozzles" which may be obtained from the Corporation on request.

●

"Applications for Automatic pH recording and Control and Recording Flowmeter" is the title of a new industry data bulletin No. 138 recently compiled by the Bristol Company of Canada Limited, 71-79 Duchess Street, Toronto. The bulletin describes and illustrates applications of pH and flowmeter instruments to operations encountered in many industrial waste disposal plants.

●

"Your Best Booster" is the title of a catalogue recently issued by the New Holland Manufacturing Company, Mountville, Pa. This publication shows the adaptability of the Company's line of belt conveyors and includes specifications as to capacity, speeds, and power requirements.

●

Emmert Mfg. Co., Waynesboro, Pa. has released bulletins 6-48 and 7-48 describing their new stainless steel draughting machines and equipment which are claimed to save up to 50 per cent in draughting time and cost. The machines are said to be adaptable to any size or make of drawing board and can be operated in any position from true horizontal to true vertical.

●

The Young Radiator Company of Racine, Wisconsin, has just published Catalogue No. 6548 to cover the complete line of cabinet unit heaters. These new heaters can be used with either steam or hot water systems and feature attractive cabinet stylings to blend with the appearance of lobbies, vestibules in commercial buildings and similar locations.

●

A new Catalogue No. 49 has just been published by Miniature Precision Bearings Inc., of Keene, New Hampshire. It contains specifications for more than forty types and sizes of standard miniature ball bearings including radial, super-light, pivot, angular contact and thrust bearings—ranging in outside diameter from 2mm. to 5/16 in.

●

Canadian General Electric Company Limited has available a 4-page specification bulletin on the new Cochrane "CBA" high differential, high pressure condensate return systems. In addition to material and operating specifications, capacity ratings are given for the six different sizes available—3, 5, 7½, 10, 15 and 25 hp.—based on a maximum of 200 psi. pressure differential. Differential pressures of from 50 to 200 psi. are listed and capacities for each unit are tabulated after each differential pressure for unit inlet pressures varying from 0-39 psi., 40-99 psi. and for over 100 psi A 2-page dimension drawing in colour shows the design and construction of the new unit. Ask for publication No. 3250-1.

New Equipment and Developments

R. G. LeTourneau Inc., has recently added two new units to their line of earthmoving and material handling equipment.

One is a new small Tournapull prime mover the D-Roadster for use with the company's E-9 Carryall Scraper. It is powered by a 100 hp. Diesel or gas engine and features complete control of all steering and scraper operations by individual electric motors actuated through toggle switches located on the control panel of the prime mover. Further information can be obtained by writing to the Company's offices at Peoria, Illinois.

The other unit is the TH-4 Tournahauler, a vehicle designed for on or off road hauling of heavy length loads such as pipe, timber, steel, etc. It is claimed that in recent tests TH-4 moved 26,000 lb. loads of pipe through mud conditions so severe that the rear wheel hubs were submerged. Details can be obtained from the Longview, Texas, offices of R. G. LeTourneau Inc.

●

The Moto-Flow Company, 138A-23rd Street, Bay City, Michigan, has placed on the market a floor-to-floor conveyor called the "Stair Levayor" which is said to feature simple inexpensive installations, operational ease and adaptability to a wide range of uses and applications. Descriptive literature may be obtained from the Company.

●

Steep Rock Iron Mines Limited, one of North America's biggest producers of high grade iron ore last year established a production record of 1,206,406 tons with a gross value of $7,049,559.00. The annual report of the company for the year ended December 31, 1947, indicates that the company is in a favourable position and that the mine is in better physical condition than ever before.

The report of President D. M. Hogarth reveals plans for expansion and reports that operating efficiency of the Company's properties has been improved to a gratifying degree through improvement in personnel and operating methods and by the acquisition of new equipment.

●

RCA Victor Company Limited has developed a new electronic microammeter which is capable of accurately measuring minute electrical currents down to one billionth of an ampere. The Company's announcement describes this development as of outstanding importance to research and radio activity, television, astronomy and other scientific and industrial projects involving the measurements of faint electrical currents.

●

The English Electric Company of Canada Limited, St. Catharines, Ontario, has announced development of an electric motor which will operate equally well on 25 or 60 cycle current.

The Company believes that this motor will be of great benefit to Ontario taxpayers and Hydro consumers in view of the respective changeover in frequency by the Hydro Electric Power Commission of Ontario. The motors are externally re-connectible from 25 to 60 cycles and cover the Company's range of standard squirrel cage induction motors from 1 to 200 hp. at 220, 440 or 550 volts in all ratings or 2200 volts for larger ratings.

●

An "Ultrasonics Materials Tester" which uses high frequency sound waves to discover and record small flaws in metals has been developed by the General Engineering and Consulting Laboratory of the General Electric Company.

The instrument shoots 1,000,000 cycle-per-second sound waves through the metal to be tested, and simultaneously plots a graph which indicates any flaws in the metal's interior.

●

Eastern Steel Products Limited has announced the completion of a long term Manufacturing and Sales Agreement with Messrs. J. & E. Hall Limited of Dartford, England, to cover the provinces of Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward Island. The British firm is one of the oldest and most progressive engineering firms in England and has been engaged in the refrigerating business since 1877.

Mr. C. A. Davis, who has served J. & E. Hall Limited for twenty years, has joined the Eastern Steel Products organization in Toronto as technical representative of the new Refrigeration Division.

Appointments and Transfers

Canadian General Electric Co. Ltd., announces the appointment of M. T. Graham as manager of the Conduit Products Section at Head Office, Toronto. Mr. Graham will be responsible for the sales of all types of G-E conduit and conduit fittings and other raceway systems.

●

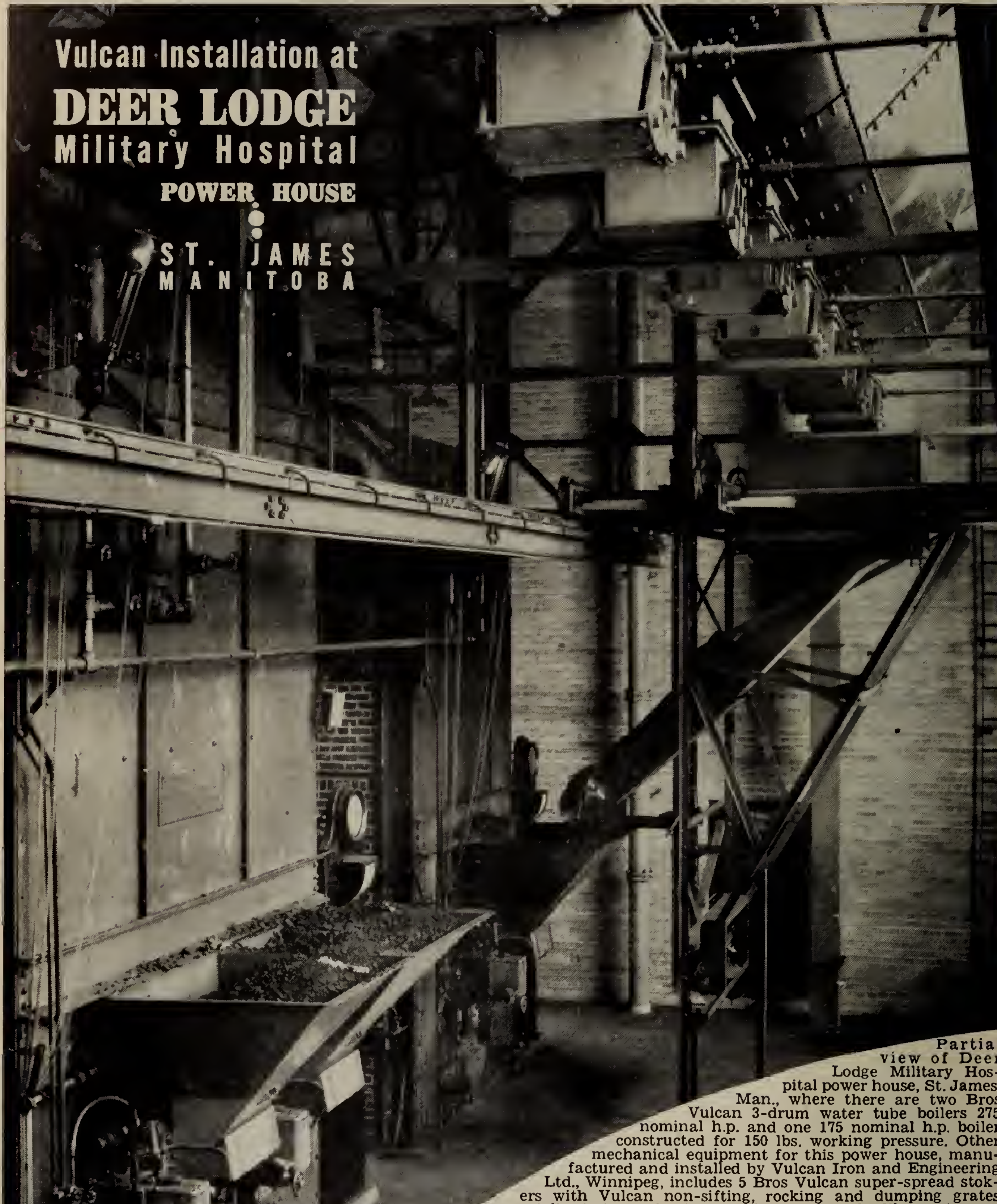
J. A. Bell has been appointed director of purchasing for Canadian General Electric Company, Ltd., succeeding E. K. M. Wedd who has retired. Mr. Bell has been with G.E. since 1925. He joined the Company via the "Test Course" in Schenectady, N.Y.

●

E. W. Miller has been appointed sales engineer in RCA Victor Co. Ltd. Engineering Products Sales Department. Mr. Miller will cover the Province of Quebec and the Ottawa Valley Territory.

●

George W. Ferrier has been appointed Montreal manager of The Bristol Co. of Canada Limited. He will be assisted by Larry E. Henne, who was formerly with Northern Electric Co. Ltd. The Bristol Company manufactures recording, indicating and control instruments and specialized mill supplies.



Partial view of Deer Lodge Military Hospital power house, St. James, Man., where there are two Bros Vulcan 3-drum water tube boilers 275 nominal h.p. and one 175 nominal h.p. boiler constructed for 150 lbs. working pressure. Other mechanical equipment for this power house, manufactured and installed by Vulcan Iron and Engineering Ltd., Winnipeg, includes 5 Bros Vulcan super-spread stokers with Vulcan non-sifting, rocking and dumping grates especially designed for burning low rank fuels. The grates are equipped with power-operated dumping mechanism. The stokers have automatic controls for coal feed and air supply and uptake damper on the boiler. Coal handling equipment consists of vertical elevators, horizontal conveyors, overhead bumpers and electrically operated travelling weight larry.

VULCAN IRON AND ENGINEERING LTD.

Winnipeg **Manitoba**

EST. 1874

IN NEW EQUIPMENT, or for replacement parts, where heavy loads and sudden shocks are factors, specify Nickel Alloy Steel, type 4340.

High hardenability gives "4340" good mechanical properties in heavy sections.

In shovels such as the one illustrated, for example, this nickel-chromium-molybdenum steel is used satisfactorily in dipper handles, boom parts, caterpillar mountings and propelling machinery.

You are invited to write for a recommendation regarding the best type of steel for your application and a suggested source of supply.

HE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED • 25 KING STREET WEST, TORONT

EMBLEM OF INCO SERVICE
TRADE MARK

Dear Sirs, Please advise us concerning the best type of steel for the application named below.

____

Name______________________________________

Address____________________________________

Professional Cards


STELCO
THE MARK OF QUALITY
Manufacturers' Wire
ROUND or SHAPED
to reduce your production costs
Mr. Round
ROUNDS - SQUARES - HALF ROUNDS - SPECIALS
Mr. Square
Mr. Keystone
Mr. Pearshape
HEXAGONS - KEYSTONES - OCTAGONS - PEARSHAPES
FLATS
Whether it's fine or heavy wire ... high or low carbon steel ... special alloys ... most any size ... any shape ... The Steel Company of Canada, Limited can produce it. New wires, in co-ordination with our engineers, can be developed to exact specifications. You are assured of uniform gauge and strength ... trouble-free production, when you purchase Stelco Shaped Wires. They will help solve your manufacturing problems ... Ask our nearest branch office for particulars.
P.S. Stelco Flat Rolled Wire can be supplied in a range of thicknesses and widths from .187 x 3/4" to .010 x 1/16".
Mr. Flat
Mr. Half Round
4819
THE STEEL COMPANY OF CANADA, LIMITED
EXECUTIVE OFFICES
HAMILTON - MONTREAL
STELCO
THE MARK OF QUALITY
SALES OFFICES:
HALIFAX, SAINT JOHN, MONTREAL, OTTAWA, TORONTO, HAMILTON, LONDON, WINDSOR, WINNIPEG, VANCOUVER

What does it take to make "canada's no. 1 roof"?

PLENTY. It takes experience, research, top-grade materials and expert application. Every one of these ingredients, and more, go into your Barrett Specification* Roof. That's why it's known as "Canada's No. 1 Roof".

Experience? Almost 100 years of it are behind the "SPECIFICATION" Roof. Barrett pioneered felt, pitch and gravel construction in 1854. Research? The Barrett research program has contributed more than a score of "firsts" to the roofing business. Materials? "SPECIFICATION" Felt and Pitch are made in Barrett's own plants . . . a guarantee that rigid Barrett standards will be maintained. Application? Only by Barrett Approved Roofers, supervised by Barrett Inspectors.

Barrett* Specification* Roofs

*Reg'd. Trade Mark

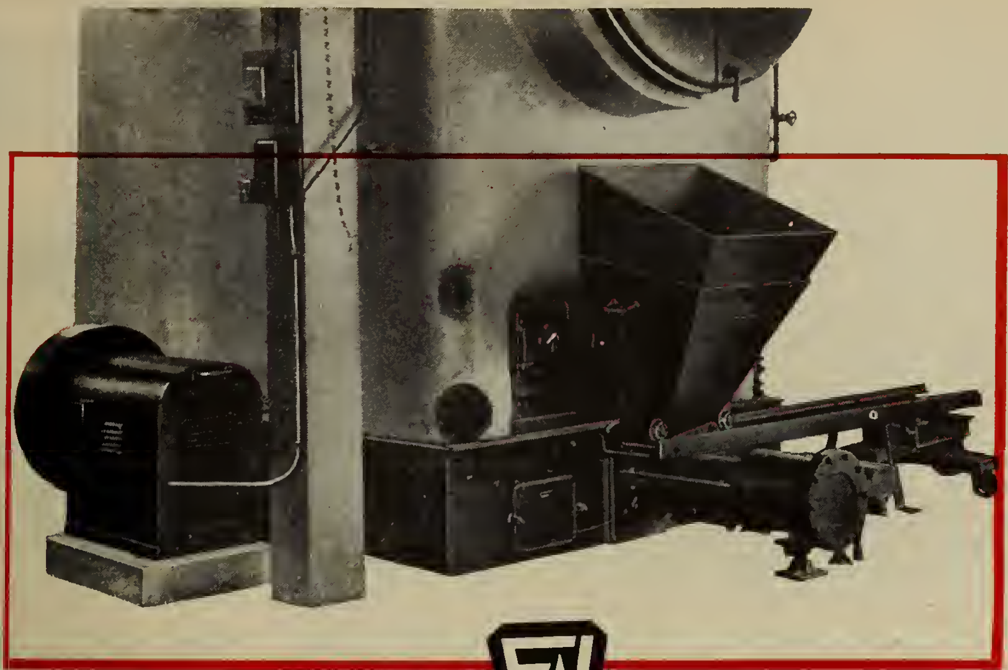
Complete control from raw material to finished product made possible a unique record in the roofing field . . . roofs that consistently outlast their bonded period. First it was Barrett "SPECIFICATION" Roof Job No. 1, the first bonded built-up roof in Canada. That roof outlived its 20-year bond by nine years without maintenance or repair before being removed for sample purposes. Now "SPECIFICATION" Roofs in every Province are equalling or *bettering* the Job No. 1 performance.

Be sure the roof you buy is "Canada's No. 1 Roof". Make it a Barrett "SPECIFICATION" Roof.

THE BARRETT COMPANY, LIMITED

MONTREAL • TORONTO • WINNIPEG • VANCOUVER

"CANADA'S No. 1 ROOF"



JONES UNDERFEED STOKER

has these special advantages

- **RAM TYPE FEED**
  with auxiliary distribution rod and shoes ensures proper coal feeding and distribution in retort with rugged simple moving parts and minimum maintenance.

- **HYDRAULIC DRIVE**
  with automatic ram reversing device eliminates shear pin, provides infinite coal feed variations and allows the power unit (fan, motor and pump) to be located out of the operator's way and away from corrosive ashes and dust.

- **ROLLING HOPPER**
  with jumping type agitator ensures continuity of coal feed and permits filling of the hopper in the coal bin by extension of the track or with a hopper truck as illustrated above.

- **AUTOMATIC OPERATION**
  without manual attention is possible because the hopper agitator ensures coal supply, the ram ensures coal feed without stalling or shear pin breakage and auxiliary distribution rod ensures proper fire condition.

FW *Jones Stokers are available on short delivery in sizes from 100 to 2500 lbs. of coal per hour. Write for further details.*

FOSTER WHEELER LIMITED
ST. CATHARINES

MONTREAL Canada Cement Building
TORONTO Commerce & Transportation Building
WINNIPEG 410 McArthur Building

FW/CS—48—10

Speedaire-driven tumbler in plant of Kaydon Engineering Corp., manufacturers of all types of ball and roller bearings from 4" I D to 120" O D.

The white outline on the photograph indicates the much larger size of standard drive required to do the work of Speedaire.

Dollar saving is 35.3% with SPEEDAIRE

THIS large tumbling barrel runs 24 hours a day, carrying 2,200 pounds of Kaydon bearing rollers.

The Speedaire unit has proven to be the best of several drives tried in this heavy duty service. In addition to giving complete satisfaction, Speedaire saved the company $221.00, a 35.3% saving over the cost of a conventional worm gear unit of equal capacity.

Speedaire is Cleveland's new fan-cooled worm-gear speed reducer. Because it is fan-cooled, Speedaire will do more work—will deliver up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantages of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

For full description, send for Catalog 300. The Cleveland Worm & Gear Co., 3287 East 80th Street, Cleveland 4, O.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Speed Reducers

Arborite

TRADEMARK REGISTERED

Decorative Wallboard

STRONG, PERMANENT, EASY-TO-CLEAN

•

Panels 4′ x 8′ and 2′6″ x 8′

•

In 25 Beautiful Surface Colours and Patterns

Arborite is the ideal wallboard for bathrooms, kitchens, clubs, bars, hotel and theatre lobbies where a water and grease-proof non-staining surface is indicated. Priced right for home or commercial usage. Easy to apply with ordinary tools and methods.

Made in Canada

Sold by building supply and lumber dealers or write

THE ARBORITE COMPANY LIMITED
385 Lafleur Ave., Ville LaSalle,
MONTREAL 32, QUE.

STEEL

...FOR A SPECIFIC JOB

The Vedder River Bridge, rushed to completion at the peak of the British Columbia Flood disaster, is a fine example showing the use of structural steel . . .

...FOR BRIDGES

Our engineers and workmen are well qualified and equipped to fabricate steel to your requirements and specifications. We are prepared for our part in the industrial expansion of Western Canada.

DESIGNERS, FABRICATORS, ERECTORS
OF STRUCTURAL STEEL

WESTERN BRIDGE

AND STEEL FABRICATORS LIMITED

Plant and Office Located at
145 WEST FIRST AVENUE VANCOUVER, B.C.

Exclusive in -

2 EXTRA WIDE BRONZE SEATS
ground to a true ball joint . .

DART UNION CO., LIMITED, TORONTO

HORTON CYLINDRICAL STEEL TANKS

store propane at Brockville

The two 90 in. diam. by 53 ft. tanks shown above are used to store propane in the Brockville, Ont., gas system. The tanks are designed for a working pressure of 200 lbs. per sq. in.

The system supplies 1,339 domestic customers and 61 commercial customers. Approximately 250 gals. of propane per day, or 7,600 gals. per month, are required to fulfill their requirements.

When considering installation of pressure storage tanks write our nearest office for information and tenders.

HORTON STEEL WORKS LIMITED

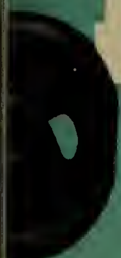
TORONTO, ONT. FORT ERIE, ONT. MONTREAL, QUE.

REPRESENTATIVES
Mumford-Medland Ltd., Winnipeg, Man. - Gordon Russell Ltd., Vancouver, B.C.

In light section gray iron castings

*Nisiloy

improves machinability....



Faster, easier, lower-cost finishing of light section gray iron castings may be attained from the use of Nisiloy—a new, powerful inoculant that promotes better machinability. Nisiloy contains about 60% nickel, 30% silicon with the balance essentially iron. Added to the ladle, this inoculant serves to eliminate localized hard areas or chilled, white edges and surfaces regardless of sharp variations in section thickness.

Get full information. Send for your free copy of a booklet that tells how the dense, gray machinable structure secured with Nisiloy reduces machining time, tool wear, rejects and manufacturing costs. Mail this coupon.

siloy is a trademark of The ernational Nickel Company.

INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED • 25 KING STREET WEST, TORON

EMBLEM OF INCO SERVICE
TRADE MARK

Please send me your booklet entitled "Nisiloy for Gray Iron Castings"

Name..

Company..

Address..

An Oil Seal as Simple as

A RIGID HEEL

provides a positive press fit in the cavity, assuring a leakproof seal at this point.

B FLEXIBLE LIP

an integral part of the seal, is available in a variety of designs to meet a wide range of conditions.

C GARTER SPRING

controls lip pressure to provide most effective sealing and maximum seal life.

• The J-M Clipper Seal has all the virtues of simplicity—plus the practical advantages of superior bearing protection, longer life and ease of installation and removal which only an oil seal of its unique design can provide.

Consisting only of a moulded one-piece body and a garter spring, the Clipper Seal has no metal case. This permits greater bore tolerances. The relatively dense, rigid heel, designed for a press fit in the packing recess, eliminates the need for a cover plate for pressures under 5 psi. The tough, flexible lip is held in light but firm contact with the shaft by the garter spring which causes it to seal with a minimum of friction and wear.

Clipper Seals are recommended for packing against oil, grease, water, air, grit and coolants at temperatures up to 225 F. They are available in sizes from ⅝″ diameter up.

For further details, write Johns-Manville, 199 Bay St., Toronto, Ont.

JOHNS-MANVILLE JM PRODUCTS

1-649

Johns-Manville ***PACKINGS & GASKETS***

Index to Advertisers

The revenue derived from the sale of advertising space assists the Institute in publishing the *Journal* on a regular monthly basis. Listed below are the names of the Companies and Individuals whose advertisements appear in this issue.

OCTOBER 1948

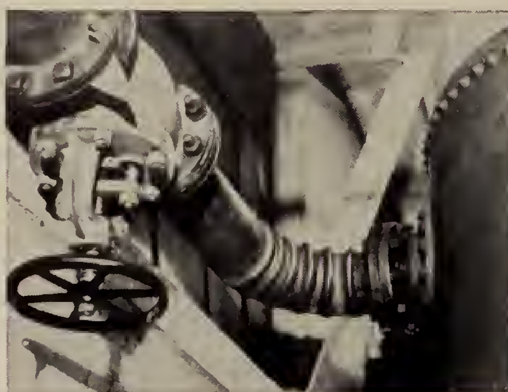
THE ENGINEERING JOURNAL

VOLUME 31 NUMBER 11
NOVEMBER 1948

PUBLISHED MONTHLY BY
THE ENGINEERING INSTITUTE of CANADA

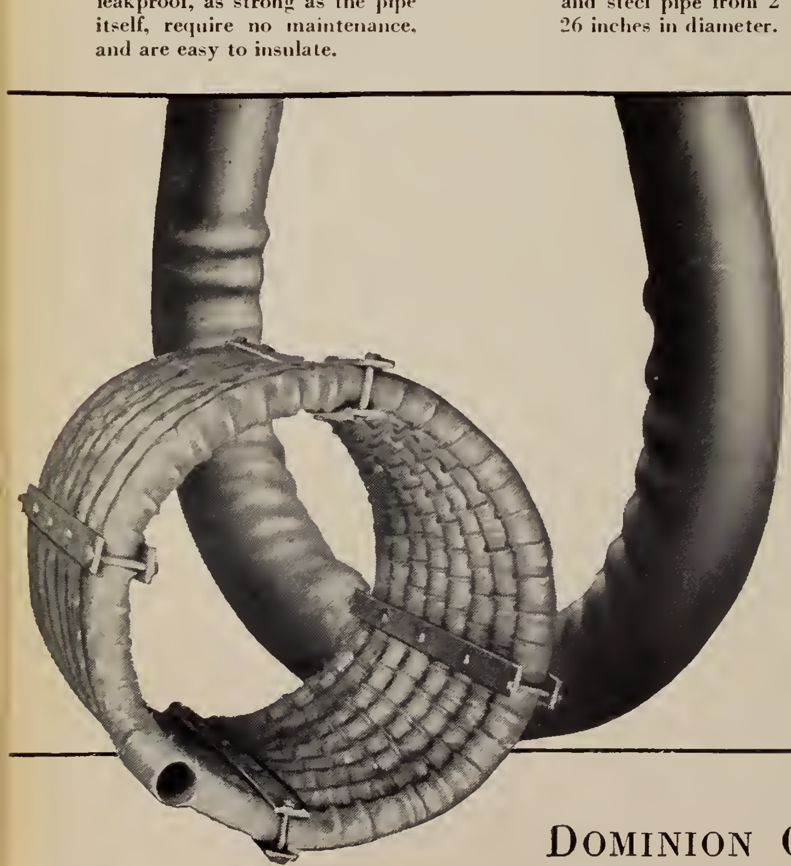
"Tailor-Made" Bends

Where compound bends are required in a continuous section of pipe, wrinkle-bends offer an ideal solution. Wrinkle-bends are leakproof, as strong as the pipe itself, require no maintenance, and are easy to insulate.



This short-radius wrinkle-bend joins a compressed air line to a reservoir. Wrinkle-bends can be made in brass, copper, aluminum, and steel pipe from 2 inches to 26 inches in diameter.

Pipe bends can be made right on the spot with the aid of an oxy-acetylene welding or heating blowpipe, a simple bending rig, and a few common tools. Wrinkle-bending does not reduce the thickness of pipe walls.



This condenser coil made from 2-inch stainless steel pipe has 350 wrinkle-bends.

There are many DOC methods for forming, cutting, joining, and treating metals. DOC engineering service is always on call to help customers with production, construction, and maintenance jobs. Just call the nearest DOC office.

"DOC" is a trade-mark.

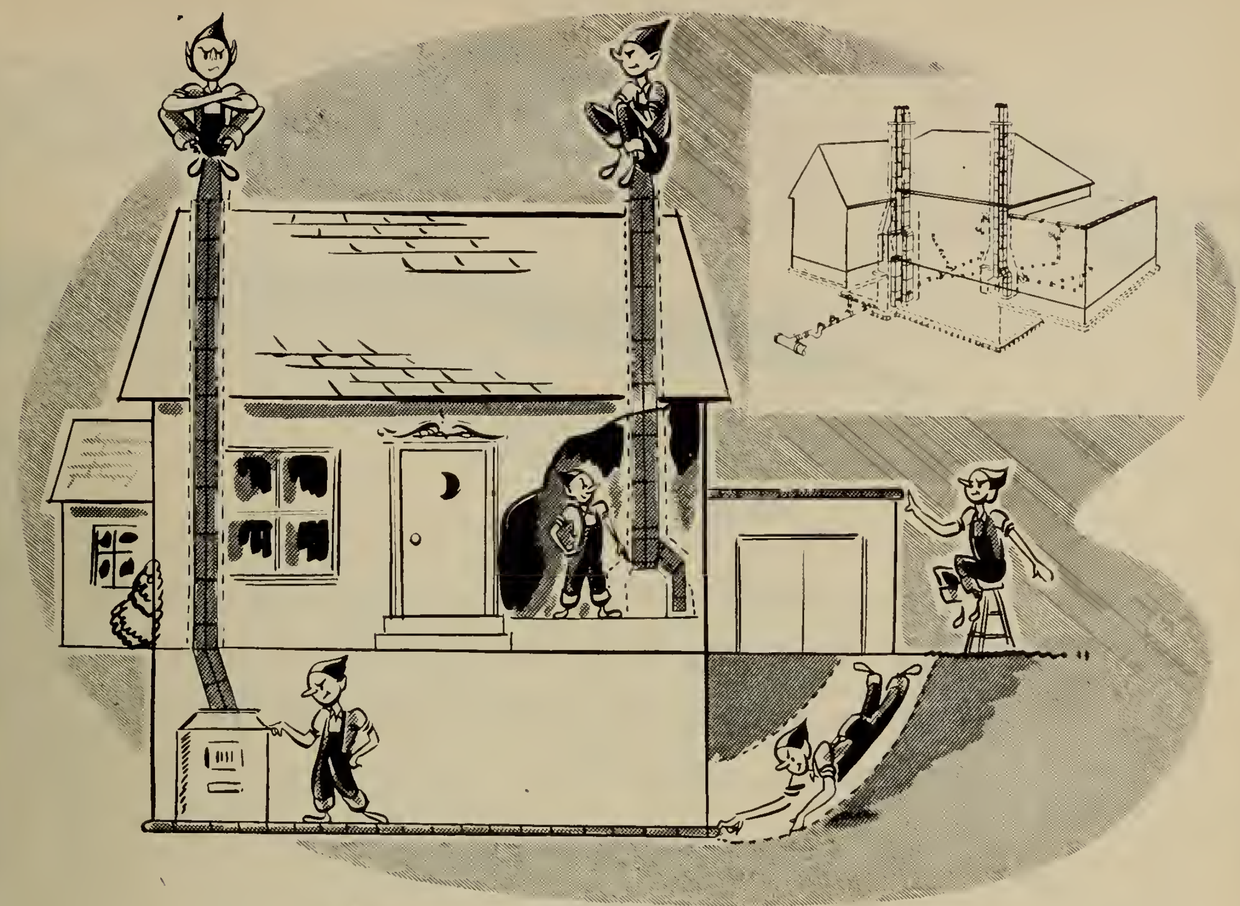
DOC

DOMINION OXYGEN COMPANY, LIMITED

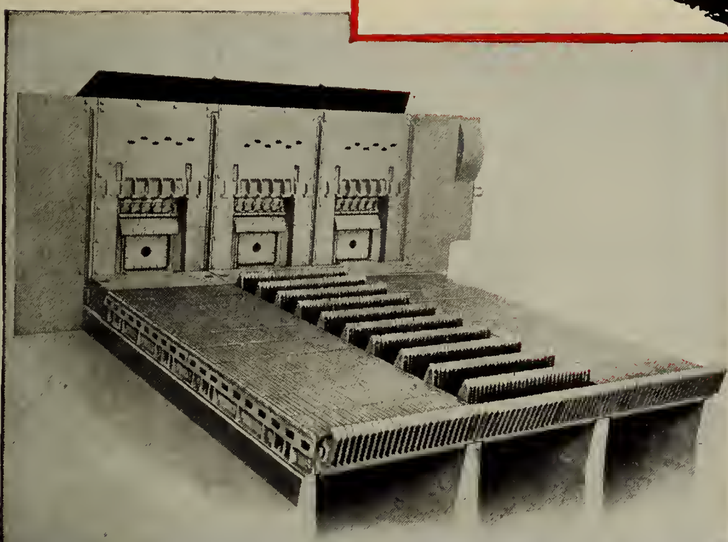
DOC

159 Bay Street, Toronto 1, Ontario

MONTREAL WINNIPEG VANCOUVER



STOKER burns cheaper coals— EFFICIENTLY



Rear view of C-E Spreader Stoker with one section of grates in dumping position.

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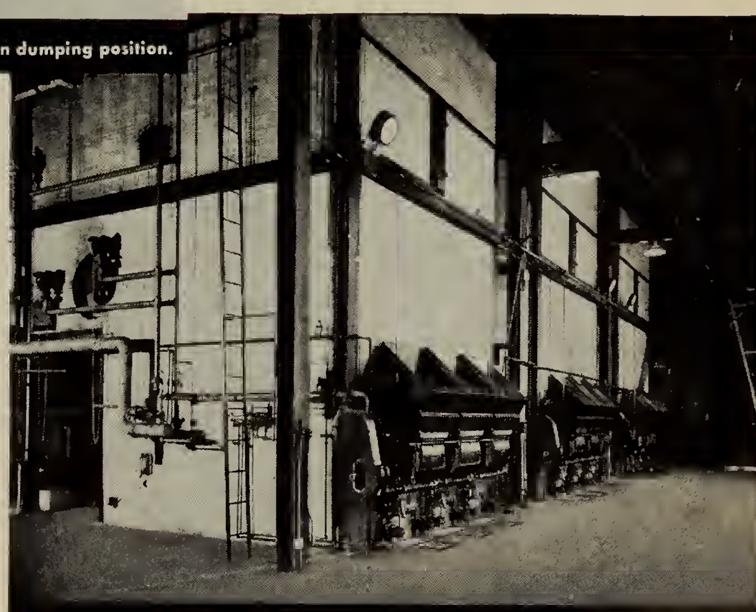

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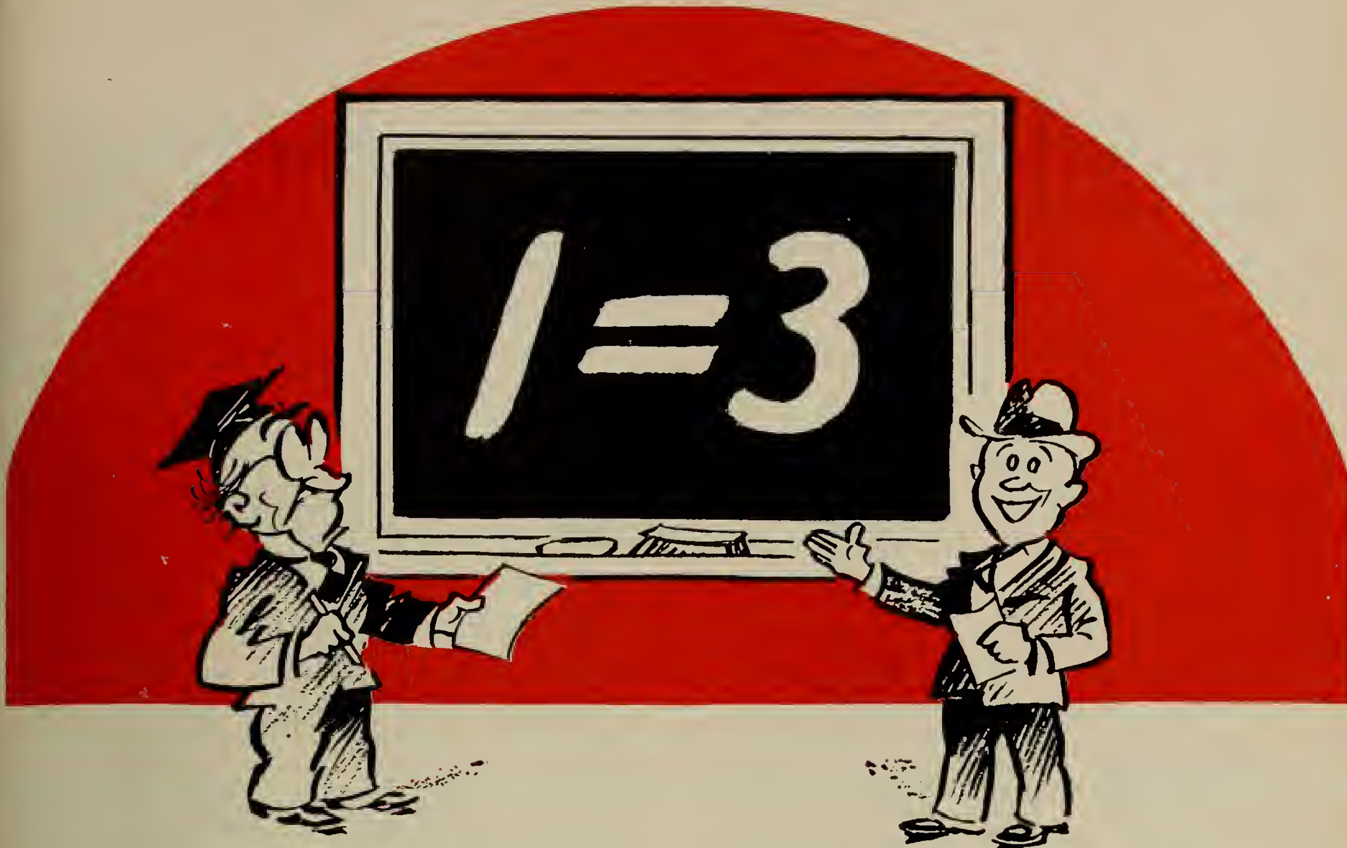
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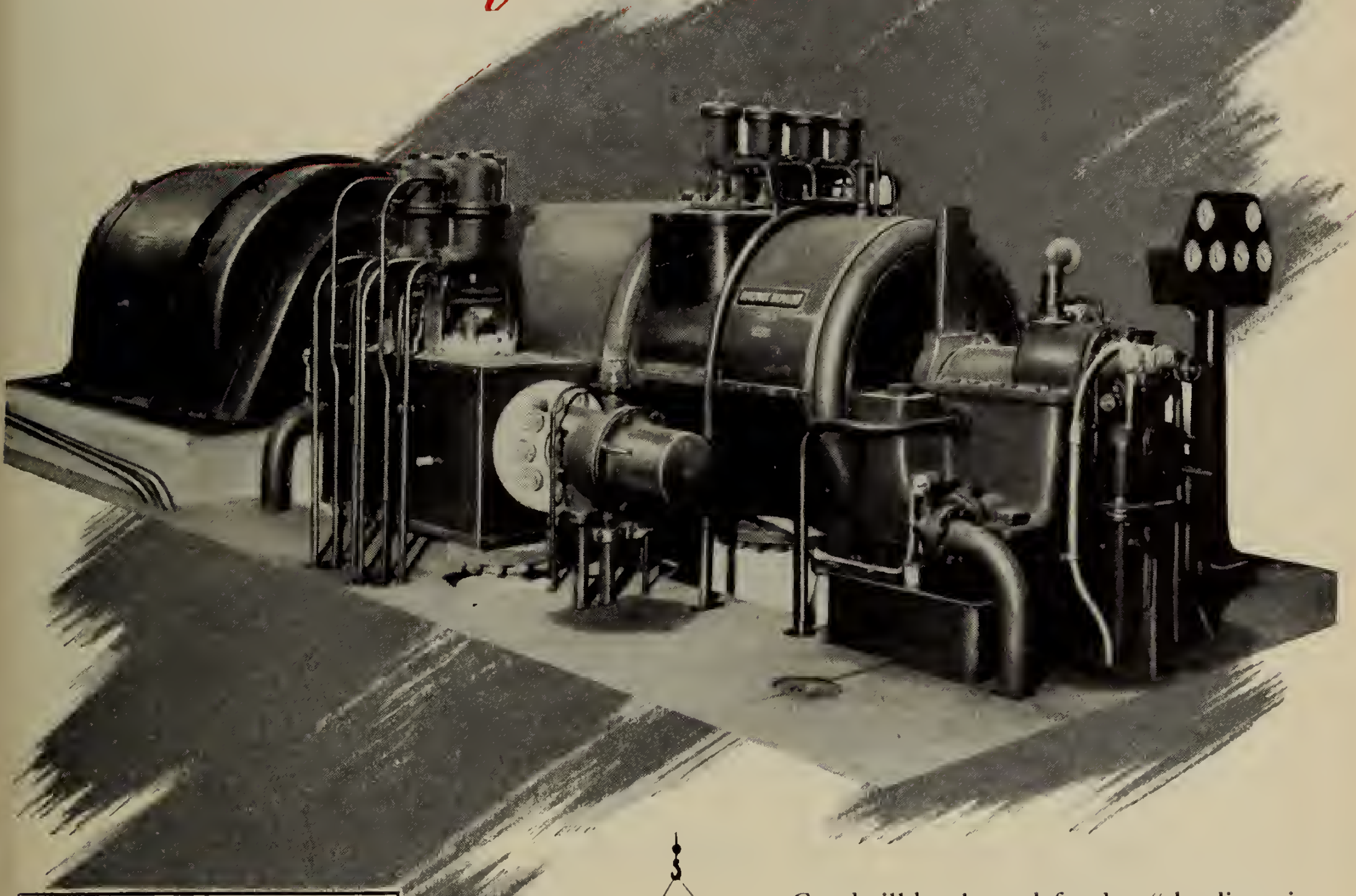

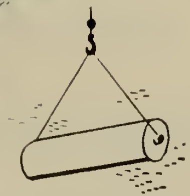


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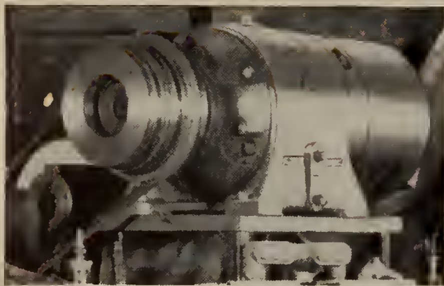

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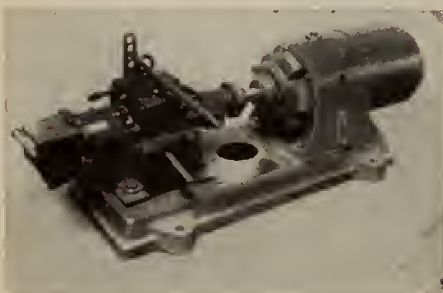

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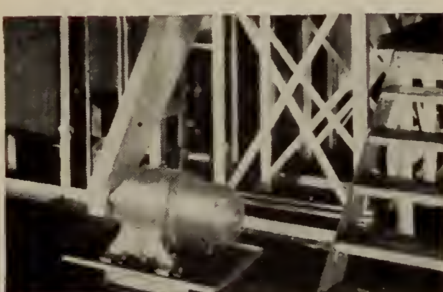

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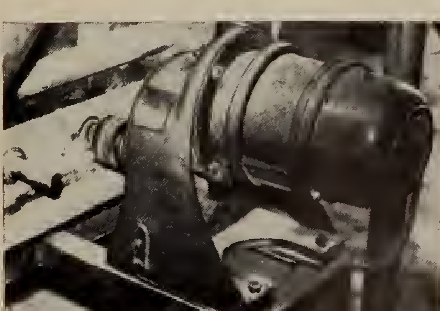

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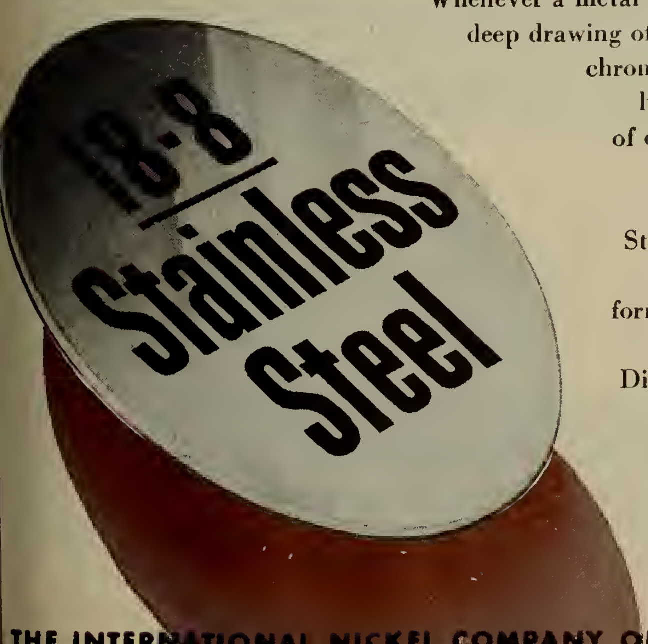

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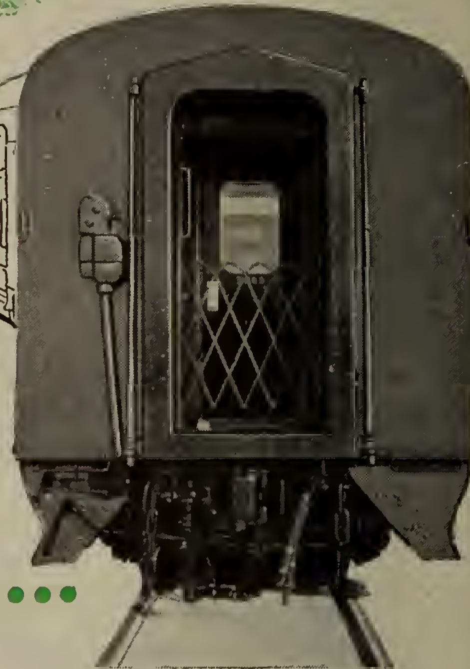

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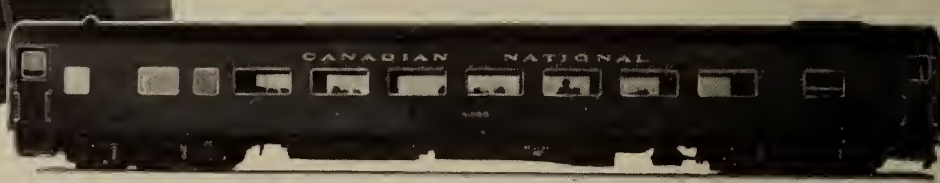

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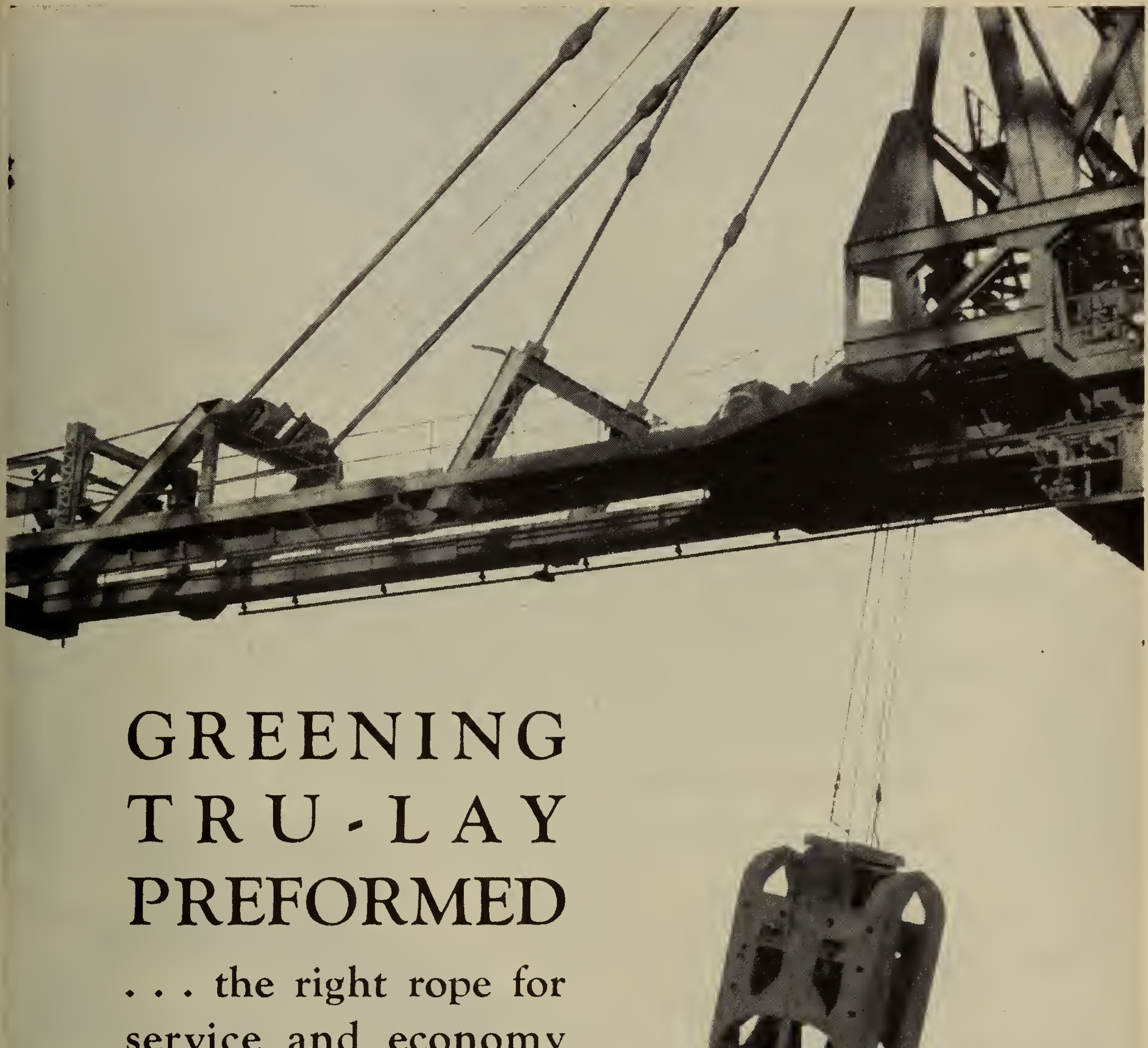
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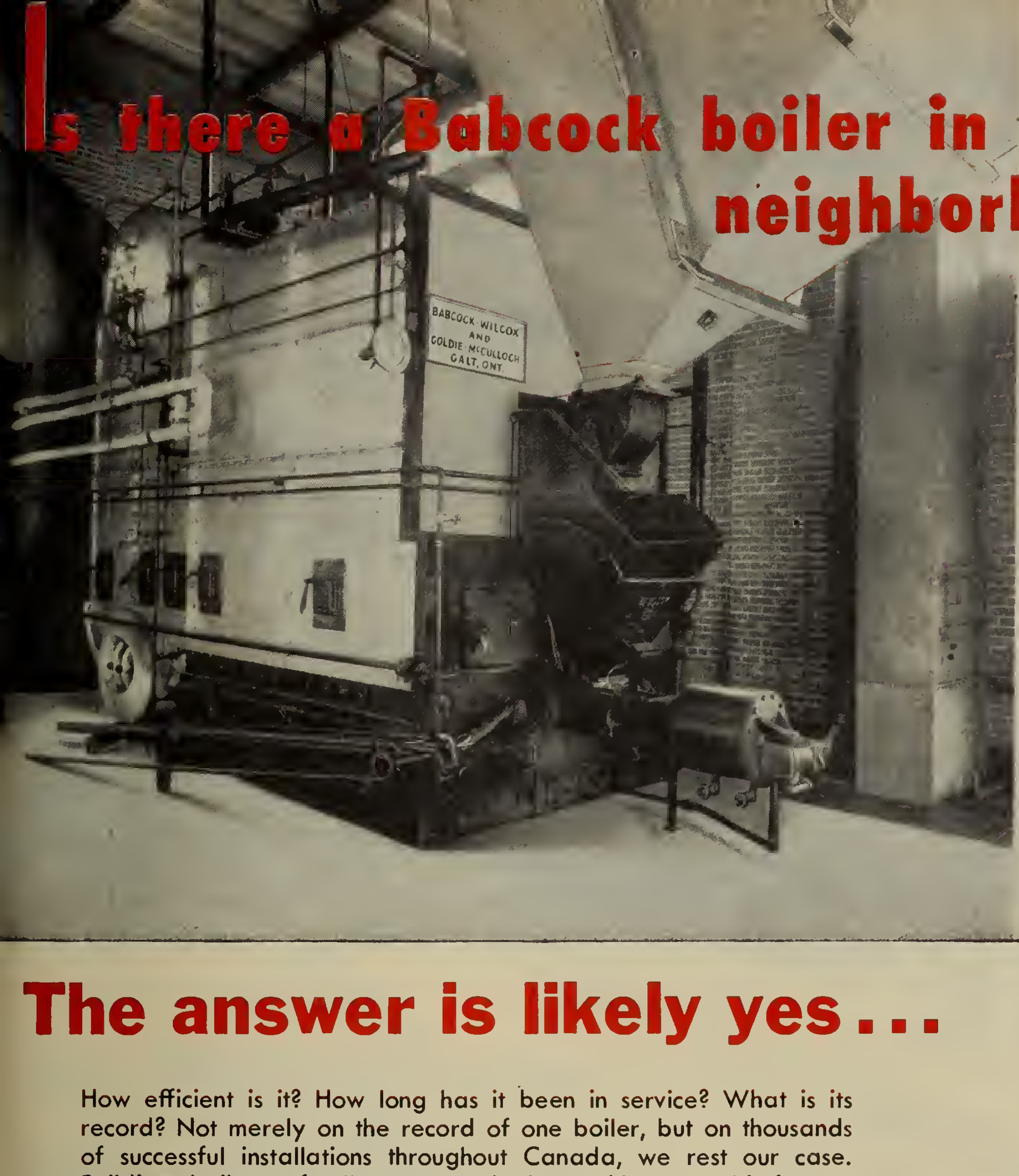

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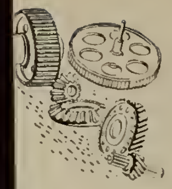

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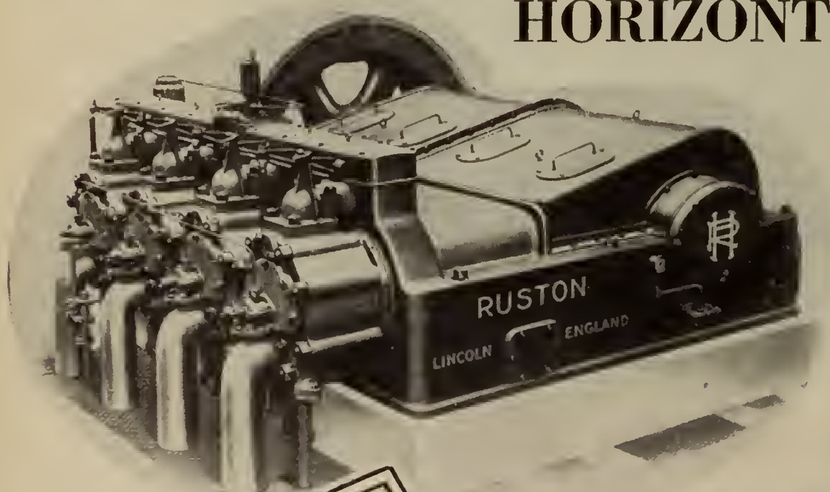

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CONTENTS

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COVER PICTURE

This month's cover illustration shows "M.V. Canadian Constructor", of the Canadian National Fleet, passing under the Lion's Gate Bridge, outward bound from Vancouver.

"Constructor" is a sister ship to "Canadian Cruiser" and "Canadian Challenger". The three vessels were built at Burrard Drydock, Vancouver; Canadian Vickers Limited, Montreal; and Davie Shipbuilding Company, Levis, Que., respectively.

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To forestall speculation, we might point out that the structure breaking the usually uninterrupted span of the Lion's Gate cables is a harbour control unit.

Photo by Jack Cash, Vancouver

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Stresses In Reinforced Concrete Columns With Bending In Two Directions

by

E. M. Rensaa, M.E.I.C.

Main and Rensaa, Consulting Engineers, Edmonton, Alta.

The design of columns is one of the fundamental engineering problems. Many engineers are not entirely satisfied with present methods — of which there are many — and proposals from authoritative sources are welcome additions to the literature on the subject. The *Journal* believes that Mr. Rensaa's paper is a valuable contribution.

Calculation of stresses in reinforced concrete columns with loads eccentric to both principal axes, and with tension over a part of the section, is a very difficult problem. If the usual assumption is made that concrete will crack when subjected to tensile stresses, it is then difficult to determine the position of the neutral axis. For single axial bending we have the simplifying condition that the neutral axis will be parallel to one of the symmetry axes, but that is not the case when there is bending in two directions. It has been found impracticable to develop and solve general exact equations for locating the neutral axis, as such equations become involved and of a high degree. Approximate equations may be written for some simplified conditions, but even such equations are not very simple (1).

Columns with double eccentric loading are quite common in building frames. Corner columns are almost always subjected to such loading. Both American and European textbooks have so far failed to give a simple and satisfactory method for calculating such stresses. The problem received much attention, however, during the early part of this decade and some methods of solution have been proposed. These methods, although in many cases sufficiently accurate, are often applicable only to special cases, and for more general solutions may involve a great deal of computation for accurate results. The methods of stress calculation proposed by the author in this paper are partly based on ideas set forth by Dr. Ing. Ernest Bittner (2). A method of successive approximations by the Swedish engineer, Dr. Techn. S. O. Asplund (3) has been used to some extent for checking the calculated stresses.

Only the problem of calculating stresses in square and rectangular columns will be considered in this paper, as those are the usual ones encountered in practice. Round columns with double axial loading form no special problem as the system of coordinate axes can be rotated so that there only will be bending about one axis.

Much work has been done to develop methods and diagrams for calculation of stresses in reinforced concrete columns with one-axial eccentric loading. Such methods and diagrams are made use of in this paper, as far as possible, for the more complex problem of calculating stresses under conditions of double eccentricity.

In the following, n will be taken as 10 for the sake of simplicity, and no deduction will be made for concrete displaced by steel. The refinement of using n-1 instead of n is in most cases unwarranted in view of the great uncertainty of the actual value of this rather variable "constant". A discussion of the effect of variation of n is outside the scope of this paper.

General Description of Stress Calculation

Calculation of stresses for double eccentric loading will be carried out in three steps. In the *first step* the column is analysed for a combination of direct load and the biggest bending moment, without consideration of the bending moment acting in the transverse direction. A preliminary position of the neutral axis for the assumed loading is found by this step and also the corresponding concrete and steel stresses.

The *second step* is to calculate the section modulus about the y-axis (see Fig. 1) for the uncracked part of column section found by the first step and for n times the reinforcing steel. Stresses caused by the transverse bending moment alone are then calculated for this assumed effective section. Stresses found by the two steps are then combined and a corrected position of the neutral axis found. The maximum combined concrete stress found by the two first steps is not very much in error and will, therefore, indicate if the assumed section can be used. The maximum calculated combined steel stress is generally too low, however.

When the corrected position of the neutral axis is drawn, it is found that the transverse bending moment has caused a portion of the concrete on the opposite side of the y-axis (see Fig. 2) to be in tension, and therefore ineffective, while a somewhat similar new portion on the same side of the y-axis as the load now is in compression and therefore effective. It follows that in the *first* and *second steps* we have included some tensile stresses which actually did not exist due to the cracked condition, while a certain section of column under compression has been excluded. In order to compensate for these errors it will be necessary to introduce corresponding forces. The effect of these must then be added to the external force system.

The *third* and, generally, last *step* is to analyse the column for corrected values of axial load and biggest bending moment, as in *step 1*. Stresses found by *steps 2* and *3* are then combined and considered to be final.

In this paper, use is often made of forces introduced to compensate for neglected internal stresses. This substitution may be explained by the following statement, which is self evident: *Any internal force assumed in error to act on a section in a certain direction may be neutralized by applying a similar force at the same point in the opposite direction.* Again: *Any internal force neglected may be compensated for by applying a similar force at the same point and acting in the same direction.*

Details of the First Step

Single axial loading forms the basis for calculating stresses under *steps 1* and *3*, and easy methods of solution are, therefore, very desirable. It is fairly easy to calculate stresses if the position of the neutral axis is known. A direct analytical calculation of its position, however, requires solving a cubic equation, and that is rather time-absorbing work. A special case is the square or rectangular column with equal reinforcement on both tension and compression sides and with no intermediate reinforcing. Both the position of the neutral axis and the stresses are easily found for this case by means of diagrams, such as those published by Turneaure & Maurer (4), or by the American Concrete Institute (5). The latter are perhaps best known by engineers and will, therefore, be used in this paper. They are also appended to make the reading of the paper easier.

The A.C.I. diagrams are not intended for columns with reinforcement distributed along all four sides. The error involved in using them for such columns, however, is not great, as will be shown in Example 1. The reason for this is that intermediate bars often have low stresses for symmetrical bending. A bar located directly on the neutral axis, of course, is wholly unstressed.

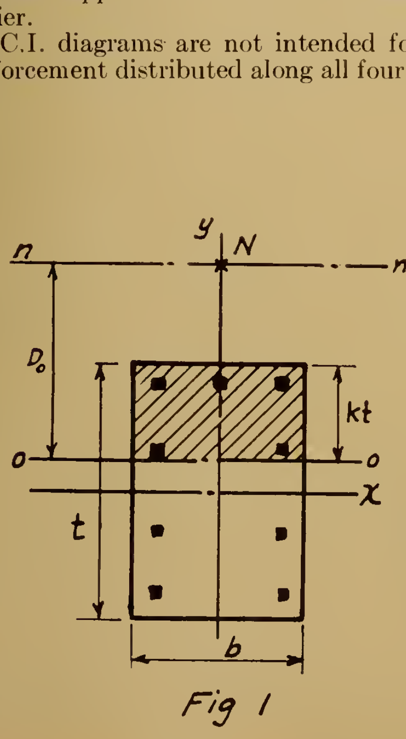


Fig 1

These diagrams are not applicable directly to columns with unsymmetrical reinforcement on tension and compression sides. There are cases, however, where unsymmetrical reinforcement has been used or is desirable. The author has, therefore, worked out a system of calculation by successive approximations which will quickly give sufficiently correct results. The application of this method is shown in Example 2.

A good method of calculating the position of the neutral axis was recently published in the *Journal of the American Concrete Institute* by Michel Bakhoum (6). The position of the neutral axis is found by trial solution of an equation. Stresses are afterwards found by equations established many years ago by European writers. This method will be described briefly as follows: It has been shown in earlier works (7) that the position of the neutral axis may be expressed by the formula:

$$D_o = \frac{I_o}{S_o} \quad . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \quad (1)$$

where D_o = distance from load to the neutral axis $o-o$ I_o = moment of inertia of steel and uncracked concrete about this axis. S_o = statical moment of n times the steel area and the uncracked concrete area about this axis.

Maximum concrete stress can then be found by means of either formula (2) or (3) below. Formula (3) gives the most accurate result if the eccentricity is great.

$$f_{c_y} = \frac{N\,k\,t}{S_o} \quad . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \quad (2)$$

$$f_{c_y} = \frac{N\,D_o\,k\,t}{I_o} \quad . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \quad (3)$$

Formula (1) must be solved by trials and that involves quite a lot of work. Bakhoum has shown that it requires fewer trials if the following equation is used:

$$D_o = \frac{I_n}{S_n} \quad . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \ . \quad (4)$$

where I_n and S_n represent moment of inertia and statical moment, respectively, calculated for an axis going through the point of application of external load, and being parallel to the neutral axis.

When using formula (4), I_n and S_n must first be calculated and D_o obtained from these. This will likely give a different position of the neutral axis from the one first assumed. If the difference between the assumed position and the calculated one is considerable, it will then be necessary to recalculate I_n and S_n on the basis of the last found D_o, and so on until the calculated value corresponds with the one previously calculated. The next step is to calculate I_o or S_o and use either equation (2) or (3) in order to find the maximum concrete stress. Very accurate results may be obtained by this method but the numerical work is considerable.

Details of Second Step

The section modulus is calculated about the y-axis for n times the steel area, and the effective concrete area found by *step 1*. Maximum steel and concrete stresses, due to the transverse bending moment in the x-direction without any axial load, are then calculated for this assumed effective section. The concrete and steel stresses found by *step 2* will be called f_{c_x} and f_{s_x} respectively.

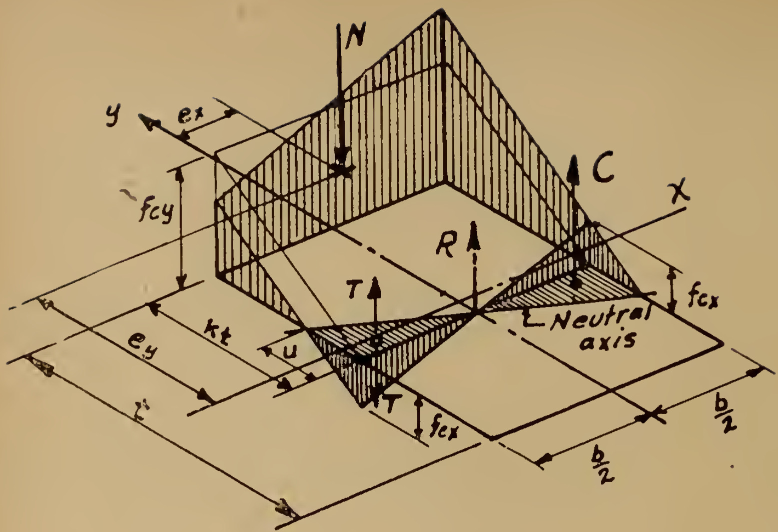


Fig. 2

Details of Third Step

Referring to Fig. 2 it will be seen that the rotation of the neutral axis, measured by distance u is:

$$u = kt.\frac{f_{c_x}}{f_{c_y}} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (5)$$

On the left side of the y-axis a triangular portion of the section with a base line of u and a height of $\frac{b}{2}$ will be in tension and therefore inactive. The stress figure is seen to be a pyramid with a right triangular base and with sides f_{c_x} and u and with altitude of $\frac{b}{2}$. The "volume" or magnitude of this force would be:

$$T = \frac{1}{6}\ u\, f_{c_x} \frac{b}{2} = \frac{b\, u\, f_{c_x}}{12} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (6)$$

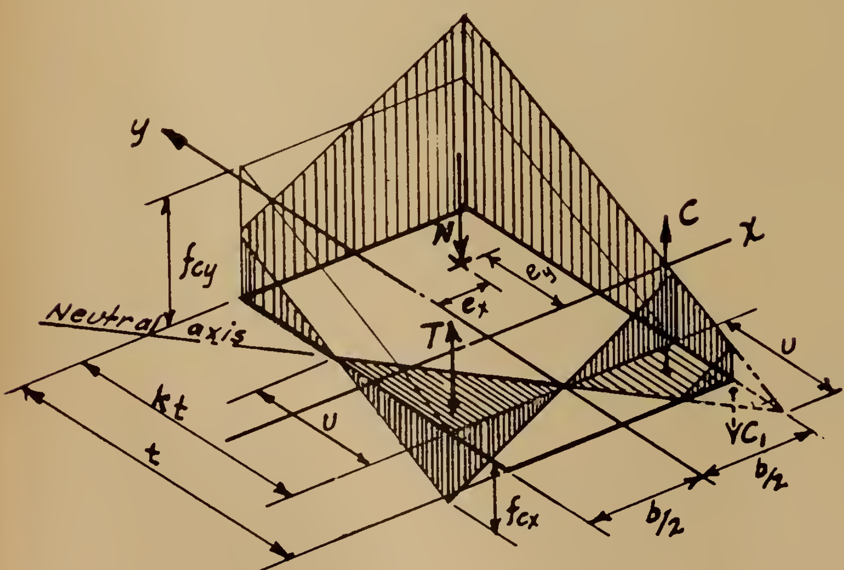


Fig. 3

and its point of application $\frac{3}{8}b$ from the y-axis. This downward-directed force must be neutralized by introducing a similar upward-directed force since concrete is assumed not to be able to resist any tension. On the right hand side of the y-axis a portion of the column which originally was assumed to be in tension has come into compression. The corresponding force C which acts upward must be added directly to the external force system. It is easily seen that for this case $C = T$.

This equality is not present if the neutral axis passes the corner on one of the opposite sides, but the error is not great if the point of intersection is fairly near the corner, and the true magnitude of the force can easily be calculated in any case. Two such special cases will be considered later.

It is also seen that for the case illustrated in Fig. 2, the magnitude of moment about the y-axis is the same for both C and T, and the resultant R of these forces will, therefore, fall on the intersection of the neutral axis with the y-axis. Since the algebraic sum of moments of C and T is zero, they will consequently not change the moment M_x in the transverse direction.

We can now combine the effect of $C + T = R$ with the external forces used under *step one*, and calculate new corrected values for direct load and bending along the y-axis. Steel and concrete stresses found by *steps* 2 and *3* are then combined as explained earlier and considered to be final.

It will be found from *step 3* that the intersection of the neutral axis with the y-axis is not exactly at the same point as was calculated by *step 1*. We have therefore in *step 2* used an effective concrete area which was not quite correct. The error involved is comparatively small, however, and can be neglected in most cases. If more exact results are required, we can repeat *step 2* with the corrected value of effective concrete section found by *step 3*, and thereafter repeat also *step 3*. The author considers that the greater accuracy obtained by the above mentioned repetitions is hardly worth while in view of the uncertainty of the actual value of n and its effect on the column bending moment.

Special Case I

Figure 3 shows a special case where the part of column section under tension is a triangle. If we draw the regular stress figure it will be seen that a part of the stress pyramid falls outside the column section and therefore is inactive. It is most convenient, however, also for this case to use an upward force C corresponding to the complete stress pyramid and then introduce a downward force C_1 corresponding to the "volume" of the small stress pyramid outside the section. The forces C and C_1 will act at the centres of gravity of the respective pyramids. It may be seen that C_1 will be comparatively small if the neutral axis passes near to the corner.

Steps 2 and *3* should be repeated for this case if C_1 has a considerable magnitude. The moment of C_1 about the y-axis should be added to M_x for calculating f_{c_x}. The sums of T, C and C_1 and their moments about the x-axis should be added algebraically to N and M_y respectively for calculating f_{c_y}.

It is seldom necessary for this special case to figure the steel stresses as the distance between the neutral axis and the tension steel will be comparatively short.

Special Case II

The column section under compression is a triangle and a part of the compressive stress pyramid corresponding to T_1 falls outside the column (Fig. 4). A similar procedure to the one outlined for Special

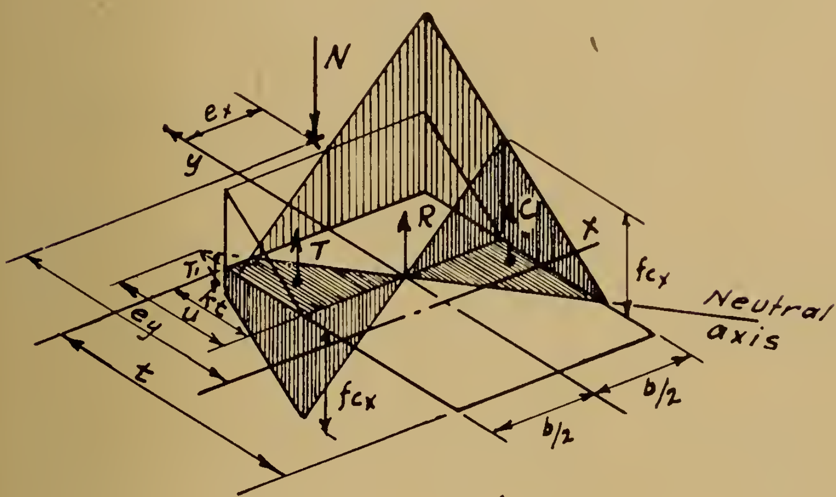


Fig. 4

Case I may be followed for this case for calculating the stresses.

The combined maximum steel stress must be calculated as it may be a deciding factor in this case.

Examples of Calculation

The application of the previously described theory will be shown by two numerical examples. Example 1 has previously been analysed by Professor Paul Andersen ① and has been chosen for the sake of convenience in giving a check.

Example 2 treats a column with unsymmetrical reinforcements, and shows how the stresses may be found by means of successive approximations. Diagrams published by the American Concrete Institute and appended to this paper will be used as an auxiliary in both examples.

Example 1

Step 1

Cross section of column and external loading as shown in Fig. 5.

$g = 0.8 \qquad gt = 20'' \qquad n = 10$

$$np = \frac{8 \times 10}{625} = 0.128$$

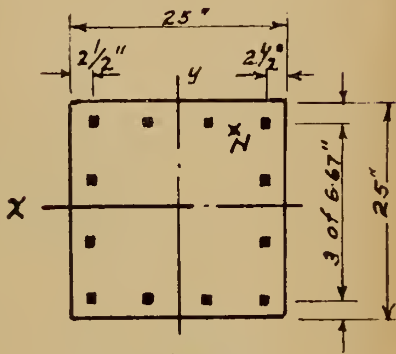
$$e_y = \frac{10766 \times 12}{137850} = 9.36''$$

$$\frac{e_y}{t} = \frac{9.36}{25} = 0.375$$

$k = 0.61 \qquad kt = 15.25'' \qquad Q = 3.05$

$$f_{c_y} = \frac{1378850}{25 \times 25} \times 3.05 = 672 \text{ psi.}$$

$$f_{s_y} = 10 \times 672 \left(\frac{1 + 0.8}{2 \times 0.61} - 1\right) = 3200 \text{ psi.}$$



12 - 1"φ bars
N = 137850
Mx = 60520 ft. lbs.
My = 107660 " "

Fig. 5

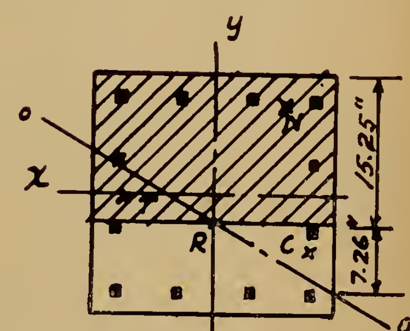


Fig. 6

Step 2

$$S_y = \frac{1}{6} \times 15.25^2 + \frac{10\,(8 \times 10^2 + 4 \times 3.33^2)}{12.5} = 2265 \text{ in.}^3$$

$$f_{c_x} = \frac{60520 \times 12}{2265} = 320 \text{ psi.}$$

$$f_{s_x} = 320 \times 10 \times \frac{10}{12.5} = 2560 \text{ psi.}$$

From *steps 1* and *2*

$$f_{c_{max}} = 672 + 320 = 992 \text{ psi.}$$

$$f_{s_{max}} = 3200 + 2560 = 5760 \text{ psi.}$$

Step 3

From equation (5)

$$u = 15.25 \times \frac{320}{672} = 7.26''$$

$$R = C + T = \frac{25}{6} \times 7.26 \times 320 = 9700 \text{ lbs.}$$

$$N = 137850 - 9700 = 128150 \text{ lbs.}$$

$$M_y = 107660 \times 12 + 9700\,(15.25 - 12.5) = 1318700 \text{ in. lbs.}$$

$$e_y = \frac{1318700}{128150} = 10.28''$$

$$\frac{e_y}{t} = \frac{10.28}{25} = 0.41 \qquad np = 0.128$$

From the diagram

$$k = 0.57 \qquad kt = 14.25'' \qquad Q = 3.25$$

$$f_{c_y} = \frac{128150}{625} \times 3.25 = 667 \text{ psi.}$$

$$f_{s_y} = 10 \times 667 \left(\frac{1 + 0.8}{1.14} - 1\right) = 3870 \text{ psi.}$$

Adding stresses found by *steps 1* and *2* we get:

$$f_{c_{max}} = 667 + 320 = 987 \text{ psi.}$$

$$f_{s_{max}} = 3870 + 2560 = 6430 \text{ psi.}$$

Step 3 shows the neutral axis to have moved one inch upward on the y-axis and we have therefore in *Step 2* used an effective concrete section which was too big. We may correct the section modulus and stresses for this error as follows:

$$S_y = 2265 - \frac{1}{6} \times 1 \times 25^2 = 2265 - 104 = 2161 \text{ in.}^3$$

$$f_{c_x} = \frac{60520 \times 12}{2160} = 336 \text{ psi.}$$

$$f_{s_x} = 336 \times 10 \times \frac{10}{12.5} = 2690 \text{ psi.}$$

Combining stresses found by *Step 3* and corrected *Step 2* we have:

$$f_{c_{max}} = 336 + 667 = 1003 \text{ psi.}$$

$$f_{s_{max}} = 2690 + 3870 = 6560 \text{ psi.}$$

We could also repeat *Step 3* with more correct values found by revised *Step 2* and would then have found $f_{c_{max}} = 1016$ psi. and $f_{s_{max}} = 6640$ psi. It is in this case unnecessary to carry the calculation too far because the A.C.I. diagrams cannot be read with unlimited accuracy. We have also in *Step 3* neglected the effect of four intermediate bars which is on the safe side but will result in calculated stresses somewhat higher than the actual ones.

This problem has also been checked by the very accurate (but laborious) method by Asplund, and the following values found:

$$f_{c_{max}} = 1000 \text{ psi.} \qquad f_{s_{max}} = 6530 \text{ psi.}$$

$$kt = 14.26'' \qquad u = 7.22''$$

Professor Paul Andersen found the following stresses:

$$f_{c_{max}} = 1003 \text{ psi. and } f_{s_{max}} = 6632 \text{ psi.}$$

It is seen that concrete stresses found by all the above methods are nearly the same, and the differences in steel stresses are also rather negligible.

Calculation of Stresses by Bakhoum's Method

We have in the above calculation disregarded the effect of some intermediate bars in *Steps 1* and *3* in order to use the A.C.I. diagrams. The position of the neutral axis and the stresses will therefore be checked by Bakhoum's method which for this case should be more accurate.

Step 1

$$e_y = 9.36''$$

$$I_n = \left(\frac{1}{12} \times 25 \times 15.25^3\right) + (15.25 \times 25 \times 4.485^2) + (10 \times 4 \times 0.64^2) + (10 \times 2 \times 6.03^2) + (10 \times 4 \times 19.36^2) + (10 \times 2 \times 12.7^2) = 33993 \text{ in.}^4$$

$$S_n = (15.25 \times 25 \times 4.485) - (40 \times 0.64) + (20 \times 6.03) + (20 \times 12.7) + (40 \times 19.36) = 2833 \text{ in.}^3$$

$$D_o = \frac{33993}{2833} = 12.0''$$

$$kt = 12 + (12.5 - 9.36) = 15.14''$$

$$I_o = \left(\frac{1}{3} \times 25 \times 15.14^3\right) + (40 \times 12.64^2) + (20 \times 5.97^2) + (20 \times 0.70^2) + (40 \times 7.37^2) = 38280 \text{ in.}^4$$

$$S_o = \left(25 \times \frac{15.14^2}{2}\right) + (40 \times 12.64) + (20 \times 5.97) - (20 \times 0.70) - (40 \times 7.37) = 3176 \text{ in.}^3$$

By formula (3)

$$f_{c_y} = \frac{137850 \times 12 \times 15.14}{38210} = 656 \text{ psi.}$$

By proportionality

$$f_{s_y} = 10 \times 656 \times \frac{22.5 - 15.14}{15.14} = 3190 \text{ psi.}$$

Step 2

$$S_y = \frac{1}{6} \times 15.14 \times 25^2 + \frac{10\,(8 \times 10^2 + 4 \times 3.33^2)}{12.5} = 2250 \text{ in.}^3$$

$$f_{c_x} = \frac{60520 \times 12}{2250} = 323 \text{ psi.}$$

$$f_{s_x} = 323 \times 10 \times \frac{10}{12.5} = 2580 \text{ psi.}$$

Step 3

By formula (5)

$$u = 15.14 \times \frac{323}{656} = 7.45''$$

and by formula (6)

$$R = C + T = \frac{25}{6} \times 7.45 \times 323 = 10000 \text{ lbs.}$$

The corrected external force and moment will be

$$N = 137850 - 10000 = 127850 \text{ lbs.}$$

$$M_y = 107660 \times 12 + 10000\,(15.14 - 12.5) = 1316400 \text{ in. lbs.}$$

$$e_y = \frac{1316400}{127850} = 10.3''$$

The position of the neutral axis will be checked by formula (4)

$$I_n = \left(\frac{1}{12} \times 25 \times 15.14^3\right) + (25 \times 15.14 \times 5.37^2) + (40 \times 0.3^2) + (20 \times 6.79^2) + (20 \times 13.64^2) + (40 \times 20.3^2) = 39330 \text{ in.}^4$$

$$S_n = (15.14 \times 25 \times 5.37) + (40 \times 0.3) + (20 \times 6.97) + (20 \times 13.64) + (40 \times 20.3) = 3266 \text{ in.}^3$$

$$D_o = \frac{39330}{3266} = 12.04''$$

$$kt = 12.04 + 2.2 = 14.24''$$

$$I_o = \left(\frac{1}{3} \times 25 \times 14.24^3\right) + (40 \times 11.74^2) + (20 \times 5.07^2) + (20 \times 1.5^2) + (40 \times 8.25^2) = 32780 \text{ in}^4.$$

From formula (3)

$$f_{c_y} = \frac{127850 \times 12.04 \times 14.24}{32780} = 668 \text{ psi.}$$

By proportionality

$$f_{s_y} = 668 \times 10 \times \frac{22.5 - 14.24}{14.24} = 3880 \text{ psi.}$$

Combining *Steps 1* and *2*

$$f_{c_{max}} = 323 + 668 = 991 \text{ psi.}$$

$$f_{s_{max}} = 2580 + 3880 = 6460 \text{ psi.}$$

Step 3 shows that the neutral axis has moved 0.9″ upward on the y-axis. If we correct *Step 2* for the effect of this we get

$$f_{c_{max}} = 1005 \text{ psi. and } f_{s_{max}} = 6580 \text{ psi.}$$

which agree quite well with the values previously found.

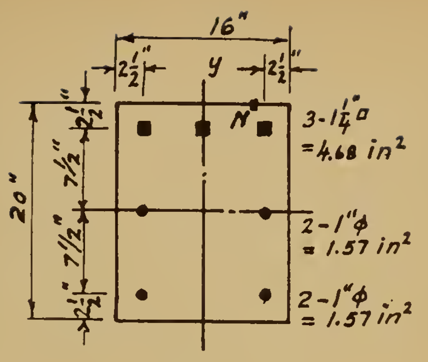


Fig. 7

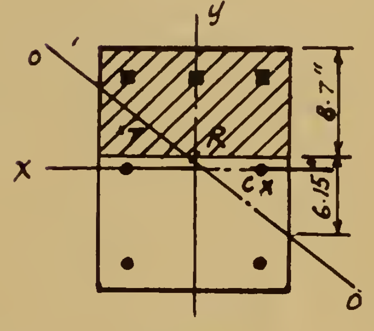


Fig. 8

Example 2

On Fig. 7 is shown a rectangular column with unsymmetrical reinforcement and with the following load and bending moments.

$$N = 60{,}000 \text{ lbs.}$$
$$M_y = 600{,}000 \text{ in. lbs.}$$
$$M_x = 300{,}000 \text{ in. lbs.}$$

A method of successive approximations developed by the author will be used for finding stresses for *step 1*.

It will first be assumed that the compression reinforcement is equal to the tension reinforcement or 1.57 in². The two bars at the middle of the long sides will be disregarded in *step 1* and we can then again use the A.C.I. diagrams.

$$np = \frac{10 \times 1.57 \times 2}{320} = 0.098 \qquad g = 0.75$$

There will be interpolated between the diagrams for $g = 0.7$ and $g = 0.8$

$$e = \frac{600{,}000}{60{,}000} = 10 \qquad \frac{e}{t} = \frac{10}{20} = 0.5$$

We find $Q = 4.6$ $\quad f_c = 862$ psi. $\quad f_s' = 6300$ psi.

These stresses would have been correct if we only had 1.57 in² on the compression side, but there is actually $4.68 - 1.57 = 3.11$ in² more on this side. Under the assumed deformation this will represent an upward directed force of $3.11 \times 6300 = 19{,}600$ lbs. This force and its moment will be added to the external system of forces and a new solution sought by means of the diagrams.

$$N = 60{,}000 - 19{,}600 = 40{,}400 \text{ lbs.}$$
$$M = 600{,}000 - (19{,}600 \times 7.5) = 453{,}000 \text{ in. lbs.}$$
$$e = \frac{453{,}000}{40{,}400} = 11.2'' \qquad \frac{e}{t} = \frac{11.2}{20} = 0.56$$

and from the diagrams,

$Q = 5.20$ $\quad f_c = 655$ psi. $\quad f_s' = 4650$ psi.

$$N = 60{,}000 - (4650 \times 3.11) = 60{,}000 - 14{,}600 = 45{,}540 \text{ lbs.}$$
$$M = 600{,}000 - (14{,}460 \times 7.5) = 491{,}550 \text{ in. lbs.}$$
$$e = \frac{491{,}550}{45{,}540} = 10.8'' \qquad \frac{e}{t} = 0.54$$

and from the diagrams:

$Q = 5.0$ $\quad f_c = 714$ psi. $\quad f_s' = 5120$ psi.

$$N = 60{,}000 - (5120 \times 3.11) = 60{,}000 - 15{,}900 = 44{,}100 \text{ lbs.}$$
$$M = 600{,}000 - (15{,}900 \times 7.5) = 481{,}000 \text{ in. lbs.}$$
$$e = \frac{481{,}000}{44{,}100} = 10.9'' \qquad \frac{e}{t} = 5.45$$

and again from the diagrams:

$Q = 5.07$ $\quad kt = 8.7''$ $\quad f_c = 698$ psi.
$f_s = 7050$ psi. and $f_s' = 5000$ psi.

It will be seen that the stresses approach the correct values very quickly and, so to speak, oscillate towards equilibrium. We might also have assumed the tension steel to have had the same value 4.68² as the compression steel, and applied the surplus force at the centre of the tension steel. This has also been tried but the convergence was not so rapid and six approximations were necessary before correct values were obtained.

There is no material error involved in this case by not taking into account the two bars at centres of the long sides under *step 1*, because the neutral axis passes very near the centre of column. The above method of successive approximations can be used, and correct results obtained, also for the case of reinforcing bars placed along the column sides. We may in the first approximation omit the effect of these bars. From the first found boundary stresses we may then calculate the stress in each group of bars at the same distance from the neutral axis. At the centre of each group a force is then applied, and its magnitude and moment added algebraically to the external force system. Compressive forces will evidently act upwards and tensile forces downwards. The procedure is from then on carried out in conjunction with the further work of successive approximations until equilibrium is established.

The second step is to calculate the section modulus about the y-axis for the uncracked concrete section and the steel. Stresses caused by the transverse bending moment M_x = 300,000 in. lbs. can then be computed. We have:

$$S_y = \frac{1}{6} \times 8.7 \times 16^2 + \frac{6.26 \times 10 \times 5.5^2}{6} = 371 + 237 = 608 \text{ in.}^3$$

$$f_{c_x} = \frac{300,000}{608} = 493 \text{ psi.}$$

$$f_{s_x} = 10 \times 493 \times \frac{5.5}{8} = 3390 \text{ psi.}$$

Referring to Fig. 3

$$u = \frac{8.7 \times 493}{698} = 6.15''$$

$$R = C + T = \frac{6.15 \times 16 \times 493}{6} = 8100 \text{ lbs.}$$

$$N = 60,000 - 8100 = 51900 \text{ lbs.}$$

$$M = 600,000 - 8100\ (10 - 8.7) = 589500 \text{ in. lbs.}$$

Step 3 may be made by several different methods:

a. We may use the method of successive approximations shown for *step 1*.

b. The new position of the neutral axis may be found by trial solutions of equation (4) and the stresses from equation (3).

c. The author has found it to be sufficiently accurate to calculate the moment of inertia about the gravity axis of the effective section found by *step 1*. The moment of the correction force R about this axis is then computed. Concrete and steel stresses due to the tensile force R and its moment about the gravity-axis may then be calculated and added to the stresses found by *step 1* and *2*. The last method is probably the shorter but the results are not quite as accurate as those obtained by using (a) or (b).

The distance to the neutral axis found by two substitutions into equation (4) is:

$$kt = 8.1''$$

and from equation (3)

$$f_{c_y} = 690 \text{ psi.}$$

By proportionality

$$f_{s_y} = 8000 \text{ psi.}$$

As the neutral axis has moved upward 8.7″ − 8.1″ = 0.6″ we will correct *step 2* for the corresponding decrease in effective concrete section.

$$S_y = 608 - \frac{1}{6} \times 0.7 \times 16^2 = 608 - 30 = 578 \text{ in.}^3$$

$$f_{c_x} = \frac{300,000}{578} = 518 \text{ psi.}$$

$$f_{s_x} = 10 \times 518 \times \frac{5.5}{8} = 3560 \text{ psi.}$$

Combining the stresses we have finally:

$$f_{c_{max}} = 690 + 518 = 1208 \text{ psi.}$$

$$f_{s_{max}} = 8000 + 3560 = 11560 \text{ psi.}$$

These results have been checked by Asplund's method of successive approximations. The 12th approximation which had not reached full convergence gave

$$f_{c_{max}} = 1172 \text{ psi.}$$

$$f_{s_{max}} = 10750 \text{ psi.}$$

The previously found maximum stresses are undoubtedly most accurate but the differences are in any case small.

Conclusion

The author has calculated several examples by the described methods and checked the found stresses. The maximum concrete stress has been found to check very closely. Concrete stress at other corners may vary somewhat from the true value but this is of no practical importance since it is the maximum concrete stress which generally decides the safety of the column. The calculated maximum tensile steel stress may also be somewhat inaccurate. The principal cause of this is that any small error in reading the diagrams is magnified n times. Tensile steel stresses in a column are generally far below allowable, however, and a correct calculation of these stresses in such cases has only academic value.

It will often be found that the maximum concrete stress at a corner will tend to be high for direct loading and double axial bending. The author's opinion is that a higher stress may be allowed at a corner if this stress is principally caused by diagonal bending. It should be considered that the high stress only prevails over a comparatively small area of the column section and that the carrying capacity is not to the same extent decreased by such overstressing as would have been the case if a greater proportion of the area had been overstressed. Tests also show that a column bent diagonally has a greater carrying capacity than indicated by its section modulus ⑧.

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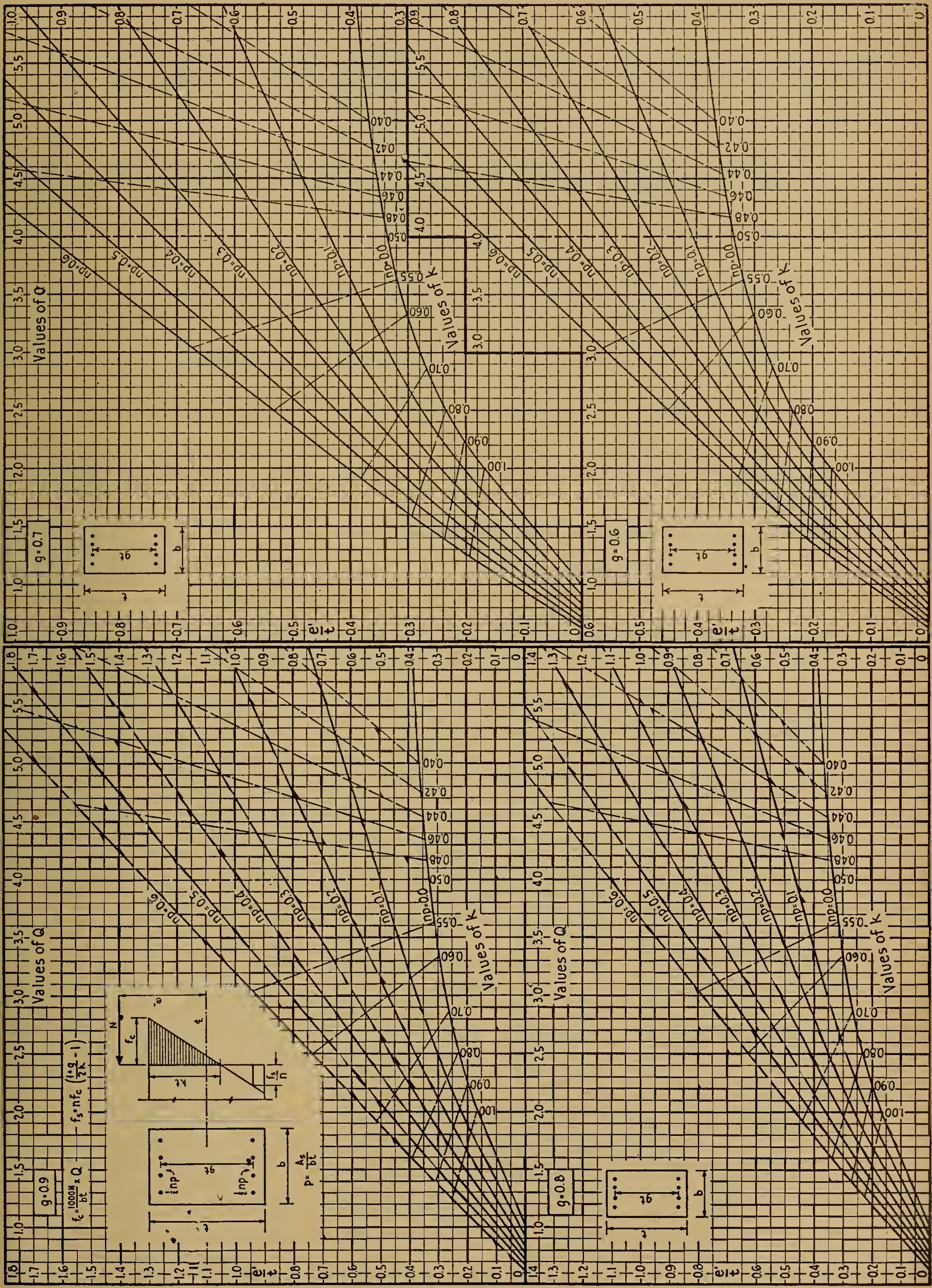
DIAGRAMS FOR ECCENTRICALLY LOADED RECTANGULAR COLUMNS WITH TIES

Reported by Committee 317 of the AMERICAN CONCRETE INSTITUTE



Reprinted from pages 96 and 97, "Reinforced Concrete Design Handbook"

Wartime Aeronautical Research & Development in Germany

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Part II

The Aerodynamic Research Establishment at Göttingen

The Aerodynamische Versuchsanstalt zu Göttingen, known for short as the A.V.A. was the premier centre for basic aerodynamic research in Germany. It was here that Prandtl, Betz and many others were able to make those important contributions to aerodynamic theory which won for Göttingen its international reputation. The Kaiser Wilhelm Institute for Flow Mechanics, described later, was actually situated within the grounds of A.V.A. During the War, additional wind tunnel facilities were constructed in an abandoned salt mine, a few miles north of Göttingen, where the old mine workings provided excellent camouflage.

The A.V.A. was founded as an incorporated body, the industry being assessed for test work done on its behalf. The accounts of the A.V.A. were examined annually by the Government and grants from the Air Ministry were adjusted to allow for fluctuation in the support received from the industry.

There was a total staff of about 700 at A.V.A. of whom some 30-50 were scientists, 100 were technical assistants and 100 were girl computers who were later used in the laboratories as technicians to replace the men who had entered military service. The most important work of the A.V.A., apart from routine tests for the aircraft manufacturers, was in the field of fundamental aerodynamics, and this was not restricted to aeronautics alone. In general, the equipment of the A.V.A. was smaller and less impressive than that of the newer laboratories such as L.F.A. and L.F.M. and much of it was quite old. On the other hand the calibre and ability of the staff appeared to be generally superior, judging by the results obtained.

Institute for Low-Speed Wind Tunnels

This institute was equipped with six tunnels at Göttingen and two low turbulence tunnels at Reyershausen. Of the tunnels at Göttingen, with the exception of a variable density tunnel with an elliptic jet, all were small and of low speed. Most of the tunnels were old and have already been described in the literature, none of them incorporating any unconventional features.

Behaviour of High Speed Wings at Low Speeds

One of the major projects in the Institute for low speed wind tunnels was the investigation of the behaviour of high speed aircraft at the low speeds encountered during take-off and landing. Models of several high speed jet aircraft used for this purpose were seen in the laboratories. The primary concern was the achievement of low speed control and stability for the swept-back wing which was coming into extensive use in Germany for high speed aircraft. The considerable advantage of the swept-back wing in delaying the onset of compressibility effects had been demonstrated in the high speed tunnels at A.V.A. and had become widely accepted in Germany. Unfortunately, sweepback has an adverse effect on lateral stability, maximum lift coefficient and on the effectiveness of controls and high lift devices, due principally to " out-flow " effects.

It was found that a swept-forward wing gave the same improvement in delaying compressibility effects, together with improved lateral stability and maximum lift coefficient, but had the disadvantage of an unfavourable rolling moment with yaw. In order to improve the maximum lift coefficient, a nose flap (Fig. 15) was developed. It appeared to be the only means of effectively increasing the maximum lift of swept-back wings. In a typical case, with 35° of sweepback, the nose flap gave a maximum lift coefficient of 2.0, in conjunction with conventional 20 per cent trailing edge flaps, representing a 35 per cent improvement over the wing without nose flap. To

EDITOR'S NOTE

Late in 1945 a group of Canadian scientists and engineers visited Germany to investigate scientific and technological achievements of our former enemies. The authors of this paper, at that time on the staff of the National Research Council, were assigned to the field of aeronautics.

The report submitted by these scientists was long and comprehensive, but, in spite of heavy demands on their time, they have prepared a condensation specially for the JOURNAL. Even in this condensed form the report is of necessity being published in four instalments. When all four parts have been published it is hoped a consolidated reprint will be available for those interested in preserving the report in its entirety.

In this second instalment the authors cover the Aerodynamic Research Establishment at Gottingen, including Low Speed Wind Tunnels; plants for study of Boundary Layer Control, Propeller Research, Flight Research, High Speed Flow and for Turbo Machines.

overcome wing-tip stalling and loss of stability and control at low speeds, a double split trailing edge flap (Fig. 16) was used. The low pressure region behind this flap serves to maintain the main flow around the wing. By rotating the flap about its apex, lateral control could be achieved.

Boundary Layer Control

Considerable work had been done here in the field of boundary layer control, utilizing both suction and blowing, the main aim being to achieve high maximum lift and possibly some drag reduction at lower lift values. The tests showed the superiority of suction over blowing. With an air entry located at the leading edge of the wing flap a maximum lift coefficient of 4.0 was obtained at the same stalling angle as for the wing without boundary layer control.

To overcome the practical difficulty of the large blowers required for boundary layer control, an attempt was made to use the low pressure at the centre of the wing tip vortex, for pumping purposes (Fig. 17). In order to get the most favourable results, the suction was applied to the wing trailing edge, through a spanwise slit. It was claimed that a 20 per cent drag reduction was obtained at high lift coefficients in addition to the increase in maximum lift. The overall drag was increased however at low lift coefficients. Boundary layer suction was also considered as a method for providing lateral control. In this case a small flap valve at the trailing edge of the wing (Fig. 18) allowed the suction to be applied to either the upper or lower wing surface boundary layer. It was claimed that this system was free from the time lag experienced with spoiler type controls.

Despite the extensive coverage and systematization of these tests, in comparison with the work done in England on boundary layer control, one can only conclude that the German work was completely uninspired and only revealed results that were either obtained or forecast years earlier.

Propeller Research

In addition to systematic tests on model propellers, an investigation had been made of propellers with swept-back tips (Fig. 19) in order to delay the approach of compressibility effects, as in the case of swept-back wings. Surprisingly larger efficiencies were obtained at high tip speeds than with conventional propellers. Wake surveys behind airscrews in flight and integration of the thrust elements over the disc gave good agreement with actual thrust values but the results were of no use in deducing blade element characteristics owing to the pulsating flow.

Some work had been done on ducted propellers, their advantage being a reduction in diameter and an increase in speed of rotation for the same thrust and power, thereby eliminating the need for reduction gearing. A nose flap on the duct improves the air flow at both high and low advance ratios. For snowmobile application such ducts improve the static thrust characteristics. This Institute had been associated with the development of snowmobiles for the Norwegian operations, in which a pontoon type had been used, permitting movement over snow, ice and open water.

Other work done in this Institute included the test of a lateral control system which it was hoped would not suffer from the usual deterioration at high lift coefficients. It consisted of extendable wing tip plates which moved in a spanwise direction to effect an increase in area of the lifting surface on one side of the aircraft, as shown in Fig. 20. This system suffered from the disadvantages of reversal in inverted flight and unfavourable yawing moment.

To provide data for the design of axial flow compressors, tests were also made on aerofoil cascades at both positive and negative angles of attack.

Work at Reyershausen

The large low turbulence tunnel was of very fine design and had a closed working section about 10 ft. in diameter or alternatively 10 ft. by 5 ft. rectangular section. A contraction ratio of 25 to 1 was employed, with a honeycomb and the wire mesh screens usual in this type of tunnel.

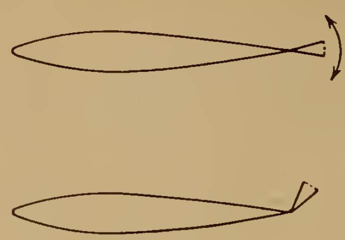
Some fundamental work had been done on the influence of surface roughness on boundary layer transition from laminar to turbulent flow and a few tests had been conducted on low-drag aerofoils derived from American and Russian aircraft, as well as on some profiles developed by the A.V.A. Another interesting project was the test of a cooling system for the Me 109 aircraft in which the ducted radiator was equipped with a by-pass for the removal of the thick boundary layer coming from the wing or fuselage, so that only high velocity air entered the radiator. This arrangement is schematically shown in Fig. 21.

Institute for Flight Research

Flight tests were confined entirely to fundamental aerodynamic work,

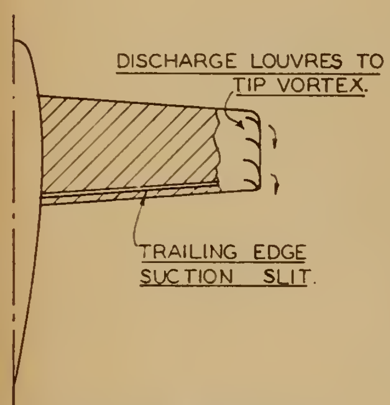
RETRACTIBLE NOSE FLAP FOR SWEPT-BACK WINGS.

FIG. 15



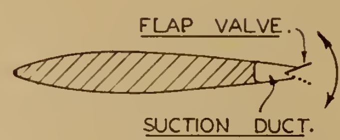
DOUBLE SPLIT TRAILING EDGE FLAP FOR SWEPT-BACK WINGS.

FIG. 16



HIGH LIFT BY SELF PUMPING BOUNDARY LAYER SUCTION.

FIG. 17



LATERAL CONTROL BY BOUNDARY LAYER SUCTION.

FIG. 18

no engine, structural or performance testing being undertaken. The Institute had between 12 and 15 aircraft and employed six civilian engineer pilots. Two aircraft were equipped with blowers, driven by auxiliary combustion engines, for flight testing the boundary layer control schemes developed in the wind tunnel. With power on, maximum lift coefficients of 5.5 were said to be achieved, without any increase in stalling angle, so that these high lifts greatly assisted the approach and landing. In take-offs, the ground run could be shortened but the high drag gave a poor climb performance so that the overall take-off was not improved. One difficulty encountered with boundary layer suction was a pronounced instability of the wings in roll at the stall.

Flight tests of reversible pitch propellers for shortening the landing run of an F.W. 190 indicated that a saving of some 75 per cent in landing distance could be achieved. Normal flap deflections were used in all cases and no tail buffeting or tendency of the aircraft to swing was encountered.

Some work had also been done on measuring the sound spectrum of typical aircraft, to assist in the problem of the acoustic detection and location of bombers from night fighters.

In the various special instruments used for the flight tests, the D.V.L. scratch recorder was widely used for all types of indication, to the exclusion of electrical recording systems and despite the microscopic size of the record so obtained. D.V.L. scratch recorders were also used, located at the control surface, for control position indicators.

Pressure Measurements

A D.V.L. sylphon capsule, linked to a mirror for photographic recording, was employed. A capacity type was under development at A.V.A. for dynamic pressure recording, in which the diaphragms of a two-chamber pressure capsule formed the condenser plates.

Temperature Measurements

Standard thermocouple installations were used with manually operated potentiometer and galvanometer indications. Free air temperatures were measured by the usual resistance thermometer, mounted in a forward facing vented cup to give a known kinetic temperature recovery.

Strain Gauges

D.V.L. scratch recorders were employed, the Germans being emphatically opposed to the use of electrical resistance methods. Inductance type strain gauges were used for dynamic measurements, while the capacity type were not considered satisfactory due to moisture effects.

Accelerometers

The standard uni-directional seismic type were in use, with D.V.L. scratch recorders. A three-directional type, developed by Betz, consisted of a glass cube mounted at the intersection of six air jets disposed at right angles to each other, as in Fig. 22, the movement of the cube under acceleration tending to throttle the air flow in some of the jets, giving a pressure change which could be observed or recorded. It was claimed to be a highly accurate instrument.

Air Speed Meters

The air log method was extensively used with a photo-electric transmitting system to reduce friction effects.

Institute for Theoretical Aerodynamics

Considerable work had been done on high speed air flow, in particular, theoretical calculations of the velocity and pressure distribution in compressible flow had been made using a theory which relates these quantities to the values in low speed or incompressible flow, for which there is a very broad theoretical and experimental foundation. The Institute had derived an improved value of the so-called Prandtl-Glauert factor which geometrically relates the compressible to the incompressible flow values. The electrical analogy method for studying compressible flows was also in use here.

Calculations of the stability of laminar boundary layers had also been made. These calculations predict a rising drag coefficient at high Reynolds number, which was confirmed by tunnel tests but at a somewhat higher Reynolds number than had been expected.

Other work included the study of turbulent boundary layers, and the development of improved air intakes for jet engines and coolers by theoretical calculation of the intake contours. The Germans were having trouble with air intakes located at the leading edge of swept-back wings, and similar difficulties had been experienced in other countries. Airscrew calculations, including contra - rotating propellers, and theoretical work on aerofoils had also engaged the attention of the staff here.

Institute for High Speed Flow

This Institute had three small, high speed wind tunnels at Göttingen and a fourth steam injector tunnel at Reyershausen. All were of simple design, as funds could not be obtained for more elaborate tunnels. The three tunnels at Göttingen were operated intermittently, from evacuated chambers totalling 14,100 cu. ft., with quick-acting valves to initiate the flow, reciprocating pumps having a total driving power of 600 kw. being used. This type of tunnel was popular in Germany, having the advantage of cheaper construction over the continuous type of tunnel. In the case of supersonic tests, steady conditions are achieved almost instantaneously in this type of tunnel, whereas the continuous tunnels gave considerable vibration and unsteadiness during passage through the sonic range. The disadvantage of the short test time available in the intermittent type of tunnel was claimed to be of secondary importance. It did not appear to restrict them seriously, except in the case of special work such as heat transfer tests.

The "1938" tunnel (Fig. 23) had a working section 11 cm. by 13 cm. and gave a Mach number of 3.0 to 3.2 for 30 seconds. This tunnel had been used mainly on projectile work, this Institute having been initially the main centre in Germany for the study of the aerodynamics of projectiles. It was also in this tunnel that the beneficial effect of wing sweepback in delaying compressibility effects was demonstrated in 1939. With 30° sweepback these effects are delayed by about 0.06 to 0.08 Mach number.

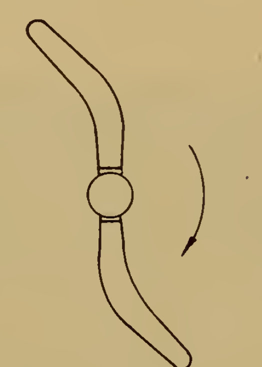
The "1942" tunnel (Fig. 24) had a circular open jet, 21.5 cm. diameter, giving a Mach number of 1.0 for 20 seconds. Speed was controlled by the axial motion of a streamlined body in the diffuser. Work in this tunnel included studies of projectiles in sub-sonic flow and tests of propeller profiles and swept-back wing profiles.

The "1945" tunnel (Figs. 25 & 27) had an open jet, 25 cm. square working section, giving speeds of Mach number 1.2 to 3.2 for 15 to 20 seconds. This tunnel had not been operated prior to the fall of Germany.

The open working section was preferred; among other advantages it facilitated mounting of the model. The length of the open jet could be varied in order to avoid shock waves, the entire jet being enclosed to permit control of the jet pressure. The roof and floor of the diffuser were flexible, to permit the formation of a second throat which is necessary for stability of flow in the working section. A silica gel drying system was required for the aspirated air, to prevent the formation of condensation shock waves which obscure the field and give rise to errors. A method for revitalizing the gel, which becomes necessary after several hours of operation, comprised an air circulation system with both electrical heating and refrigeration.

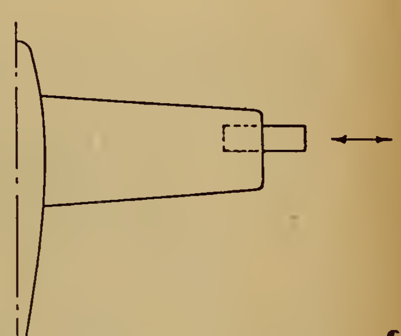
In this particular tunnel the quick-acting valve was a hydraulically operated, gate type, capable of full operation in one second. The conical rotary type of electrically actuated valve developed at A.V.A. was more popular, but owing to material shortages, could not be obtained for the "1945" tunnel.

A unique development at the



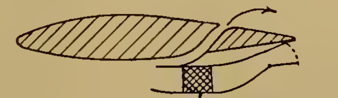
SWEPT BACK PROPELLER BLADES FOR HIGH FLIGHT SPEED

FIG. 19



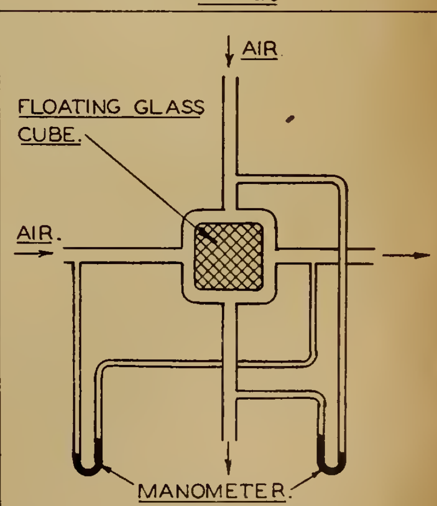
LATERAL CONTROL BY EXTENDABLE WING TIP PLATES.

FIG. 20



BOUNDARY LAYER REMOVAL SYSTEM FOR WING RADIATOR.

FIG. 21



BETZ PNEUMATIC THREE COMPONENT ACCELEROMETER.

FIG. 22

A.V.A. was the use of a grid of Laval nozzles for obtaining supersonic flow. This consisted of a brass plate, about $\frac{3}{4}$ in. thick, in which a large number of holes had been drilled, arranged in rows and columns, as in a grid, each of the holes being shaped like a Laval nozzle. This arrangement was said to give better pressure distribution and lower losses than the single Laval nozzle usually employed. Different grid plates with different shaped holes were required for each supersonic speed.

An ingenious 3-component, spring type balance had been designed and built for this tunnel. This was of the double-ended type incorporating three sets of axes, arranged to measure lift, drag and pitching moment consecutively, by selection of the appropriate axis. Although it only measured one component at a time, an experienced operator could obtain a reading within 5 seconds. Optical observation of the air flow by Schlieren photography was also intended for this tunnel.

The steam injector tunnel at Reyershausen is shown in Figs. 26 & 28. This was a novel expedient to overcome the lack of suitable electrical driving equipment and shortage of power for high speed tunnels, and made use of the existing steam generating equipment at the abandoned salt mine. A large steam storage tank of about 4500 cu. ft. capacity, at eight atmospheres pressure, was adequate for intermittent operation of the tunnel, running time being two minutes. The steam was injected from an annular orifice approximately 1 in. wide, downstream from the working section, the steam being supplied by five 12 in. diameter pipes, visible in the photograph, and released through quick-acting pneumatically operated double-conical valves.

Speed control in this sonic tunnel was obtained by the movement of a streamlined body in the diffuser, to choke the flow. The closed working section of the tunnel was about $31\frac{1}{2}$ in. in diameter and was surrounded by a pressure chamber in which the 3-component hydraulic-capsule type balance was located. The diffuser was about 60 ft. in length. The tunnel was used for aerodynamic tests of projectiles, studies of air inlets for jet engines and tests of athodyds (aerothermodynamic ducts) or ramjets.

The operation of this tunnel caused a vortex-ring shaped cloud to sit over the diffuser exit. As this would be easy to spot from the air, the staff were always careful not to operate the tunnel when Allied aircraft were abroad.

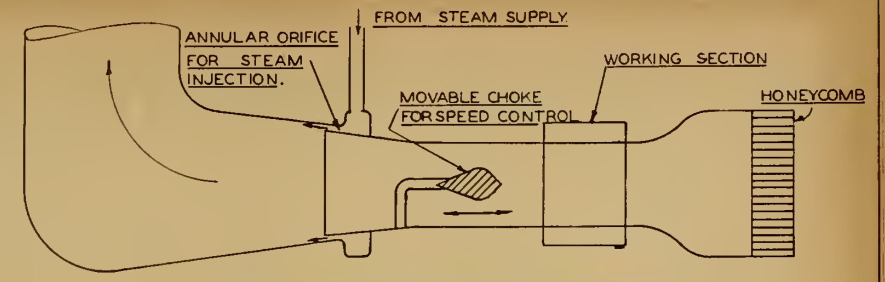
This Institute seems to have

Fig. 23 (upper left) The "1938" supersonic tunnel at A.V.A., Göttingen.

Fig. 24 (lower left) The "1942" sonic tunnel at A.V.A., Göttingen.

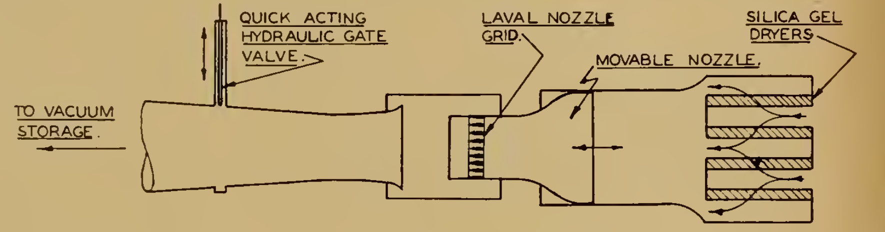
Fig. 25 (upper right) The "1945" intermittent supersonic wind tunnel at A.V.A., Göttingen.

Fig. 26 (lower right) The sonic steam injector tunnel at A.V.A., Reyershausen.



SONIC STEAM INJECTOR TUNNEL.

FIG. 28



"1945" INTERMITTENT SUPERSONIC WIND TUNNEL

FIG. 27

been primarily concerned with projectile shapes and the routine testing of projectile models. Some force measurements were also carried out on models of guided missiles.

Institute for Turbo-Machines

This Institute has been working for many years on axial blowers for stationary turbines and later, for jet propulsion units in aircraft. The work has been directed toward the development of a compact compressor of the axial flow type, by employing small diameter with high rotational speed and high rates of axial flow, combined with a high pressure rise at each stage. Working in the subsonic range it has been possible to obtain single stage efficiencies as high as 88 per cent with a blade tip speed of 650 feet per second under the above conditions. This work was carried out on small scale model compressors, and was supplemented by tests on cascades in order to separate out the influence of radial motion in the boundary layer and to supply basic design data. The tests established the importance of impeller 'solidity' (or number of blades); hub to blade diameter ratio, in which the relative magnitude of the boundary layer is important; Mach number at the blade tips; and Reynolds number.

Two small scale compressor test stands were available, incorporating a closed variable density air circuit for the test compressor, the first one for 6 in. wheels driven by a 90 hp. air turbine, and the second one for 8 in. dia. counter-rotating wheels, which is provided with two 100-kw. electric driving motors, giving speeds up to 33,000 r.p.m.

In addition, a large full-scale compressor test stand had recently been added to the equipment, having a driving power of 2900 kw. and capable of testing blowers up to 40 in. in diameter at speeds up to 12,000 r.p.m. This stand had been used for testing the 4-stage compressor on the new Heinkel Hirth He-S11 jet engine. A cascade testing tunnel for turbine and compressor blades was also under construction at this Institute. It was proposed to employ the same driving motor as for the full scale compressor test stand, with special blowers to give air speeds up to 820 feet per second in a working section 2 ft. square. The compressors of the German jet engines, including the Junkers Jumo 004, the BMW 003 and the Heinkel Hirth He-S11, were designed in consultation with this Institute.

(To be continued)

An Interesting Exhibit

Through the courtesy of the National Research Council we reproduce a photograph of great historical interest—the first radar magnetron tube seen in America.

In 1940, Sir Henry Tizard, one of a group of British Scientists working on the development of Radar, headed a mission to the United States to disclose "freely, completely and unconditionally, in the common interest, all that was known in the United Kingdom regarding the science of radiolocation". Among the mass of technical data and information brought to this continent by the Tizard Mission was a sample 10-cm. magnetron tube, the nucleus of successful centimetric radiolocation development and the pioneer of the vast family of radar magnetrons which have since been manufactured in North America.

This tube is now in the possession of the National Research Council where it serves as a reminder of and monument to that community of interest and understanding among scientists of the British Commonwealth and the United States which contributed so much to the successful prosecution of the second World War.

Making The Most of Engineering

*An Address delivered before the Detroit Section of the Society of Automotive Engineers on May 19, 1947.**

by

James C. Zeder

Chairman of The Engineering Board, The Chrysler Corporation, Detroit, Mich.

Although the following address has already received wide publicity, the Publications Committee believes it is

James C. Zeder

worthy of repetition in the *Journal*, due to the importance of the message it carries. Behind the light conversational style of the author there is much sound advice that, if heeded, can be really helpful in shaping the careers of those still willing to learn. Particularly it merits careful and thoughtful reading by the young engineer, for in it there is given a proven formula for success.

Technical proficiency, the author points out, is not enough. He urges engineers to apply the same scientific reasoning and research used in overcoming engineering problems, to their own personal problems—how to get along with others, how to extend their services, how to think ahead, how to undertake a serious programme of self-development and self-adjustment, based on reason rather than emotion.

This discussion will be in quite a different direction from the technical matters usually brought to engineers' meetings. In contrast, this is a report on observations made, and a few conclusions arrived at regarding a personal phase of engineering. This personal angle is important, because if we neglect it, we apply brakes to our progress. Yet if we develop it and put it to use, it becomes a powerful asset. How much more successful most of us would be as engineers if, at the same time, we were somehow able to be more successful as individuals! How much more we could make of Engineering if we could give the same effort and thought to engineering *ourselves* that we spend on materials and mechanisms.

This applies to all of us, and it doesn't matter what type of engineering progress we have in mind . . . it may be along the lines of research, of design, of some specific branch of science, or in the direction of greater executive responsibility. Each one of these objectives is necessary to the advancement of the profession. And fortunately we are enough different from each other in temperament and particular ability so that each direction of advancement represents a satisfactory goal for a certain number of us.

What we as engineers too often overlook is the fact that our individual success is measured not only by how much we know, but, of even greater importance, how much of our information we can pass on to others and how much of it gets into actual use. That in turn depends upon something more than an ability to solve technical problems. We must match that with an equal ability to make progress in fields beyond technology, so that our knowledge and experience can have practical application.

Yet, it is these non-technical obstacles that seriously bother us. What we *worry* and *complain* about are such things as how we can get more recognition, more money, more and better equipment, or a better job. But these are things we can't secure all alone—somebody besides ourselves has to do something about them.

Accordingly, to solve our really troublesome problems, we engineers should spend more time and thought in what is frequently called " human engineering ", so let's concentrate on the first step in such a project. That is to determine what engineering we should do *on our-*

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selves as individuals, to accelerate our progress.

Typical Complaints and Their Analysis

As in any engineering problem, it's important to determine right at the beginning what are the obstacles ahead. So, let's look at a few of the typical circumstances that confront us as engineers;

1. It is almost impossible to secure recognition or greater income.
2. The company is not progressive.
3. Progress in my company can be gained only by the " high pressure boys ".
4. There's no future because there are too many older men ahead of me.
5. There's no credit for routine work, and I never get the spectacular jobs.
6. The management completely disregards the true importance of the field of engineering I'm in, so that little attention is paid to my work.
7. There's no real money in engineering.
8. Engineering doesn't have enough voice in management decisions affecting engineering.
9. Engineering does the work, but someone else gets the credit.
10. Engineers spend most of their time correcting other people's mistakes.

We could go on for quite a while like this, but those are enough to show you the type of circumstances referred to.

There's neither the time nor the need to discuss each complaint. If we let them, they can put an overpowering drag on our progress. Or they can be actual starting points for continued advancement, if we put them to work. It all depends on *US*.

The seriousness of a complaint does not depend upon whether the circumstances are either worse or better than we think they are; instead, the important factor in the case is the *attitude* we take toward it. Too many times it is the *state of mind* that defeats us, far more seriously than the situation which prevails. As soon as we allow our attitude toward a complaint to degenerate into a state of chronic grumbling the more certain it is that we will be brought to a stop or even start sliding downhill.

Unfortunately, when we encounter obstacles outside our own back yard of engineering, we tend to throw away the precision tools of reasoning; instead, we start hacking away with the erratic implements of emotion. We lose all sense of proportion because, instead of using a steel rule, we try to size up the situation with an elastic tape measure. And the more disturbed we get, the more we stretch the tape! The natural result is that we become uncertain and confused. The surest evidence that we are disorganized is our inability to get our mind free from the complaint long enough to go to work on ways to get around it.

Confidence, the surest stimulant to action, gives way to fear. Medical men tell us that prolonged fear actually injects serious poisons into the system. Certainly its ability to magnify and intensify the hazards of any course of action sets up a paralysis which resists the strongest kind of effort. So, when we permit a complaint to get under our skin, we give ourselves over to a drug that really disorganizes us. Among other things, it blunts the sharp edge of our initiative, it neutralizes the finest technical proficiency, and it completely disrupts our ability to exercise good judgment.

Applying Scientific Approach to Circumstances

If we expect to make progress as engineers we must become better engineers, of course; but we must also improve our ability to make a constructive approach to the *circumstances* that bother us. That being true, we might learn something from our usual *engineering* approach to problems involving *physical laws*. When you stop to think ot it, we *could* have a lot of complaints against nature. Imagine the performance we'd get out of our cars if we could make a few exceptions to the law of gravity. How much easier it would be if nature didn't insist in using up a lot of energy in the form of friction and heat! Think of all the troubles we get into because mechanisms are subject to wear. How it would simplify things if there were no such thing as corrosion or rust!

Everywhere we turn we run into circumstances which slow down or limit our progress, or force us to go in some other direction. So what do we do . . . complain about it? Of course we do, but not seriously, and not for long. Why? . . . because we have come to accept natural law not as a reason for personal complaint, but as a challenge. The engineer has concentrated his time on finding ways either of using the forces of nature or of avoiding harmful conflict with them. Instead of being stopped by friction, we minimize it with lubrication and overcome it with power; and without it we'd be in a bad way both for the traction that makes travel possible, and for the braking that permits us to stop.

Corrosion is, perhaps, the finest example of all. There are no benefits of corrosion. Yet, out of the efforts to combat it have come some of the greatest sources of beauty we have. . . . Think of the many beautiful metallic platings, the style possibilities of stainless steel, the rich colours we now have from modern lacquers and enamels, to mention a few. Our experts in art and styling would have a pretty slim bag of tricks without all the decorative techniques which were first started as attempts to prevent corrosion.

The point of all this is to show how consistently we, as *engineers*, demonstrate that it's not the size of the obstacle but the constructive approach to its solution that's important. If we thought that gravity, friction, wear, and corrosion were unfair, and if we had the feeling that they were aimed directly at our personal engineering progress, we'd be licked before we started. There doesn't seem to be much pay dirt in trying to get them changed or repealed either, if the general standing of magicians and medicine men is any indication. They haven't gotten past first base, after centuries of plain and fancy trying.

Yet apparently the main difference between the magician and the engineer has been a state of mind . . . a method of approach. The laws of nature haven't changed. The same forces that today can drive a car over two miles a minute have existed since time began. The obstacles that made such performance seem fantastic even twenty years ago are also still there. But we ourselves have seen the tremendous strides made in the field of automotive engineering alone. Present day engineering accomplishments prove that there is no ceiling, no door completely closed, when the attack is made in a *constructive* state of mind.

The more closely we study this whole subject, the more clearly one fact emerges. The natural laws that have been the roughest on us have forced us to do hard work; but that very effort has been one of our greatest sources of scientific progress. In other words, instead of holding us back, the obstacles actually forced us further ahead than we otherwise might have been . . . as long as we concentrated on finding solutions, rather than squandering all our energy in complaints. The conclusion seems obvious . . . to make the most of engineering, we, *as people,* should apply the same approach to our complaints against *circumstances* that we, as engineers, have used so successfully in capitalizing on the obstacles we're continually fighting in natural laws.

It's not easy to take this objective view of *personal* obstacles, because when *people* oppose us, the most natural thing is to get upset. We have all kinds of energy to pour into impatience, anger, resentment, suspicion, and injured pride; but it's something else again to force our thoughts into channels of analysis, unprejudiced judgment, enterprise, and constructive action *in spite of disturbing circumstances.* It takes hard work, without much let up . . . but it's worth trying. If we succeed, it means we will replace bitterness and disappointment with assurance and satisfaction. What's more, when we try it, we discover that our growth and the measure of our success increases whenever we apply reason rather than emotion to *every* obstacle in our path.

This certainly is not to imply that we should never complain—far from it! A state of unruffled contentment with ourselves and our surroundings may look inviting from a distance. Yet, like a complete balance of forces, it means no movement, no forward progress, no development. Dissatisfaction with circumstances, and with our rate of progress, in itself, then is a *healthy* symptom. More than that, it's the initial spur to personal advancement. For whether it is real or imaginary, larger or smaller than it appears, if the obstacle is used as a starter, not a brake, it can serve as a sure means of driving us to greater efforts, the sure basis of continuous advancement. Walt Whitman has pointed this out in a famous passage. He asks:

> "Have you learned lessons *only* of those who admired you and were tender with you, and stood aside for you? Have you not learned great lessons from those who braced themselves against you, and disputed the passage with you?"

Looking at it from that viewpoint, our various complaints do not diminish in importance, they merely fall into another category. Instead of resenting them as irritating barriers, we can now recognize them as the potential starting points to substantial progress. That very kind of difficulty you may now be having has been an important spur to the growth and eventual progress of quite a few really successful engineers.

The Typical Engineer

To get a better perspective, let's set the stage with an automotive engineer . . . any typical member of S.A.E., who, of course, has been doing a good job. Everything is satisfactory, except one thing . . . the only *reward* he's had for doing good work is to have more of the same dumped in his lap in stifling quantities. And because nobody has taken him up to the mountain top to show him the new territory that's being turned over to him, he figures the road is permanently blocked and that the only solution is to find a new mountain!

There isn't one of us here who, like our typical engineer, doesn't feel perfectly capable of carrying greater responsibilities. We all *know* that, if we were given the opportunity, we could do more important work than we are doing today. The stronger we feel that way, the more disappointing it is for months or even years to roll by without the company showing any appreciable recognition of our real talent. Like us, this typical engineer can point to an excellent record. He's taken a personal interest in each new project. He's made many contributions beyond actual requirements. He's given unswerving loyalty to his superiors. He knows he is the type of person who should be a key man in the organization.

The company, while recognizing the value of these qualities, looks at each one of us from its own perspective, and through eyes which are looking for *other* qualifications as well. It must think in terms of group objectives, of broad purposes to be attained, and of progress through team work, and organization. There are various types of work to be done, but as a company grows in size, the more necessary it becomes that people must fit themselves to jobs rather than that jobs can be created to fit people.

While our typical engineer may be using a *foot* rule to mark off the extent of his abilities, the company may have to employ a *yardstick.* Our fitness to be given work of broader scope depends upon qualifications beyond the satisfactory performance of our present jobs. It isn't simply a matter of how far we personally have advanced during the past years. The deciding factor is how close we have managed to come to the *ideal* requirements for the particular position which needs to be filled. In this connection, how often do we stop to consider the ways in which we ourselves are being "typed" by our associates. We do that very thing, almost automatically, to those around us.

At the same time we are being catalogued . . . but under what headings, do you suppose? If we could only look at ourselves from the viewpoint of those who do the selecting for each new job, what do you expect we'd see? Are we "too cool and aloof to work with others". . . do others feel we're "too opinionated and know all the answers". . . . are we "impatient and short-tempered". . . are we continually being "misunderstood"? How do we really stack up as building material? Do we fit in with the rest of the structure? Are we fully prepared to carry our full share of the load? After a glimpse like that, every one of us would recognize that there *should* be a few changes made . . . in us.

The trouble with many of us in the engineering profession, however, is that we don't look too favourably on the necessity for the personal development and readjustment that is needed if we are to get the recognition we expect. Too often we assume that all we need is more engineering. That makes it all the more disturbing when someone moves ahead of us, who we think has nowhere near as comprehensive a background in engineering as ours.

Technical Proficiency Not Enough

As a matter of fact, the more you study individual cases of engineers whose progress has lagged seriously behind their engineering ability, one thing becomes increasingly evident . . . *technical proficiency, alone, is not enough.* In fact, too much emphasis on scientific achievement can, itself, be one of the very reasons why some engineers continue to be passed by. In concentrating on engineering, these men have completely neglected to consider or develop these *other* characteristics which carry men ahead. Unfortunately, as more and more interest is centered on engineering problems alone, the ability to find and make use of new avenues of personal development and progress seems to diminish.

As engineers, we have many fine prerequisites to success. The difficulty with many of us is that we're not prepared to make the best possible use of our equipment. Any of you who are fishermen and who have really whipped a stream know that there's a lot more to fly fishing than having just the right weight of rod, the most modern type reel, the finest, smoothest running line that's available, and the latest versions of the flymaker's art. For, even though the stream is well stocked, you can catch more frustration than fish if you don't cast in the right pools, drop the fly down in just the right way, and work with the sun, wind, and stream, rather than against them. Good equipment helps, but it's how you use it that really fills up the creel. So, just because you haven't caught any good-sized fish in the engineering stream you're working, don't blame the stream, or necessarily the equipment, which in this case is your own engineering training and experience. Instead, the chances are that it's the way you're using it that's at fault.

To get back to our hypothetical engineer, what is it that he should do if he is to make the most of himself and of his engineering. No two people can use an *identical* plan, because each of us is different, in background, in personality, and in our own interpretation of what constitutes a satisfactory objective. Yet, in any company, there are certain methods of approach, particular abilties or ways of doing things, which secure more favourable attention than others. Again, there are common denominators of personal advancement that have proved to be effective in one company after another.

Special Studies Already Made

Fortunately for us, extensive studies have already been made with which we can supplement our own findings. For instance, a few years ago a young man in the sales department of an entirely different industry became, like many of us, quite dissatisfied with the progress he was making. He kept asking himself what it could be that certain men, apparently no more intelligent than he, were using to get ahead so fast. So he set out to find some of the answers. For several years he made thorough-going studies of the successful men with whom he came in contact. He made the same *variety* of careful determinations that we would use in determining the characteristics of a new, super-strong metal suddenly put on the market. At weekly get-togethers of a few of his associates, men interested in the same thing, he checked his own observations with theirs.

In building up a pattern of success for themselves, these men soon discovered that they had evolved a highly marketable product. They had produced a system of personal behaviour and an analysis of ways to get things done that applied to widely differing occupations. What they had learned could be used to make progress in accounting, in salesmanship, in office management, in factory operations, and even in engineering. Literally thousands of individuals in hundreds of companies, many in some of our largest corporations, have learned to apply these fundamentals to their own jobs. As a result, most of them are more effective in their jobs. Consequently, they are getting more recognition and greater compensation. Many of the principles revealed are ones in which we as engineers, are particularly prone to be deficient, so they're worth considering right here.

Here's the first point . . . these investigators learned that above everything else the most widespread and useful characteristic of success is the *ability to get along with people.* That doesn't mean being an easy mark . . . letting others run over you. To get places, you must get things *done.* But some individuals seem to do that with an unusual amount of cooperation from others, and a minimum of opposition. In fact, that's how they manage to out-produce the rest of us by enough margin to secure the kind of recognition *we'd* like to get. Yet, along the way they make many real friends and few actual enemies.

We all can think of individual engineers who are brilliant men, but who have found themselves stopped time and time again because of failures in getting along with people. They are men of keen vision and truly advanced ideas, but they're always looking in vain for a congenial atmosphere. No matter where they go, things are never quite right for *them.* They are full of zeal, imagination and initiative . . . all prerequisites of success. The trouble is they have applied these talents to only *one* half of the job . . . the technical side. As a result they are continually in trouble because of the lofty, uncompromising attitude they feel they must take toward others. Quite unintentionally, they set up a corrosive action which undermines the best efforts of those around them with an atmosphere of antagonism. They honestly can't understand what causes the trouble. Eventually, they become convinced that everyone is lined up against them.

Other engineers seem to feel it necessary to develop what might be called the porcupine approach. They always know all the answers. So, whenever any outside suggestion is made, they invariably have a well-sharpened quill ready to puncture the would-be cooperator.

Then, there are those of us who tend to feel that compromise is just as unthinkable in actions or methods of operation as it would be in technical opinions. So we find ourselves inflexibly anchored to one spot. In addition, there's the super-scientist who always seems to be misunderstood. He *is,* simply because he never feels it worth while to put aside enough of his advanced technical terms to be understood by those outside his own highly specialized field. But most important of all, there are a lot of us, like you and me, who aren't prima donnas, but who still don't travel at anywhere near our potential rate. Like the others, we owe much of our own trouble to our failure to pay as much attention as we should to the important matter of human relations.

Here's a second characteristic of successful people. It's their habit of looking beyond their own department, or their own activity . . . and the object is seldom to locate greener pastures. Instead, they are continually searching for ways in which they can make their own efforts contribute more to the rest of the organization. That's not altruism . . . far from it. They've discovered that their own market value goes up whenever they extend their services. Greater recognition is theirs as fast as more people understand the use and importance of what they're doing.

A third avenue to progress, in whatever direction you want to go, is travelled by the numbers of people who are consistently moving up, entirely independently of company plans and any regular promotion schedules. Instead, they exercise considerable control of the time, rate, and direction of their progress by doing a great deal of planning of their own. In their efforts to move ahead, they work as untiringly and in as many directions on *personal development* as any engineer worth his salt expects to work on getting the bugs out of a new process or an experimental model. If one plan fails, they pick up the pieces, determine the probable cause of failure, and then put together another one. The next one should do better, because it avoids the pitfalls that apparently wrecked its predecessors.

Must Strengthen Personal Qualities

Right here one thought should be emphasized as strongly as possible. It's this: Personal progress, if it is to be lasting, must be based not on smart moves or clever scheming, but on the strengthening of fundamental qualities. The self-development must start from the core of the individual. A quick case-hardening of the surface won't take the load . . . the base material itself must be improved.

Every outstanding leader, the sort of man you and I recognize as a " topper ", gives us the finest proof of much that we've been discussing. His sincerity and genuineness are inescapable. He's not putting on an act—he's being himself. And the edge he has on the rest of us, above everything else, is the successful attitude, or state of mind we've talked about.

Each one of us has seen this kind of person in action at one time or another. Time and again he amazes us by pointing out many ways to improve something we thought was the last word. He *begins* where we are ready to stop. This happens in such widely different circumstances as designing a new model, planning a new engineering programme, appraising a new mechanism, or working out the basic lines of an entirely new activity. The amazing thing is that his suggestions seem to come readily, and are sound, no matter what the subject. His is an orderly, well-trained mind to which he adds an exceptional ability to see things in their right light and true perspective. With this combination, he can find the road through or around a difficult situation with few, if any, false starts, and with a minimum of wasted effort. His energy is concentrated on going beyond it.

He isn't blind to obstacles—far from it. As a matter of fact, he sees them more clearly than most of us, because his vision isn't cluttered up with worry over their existence. He knows there are always ways around even the most disturbing circumstances, so he looks *past* them. His mind is free from confusion. He moves without lost motion. His decisions are quick and clear. He *leads* because he's always *thinking* ahead of us.

Are men like these in a class set entirely apart, which we can but admire from afar? Are these men endowed with so much more talent than the rest of us? Are they gifted with aptitudes beyond our reach? Probably in some cases they are . . . but actually many of them are not much different from you and me . . . except in one all important particular. That's the matter of ATTITUDE . . . the state of mind with which they bring success to everything they do.

Men so fortified have been referred to as individuals who simply couldn't seem to avoid success. Many of them are men right here in the automotive industry . . . men we have worked with and seen in operation. Every one of them has had to overcome one obstacle after another. At least once or twice in the career of every successful engineer, there were times when all his efforts seemed to be ending in blind alleys. He wasn't stopped—certainly not for long. Why? Because of the state of mind with which he attacked the situation. It led him to use the same thoroughness in preparing himself to meet *circumstances* that he did to solve technical problems. He tackled *both* sides of the problem—that's why, whichever way he turned, he did a better job and made faster progress than the average individual.

Conclusions

In bringing this talk to a close, let us go back for just a minute to those ten complaints we listed right at the start. We can look at them either individually or as a group. In any case, we can agree that they *all* are vulnerable to *trained attack*. And there is no profession better equipped to make that kind of attack than the one represented by engineers.

We can do it by approaching obstacles involving circumstances with the same constructive state of mind that we use to solve strictly engineering problems. It means relying on reason, instead of giving way to emotion. It means developing the ability to get along with people. It means making continuous studies of the ways in which we can better relate our field of interest and our engineering accomplishments to the broad objectives of the company that employs us. It means applying engineering know-how to the progress of *engineers* — to the job of getting the utmost use from the engineering knowledge and experience of each individual.

What can we, personally, do about it? The answer (and the whole subject) boils down to this: Each one of us can make more progress in Engineering if we are willing to carry on a serious programme of self-development and self-adjustment. By so doing, we will gain the stature and maintain the attitude which will give us capacity for progress *beyond* whatever problems we meet.

If you can absorb that thought, *you* can do whatever is necessary to put it to work. And when you do, you'll be working toward a continually broadening conception of how much it can mean, *to you*, to " Make the Most of Engineering ".

From Month to Month

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

Canons of Ethics

Elsewhere in this *Journal* are printed the Canons of Ethics as prepared by the Engineers' Council for Professional Development (ECPD). They are the result of many years deliberations by a special committee appointed for the purpose, upon which the Institute was represented by Dr. C. R. Young, of Toronto.

It was the hope of ECPD that a code of ethics could be devised that would be acceptable to and adopted by all societies represented on the Council, and by others as well. This objective has been reached partially, in that the Code has been approved by all such member organizations. This approval was given by the Council of the Institute at the Banff meeting, upon the recommendation of a special committee appointed to make a study and a report.

The next step—and perhaps not an easy one—is to get each society to adopt the Code either in addition to its present code or in place of it. It would be a wonderful accomplishment in the interest of co-operation if such could be brought to pass. Already one or more organizations have agreed to its adoption, thus showing the way.

Earlier drafts of the Code were submitted to the Institute along with the other members for examination and comment. The Institute has set up two different committees at different times to study them and report. The latest draft was before a committee in Toronto with Otto Holden as chairman. This committee's recommendations were well received by ECPD's committee, and the final draft contains many of their suggestions.

The Code of Ethics presently used by the Institute goes back many years. It, too, was the product of a joint effort, and is used as well by the American Society of Mechanical Engineers. Perhaps this time a greater number of the participating organizations will take proper action.

Members are asked to read the Canons. Council would be interested in knowing their reactions. The time will come shortly when a decision must be made by the Institute as to their adoption. An expression of opinion from the membership would be helpful.

Echo of Collective Bargaining

Recently the Corporation of Professional Engineers of Quebec circularized its membership to obtain their ideas on the controversial subject of collective bargaining. As far as federal legislation was concerned the issue was closed but the Corporation thought it advisable to do now what time had prevented it from doing several months ago, i.e., consult the membership.

The questionnaire offered the four proposals which seemed to cover the whole field of possibility from actual inclusion in trade unions to complete exclusion from collective bargaining. Each member was asked to indicate his preference.

Proposal number one offered "unconditional inclusion under labour codes". It received support from twenty-one members.

Proposal number two was "inclusion under labour codes with preferential treatment". One hundred and forty-two voted for it.

Proposal number three was "exclusion from labour codes". Two hundred and eighty supported it.

Proposal number four offered "exclusion from labour codes" with the possible alternative of having the Corporation represent them in labour discussions. This was the favourite alternative and eight hundred and eight voted for it.

The outstanding feature of the results is that they leave no doubt as to the desire of the members to be excluded from collective bargaining legislation. There were some people who claimed that the council of the Corporation in asking recently for exclusion from the federal labour act were not acting in accordance with the wishes of the majority. The questionnaire surely clears up that situation nicely.

Progress at Ottawa

In the Spring of 1946 the Institute presented a brief to the Royal Commission then sitting at Ottawa to consider changes in the "administrative classification" of civil servants. Among the recommendations was one proposing that an Interdepartmental Panel be established, along the lines of that created by the Scientific Service of the British Civil Service. In the eventual report of the Commission no recommendation was made for such an establishment.

Actually it would have been a great surprise had the advice been accepted. Usually Royal Commissions ignore most of the good advice they get, and what they do accept is ignored in turn by the government. Apparently commissions and government alike have some sort of inferiority complex, which prompts them to decline proposals and advice from "outsiders" for fear it may be thought they have no ideas of their own.

However, it appears that at least one governmental department has the intelligence and courage to try out the idea within its own boundaries. Recently the Department of Mines and Resources has announced the formation of a Joint Council made up of representatives of the four branches of the Department. In addition, each branch will have a council of its own to deal with matters which relate directly to the administration of the branch.

The purpose of the Joint Council is to give all members of the staff the opportunity for direct representation in the discussion of matters affecting their welfare and conditions of work, and to make available to department heads their ideas and experiences in matters relating to the proper functioning of the department.

The four branches of the department are Mines, Forests and Scientific Services, Lands and Development, and Immigration and Indian Affairs. The proposal has the approval and support of such organizations as the Civil Service Association of Ottawa, the Civil Service Federation of Canada and the Professional Institute of the Civil Service of Canada.

It will be interesting to watch the work of the new council. Perhaps its success will be an inspiration to the government to adopt a similar plan for co-ordination between all departments—or is that too much to hope?

Conservation

The chairman of the Institute's Committee on Conservation of Natural Resources, Dr. Alan E. Cameron, presented on behalf of the committee, an interesting report to the Fifth Annual Conference of the Provincial Ministers of Mines held in September, 1948, at Jasper, Alberta.

The report outlines the objectives of the committee and offers to the conference its services, particularly in relation to conservation in the mineral industry. It refers to the peculiar economic conditions that apply to the development of an ore body, and suggests procedures that may be helpful in extending a development to its most economic conclusion.

The necessity of developing the other resources in the region in order to stabilize the community that rises around a mineral deposit is stressed. Reference is made to agricultural and forest resources along with power, highways and water supply, as necessary parallel developments if a community is to survive.

The report concludes with the statement that the proposals place a heavier burden and greater responsibility upon governments, but that as the natural resources belong to the Crown, it appears that these responsibilities cannot be placed elsewhere, in addition to which there is no other authority that has the power to establish and carry out the necessary regulations.

"The Civil Engineer in War"

Under this title the Institution of Civil Engineers has prepared a most informative publication, which is being distributed in Canada by the Engineering Institute and in the United States by the American Society of Civil Engineers.

The work has been in the course of preparation ever since the cessation of hostilities. It has been a huge task made more difficult by the reticence of the authorities to release much of the information, which until recently was still on the secret list. There are three volumes containing fourteen hundred pages and one thousand diagrams and photographs.

The work should be in the library of every civil engineer, and in university and public libraries as well. It is one of the most ambitious projects ever undertaken by an engineering society. It is a book of reference, a history, and a tribute to the profession.

The publication has been made possible only by the co-operation of the Admiralty, War Office, Air Ministry, and other government departments. It is a comprehensive and authoritative account of the main engineering works of the years 1939 to 1945. It describes the problems and their urgency, the methods of their solution, and still more important, the manner in which the solutions will benefit post-war engineering.

The subjects covered are air fields, roads, railways, and military bridging; docks and harbours, with a special section on "Mulberry"; materials, structures, hydraulics, water-supply, tunnelling, and surveying .

The price in Canada, if purchased through the Institute, is $9.75 for the set including all charges. A supply is now on the high seas to meet the needs of Canadians. If you are interested—and if a civil engineer you should be—send your order and remittance in the above amount (at par in Montreal) to Headquarters as quickly as possible. Only a limited quantity is available for distribution in this country. If you would like to see the table of contents before deciding just write in and say so. A six page folder giving all the details is yours for the asking.

Scientific Liaison Offices

The following information has been supplied by The National Research Council. (Ed.)

Most Canadian scientific workers already know the liaison office of the National Research Council in Ottawa as an agency from which reports on German science and technology can be borrowed. Those who have not yet used this service, but who are interested, may write directly for lists of publications available on loan. An examination of these lists will undoubtedly uncover some titles of interest.

The National Research Council operates liaison offices in London and Washington as well as in Ottawa, and Canadian scientists are invited to utilize the services of these offices. The offices are not intended to do for the scientist anything that he can easily arrange for himself, but they will assist in such matters as making contacts, securing information about scientific activities, scholarships, and availability of equipment, arranging visits and itineraries, and interviewing applicants for positions in Canada and reporting thereon.

For geographical reasons, demands on the Washington office will be relatively fewer because Canadians can make most of their American contacts personally and directly, but it is believed that the London office can very frequently be useful. Scientific workers interested in securing assistance in any matter in which they believe these offices can be useful may write directly to the Liaison Office, National Research Council, Ottawa.

Canons of Ethics for Engineers

Foreword

Honesty, justice, and courtesy form a moral philosophy which, associated with mutual interest among men, constitutes the foundation of ethics. The engineer should recognize such a standard, not in passive observance, but as a set of dynamic principles guiding his conduct and way of life. It is his duty to practise his profession according to these Canons of Ethics.

As the keystone of professional conduct is integrity, the engineer will discharge his duties with fidelity to the public, his employers, and clients, and with fairness and impartiality to all. It is his duty to interest himself in public welfare, and to be ready to apply his special knowledge for the benefit of mankind. He should uphold the honour and dignity of his profession and also avoid association with any enterprise of questionable character. In his dealings with fellow engineers he should be fair and tolerant.

Professional Life

Sec. 1. The engineer will co-operate in extending the effectiveness of the engineering profession by interchanging information and experience with other engineers and students and by contributing to the work of engineering societies, schools, and the scientific and engineering press.

Sec. 2. He will not advertise his work or merit in a self-laudatory manner, and he will avoid all conduct or practice likely to discredit or do injury to the dignity and honour of his profession.

Relations With the Public

Sec. 3. The engineer will endeavour to extend public knowledge of engineering, and will discourage the spreading of untrue, unfair, and exaggerated statements regarding engineering.

Sec. 4. He will have due regard for the safety of life and health of the public and employees who may be affected by the work for which he is responsible.

Sec. 5. He will express an opinion only when it is founded on adequate knowledge and honest conviction while he is serving as a witness before a court, commission, or other tribunal.

Sec. 6. He will not issue ex parte statements, criticisms, or arguments on matters connected with public policy which are inspired or paid for by private interests, unless he indicates on whose behalf he is making the statement.

Sec. 7. He will refrain from expressing publicly an opinion on an engineering subject unless he is informed as to the facts relating thereto.

Relations With Clients and Employers

Sec. 8. The engineer will act in professional matters for each client or employer as a faithful agent or trustee.

Sec. 9. He will act with fairness and justice between his client or employer and the contractor when dealing with contracts.

Sec. 10. He will make his status clear to his client or employer before undertaking an engagement if he may be called upon to decide on the use of inventions, apparatus, or any other thing in which he may have a financial interest.

Sec. 11. He will guard against conditions that are dangerous or threatening to life, limb, or property on work for which he is responsible, or if he is not responsible, will promptly call such conditions to the attention of those who are responsible.

Sec. 12. He will present clearly the consequences to be expected from deviations proposed if his engineering judgment is overruled by nontechnical authority in cases where he is responsible for the technical adequacy of engineering work.

Sec. 13. He will engage, or advise his client or employer to engage, and he will co-operate with, other experts and specialists whenever the client's or employer's interests are best served by such service.

Sec. 14. He will disclose no information concerning the business affairs or technical processes of clients or employers without their consent.

Sec. 15. He will not accept compensation, financial or otherwise, from more than one interested party for the same service, or for services pertaining to the same work, without the consent of all interested parties.

Sec. 16. He will not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with his client or employer in connection with work for which he is responsible.

Sec. 17. He will not be financially interested in the bids as or of a contractor on competitive work for which he is employed as an engineer unless he has the consent of his client or employer.

Sec. 18. He will promptly disclose to his client or employer any interest in a business which may compete with or affect the business of his client or employer. He will not allow an interest in any business to affect his decision regarding engineering work for which he is employed, or which he may be called upon to perform.

Relations With Engineer

Sec. 19. The engineer will endeavour to protect the engineering profession collectively and individually from misrepresentation and misunderstanding.

Sec. 20. He will take care that credit for engineering work is given to those to whom credit is properly due.

Sec. 21. He will uphold the principle of appropriate and adequate compensation for those engaged in engineering work, including those in subordinate capacities, as being in the public interest and maintaining the standards of the profession.

Sec. 22. He will endeavour to provide opportunity for the professional development and advancement of engineers in his employ.

Sec. 23. He will not directly or indirectly injure the professional reputation, prospects, or practice of another engineer. However, if he considers that an engineer is guilty of unethical, illegal, or unfair practice, he will present the information to the proper authority for action.

Sec. 24. He will exercise due restraint in criticizing another engineer's work in public, recognizing the fact that the engineering societies and the engineering press provide the proper forum for technical discussions and criticism.

Sec. 25. He will not try to supplant another engineer in a particular employment after becoming aware that definite steps have been taken toward the other's employment.

Sec. 26. He will not compete with another engineer on the basis of charges for work by underbidding, through reducing his normal fees after having been informed of the charges named by the other.

Sec. 27. He will not use the advantages of a salaried position to compete unfairly with another engineer.

Sec. 28. He will not become associated in responsibility for work with engineers who do not conform to ethical practices.

Presidential Tour

President Finlayson commenced his tour of the branches with an itinerary that set up a new record. As his home is in Vancouver it was necessary to do almost all the branches in the east on one trip, the balance remaining until his next trip east to attend the annual meeting at Quebec. Consequently the first tour covered everything in Nova Scotia, New Brunswick, Quebec and all but two branches in Ontario. The most northerly branches in the west were also included—a total of nineteen.

Accompanied by Mrs. Finlayson and the general secretary, his first call was at Arvida on August 27th. For this portion of the trip the party was pleasantly augmented by the presence of Vice-President Eadie and Mrs. Eadie of Montreal. At Arvida Vice-President Saunders and Mrs. Saunders of Ottawa joined the entourage, returning with them down the Saguenay and as far as Quebec.

The Sunday was spent at Quebec where Vice-President Lariviere took over, showing the party many of the famous features of the district both of engineering and historic interest.

The Maritimes

Moncton received the president on Monday. Before the branch meeting the mystery of "magnetic hill" was investigated, and "the Rocks" too were visited. The outstanding feature of course was the huge stack of lobsters awaiting the guests at the yacht club at Shediac. The president being a native of Nova Scotia did ample justice to the fare, but no more than did others of his party who were not so blessed in the place of their birth.

Top: President Finlayson, Branch Chairman J. H. McCann, Jr., Vice-President I. P. Macnab, and F. V. Burgess, at Cape Breton Branch meeting.

Bottom: The executive of the Halifax Branch held a luncheon for the president at the Lovett House, Chester, N.S.

At Halifax the usual hospitality was extended. The programme included a luncheon at Chester proffered by the officers of the Association of Professional Engineers of Nova Scotia—and the branch meeting at night held at the Lord Nelson Hotel. Here it was a treat to hear the president inform the Haligonians of their own engineering history—most of it known only to a few "old timers" in the audience who had lived through it.

From Halifax Vice-President Macnab accompanied by Mrs. Macnab motored the party to Sydney, where a meeting was held on the evening of Thursday, September 2nd. The "extra curricular" activities here included a visit to the old fort at Louisbourg, and a luncheon at the summer home of C. M. Anson, a past vice-president.

Monday, September 6th, was Labour Day, so the long week-end was spent on a tour of the famous Cabot Trail of Cape Breton, with a stop over at the Keltic Lodge at Ingonish. With Vice-President Macnab still at the wheel, the party continued on to St. Andrews-by-the-Sea, arriving Tuesday evening the 7th.

At St. Andrews the president presided at a regional meeting of Council on the 8th and was the speaker for the dinner on the 9th and in general took an active part in all phases of a very successful maritime professional meeting. A poem in his speech which parodied maritime place names made the names Skoodoowabskooksis and Skoodoowabskook by-words of the meeting.

Quebec

Leaving St. Andrews on Saturday, this time in the care of Mr. and Mrs. Paul Vincent of Quebec, the party proceeded by motor to Quebec via Fredericton, arriving Sunday evening, fatigued but in high spirits.

As usual the Quebec branch carried out a full and interesting programme. At noon on Monday, the branch meeting was held at Kent House at Montmorency the famous old home of Queen Victoria's father. The afternoon was devoted to a golf tournament, combining the membership of the branch with the local branch of the Ecole Polytechnique Alumni.

The president did not play golf, but in its place was motored around the Island of Orleans—once again in the competent care of Vice-President Lariviere. In the evening a joint dinner was held at the Royal Quebec Golf Club (Boischatel), after which great numbers of exceedingly fine prizes were distributed to winner and loser alike. Even Mrs. Finlayson and the president were recipients—apparently a reward for not playing.

The next morning (Tuesday the

14th) Transport Officer Lariviere was again in charge and the party arrived at Shawinigan Falls in time for luncheon with the executive of the branch and their wives. A tour of the industries and an official call on the mayor (see photo) rounded out the afternoon and led up to a dinner at the Cascade Inn that evening—a very successful affair.

From Shawinigan the trail led to Montreal—this time with Louis Trudel in charge. A stop-over of a few hours in Montreal permitted the party to overhaul their several pieces of luggage and to add to their wardrobe certain items that seemed appropriate in view of the drop in temperature. That night saw the group on their way to Hamilton—by rail.

Top: At the Ajax Division of University of Toronto. Front row (l. to r.), Prof. A. Wardell; J. F. Maclaren, Toronto Branch chairman; Prof. W. J. T. Wright; Dean C. R. Young. Back row (l. to r.), J. H. Follwell, Prof. H. L. Shepherd, Dean H. R. Perry, A. Russell, Brian Judges and R. G. Oxland of the University of Toronto Engineering Society, Rev. Carl Swan.

Centre: Shediac Yacht Club, scene of the Moncton Branch lobster party.

Bottom: Luncheon with the branch executive at the Saguenay Inn, Arvida, Que.

Left: "The Rocks", near Moncton, N.B.

Ontario

At Hamilton a delightful luncheon was arranged by the executive at the suburban "Estaminet", after which the party divided so that the president could visit some industries and Mrs. Finlayson see something of the city and the beautiful countryside.

The Branch meeting took the form of a smoker at the Mess of the 8th Field Regiment, R.C.A. preceded by a dinner with the executive and their wives at the Royal Connaught Hotel. The president presented the Institute's Plummer Medal to E. T. W. Bailey, M.E.I.C., for his paper "Oxygen Accelerated Combustion in Open Hearth Furnaces". He also presented the special awards of the branch to the winners of last season's Students and Juniors paper competition, G. L. Schneider, S.E.I.C., E. M. Tuff, Jr.E.I.C., and R. W. Kennedy, Jr.E.I.C.

On Friday morning Vice-President Vance and Mrs. Vance conducted the group by motor to London. Here the president was a luncheon guest of the Board of Directors of the Western Fair, and had an opportunity to extend the greetings of the Institute to the officers of this very successful enterprise.

In the afternoon Dean Finlayson called on the president of the University of Western Ontario, Dr. G. E. Hall and on other members of the faculty well-known to him. A visit to the new Collip Medical

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Top: The president signs the "golden book" in Shawinigan Falls' new city hall. Left to right, Geoffrey Ince, branch secretary; Mayor François Roy of Shawinigan Falls; the president; Alex. Larivière, Quebec vice-president; the general secretary; and M. Eaton, chairman of the St. Maurice Valley Branch.

Centre: The head table at the St. Maurice Valley dinner.

Upper: Secretary Ince, Mr. Wright, Mayor Roy and the president. Lower: Mr. Eaton; Vice-president Larivière; Sidney Williams, vice-chairman of the Valley Branch; Colonel H. E. Bates; and Viggo Jepsen, councillor for the branch.

Bottom: London Branch dinner meeting. Left to right, Mrs. E. R. Jarmain; Dean Finlayson; E. R. Jarmain, branch chairman; Mrs. Finlayson; E. V. Buchanan; Mrs. V. A. McKillop and Vice-President J. A. Vance.

Research Building was also a part of the programme.

In the evening the branch met in the Officers' Mess of the Wolseley Barracks, the ladies being in attendance to enhance the occasion.

Saturday morning saw the party off again with Mr. Vance en route to Niagara Falls. At Woodstock a most enjoyable luncheon of twenty had been arranged by Mr. Vance. In the afternoon the extended itinerary took in some of the fine farms of the district, a quick inspection of many municipalities including Kitchener and Galt and some of the features of the Niagara district.

Week-end at Niagara

At Niagara Falls over the week-end there was time for some extra sightseeing, and the local members did a fine job of direction. The striking beauty of the district was well displayed in fine weather and good company. The presidential activities included most of the usual sight-seer's favourites, such as the Maid of the Mist and the Cave of the Winds. Naturally an inspection of the Welland Canal and many points of historic interest for the historically-minded president was a " must " on this programme.

The branch meeting was held on Monday the 20th at the Red Casque—a wayside inn outside the city—and a delightful spot, too. The next day saw the party move on to Toronto (en route to Ottawa), where branch chairman J. F. MacLaren took them in hand for lunch and for sight-seeing.

Leaving Toronto on the night of September 22nd, they spent the following day with the Ottawa Branch. The programme here was made up of a luncheon meeting at the Chateau Laurier where two hundred members and wives were present; a reception at the home of Mr. and Mrs. L. M. Christmas, an officer of the branch; and a dinner party with the executive officers and their wives in the evening at the Chateau Laurier. The recently-formed Engineers' Wives Association made its presence felt in a

The two upper pictures were taken at the dinner party of the Ottawa branch executive.

The Peterborough branch dined with the President at the Peterborough Golf and Country Club, where the two lower pictures were taken.

Top: At Hamilton the president presented the Plummer Medal to E. T. W. Bailey.

Centre: The president poses with the other prize winners of the Hamilton Branch. On his left are G. L. Schneider, E. M. Tuff, R. W. Kennedy, and W. E. Brown, branch chairman.

Bottom: Some of the engineers who attended the meeting of the Niagara Peninsula Branch at the Red Casque Inn.

most acceptable manner. The success of this organization, patterned on similar associations at Winnipeg and Calgary, might well be an inspiration to the ladies at other centres.

From Ottawa Vice-President W. L. Saunders provided the transportation to Peterborough, where a very successful meeting was held at the Peterborough Golf and Country Club. During the afternoon the president made a short motor tour of the city and Mrs. Finlayson with the ladies was driven to nearby Stoney Lake for dinner. A party of five members from the Kingston Branch added special interest to the function.

On the morning of Saturday the 25th, with Vice-President Saunders in charge the party motored to Cornwall, stopping at Picton for lunch and at Brockville to change " horses ". R. H. Wallace, of Cardinal, chairman of the Cornwall Branch, took over the party here and on the remainder of the trip pointed out the various sections of the country that would be submerged by the proposed St. Lawrence waterways proposal, a subject in which the president showed a special interest.

On Sunday the president was motored over a lot of the territory around Cornwall, which permitted him to see on the ground just what was proposed in the way of power development from the Long Sault Rapids.

On Monday the branch, including the ladies, met at dinner with the president at the King George Hotel. A special feature here was the singing of a ladies choir under the direction of Arthur Vogt. Vice-President R. S. Eadie and Councillor J. B. Stirling were welcome guests from the Montreal Branch as was also Vice-President Walter Saunders from Ottawa.

Tuesday saw the party at Kingston. In the evening the branch with their ladies to the number of ninety met for dinner at the Kingston Yacht Club. The president presented W. A. Trotter, S.E.I.C., a student of Queen's with the certificate for the students' prize.

It was a welcome surprise for the branch to find Col. J. A. Macdonald, immediate past chairman of the Cape Breton Branch, among the guests. He was accompanied by Mrs. Macdonald and his niece.

On Wednesday the president and general secretary spoke to the third and fourth year students of Queen's. Lectures were cancelled for the occasion which resulted in a packed Convocation Hall.

Montreal

Leaving Kingston by rail Tuesday the party arrived in Montreal that night. On Wednesday the branch held a dinner at the Mount Stephen Club to which were invited to meet the president, the officers of the branch, past-presidents and representatives of several sister societies. Later the branch meeting was held at the Mount Royal Hotel, concluding with very acceptable refreshments. The Julian C. Smith Medal was presented to Dr. P. L. Pratley, M.E.I.C., and also the certificate for a student prize to Guy M. Lord, S.E.I.C., of Ecole Polytechnique.

Back to Ontario

That night saw the travellers entrained for Toronto where a lengthy programme was in store. Proceedings opened on Friday afternoon with a talk to the third and fourth year students, and the presentation of the student prize to D. B. Mutton, S.E.I.C. Past-President Dr. C. R. Young presided. This was followed by a dinner of the executive and Institute officers in the graduates dining room of Hart House, after which the general meeting was held in the Debates Room. There was an excellent turn out of about two hundred members and guests. The Keefer Medal for 1947, won by E. P. Muntz, M.E.I.C., for his paper " Steel Rail Piles Replace Concrete Piles ", was presented by the president.

Saturday was given over to a regional meeting of Council in the library of the Royal York Hotel, presided over in turn by the president and by Vice-President Vance. That night Chairman MacLaren once again extended his delightful hospitality, the setting being the Granite Club.

During the two days Mrs. Finlayson was entertained by Mrs. MacLaren and other ladies at luncheons, fashion show and theatre.

Sunday was really a day of rest.

On Monday the president and general secretary were conducted by Mr. MacLaren and Past-President Dean Young to Ajax where they spoke to six hundred students of the first and second years. Luncheon at the staff house followed, and then a quick trip over the " lot " to see how a shell loading plant had been ingeniously converted into a university—a remarkable achievement—then back to Toronto.

Top: The Cornwall branch dinner was held at the King George Hotel, and included the ladies. Visitors from Montreal included J. B. Stirling and R. S. Eadie.

Centre: Head table at Kingston included (l. to r.) Mrs. R. C. Wallace, Past-President L. F. Grant, Mrs. Phil Roy, Dean Finlayson, Branch Chairman Phil Roy, Mrs. Finlayson, Principal R. C. Wallace of Queens University, Mrs. L. F. Grant, and Norman Simmons, president of Queens Engineering Society.

Bottom: The President awards the certificate for the student prize to W. A. Trotter, S.E.I.C., of Queens.

Go West

That evening at six o'clock saw the president and Mrs. Finlayson on the train for Sarnia where they were the house guests of J. W. MacDonald. Vice-President Vance and Mrs. Vance were again "on the job" to provide transportation. During the day on Tuesday the president visited the Imperial Oil and Polymer plants and did a quick tour of the whole industrial section of the community. At noon he dined with the branch executive and, in the evening, addressed a dinner meeting of the branch at the Sarnia Golf Club.

On Wednesday Mr. Vance motored the party to Windsor. During the afternoon after luncheon with the executive a visit was made to the Ford Plant. The branch meeting was held that evening.

From Windsor the president and Mrs. Finlayson crossed over to Detroit to embark for the west. They arrived in Winnipeg on Friday the 8th and left for Saskatoon, Prince Albert and Edmonton on the 11th, and by Oct. 17th they were home in Vancouver — and doubtless glad of it.

It has been a big undertaking—over two months of travel by boat, rail and motor, covering a distance of about eight thousand miles. Including meetings with branches, executives, students and other groups the president has participated in forty-two meetings on this trip alone. In the Spring he will visit the remainder of the western branches—ten in number, on his way to the Annual Meeting in Quebec in May.

(Ed. Note). The "reporter" of this saga left the party at Toronto on October 4th, and time has not permitted a proper check back on details, therefore the account of events after that date is very sketchy and doubtless inaccurate. Reports from branches subsequently will fill in all the missing detail and correct the errors.

"E.I.C. Week" at McGill

A number of student engineers on the McGill campus have just completed a job which may set an entirely new pattern for interesting students in The Engineering Institute of Canada.

James F. Harris, president of the McGill Undergraduate Engineering Society, was a delegate to the Institute Conference of students in Banff last June. During that meeting he outlined a project he had been developing for some time—the organization of an "E.I.C. week" at McGill. The week of November 1st saw the maturing of his plans with results which exceeded the most optimistic estimates. Mr. Harris and his associates by Friday, November 5th, had delivered to Headquarters three hundred and ninety completed applications for student membership.

This outstanding performance was accomplished with a minimum of outside help. Mr. Harris and Mr. H. Pragnell, chairman of the professional committee of the Undergraduate Society, organized a group of students who were satisfied in their own minds that membership in the Institute could help in developing the professional consciousness so necessary to success in engineering. The Undergraduate Society's Publication Board produced leaflets listing the arguments in favour of membership in the national professional body. *The McGill Daily* was supplied with editorial items every day during the week which told something about Institute activities. Posters and notices were prominently displayed throughout the engineering building. A desk was set up in the main lobby of the engineering building and kept well stocked with information booklets, application forms and blank cheques. Members of the faculty readily sponsored all applications.

If the new student members are willing to make the same kind of a working contribution to the life of the Institute as that which they have just seen made by the officers of their own society, they will have many occasions to be satisfied with their new affiliation.

Jim Harris was the prime mover of "E.I.C. week" at McGill. Much of the spade work was done by Herb Pragnell. Other members of the group, all student members of the E.I.C., were Wilton Davis, William Dixon, M. B. T. George, D. H. Evers, Doug Abbey, J. A. McCutcheon, Ed Gauthier, Claude Howard, John Harvey, John Taylor and Harold Kay. They have shown beyond any doubt just what can be done by a small enthusiastic group in the development of an idea.

Head table at the Halifax dinner. Past-President J. B. Hayes, the general secretary, Vice-President Macnab, Dean Finlayson, W. C. Risley, Halifax Branch chairman, and Mayor J. E. Ahern, mayor of Halifax.

Maritime Professional Meeting

Another outstanding regional meeting has been carried out by the engineers of the maritime provinces. This time the stage was set at the Algonquin Hotel, St. Andrews-by-the-Sea, N.B. The maritimers are fortunate in having such beautiful spots for gatherings of this kind—Digby, Pictou, White Point Beach, Keltic Lodge, and so on. The combination of maritime scenery and maritime hospitality is hard to beat.

The programme has been printed previously in the *Journal* and so this brief account makes no effort

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In the picture at the top, W. T. Ross Flemmington, president of Mount Allison University, Sackville, is shown addressing the banquet on Friday night.

W. G. Macdonald of Halifax took this picture after the Friday night banquet. Front row—Mrs. Mellish Lane, Mrs. J. W. MacDonald, Mrs. A. R. Harrington, Mrs. W. G. Macdonald, and W. G. Macdonald. Back row—Mellish Lane, J. W. MacDonald, A. R. Harrington, Mrs. Harry Keddy, and Harry Keddy.

to cover that ground again. Suffice it to say that the technical sessions on both mornings were well attended and the papers will make valuable additions to the literature of the profession.

On the Wednesday preceding the two days of the meeting, a regional meeting of Council was held in the Casino. The attendance included representatives from all the Maritime branches and from London, Quebec and Montreal as well. President Finlayson of Vancouver presided. The Association of Professional Engineers of Ontario was represented by E. V. Buchanan a vice-president, and T. M. Medland, executive director, two very welcome guests.

To some extent the weather interfered with the lighter side of the programme. For the afternoon of Thursday a boat trip had been planned, but fog intervened and other arrangements had to be put together hurriedly by individuals and small groups. This change of programme seemed to disturb no one. After all, two hundred congenial people housed in the same hotel should have resources within themselves to overcome a little inconvenience such as a fog.

On both days there were many diversions to suit the many tastes, such as golf, bridge, movies, sightseeing and delightful motor trips to places like St. Stephen and Calais. Weather or no weather everyone had a good time.

Friday evening was devoted to dancing. The Casino, set apart from the hotel proper, was an excellent place for such entertainment. It was cool, comfortable, and commodious, and no one wanted to stop at the appointed hour, except the orchestra.

The committee in charge of the meeting deserves great praise. Arrangements were complete in every detail. Visitors from " Upper Canada " were enthusiastic in their comments and were most appreciative of the Maritime hospitality. Such meetings do much to develop a better knowledge of Canadian affairs and Canadian people. It is natural that the Institute as a national organization should take a part in the dissemination of this national knowledge which contributes so directly to a national spirit. The committee of Maritimers in charge of the meeting have done an excellent job on behalf of the Institute and the profession.

Engineers' Council for Professional Development

The 16th Annual Meeting of the Engineers' Council for Professional Development was held in Detroit on October 29th and 30th. Many members of this Institute will recall that last year's meeting was held in Montreal.

All sessions except the dinner were held at the Rockham Memorial Bldg., which is the Headquarters for the Engineering Society of Detroit, an overall organization that coordinates the activities of 28 member societies in that area. The wing of the building devoted to engineering affairs provides facilities almost beyond the fondest dreams of the most hopeful of engineers. It combines offices and auditoriums with the most luxurious of club accommodations.

The Engineering Institute representatives were Dr. L. F. Grant, a member of the Executive, James A. Vance, a councillor and the general secretary, a member of the Committee on Information.

The usual business of an annual meeting included the presentation of reports from chairmen of all committees and reports from the member societies on their year's activities concerned with E.C.P.D. policy and programme.

At the luncheon on the first day, Dr. H. P. Hammond, dean, School of Engineering, Pennsylvania State College, was the speaker. His subject was " The Young Engineer — His Professional Growth and Development. "

At dinner that night, Dr. Jas. W. Parker, chairman of E.C.P.D. and president of the Detroit Edison Co. presented his annual report and Dr. A. G. Ruthven, president of the University of Michigan, was the guest speaker. For luncheon on the second day, Dr. S. M. Dean gave an unusually interesting and useful talk on the development of a sense of civic responsibility in the young engineer. He is the president of the Engineering Society of Detroit. He spoke from notes only but a request was made — almost a demand — that he put it all on paper. The *Journal* will be delighted to print it, if as and when available. It should be in the hands of every junior engineer on this continent.

The report from standing committees showed the far reaching importance of the work within the purview of the Council. These standing committees deal with —

Student Selection and Guidance (Institute representative — Dr. G. R. Langley).

Engineering Schools (Institute representative — none).

Professional Training (Institute representative — Prof. R. DeL. French).

Professional Recognition (Institute representative — E. V. Buchanan).

In addition there are these special committees dealing with—

Principles of Engineering Ethics (Institute representative — Dr. C. R. Young).

Ways & Means (Institute representative — Dr. L. F. Grant).

Information (Institute representative — Dr. L. Austin Wright).

The purposes of this organization as outlined in the charter, and the programme as discernible in the titles of the committees are ambitious and comprehensive beyond any attempts made previously. The Council is the outstanding example of successful co-operation within engineering circles. This success in large measure, lies in the clearness of its purpose, its adherence to a policy of developing plans and methods to be enacted by the member bodies if they see fit, and the active support of outstanding personnel in the field of education and industry.

The *Journal* proposes to deal with the work of the committees, one at a time over a series of issues, so that members may become more aware of and better acquainted with the work and influence of this quiet working cooperative group — unique in professional circles anywhere. The significance of its purposes is important to the profession and should be better known to all members of the Institute.

Staff Change at A.I.E.E.

The American Institute of Electrical Engineers has announced that Charles S. Rich, formerly secretary of the Institute's technical programme committee has been appointed editor of *Electrical Engineering* and *Transactions* to succeed G. Ross Henninger who recently resigned.

Mr. Rich is a graduate in mechanical engineering from Cornell University and has been with the A.I.E.E. headquarters organization since 1930.

Mr. Henninger is well known to many E.I.C. members through his contributions to the work of the Engineers' Council for Professional Development.

Meetings of Other Societies

The fifteenth annual Chemical Engineering Symposium will be held at Massachusetts Institute of Technology on December 28 and 29, 1948, by the **American Chemical Society's** Division of Industrial and Engineering Chemistry, it is announced by Professor Joseph C. Elgin of Princeton University, chairman of the Division.

The third national Materials Handling Show will be held at Convention Hall, Philadelphia, January 10 to 14. The exposition is devoted to various systems of handling materials in production and shipment.

This year the show will be jointly sponsored by the management and materials handling divisions of the **American Society of Mechanical Engineers** and the **Materials Handling Institute.** The A.S.M.E. Groups will conduct a five-day Conference on Materials Handling concurrently with the exposition. A Materials Handling Theatre will exhibit recent films on handling subjects.

Advance registration cards may be obtained from Clapp and Poliak, Inc., 350 Fifth Ave., New York 1, N.Y. Hotel reservations may be obtained through the secretary, housing bureau, Materials Handling Show, 17th and Sansone, Philadelphia, 3, Pa.

The **American Society for Testing Materials** has announced that the 1949 Spring Meeting and A.S.T.M. Committee Week will take place at the Hotel Edgewater Beach, Chicago, Ill., February 28 to March 4.

The fourth Empire Mining and Metallurgical Congress will convene in Great Britain in July, 1949, under the auspices of the Empire Council of Mining and Metallurgical Institutions.

The chief object of the Congress is to afford an opportunity for scientists, engineers and others concerned with the mining and metallurgical industries to meet and discuss technical progress and problems, including the development of the mineral resources of the Commonwealth. President of the Congress is Sir Henry T. Tizard, K.C.B., A.F.C., F.R.S.

Correspondence

September 20, 1948

To the Editor,
The Engineering Journal.

One remark of Dr. L. Austin Wright in his comment on the letter of F. W. Davidson, both of which appeared in your August issue, prompts me to make an observation. It concerns the assertion that appreciation of cultural subjects comes largely in the high school years, if it is to come at all, and that later formative influences are largely ineffective.

It would be lamentable if this were true. It would debar from cultural understanding all of those who have had unsatisfactory secondary school training, or perhaps none at all. Few men have equalled Abraham Lincoln in his mastery of the written and spoken word and such circumstances as moulded it were not of the home or the school.

Actually, many persons do not develop a fondness for literature and the arts until they have gained maturity. I have known many to whom enlightenment and sensitive discrimination have come long after school days were over and the opportunity for reflection presented itself.

Those professional schools of engineering that have included in their curricula certain liberal subjects paralleling the technical ones, and most of the leading schools on this continent have done so, hold that through bringing to the attention of undergraduates fields of thought and wholesome enjoyment of which they had as yet but faint conception many would be led to explore them further. From conversations with those engineering students at the University of Toronto whose imaginations have been kindled I am confident that this will be the case.

To eliminate the liberal stem from engineering education would constitute an injustice to those students who have been deprived of the mellowing influences of a cultivated society before entering the university. Many of them lack only the kindling spark to light the train of humanistic understanding.

C. R. Young, M.E.I.C.

Port Coquitlam, B.C.,
Sept. 9, 1948.

The Library,
The Engineering Institute of Canada,
Montreal.

Dear Mrs. Short.

Thank you very much indeed for your letter of September 2, wherein you stated that you had so kindly tracked down the information which I needed . . . as far as I am concerned I get my money's worth and then some, from my fees out of the splendid service that your staff alone provides. It's a wonder to me that it isn't played up more, because I'd be sunk away out here, with no reference books to go back on.

When available could you please send a copy of the following on loan to me at the above address—etc.

Thanking you very much again,

Yours truly,

(Signed) S. M. Schofield, Jr.E.I.C.

The 1949 Annual Meeting

WILL BE HELD AT

The Chateau Frontenac, Quebec City

May 11-13, 1949

The Quebec Branch is preparing for an attendance of over one thousand. Many of your friends will be there.

Personals

Notes of the Personal Activities of Members of the Institute

J. B. Hayes, M.E.I.C., past president of the Institute, retired in September, due to ill health, from his position as manager of the Nova Scotia Light and Power Company Limited, Halifax. He had been appointed to that position in 1929.

He is a past president of the Halifax Board of Trade, the Canadian Electrical Association and the Canadian Transit Association, and a member of the Association of Professional Engineers of Nova Scotia.

W. M. Scott, M.E.I.C., chairman of commissioners, Greater Winnipeg Water District, has recently retired as lecturer in municipal engineering, University of Manitoba.

Prof. James A. Coote, M.E.I.C., has retired from the department of mechanical engineering in McGill University after thirty-two years of teaching. For the major part of this period he has been interested in industrial engineering and has directed the work under that option. Professor Coote will now be located in the offices of R. A. Rankin and Company, Montreal, where he will continue with consulting work in this field.

J. C. Davis, M.E.I.C., of St. Boniface, Man., was decorated in September with the Order of the British Empire. He is president and manager of J. C. Davis Limited, Winnipeg, Man.

A former Montrealer, he studied at University of Montreal, and at McGill University. He is an executive of the Greater Winnipeg Co-ordinating Board, and a member of the Greater Winnipeg Metropolitan Town Planning Board. During the recent war he worked on the advisory board of the Department of War Services.

E. L. Baillie, M.E.I.C., has been named division manager of Imperial Oil Limited, at Saint John's, Newfoundland.

After graduating in civil engineering from Nova Scotia Technical College in 1926, Mr. Baillie worked with the Dominion Bridge Company and later with the Nova Scotia Power Commission on the Mersey River development. He was professor of mathematics and general engineering subjects at St. Francis Xavier University for two years, after which he went as a construction engineer to the Nova Scotia Department of Highways. He joined Imperial Oil Limited in 1930 as asphalt sales engineer, and has served with the organization in various sales capacities, leading up to his recent appointment.

A. S. Mansbridge, M.E.I.C., has accepted the post of chief designing engineer with the pulp division of Bloedel Stewart and Welch Ltd., at Port Alberni, B.C. Mr Mansbridge worked on the design of that Company's pulp mill at Port Alberni until the end of last year, and has meanwhile been employed as designing engineer for Pacific Mills Limited, at Ocean Falls, B.C.

J. V. Rogers, M.E.I.C., has been named assistant chief engineer of the Consolidated Mining and Smelting Company of Canada Limited, Trail, B.C. Mr. Rogers started with the Company in 1940, but was sent on loan to the Dominion Government, as chief draughtsman on the construction of the Alberta Nitrogen Plant at Calgary, later acting as engineer for the plant. He returned to Trail in 1944 and worked on special problems for the chief engineer and was later appointed superintendent of construction and maintenance for the Company in the Trail area.

E. L. Baillie, M.E.I.C.

A graduate of the University of British Columbia, class of 1923, his work before going to C.M. and S. Company included mining engineering in British Columbia and hydro-electric construction in Saskatchewan and Ontario.

S. A. Willis, M.E.I.C., former works manager of the Canadian Gypsum Company, Windsor, Ont., has resigned that position to start an engineering and contracting firm in New Jersey. He was connected with Canadian Gypsum for some 12 years, during which time he has directed the modernization and expansion of gypsum production. Before coming to Windsor in 1936 he was in the operating and engineering departments of the U.S. Gypsum Company, at Philadelphia, New York and Farnams, Mass. He is a graduate of LaFayette College, Easton, Pa.

Lt.-Col. L. G. Lilley, M.E.I.C., commandant of the Royal Canadian School of Military Engineering, Chilliwack, B.C., was posted there in September, 1947. He will remain until January 1949, when he will be attending the Canadian Army Staff College at Kingston, Ont. A graduate of the University of New Brunswick, class of 1935, Col. Lilley worked with the Dominion Department of Public Works at Saint John, N.B., and with the Bell Telephone Company in Montreal, before joining the R.C.E. After service overseas, he was an executive officer at N.D.H.Q., Ottawa, before going to R.C.S.M.E.

J. V. Rogers, M.E.I.C.

Y. R. Tasse, M.E.I.C., is a vice-president of the Canadian General Electric Test Alumni Association. He was elected at the 20th Annual Reunion of the Association held in Peterborough, Ont., in September. He is apparatus engineer for C.G.E. at Quebec City.

G. M. Bell, M.E.I.C., is manager of the Montreal Office of Commonwealth Electric Corporation Limited. He has worked in engineering and sales with Canadian General Electric Company Limited and with Canadian Westinghouse Company Limited, serving recently with the latter as sales engineer in the Montreal office.

L. D. Briden, M.E.I.C., has been appointed resident construction engineer of the Bolivian Power Company Limited, at La Paz, Bolivia. His transfer to South America took place in August last. He was previously an engineer for the Newfoundland Light and Power Company, at Tors Cove, Nfld.

W. G. Enouy, M.E.I.C., is sales manager of the Robertson Division of Robertson-Irwin Limited, a new company formed by the amalgamation of H. H. Robertson Company Limited and Thomas Irwin & Son, Limited. Mr. Enouy is at the head office of the company in Hamilton. He was sales manager, there, for H. H. Robertson from 1946 when he transferred from the Montreal Office.

E. K. Cumming, M.E.I.C.

E. K. Cumming, M.E.I.C., has been named manager of the newly established Edmonton sales office of the C. A. Dunham Company Limited of Toronto. Mr. Cumming, who is secretary-treasurer of the Edmonton Branch of the Institute, has been on the staff of the University of Alberta, and has worked in the field of building design and construction.

F. S. Hutton, M.E.I.C., has been appointed division engineer for Canadian National Railways at Hornpayne, Ont. He joined the Company in 1936, and worked in various capacities on construction. He was in military service overseas with the R.C.E. and the Canadian Railway Operating Group from 1942 to 1946, with the rank of lieutenant. He was appointed in 1946 as assistant engineer at Stratford, Ont. Later that year he was made assistant division engineer at London, Ont.

G. J. Dodd, Jr., M.E.I.C., is sales representative in the State of Minnesota for the Hummel and Downing Company of Milwaukee, paper box manufacturers. He joined the Company in July last, coming from the Russell-Miller Milling Company in Minneapolis, Minn., where he was assistant to the chief engineer.

Capt. I. M. McLoughlin, M.E.I.C., will be on the technical staff course at the Military College of Science in England for the next two years. A graduate of Nova Scotia Technical College in 1941, he was with Defence Industries Limited, before joining the R.C.O.C. and later transferring to the R.C.E.M.E. In 1946 he was a technical staff officer in the Directorate of Mechanical Engineering. Later that year he was posted to the R.C.E.M.E school at Barriefield, Ont.

R. A. LeBlanc, JR.E.I.C., was named, in August last, service and sales representative of Otis Fensom Elevator Company Limited, with headquarters in Montreal. Mr. LeBlanc left the employ of National Breweries Limited, Quebec City, last November, and has assumed his recent appointment after a training period with the Otis Elevator Company in New York.

L. E. Henne, JR.E.I.C., is now on the Montreal staff of the Bristol Company of Canada Limited, Toronto. Mr. Henne was formerly with Northern Electric Company, Montreal. He is a graduate in electrical engineering of University of Manitoba.

J. D. Solomon, JR.E.I.C., has left his position with A. V. Roe Canada Limited and has formed the Suburban Engineering and Construction Company, in Toronto. He is a partner and engineer engaged in general construction. Mr. Solomon left Toronto University in 1942 with the degree of B.A.Sc. civil and was with Hamilton Bridge Company Limited, before going to A. V. Roe in 1946 as assistant design engineer.

Kenneth MacDonold, S.E.I.C., is a junior engineer with the New Brunswick International Paper Company at Dalhousie, N.B. He received a B.Sc. degree in mechanical engineering from Queen's University this year.

Visitors to Headquarters

Dr. Karl T. Compton, president of Massachusetts Institute of Technology, Cambridge, Mass., on October 22.

H. Brion White, JR.E.I.C., Toronto, Ont., on October 26.

Major C. Ben. Bate, M.E.I.C., Quebec City, Que., on October 29.

F. I. Lamb, British Trade Commissioner, Montreal, Que., on November 1.

W. E. Jefferson, M.E.I.C., secretary-treasurer of the Halifax Branch of the Institute, on November 2.

Alvin E. Dodd, honorary president, American Management Association, New York City, on November 3.

Air Commodore Sir Frank Whittle, consultant, British Overseas Airways Corporation, London, England, on November 10.

Obituaries

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

Edwin James Beugler, M.E.I.C., who was long associated with the railroad and utility fields in the United States, passed away at his home in Cheshire, Conn., on September 12, 1948. He was born at Williamsport, Pa., in 1869.

For fifteen years Mr. Beugler was consulting engineer for Westinghouse Church Kerr & Company of New York, in the design and construction of harbour works and power plants, which position required extensive foreign travel. For several years he was vice-president of The Foundation Company of New York, and latterly he was in private consulting practice in Cheshire. From 1935 to 1941 he served as the first secretary of the Connecticut State Registration Board for professional engineers and land surveyors.

Mr. Beugler became a member of the Engineering Institute in 1907, while he was with Westinghouse Church Kerr & Company. Then he had recently left the employ of the Boston Terminal Company after three years service in charge of engineering and maintenance departments of South Terminal Station. Previously he had worked with the New Haven and Hartford Railroad for nearly ten years. From 1890 to 1893 he was with the Philadelphia and Reading Railroad, working on locating, draughting, estimating, etc. He had previously been associated with the Penn. Railroad and with the Bloomsburg and Sullivan Railroad in Pennsylvania.

Mr. Beugler studied engineering at Massachusetts Institute of Technology from 1897 to 1899. He became a member of the American Society of Civil Engineers in 1904, and of the Boston Society of Civil Engineers in 1905. He was an honorary member of the Connecticut Society of Civil Engineers at the time of his death. His Life Membership in the Engineering Institute dated from 1942. He had then completed thirty-five years of active membership.

Lt.-Col. George Arthur McClintock, M.E.I.C., of Thetford Mines, Que., passed away in Quebec City on September 30,

G. A. McClintock, M.E.I.C.

1948. He was born in California, U.S., in 1890.

He did topographic work with a C.N.R. survey in British Columbia in 1911 and 1912, and he served for a time on the Pacific Great Eastern line. He did more railway work in the United States before entering University of Toronto in 1913 to study engineering.

He enlisted in 1914 and served overseas in the Royal Canadian Artillery. He was twice wounded and was awarded his commission in the field. On demobilization he re-entered university, completed his engineering studies and received the degree of B.A.Sc.

He was superintendent for J. A. Grant Construction Company for a time, before going to Cuba on surveying work. Returning in 1922, he was inspector on the erection of a mill at Thetford Mines, Que., for the Asbestos Corporation of Canada, and then went to the Bell Asbestos Mines Department of Keasbey and Mattison Company there. He remained with Bell Asbestos Company Limited, and was chief engineer at the time of his death.

In World War II he served with the R.C.E., and on demobilization commanded the Canadian Construction Corps R.C.E. Units. In the interval between the wars he had taken an active part in the organization and training of the N.P.A.M. Engineer Units in Military District No. 5.

Col. McClintock came into the Institute as a Student in 1904, transferring to Associate Member in 1925, and to Member in 1940. He was active in the Canadian Institute of Mining and Metallurgy.

NEWS of the BRANCHES

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented at their meetings

Cornwall

G. G. M. Eastwood, M.E.I.C.
Secretary-Treasurer

T. B. Webster, M.E.I.C.
Branch News Editor

President Finlayson paid his visit to Cornwall on the week-end of September 26th. The Branch was thus given the privilege of entertaining the president on two separate occasions. The first, a visit to the site of the proposed St. Lawrence Power Project; the second, a dinner for the President and his party.

The visiting party and branch members and their wives were taken to the site of the proposed seaway and power development project at Sheek Island and Barnhart Island on Sunday afternoon where Dean Finlayson showed a keen interest in the scheme which he considered would eventually be undertaken.

On Monday evening there was a large turn-out of engineers and their wives for the Presidential dinner presided over by Chairman R. H. Wallace. In his address, the President stressed the need for a better grounding at the secondary school level in the fundamentals of mathematics, science and engineering so that greater progress in the field of pure research could be made in this country. Dean Finlayson was thanked by B. T. Yates.

Other guests of the evening were Vice-Presidents R. S. Eadie and W. L. Saunders, Councillor J. B. Stirling and General Secretary L. Austin Wright.

Halifax

W. E. Jefferson, M.E.I.C.
Secretary-Treasurer

M. L. Baker, M.E.I.C.
Branch News Editor

A dinner meeting was held jointly by the Halifax Branch of the Institute and the Association of Professional Engineers of Nova Scotia, at the Lord Nelson Hotel, on September 1, to welcome Dean J. N. Finlayson, president of the Institute, on his official visit to Halifax. Guests at the dinner included Mayor J. E. Ahern, Air Commodore F. G. Wait, O.B.E., officer commanding No. 10 Group, R.C.A.F.; and Major General H. W. Foster, officer commanding Eastern Command. Fifty members were present at the dinner. W. C. Risley, chairman of the branch, presided.

Preceding the dinner a short period of silence was observed in memory of J. Lorne Allen, M.E.I.C., former town engineer of Dartmouth, who died the morning before the meeting.

A most enjoyable talk was given by the president, in the course of which he spoke of the need of a united body in Canada to speak for all members of the engineering profession. Such a body could serve the engineering profession and industry alike by a study of industry's requirements and adoption of the latest scientific methods to foster industrial development. He mentioned that a suggestion was made that the representation on Dominion Council be expanded to include representatives from various scientific organizations.

On the topic of employment of engineers the president said the profession should make an earnest attempt to draw to employers' attention the value of trained engineers on the staff. He cited two examples of the results of a scientific approach to industrial problems, namely, the proven value of trained foresters to the lumbering industry and of trained metallurgists to foundries and machine companies.

Interesting remarks were made by the President, about the years he spent in Halifax as professor of civil engineering at Dalhousie University. He saw and had some part in the beginnings of two important engineering projects in the province,—the development of hydro-electric power, and the construction of the harbour terminals.

A welcome visitor accompanying Dean Finlayson was Dr. L. A. Wright, who reported on Institute affairs, mentioning particularly items of interest about membership and the *Journal*.

Included in the activities of the day was a luncheon at the Lovett House in Chester. Dean and Mrs. Finlayson, members of the Council of the Association and their wives, members of the executive of the Halifax branch and their wives, made up the group attending this event, which was under the direction of the Council of the Association.

Hamilton

I. M. MacDonald, Jr.E.I.C.
Secretary-Treasurer

L. C. Galloway, Jr.E.I.C.
Branch News Editor

The Hamilton branch of the Institute opened its winter series of meetings with a smoker on September 16 in the Royal Canadian Artillery Mess. Sixty-two members and guests attended, and the Hamilton branch was especially honoured by the presence of President J. N. Finlayson, Vice-President J. A. Vance, and General Secretary L. Austin Wright.

Chairman W. E. Brown introduced President Finlayson who spoke about his tour through eastern Canada and expressed his appreciation of the honour which his position carries. He praised the efforts and acomplishments of engineers in Canada and urged them not to be misled into a false sense of self-deprecation. Engineering is a mode of culture which is not to be despised, and which should not be considered secondary to other accomplishments of the human race.

Mr. Vance and Mr. Wright were prevailed upon to add a few remarks. Then President Finlayson presented four awards to Hamilton branch members.

To E. T. W. Bailey, M.E.I.C., was awarded the Plummer Medal in recognition of his outstanding paper entitled **Oxygen Accelerated Combustion in Open Hearth Furnaces.**

E. M. Tuff, Jr.E.I.C., G. L. Schneider, S.E.I.C., and R. W. Kennedy, Jr.E.I.C., were awarded certificates for the first, second and third prizes respectively, of which their papers had been judged worthy at the Students and Juniors Papers Competition in March 1948.

After Chairman Brown had adjourned the meeting, refreshments were served.

Stainless Clad Plate and Sheet was the subject of a speech by Mr. L. C. Grimshaw of the Jessop Steel Company, Washington, Pennsylvania, at the September meeting of the Hamilton branch, held at McMaster University on September 23 with Chairman W. E. Brown presiding. It proved to be a fine beginning for the promising series of meetings which have been planned for the 1948-49 programme. Neil Metcalfe introduced the speaker to the 78 members and guests present.

Mr. Grimshaw explained that stainless clad steel, as its name implies, is steel to which a thin sheet of stainless steel is bonded. The chief obstacle to the achievement of a welded bond over 100 per cent of the area of contact between steel and its stainless cladding, is the stubborn oxide film which quickly forms on any stainless steel exposed to air.

The manufacture of stainless steel begins with the provision of clean slabs of steel and stainless steel of the desired composition. The oxide film is removed from the stainless steel with hydrochloric acid, and a coating of electrolytic iron deposited in its place on the surface to be bonded. The bonding is achieved by heating the slabs and hot-rolling them together to the desired finished size. The rolling pressure welds the stainless steel to the steel backing.

Mr. Grimshaw enumerated the advantages of stainless clad plate and sheet. The advantage it possesses over ordinary steel is, of course, its resistance to corrosion. In many cases, especially in the thicker sizes, it is more economical to use stainless clad steel than solid stainless steel. It has higher heat conductivity, higher strength, and better heat-treating characteristics than solid stainless steel. In fabrication, it presents welding problems similar to those encountered with stainless steel, though generally easier to overcome. In conclusion, with aid of slides, Mr. Grimshaw described some of the present applications of stainless clad steel.

Mr. Grimshaw answered the numerous questions of the audience. Then Chairman W. E. Brown made several announcements and adjourned the meeting.

Moncton

V. C. Blackett, m.e.i.c.
Secretary-Treasurer

On August 30, a welcome was extended the president of the Institute, J. N. Finlayson, on the occasion of his official visit to the Moncton Branch. Accompanying the president were Mrs. Finlayson and General Secretary L. Austin Wright. On their arrival in Moncton, the visitors were met by the branch executive, and, later were entertained at a shore dinner at Shediac, attended by some fifty members of the branch and their ladies. Previous to the dinner, the presidential party, together with the majority of those present, were taken for a trip on Shediac Bay in sea-going motor boats. On their return, a lobster dinner was served in the Shediac Bay Yacht Club.

At the conclusion of the dinner, W. C. MacDonald, chairman of the branch, introduced the president to the gathering. Mr. Finlayson, who is a native of Pictou County, N.S., devoted the greater part of his address to historical reminiscences of the Maritimes and Maritime people. Referring to the Institute, he expressed pleasure at seeing so many young engineers taking an active interest in the Institute.

Dr. Wright spoke briefly on matters of interest to the members and gave statistics showing the phenomenal growth of the membership in recent years.

Other speakers included T. H. Dickson and S. R. Frost, who extended sincere greetings to Mr. and Mrs. Finlayson and Dr. Wright, and expressed the appreciation of the members in having them visit the branch.

Following the remarks of the various speakers, an enjoyable social evening was spent, and the return to Moncton made about midnight.

Acting under the direction of the executive, R. L. Parsons, vice-chairman of the branch, was responsible for all arrangements for the reception at Shediac, and G. L. Dickson was in charge of automobile transportation.

Next morning, the guests, accompanied by branch officers, motored to Moncton's famed Magnetic Hill, and afterwards down the Albert County side of the Petitcodiac River to view the "Rocks", one of the natural wonders of the Province.

Montreal

On September 30, the president of the Institute, Dean J. N. Finlayson, and 13 other guests were entertained at dinner at the Mount Stephen Club prior to the opening meeting which was held at the Cardy Hall of the Mount Royal Hotel.

Over 160 were present at the opening meeting, when J. W. Hughes of the Canadian Pacific Railway was elected to the Branch Nominating Committee. The president gave an interesting address, and presented the Julian C. Smith Medal to P. L. Pratley, m.e.i.c. Guy M. Lord, s.e.i.c., Ecole Polytechnique was presented with an Institute prize. Refreshments were served after the meeting.

It is unfortunate that more members do not turn out on these occasions which are intended to be social affairs rather than business meetings.

We were most fortunate, through the courtesy of the Canada Cement Company, and arrangements made by J. W. MacBride of the Programme Committee, in obtaining an exhibit of the work of Robert Maillart, a Swiss engineer, and displaying it for several days at Institute headquarters. To those not familiar with his work it was a revelation of what could be done to give grace and beauty to concrete structures.

Through the kindness of Mr. B. Rider, works manager of the Canadian Tube and Steel Products Ltd., about 150 members paid a very interesting and enjoyable visit to the Company's plant on Saturday morning, October 16. About 60 members went by autobus from Institute headquarters. Arrangements were made by R. E. Smallwood of the Programme Committee and A. E. Andrews, personnel manager of the Company. Mr. Andrews has expressed willingness to arrange further visits for any member or group of members desirous of seeing a particular phase of the Company's operations.

The branch dance is arranged for February 11, 1949, at the Mount Royal Hotel. Now is the time to plan on bringing a party to this event. The last dance was well attended and a great success and the entertainment committee promises that the February dance will be better still.

Saguenay

J. E. Dyck, m.e.i.c.
Secretary-Treasurer

Junior Section

F. H. Duffy, m.e.i.c.
Secretary-Treasurer

A meeting of the Junior Section of Saguenay Branch was held in the Arvida Protestant School on September 15, 1948. Mr. H. E. Brooker of the Aluminum Company of Canada Limited addressed the meeting on the subject of **Engineering Inspection—Dimensional.**

During the war Mr. Brooker was in charge of the draughting office and specification and gauging departments of Naval Ordnance in Canada, for the British Admiralty, and his talk was based on his work during that time.

The speaker described various methods of inspection and elaborated on the particular methods of the office with which he was connected. He traced the progress of an imaginary article from the design department, to gauging for mass production, to trials and to final design He then outlined the inspection methods used to guarantee a satisfactory product.

Materials used for gauges were described, as well as methods of sampling and gauging the finished product. Tolerances allowed on sample articles were discussed, as were the relationship between allowed tolerances and price; gauge tolerances, for sampling and check gauges; and the effect of these tolerances on the size of the sampled article. In conclusion Mr. Brooker described some of the multiple gauges used for inspection purposes. An interesting discussion period followed and the speaker was called upon to answer numerous questions.

The chairman, C. J. Tanner, introduced Mr. Brooker, who was thanked, on behalf of the section by B. F. Naismith.

St. Maurice Valley

G. W. Ince, s.e.i.c.
Secretary-Treasurer
J. G. MacLeod, m.e.i.c.
News Editor

The visit of Dean J. N. Finlayson, president of the Institute, to Shawinigan Falls, was the occasion of the opening dinner of the St. Maurice Valley Branch on September 14th.

Mr. Francois Roy, mayor of Shawinigan Falls, greeted Dean Finlayson, L. Austin Wright and other officials of the Institute in the afternoon at the City Hall, and the party visited the power house of the Shawinigan Water and Power Company in the City. Branch chairman M. Eaton presided at the dinner.

Mr. Roy, in welcoming the visitors and guests to Shawinigan Falls, emphasized the importance of the engineer's role in the development of Shawinigan Falls, and of the whole St. Maurice Valley region.

Mr. Wright reported on Institute affairs, mentioning that the membership of over 10,000 includes a large number of young engineers. He said that this trend should be encouraged in order to insure the future of the Institute.

Col. H. E. Bates introduced the president, who said that his pleasant association with fellow engineers during his Eastern Canada tour made him very proud of his profession. He was surprised to see at first hand the outstanding progress made in the field of electrical engineering in the St. Maurice Valley, and the evident prosperity engendered by these power developments.

Discussing the profession as a whole, President Finlayson expressed the hope that in the near future all branches of Canadian engineering would be organized as a body, capable of expressing the will of the group and charged with maintaining the status of the profession.

S. E. Williams thanked the president.

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Power Development in the St. Maurice Valley was the topic of an address by Guy Rinfret, supervising engineer of the Shawinigan Engineering Company, at a joint dinner meeting of the Branch and the St. Maurice Valley Sub-Section of the A.E.E.E., at La Tuque on Saturday, September 25. Branch Chairman M. Eaton presided.

The visiting engineers were officially welcomed by Mr. Omer Journeau, mayor of La Tuque, who commented on the importance of the engineer's role in the prosperity of the region

Mr. Rinfret traced development of power on the St. Maurice River from the original installation at Shawinigan Falls, to the Trenche Development which will be completed in 1952 and whose ultimate capacity will be 384,000 horse power. He also described the whole St. Maurice River system, which when completely developed will generate in excess of 2 million horse power, and whose storage reservoirs now impound over 300 billion cubic feet of water. Mr. Rinfret illustrated many of his statements with slides.

After the meeting, tours were conducted through the La Tuque Power Plant and the Brown Corporation Pulp Mill, after which refreshments were served at the La Tuque Golf Club.

Winnipeg

G. W. Moule, M.E.I.C.
Branch Secretary

R. H. Tivy, Jr.E.I.C.
Branch News Editor

Some 80 members of the Winnipeg Branch of the Institute and of the Association of Professional Engineers of Manitoba attended the first joint general meeting of the season to hear Dr. Huet Massue M.E.I.C., on the subject of **A Factual Analysis of the Tennessee Valley Authority**. The meeting was held the evening of September 23 in Theatre "F" of the University of Manitoba buildings on the Broadway site.

In his main paper, Dr. Massue, who is statistical engineer of the Shawinigan Water and Power Co., Montreal, showed by means of a statistical analysis what he felt to be a truer picture of the T.V.A. operations than propaganda in the past had sometimes presented.

Through a series of coloured slides the speaker dealt with the various phases of the undertaking from its inception to the present time. Dr. Massue stated that the present rates charged for electricity by this authority do not cover the true costs of its production. "If electricity rates were made to bear the full cost of operation of the T.V.A., the rates would have to be much higher than anywhere in the country," he said.

However, Dr. Massue pointed out that a certain proportion of the T.V.A. investment is charged to navigation, but of this he said: "When the true cost of navigation to the Government is considered, it is found to be at least three times more costly than railroad transportation".

"Flood control on the Tennessee has benefited from the construction of the several dams throughout the watershed. It is said, however, that the permanent flooding of about 1,000,000 acres of land has resulted in an annual loss in agricultural production, greater than the damage which used to result from the temporary floods in the valley".

Following the speaker's presentation, a number of questions from the floor brought up the social aspects of the project being discussed. In reply to these, Dr. Massue emphasized the fact that his analysis was mainly economic. He said he had no objection as such to government agencies selling power, but felt that they should not be on a subsidized basis in order to give private power companies a fair chance of survival.

In addition to his main paper, the speaker presented a short statistical analysis of the E.I.C. membership across Canada. This included also a group of lantern slides which Dr. Massue used for illustration. He presented a handsomely bound and illuminated copy of this analysis to the Branch.

The speaker was introduced by E. V. Caton of the Winnipeg Electric Company and thanked by J. W. Tomlinson of the Manitoba Power Commission. Harry McLeod was chairman of the meeting.

Electrical Section

J. C. Pratt, M.E.I.C.
News Editor

The Electrical Section of the Winnipeg Branch of the Institute held its first meeting of the season as guests of the speaker, R. Noonan, president and general manager of Pioneer Electric Ltd.

The Company at present specializes in 3-kva. rural distribution transformers and 7½, 15- and 50-kva. standard distribution transformers. It has, however, built transformers up to 1000 kva. Mr. Noonan's address consisted of a resumé of his experiences leading up to the establishment of the Pioneer Electric in Winnipeg and a brief outline of transformer construction. Following the talk a tour of the plant was made and the various manufacturing operations were explained and inspected.

This "In the Plant" meeting was the first of its kind held by the section, and it is hoped by all that were present that similar meetings can be arranged in the future.

FOURTH ANNUAL DANCE

Sponsored by the JUNIOR SECTION - MONTREAL BRANCH

Date: December 3rd.
Place: Ritz Carlton Hotel.
Time: 9.00 p.m.
Price: $3.00 per couple.
Orchestra: Al McGowan.

Tickets available from:
1. **Any member of the executive.**
2. **Institute Headquarters.**
3. **John Bateman, chairman. Entertainment Committee, BE. 3913.**

No tickets will be sold at the door

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Library Notes

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BOOK REVIEW

MASONRY SIMPLIFIED

J. R. Dalzell and Gilbert Townsend. Chicago, American Technical Society, 1948. 2 vols., illus., 8½ x 5½ in., cloth. Vol. I—$5.75, Vol. II—$6.75 in Canada.

This two-volume work on masonry covers the tools and materials used, the methods employed, and the problems confronted by the mason in actual construction.

Throughout the text emphasis has been placed on the fundamental aspects of masonry. Volume I begins with a study of the general knowledge necessary to the mason, dealing respectively with lime, mortar, and concrete as building materials. A thorough and well-illustrated study of blueprint-reading follows. On the assumption that the mason has now mastered the generalities behind building materials, the authors discuss each type of masonry separately: concrete, structural clay tile, brick, and special applications to sidewalks, driveways, floors, and steps.

Volume II, entitled "Practical Construction", claims to apply the fundamentals of masonry to every job the mason must perform, and to fulfil the needs of apprentices, tradesmen, teachers, and laymen home mechanics. After an introductory chapter on formwork, the authors deal with masonry in footings, foundations, beams and lintels, columns, chimneys, fireplaces, walls and partitions, and septic tanks.

As well as being a textbook these two volumes answer many of the demands of a handbook for masons, in that each topic is finely subdivided, titled and indexed. This, along with such factors as large, clear type and an abundance of illustrations, combine to make the book attractive to the reader. Each chapter opens with a list of the questions it will cover, followed by a short introduction designed to awaken interest in what is to come. At the end of each chapter is a checklist of information and a number of review questions, the answer to which the reader is supposed to have at his finger-tips. The great number of illustrations and diagrams not only add to the attractiveness of the book, but more important, their clarity and the fact that they are labelled in detail provide excellent aids to rendering the text entirely intelligible and instructive. L.S.

ABSTRACTS

INSTITUTION OF ELECTRICAL ENGINEERS

Summaries of Papers to be read in London, Second Half Session 1948-49

Analogies between the Vibrations of Elastic Membranes and the Electromagnetic Fields in Guides and Cavities (with the Development of Equivalent Circuits, *E. C. Cherry.*

Considers the electro-mechanical analogies between inductances, and capacities in lumped circuits, on one hand, and masses and springs on the other hand.

Errors at very High Frequencies, *H. G. Hopkins and F. Horner.*

Describes investigations into the cause and properties of site errors at metre wavelengths. Discusses difficulties encountered in calibrating a site, and practical techniques available for locating effective reflecting obstacles on a site and methods for suppressing unwanted reflections.

Scattering of Radio Waves by Metal Wires and Sheets, *F. Horner.*

Method is described and formulae are derived for estimating scattered fields using transmission line equations for wires and simple diffraction theory for sheets.

Storage System for Use with Binary Digital Computing Machines, *F. C. Williams and T. Kilburn.*

Properties required of a storage system and its operation as part of a machine are explained with reference to a much simplified and hypothetical machine.

LIBRARY REGULATIONS

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ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Design of Crystal Vibrating Systems: for Projectors and other Applications:
W. J. Fry. J. M. Taylor and B. W. Henvis. New York, Dover Publications, 1945. 182 p., illus., cloth. (U.S. Navy. Naval Research Laboratory. Publication).

Dominion of Canada Income Tax Act, effective January 1, 1949 and Excise Tax Act; 14th ed.:
CCH Canadian Ltd., Toronto, 1948. 256 p., paper.

Electric Winders; a Manual on the Design, Construction, Application, and Operation of Winding Engines and Mine Hoists; 2nd ed.:
H. H. Broughton. London, Spon, 1948. 450 p., illus., fabrikoid.

Engineering Contracts and Specifications, 2nd ed.:
Robert W. Abbett. New York, Wiley; London, Chapman and Hall, 1948.. 327 p., illus., cloth.

Guide to Technical Writing:
W. G. Crouch and R. L. Zetler. New York, Ronald Prcss, 1948. 401 p., illus., cloth.

Handbook of Scientific and Technical Societies and Institutions of the United States and Canada; 5th ed.:
National Research Council, Washington, 1948. 371 p., cloth. (U.S. National Research Council. Bulletin No. 115).

Introduction to Applied Mathematics:
Francis D. Murnaghan. New York, Wiley; London, Chapman and Hall, 1948. 389 p., illus., cloth.

Non-Ferrous Metals and Alloys:
Edwin Gregory and E. N. Simons. London, Elek, 1948. 196 p., illus., cloth.

Radio Handbook (Manuel Radio); édition française:
Editions Techniques anct. P. H. Brans, Antwerp, Belgium, 1948. 351 p., illus., paper.

Rubber to Metal Bonding:
S. Buchan. London, Crosby Lockwood, 1948. 239 p., illus., cloth.

Simplified Design of Structural Timber:
Harry Parker. New York, Wiley; London, Chapman and Hall, 1948. 218 p., illus., fabrikoid.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

Canadian Electrical Association:
Proceedings of the Fifty-eighth Annual Convention, 1948.

Second International Conference on Soil Mechanics and Foundation Engineering:
Proceedings, Volumes 1 to 5, 1948.

TECHNICAL BULLETINS, ETC.

American Welding Society. Publications:
D7.2-48T—Survey of Automatic Arc and Gas Welding Processes as used in the Automotive Industry.

Bell Telephone System. Technical Publications. Monographs:
B-1542—Mathematical Theory of Linear Arrays, S. A. Schelkunoff.—B-1543—Submarine Detection by Sonar, A. C. Keller.

Chalmers Tekniska Hogskolas. Handlingar:

Nr 74—On the Propagation of Waves in an Inhomogeneous Medium, Olof E. H. Rydbeck.—75—Education and Training for Engineers in Great Britain, D. B. Hoseason.

Harvard University. Graduate School of Engineering. Publications:

No. 447—Research on Stress-Deformation and Strength Characteristics of Soils and Soft Rocks under Transient Loading, A. Casagrande and W. L. Shannon.

Institute of Metals. Reprints:

Further Experiments on the Adhesion of Tin-Base Bearing Alloys, P. G. Forrester and L. T. Greenfield.—Observations on the Annealing Characteristics of an Aluminium-Copper-Magnesium Alloy, Maurice Cook and T. L. Richards.—Relationship between Stress and Strain for Homogeneous Deformation, E. Voce.—Search for Minerals by Physical Methods, A. O. Rankine.

Institution of Engineers, Australia. Stormwater Standards Committee:

Draft Report on the Committee's Fourth Term of Reference.

Institution of Mechanical Engineers. Advance Copies:

Full Journal Bearing, A. Cameron and W. L. Wood.—Producer Gas for Road Transport, T. F. Hurley and A. Fitton.

International Civil Aviation Organization. Publications:

Aerodrome Approach Lights (Circular 6-AN/5).—Final Report of the Second Session, Facilitation Division (Doc 5464-FAL 535).—ICAO Regional Manual—North Atlantic, Amendments No. 20 and 21, Sept. 15th and Oct. 1st, 1948.—Minutes and Documents of the Legal Committee, Second Session (Doc 6014-LC/111).

National Research Council. Associate Committee on Corrosion Research and Prevention. Bulletin:

No. 1, Sept. 1948.

North Dakota Research Foundation. Bulletin:

No. 4—First Supplement 1948, Bibliography of the Geology and Natural Resources of North Dakota, Chrissie E. Budge.

Ohio State University. Engineering Experiment Station. Bulletin:

No. 133—Some Studies of Ohio Coals, Shales, and Oils, T. H. Kerr.

Ontario. Dept. of Mines. Publication:

P.R. 1948—8—Report on Some Radioactive Mineral Occurrences in Cardiff and Monmouth Townships, Haliburton County, Ontario, S. E. Wolfe and Nelson Hogg.

Purdue University. Engineering Experiment Station. Research Series:

No. 104—Some Recent Developments in Heat Transfer, W. H. McAdams.

...Extension Series:

No. 65—Proceedings of the Personnel and Industrial Relations Conference, held at Purdue University, May 17-18, 1948.

Statens Skeppsprovningsanstalt. Meddelanden:

Nr 10—Some Systematic Tests with Models of Fast Cargo Vessels, H. F. Nordstrom.

U.S. Highway Research Board. Bulletin:

No. 12—Highway Finance.

University of Minnesota. Institute of Technology. Engineering Experiment Station. Bulletin:

No. 27—Water Permeability of Structural Clay Tile Facing Walls, Joseph A. Wise.

STANDARDS, SPECIFICATIONS, ETC.

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449: 1948—Use of Structural Steel in Building.—488: 1948—Moulded Insulating Materials for General Electrical Purposes.—1449: 1948—Steel Plate, Sheet and Strip.

...Code of Practice:

CP(B)780—Design and Construction of Pipe Ducts.

Canadian Standards Association. Standards:

CSA C22.2 No. 75-1948—Canadian Electrical Code, Part II: Essential Requirements and Minimum Standards Covering Electrical Equipment; Construction and Test of Thermoplastic-Insulated Wires and Cables, 2nd ed.—Z94-1948—Code for Head and Eye Protection.

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Limits and Fits for Use in Locomotive Work, January 1948.

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Asbestos; its Preparation and Application:

A. E. Williams. London, Emmott, 1948. (Mechanical World Monograph No. 47).

Modern Methods of Home Heating:

J. L. Shank. (Reprinted from American Builder).

Report on the Work Carried out in the "Panel" or "Radiant" Heated Test

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 (not including bank charges and exchange) is given below. Subscriptions should be placed at E.I.C. Headquarters, 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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INSTITUTION OF ELECTRICAL ENGINEERS		
Proceedings—three parts, per year	£1–16s–9d	£3–13s–6d
Part I—General—bi-monthly, per year	10s–6d	£1– 1s–0d
Part II—Power Engineering—bi-monthly, per year	15s–9d	£1–11s–6d
Part III—Communications Engineering—bi-monthly, per year	15s–9d	£1–11s–6d
Science Abstracts—two sections, per year	£1–10s–0d	£3– 0s–0d
Section A—Physics Abstracts, per year	17s–6d	£1–15s–0d
Section B—Electrical Engineering, per year	17s–6d	£1–15s–0d
INSTITUTION OF ENGINEERS, AUSTRALIA		
Journal—monthly, per year	£2– 2s–0d	£4– 4s–0d
INSTITUTION OF ENGINEERS (INDIA)		
Journal—quarterly, single copies	3s–0d	4s–5d
Per year	12s–0d	18s–0d
INSTITUTION OF MECHANICAL ENGINEERS		
Proceedings—quarterly, per year	£2–12s–3d	£3– 3s–0d
NEW ZEALAND INSTITUTION OF ENGINEERS		
Proceedings—annual, bound	10s–6d	£1– 1s–0d
SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS		
Transactions—monthly, single copies	2s–6d	3s–6d

Buildings at the National Council Laboratories, Ottawa, during the Winter 1947-1948:

C. D. Niven. Ottawa, National Research Council, 1948.

Research on Arc-Welded Butt Joints of Mild Steel:

Georges Welter. (Reprinted from Welding Journal Research Supplement, July 1947)

Theory of Buckling of Frameworks:

Thomas C. Kavanagh. Column Research Council, Engineering Foundation, 1948.

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada.

INVENTOR AND HIS WORLD:

H. Stafford Hatfield. West Drayton, Middlesex, England; Penguin Books, 1948. 256 p., 7 x 4¼ in., paper, 25c.

The author discusses the nature of invention and the inventor, and leads up to the practical aspects of invention. He suggests methods for working out and financing of an invention, and includes general rules and warnings. He deals with invention in various fields—war, machinery, chemistry, electricity, psychology, biology—and also gives an outline of patent law. There is a fairly extensive bibliography.

PERSONAL AIRCRAFT BUSINESS AT AIRPORTS:

L. L. Bollinger and A. H. Tully, Jr. Boston, Harvard University, 1948. 348 p., illus., 8½ x 5½ p., cloth, $4.25

This is a study of aircraft financing and management, and deals with personal flying at airports. It focuses upon the fixed-base operation which is the key unit at airports concerned with aircraft sales and service, flight training, and other business activities related to personal flying.

PREFABS ON PARADE:

O. W. McKennee. N.Y., Housing Institute, 1948., 110 p., illus., 11 x 8½ p., paper, $2 50

This book gives a listing of prefabricated manufacturers in the United States, along with an introductory chapter on the various types of prefabricated construction, ground planning and a history of the prefab field For each manufacturer listed, a typical home is pictured and described, complete with specifications approximate cost, building information, and financing data. Prefab garages, accessories and similar buildings are also included.

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.

ANNUAL REPORT ON THE PROGRESS OF RUBBER TECHNOLOGY, Vol. XI, 1947.

Edited by T. J. Drakeley published by W. Heffer & Sons Ltd., Cambridge, England, for the Institution of the Rubber Industry, 12 Whitehall, London, S.W.1, England. 145 pp., tables, 9½ x 7¼ in., paper, 12s. 6d.; 4s. 6d. to members.

The current issue of this technical literature survey covers the important aspects of the planting and production, chemistry and physics, and processing of raw rubber and other natural rubber-like materials. Separate chapters are also devoted to synthetic rubber, cellular rubber, hard rubber, and all of the major classes of rubber products. The selected bibliographies accompany their respective chapters as usual

ELEMENTARY STEAM POWER ENGINEERING.

E. MacNaughton. 3 ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1948 640 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.50.

This book presents in a clear and concise manner the fundamental principles underlying the construction and operation of steam power plants and equipment. New data on thermodynamic principles, turbines and boilers have been added to this edition, while the remaining material has been thoroughly revised and brought up to date. As in previous editions, practical applications have been introduced before discussions of the theoretical aspects.

ELEMENTS OF FUEL TECHNOLOGY.

G. W Himus. Leonard Hill Limited, 17 Stratford Pl., W.1, London, 1947. 506 pp., diagrs , charts, tables, 10 x 6 in., cloth, 42s.

This book gives an outline of some of the problems involved in the correct use of fuel. Both coal and oil are considered as well as the secondary fuels derived from them Numerous illustrations and references are included. The descriptions and illustrations of plant and apparatus have been taken from British practice.

LA FATIGUE DES METAUX.

R. Cazaud, preface by A. Caquot. 3 ed. Dunod, 92 Rue Bonaparte, Paris, 1948, 318 pp., illus., diagrs , charts, tables, 9¼ x 6¼ in., paper, 1650 frs.

The theory and characteristics of fatigue failure of metals are discussed in the light of recent developments in the field. Methods and machines for fatigue testing are described, and the influence of various factors on fatigue is considered. Separate chapters are devoted to the resistance of joints and machine assemblies to fatigue, and to the improvement in endurance of machine parts. Fatigue limit values for a large number of metals and alloys are given together with graphs and tables of other data.

FORMING OF AUSTENITIC CHROMIUM-NICKEL STAINLESS STEELS.

Assembled and edited by V. N. Krivobok and G. Sachs. International Nickel Co., New York; International Nickel Co. of Canada, 25 King St. W., Toronto, 1948. 309 pp., illus., diagrs., charts, tables, 11¼ x 8½ in., cloth, $4.00.

This book gives fabricators of metal equipment a better understanding of the adaptability of stainless steels to all modern processes of forming. It presents a detailed description of the modern forming procedures as applied to chromium-nickel stainless steels and as practiced in U.S. plants. Bending and straight flanging; forming of curved sections and tubing; deep drawing; die forming; forming of contour flanged parts, and forming by miscellaneous methods are discussed. The specific examples of forming technique are supplemented by details of tool design and tool materials, lubricants, data on dimensions, and consecutive steps on fabrication.

INDUSTRIAL RESEARCH, 1947.

Advisory Editor, P. Dunsheath. Todd Reference Books Limited, London andNew York; British Distributors; George G. Harrap & Co., Ltd., 182 High Holborn, London, W.C.1. 535 pp., 8¾ x 5½ in., cloth, 25s.

This British Empire directory contains statements on the character and activities of government, public and private organizations which have industrial research programs. Careers in industrial research are briefly described, with information on university requirements, grants, etc. Books periodicals, and films of interest are given in classified groups. The volume also contains lists of laboratories, technical colleges, consultants, libraries, and a "who's who" in industrial research.

N.F.P.A. HANDBOOK OF FIRE PROTECTION.

Crosby-Fiske-Forster. 10th ed. National Fire Protection Association, 60 Batterymarch St., Boston, Mass., 1948. 1544 pp., illus., diagrs., charts, tables 7-3/4 x 5 in., fabrikoid, $9.50.

This book, like its predecessors, aims to present in compact form, for ready reference, all the essential information on fire prevention that time has stabilized into good practice. Among the new features are a chapter on chemistry and physics of fire, a chapter on water spray protection, and a complete new treatment of the general field of building construction. The new chapter on magnesium and other combustible metals outlines fire hazards and methods of protection. A table of trade names of plastics gives the properties of each. The book is useful to experienced fire protection engineers as well as to students of fire protection, inspectors and property owners.

NATIONAL ELECTRONICS CONFERENCE, Proceedings, Volume 3, Chicago, Illinois, November 3-5, 1947.

(Obtainable from Dr. R. R. Buss, Electrical Engineering Dept., Northwestern University, Evanston, Ill.), 1948. 698 pp., illus., diagrs., charts, tables, 9 x 6 in., paper, $4.00.

Some sixty papers are printed in full, classified under the following subjects: noise suppression, electronic instrumentation, coaxial elements, microwaves, computers, electronic circuit analysis, industrial electronics, nucleonics, communication, television, antennas, FM broadcasting, military applications, and general basic or descriptive papers. Brief abstracts only are provided for twenty other papers that are scattered through the several subject groups. Similar compilations of the papers presented to the previous two conferences are also available.

REVIEWS OF PETROLEUM TECHNOLOGY, Vol 7 (covering 1941-45).

F. H. Garner and E. B. Evans, Editors, and G. Sell, Publications Secretary. Institute of Petroleum, Manson House, 25 Portland Pl., London, W.1, 1947. 535 pp., tables, 9¼ x 6 in., cloth, 21s.

Normally an annual publication, the present volume covers the gap resulting from the war in anticipation of the resumption of yearly issues. Reference to nearly 3,500 original articles is made in this comprehensive survey covering petroleum geology, geophysics, production and refinery engineering, the chemistry and physics of petroleum, specifications and test methods for petroleum products, and alternative and synthetic fuels. Detailed author and subject indexes are provided. The most important of the subjects which had to be omitted is gasoline and other light distillates, but these omitted topics are to be included in the next volume.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

November 15th, 1948

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

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

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

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

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

The Council will consider the applications herein described at the December meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

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

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

FOR ADMISSION

BOELEN—JOAN WILLEM, of Montreal, Que. Born at Garoet, Neth. East Indies, Sept. 8, 1916, Educ.: Civil Engr., Univ. of Delft, Holland, 1942; R.P.E. of Netherlands; 1942-43, soil mech. laboratorium, Ooostplantsoen, Delft; 1943-47, divisional operating supt., Netherlands Railways, Utrecht; 1947-48, engr., Simon's Emb. fabr. en Houthandel, Ooosternout; at present, designer and dftsman., Stadler, Hurter & Co., consultg. engrs., Montreal, Que.

References: A. T. Hurter, C. J. Jeffreys, J. W. Roland, P. Bastien, L. A. Wright.

CAMPBELL—HOWARD, of Cardinal, Ont. Born at Calgary, Alta., March 14, 1919. Educ.: B.Eng., (Chem.), McGill, 1940; 1940-41, asst. chief chemist., Canada Starch Co.; with Welland Chemical Works, as follows: 1941-42, supervisor, operns., 1942-43, supvr., nitric acid operns., 1943-44, chem. engr., process costs, correlating work of engrg., process develp't. groups and operating dept., 1944-45, prod. engr., 1945-47, prod. supt.; 1947- to date, wet starch supt., (operating supervn.), Canada Starch Co., Cardinal, Ont.

References: R. H. Wallace, A. S. Fraser, J. B. Phillips, E. Brown, R. E. Jamieson, A. M. Fennis, R. T. Hollies.

CATFORD—DENIS ROLAND, of Three Rivers, Que. Born at Toronto, Ont., March 16, 1922. Educ.: B.A.Sc., (Chem. Engrg.), Toronto, 1946; with Canadian International Paper Co., as follows: 1945-46, lab. chemist, i/c contour testing in the mfg. of dissolving and bond pulps, bleach plant, Gatineau, Que., 1946-47, filter plant chemist, responsible to bleach plant supt. for prod. of suitable process water for bleach plant, 1947 to date, process engr., becoming familiar with and aiding in solution of problems dealing with unit processes in newsprint mfg., i.e., pressing, drying, screening, etc., Three Rivers, Que.

References: W. T. Bennett, C. F. Walker, G. B. Baxter, A. M. Hubley, C. H. Neil.

CHOUINARD—ROGER, of Montreal, Que. Born at Edmundston, N.B., Jan. 9, 1922. Educ.: B.Eng., (Elect.), Nova Scotia Tech., 1948; 1946, (summer), transmission lines, Canadian Comstock and Foundation Co. (for Quebec North Shore, Baie Comeau); 1947, (summer), asst. to town engr., Edmundston, N.B.; 1948, (June), to date, jr. engr., Shawinigan Engineering Co., Montreal, Que.

References: H. O. Wilson, R. E. Heartz, W. H. Sharples, D. S. Nicol, G. H. Burchill.

EASTON—HARRY LEONARD, of Deloro, Ont. Born at The Pas, Man., April 22, 1917. Educ.: B.Eng. (Metall.), McGill, 1940; 1936, (summer), labourer, B. F. Harris Lumber Co., Crooked River, Sask.; with Flin Flon Gold Mines Ltd., 1937-38, mine supervisor i/c of development, plant operating, road bldg., etc.; 1939, (summer), asst. miner, Britannia Mining & Smelting, B.C.; 1940-44, asst. to plant supt., i/c setting up process, machines, tech. control in new plant, finally sr. foreman i/c metall. tech. and plant control depts., Defence Industries Ltd., Brownsburg, Que., (small arms divn.); 1944-45, foundry & heat plant engrg., responsible for plant layout and design for foundry and furnace problems, etc., Ford Motor Co., Windsor; 1945-46, plant engr., directly responsible for plant layout, mchy. & process, etc., for six million dollar plant extension, Cleveland, for Freuhauf Trailer Co., Detroit, Mich., J. G. Turner, Cleveland; 1946, (7 mos.), asst. plant supt., Spurgeon Steel Co., Detroit; 1946-47, foundry metall. i/c foundry, furnace operations, Sorel Steel Foundries Ltd., Sorel, Que.; at present, plant metall., and since July 1947 training for plant supt.'s position, Deloro Smelting & Refining Co., Deloro, Ont.

References: V. M. MacIsaac, C. Krassov, H. T. Brunskill, W. Dixon, C. R. Whittemore.

HAWORTH—JACK, of Cornwall, Ont. Born at Oswaldwistle, Eng., Nov. 8, 1922. Educ.: B.Sc., Queen's, (Mech.), 1947; 1943, (summer), asst. to asst. engr., Courtaulds (Canada) Ltd., Cornwall; 1946 & 1947, (summers), student asst. engr., Dept. of Transport (Canal Office), Cornwall; with Robt. A. Rankin Co., Ltd., (for Courtaulds (Canada) Ltd.), 1947-48, design & drawing up equjpt. instlns. in rayon plant, 1948 to date, also supvn. of installation.

References: F. R. Warner, J. Oliver, E. J. Bartley, G. G. M. Eastwood, C. R. Wintermark, H. Schmelzer, L. P. Stidwell.

HOGG—FRANCIS EDGAR, of Arvida, Que. Born at Saskatoon, Sask., Nov. 27, 1914. Educ.: Metall. Engr., Colorado School of Mines (acc. ECPD), 1937; 1937-38, tank tester, routine chem. analyst, Consolidated Mining & Smelting Co., Ltd.; 1940-43, roasting furnace operator, sintering kiln operator, elect. furnace charger, elect. furnace supvr., Chromium Mining & Smelting Co., Ltd.; with Aluminum Co. of Canada Ltd., as follows: 1943-46, tech. dept. engr., asst. chief metall., Toronto, 1947 to date, tech. dept., intermediate engr., metall. group supvr., and chainman., metal purity, etc., Arvida, Que.

References: F. T. Boutilier, J. E. Dyck, B. E. Bauman, C. J. Tanner, J. T. Nichols.

LAZENBY—FREDERIC ARTHUR, of North Vancouver, B.C. Born at Port Hammond, B.C., May 30, 1902. Educ.: B.A.Sc., (Civil), B.C., 1925; R.P.E., B.C.; 1925, chainman, dam constrn., Burrard Power Co.; 1926, levelman, road & dam, Bridge River Power; 1927, dftsman., hydro design, B.C. Electric Co.; 1928, field dftsman., R/W surveys, Bridge River Power; B.C. Electric, as follows: 1929-32, detailer, hydro design, 1937, dftsman., hydro design; Dept. National Defence, 1933, asst. engr., 1934-36, unemploy. relief projects., supt. East Kootenay Group; with B.C. Electric Rly. Co., as follows: 1938-40, asst. engr., (civil), hydro elect. design & constrn., 1941-44 asst. supt., generating stns., steam & hydro, mtce. & operation, incl. dams, waterways, plant bldgs., equipt., 1947-48, liaison engr., Bridge River develop't., hydro-elect., and at present, liaison engr., for owner co. between engrs., contractors, mfrs., legal and purchasing depts., Vancouver, B.C.

References: P. H. Buchan, L. H. Burpee, J. P. Fraser, R. E. Heartz, E. I. W. Jardine, N. D. Lambert, C. R. Lindsey, J. A. McCrory.

MacGREGOR—HUGH DENZIL, of Fort Garry, Man. Born in County of Argenteuil, Que., July 23, 1911 Educ.: B.Eng., (Elect.), **McGill, 1934; R.P.E.**, Ontario; with Canadian General Electric, as follows: 1936-37, application engrg., Toronto, 1937-38, application engr., distribution & equipt., 1938-39, sales engr.; 1941-45, Radar Tech. O/C, R.A.F.; with Canadian General Electric, as follows: 1945-46, mgr., line equipt. section, utilities & lighting divn., supply dept., Toronto, 1946 to present, dist. engr., application and sale of dist equipt. (transformers, meters, arresters, etc.), Winnipeg section.

References: M. D. Young, S. H. Eggertson, A. M. Thompson, C. D. Osterland, T. E. Storey.

McQUEEN—DONALD ROBERT, of North Vancouver, B.C. Born at Wilkie, Sask., Sept. 7, 1918. Educ.: B.A., (Physics-Maths.), B.C., 1941; R.P.E., B.C.; 1941-45, res. tech. officer, Boeing Aircraft of Canada, Vancouver, B.C.; 1946-48, dftsman. & designer, Burrard Drydock Co., Ltd., Vancouver, B.C.; June 1948 to date, asst. to genl. supt., Fraser Valley Milk Producers Assn., Vancouver, B.C.

References: W. N. Kelly, A. D. Creer, H. P. Archibald, D. J. Rattenbury, E. L. Hartley.

NASMYTH—PAN HOPE, of Cornwall, Ont. Born at Vancouver, B.C., Sept. 21, 1917. Educ.: B.A.Sc., (Mech.), B.C., 1942; 1942-45, Lieut., and finally Capt., R.C.E.M.E.; with Robt. A. Rankin, Montreal, as follows: 1945-46, mech. engr., 1946 to date, project engr. i/c of Courtaulds (Canada) plant extension, Cornwall, Ont., co-ord. of elect., civil, mech. & arch. design, co-ord. of bldg. constrn., mech. & elect. instlns., etc.

References: H. Schmelzer, J. B. Stirling, G. G. M. Eastwood, E. J. Bartley, J. L. Bieler. W. D. Kirk, R. A. Rankin, J. Oliver.

RICHARDSON—DONALD WESTWOOD, of Barnet, Herts, Eng. Born at Islington, Eng., Nov. 20, 1907. Educ.: 1923-24, London Poly.; 1924-27, No. 1 School of Tech. Training, R.A.F., Bucks., England; 1933-36, DeHavilland Aero. Tech. School; Assoc. Fellow, Aero. Society; 1924-30, R.A.F. as aircraft apprent. and airman (non-com.); Philips Lamps Ltd., 1930-34, radio service engr., 1934-36, asst. service mgr.; with De Havilland Aircraft Co., Ltd., as follows: 1939-41, inspect., 1941-42, sr. liaison engr., 1942-47, lecturer, sr., aircraft engr., finally chief ground instructor.

References: G. S. Lace, P. Simpson, W. H. Jackson, L. G. Trorey, R. D. Hiscocks.

SINCLAIR—ERNEST H., of Montreal, Que. Born at Edmonton, Alta., Jan. 23, 1917. Educ.: B.Sc., (Mech.), Univ. of Idaho, (acc. ECPD), 1943; R.P.E., Quebec; 1942, (4 mos.), mech. inspectr., Dominion Bridge Co., gun plant, Vancouver, B.C.; 1943-45, contract engr., Canadian Ice Machine Co., Ltd., Toronto, Ont.; 1945-46, traing. course, York Corporation; 1946 to date, branch engr., Quebec divn., Canadian Ice Machine Co., Ltd., Montreal, Que.

References: A. E. Sargent, H. S. Petford, W. L. Yack, F. W. R. Angus, C. U. Vessot.

SPRENGER—ERIC ALOYS, of Longueuil, Que. Born at Quebec City, Aug. 14, 1908. Educ.: B.Eng., (Mech.), McGill, 1940; R.P.E., Quebec; 1925-30, machine shop, test lab., etc., Wayagamack Pulp & Paper, Three Rivers, Que.; 1936, (11 mos.), machine shop, layout work, Dominion Bridge Co., Lachine; with Dominion Engrg. Works, as follows: 1937-38, machine shop, layout work, 1940-43, inspecn. engr., Longueuil, plant, supervn. of ordnance, gauge design and liaison officer; 1943-44, armament designer trainee at Chief Engr.'s Armament Design Dept., Fort Halstead, Sevenoaks, Eng.; with Dominion Engrg. Works, 1944-45, prod. engr., Longueuil plant, 1945, (9 mos.), asst. to plant mgr., Longueuil, 1945, (3 mos.), plant mgr., Longueuil; 1946 to date, works mgr., gun division, Canadian Arsenals Ltd., Longueuil, Que.

References: J. G. Notman, H. M. Black, R. S. Eadie, J. D. Chisholm, E. C. Mayhew.

TEMPLE—DENIS, of Montreal, Que. Born at Karachi, India, Nov. 14, 1913. Educ.: Diploma, Civil Engrg., Assoc., City & Guilds Institute. 1934; Assoc. Member (1939) Inst. C.E., London; 1934-36, asst. under agreement to A. P. I. Cotterell & Son, M.M. Inst. C.E., consultg. engrs., London, as res. engr. to London Film Productions Ltd. (Denham Studios sewage works); with Anglo-Iranium Oil Co., Ltd., London, 1936, engr. trainee, design of refinery equipt., 1939, civil engr. in South Iran, responsible for all civil engrg. work in largest oilfield area; 1939-47, Inspecting Office, scientific research, R.E., Regimental Liaison Staff Works Services; 1947-48, sr. projects engr., preparation of schemes for firing large industrial furnaces, Peabody Ltd., combustion engrs., London, Eng.; 1948 to date, engr., design of refinery equipt., McColl Frontenac Oil Co., Ltd., Montreal, Que.

References: G. W. Jarvis, E. H. Brooke, J. B. Stirling, W. Fraser, D. C. MacCallum, L. L. Youell.

THOMSON—JOHN McLAREN, of Luton, Beds., Eng. Born at Aylesbury, Bucks, Eng., April 1, 1924. Educ.: Ordinary and Higher National Certificates in Mech. Engrg. with endorsement; Graduate, Inst. M.E.; with Vauxhall Motors Ltd., Luton, (branch of General Motors), as follows: 1941-44, engrg. apprent., 1944-46, awarded scholarship extension as engrg. student, 1946 & 1947 (9 mos.), asst. to factory planning engr. in project & develop't. dept. (at this time Mr. Thomson came to Canada and returned in July, 1948, evidently to remain).

References: J. Bedford, (A.M.I.M.E.), H. L. Guy, (M.I.M.E.).

VEINOT—WILLIAM DOUGLAS, of Montreal, Que. Born at Liverpool, N.S., March 19, 1921. Educ.: Aero Engrg. Diploma, Curtiss-Wright Tech. Institute, Los Angeles, (not. acc. ECPD), 1940; 1940-41, supervising inspector, R.C.A.F., Aeronautical Inspection Directorate; 1941-44, foreman, flying test section; 1944-1947, section tool and process divn., **Canadair Limited; 1948 to** date, field engr., McColl Frontenac Oil Co., Ltd., Montreal, Que.

References: A. G. Farquharson, G. W. Jarvis, E. H. Brooke, G. A. McGibbon, **R. L. Seaborne, J. H. M. Jones.**

WATTS—JAMES GEORGE, of Vancouver, B.C. Born at Omaha, Neb., Feb. 2, 1890. Educ.: Univ. of Idaho (acc.ECPD), 1909-12 (did not graduate); with Ritchie, Agnew & Co., Prince Rupert, B.C., as follows: 1912-13, dftsman., 1913-14, engr.; 1914, contractor on own account; 1915-18, townsite engr.-mgr., Anchorage, Alaska; 1918, asst. chief engr., Spruce Divn. (U.S. Army); 1919-24, owned and operated sawmill and lumber business; 1924-32, valuation engr., General Appraisal Co., Seattle, Wash.; 1934-37, mech. supt., Canadian Fishing Co., Ltd., Vancouver, B.C.; with General Appraisal Co., Ltd., Vancouver, B.C., as follows: 1938-40, valuation engr., 1940 to date, managing-director.

References: G. P. Stirrett, W. G. Swan, F. R. Adams, H. M. MacPherson, J. Robertson.

WILLIAMS—HOWARD J., of Baintree, Mass. Born at Kingston, Ont., April 28, 1895. Educ.: B.Sc., (Civil), Queen's, 1917; S.M. (Civil Engrg.), M.I.T. (acc. ECPD), 1920; Member, A.S.C.E.; 1917, (8 mos.), field engr., Cedar Rapids Power Co., Cedars Que.; 1917-19, field engr., H.E.P.C., Niagara Falls, Ont.; 1920-23, asst. engr., Maine Water Power Co., Augusta, Maine; 1923, (4 mos.), asst. engr., John F. Vaughan, consultg. engr., Boston; 1923-26, asst. engr., Water Supply Board, Providence, R.I.; with Fay, Spofford & Thorndike, Boston, Mass., as follows: 1926-47, sr. engr., July 1947 to date, partner.

References: A. C. D. Blanchard, W. M. Fife, C. B. Breed, A. A. McLaren, H. C. Bates, W. C. Miller, N. M. Cooke.

TRANSFERRED FROM THE CLASS OF JUNIOR

BARRETT—MICHAEL JOSEPH, of Montreal. Born at East Saint John, N.B., on March 13, 1913. Educ.: B.E. (Mech.), N.S.T. 1935; R.P.E., Que.; 1937-38, asst. mech. super. National Gypsum Co., Cheticamp, N.S.; 1938-40, vent. engr. Sun Life Assurance; 1940 to date, engr. i/c plumbing, heating, process piping, ventilation, Dominion Rubber Co., Montreal. (Jr.1938).

References: R. Ford, S. Ball, R. Barbour, C. R. Timm, E. A. Ryan.

BILLINGS—GEORGE MICHAEL, Major, R.C.C.S., of Halifax. Born at Leicester, England, on Feb. 1, 1911. Educ.: Grad. R.M.C.; B.Sc. (Elec.) Queen's, 1936; 1934 to date with Dept. of National Defence, wireless, line communications engineering; 2 i/c eastern command signal regiment; prior to the war employed as district Signals Officer M.D. 10. (St.1936, Jr.1946).

References: L. F. Grant, D. M. Jemmet, H. Lawson, H. W. Love.

CARSON—ROBERT JOHN, Lieut.-Colonel, of Halifax, N.S. Born at Muree, India, on Sept. 13, 1914. Educ.: Grad. R.M.C., 1936; B.Sc. (Civil) Queen's, 1937; with the R.C.E. as follows: 1937-40, Works Officer, Victoria & Prince Rupert; 1940-41, directorate of engineer services, Ottawa; 1941-44, O/C overseas, England; 1944-45, BM 1 Cdn AGRE, France; 1945-46, ACRE/1 Cdn CRE Wks. occupation force Germany; 1946-47, DEO MD 12, Regina, Sask.; later called area engr.; 1947 to date, Command Engr. Eastern Command, Halifax, N.S. (St.1937, Jr.1946).

References: P. C. Ahern, L. F. Grant, H. L. Sherwood, J. B. Stirling, H. W. Love, N. D. Lambert, G. R. Turner, H. L. Meuser, D. S. Ellis.

CUTHBERTSON—ROBERT SHEDDEN, of St. Thomas, Ont. Born at Greenock, Scotland, on Nov. 29, 1915. Educ.: B.Sc. (Mech.) Queen's, 1941; R.P.E., Ont.; summer work with the Canada Starch Co. as follows: 1934-35, operator & technician, dextrine production; 1935-37, power house mechanic, fireman's helper; 1939, student dftsman.; 1940, sub-station constrn., instru'man H.E.P.C. Ont.; with Northern Elec. Co.; 1941-43, production methods, new parts screw machine, milling machine & punch press operations; with Timken Roller Bearing Co.; 1945, study of tooling, production methods, Canton, Ohio.; 1947, tool engr.; at present, production supt., St. Thomas, Ont. (St.1941, Jr.1945).

References: R. H. Wallace, J. W. Fagan, E. G. Gagnon, C. A. Peachey, J. G. Little, J. W. Jolly.

DAVIS—BRUCE L., of Arvida, Que. Born at Toronto, on Oct. 7, 1915. Educ.: B.A.Sc. (Mining), Toronto, 1941; R.P.E. Que.; with the Aluminum Co. of Canada as follows: 1941-42, asst. engr. i/c mech. mtce., ore plant; 1942-43, superv. ore plant, operating supt. project 45A; 1947, supt. caustic plant; 1948, supt. caustic, supt. project 45A; 1947, supt. Caustic plant; 1948, supt. caustic, chlorine plant, carbon dept., Arvida. (St.1941, Jr.1944).

References: B. E. Bauman, J. F. Braun, G. M. Mason, E. F. Hartwick, J E. Dyck, F. T. Boutilier.

DEMERS—CHARLES-EUGENE, of Quebec. Born at Quebec City on June 3rd, 1916. Educ.: B.Sc. (Civil), Queen's, 1941; R.P.E. Que., summer work as follows: Quebec Highway Dept., 1938 and 1939, instru'man; 1940, dftg.; on the Chute a Caron & Shipshaw Power Developt. project as follows: 1941-42, field engr., Foundation Co.; 1942-44, field engr., H. G. Acres & Co. for the Aluminum Co.; 1944-48, director, constrn. mgr., Komo Construction Ltd., Quebec. (St.1941, Jr.1943).

References: D. S. Ellis, A. Pouliot, C. Miller, G. R. Adams, C. C. Lessard, M. Royer, M. G. Archer.

DUNN—SYDNEY MEWBURN S., of Brantford, Ont. Born at Toronto on July 16, 1917. Educ.: B.A.Sc. (Met.), Toronto, 1940; R.P.E. Ont.; summer work, 1937, at Coppercliff Orco Assay Lab.; 1938, Pt. Colborne N. Electrolytic Bldg.; 1939, Orco Precious Metals Refinery; 1940 (6 mos.), jr. metl. Anaconda American Brass; 1940-41, engr. in training, A.W.S.C., Great Britain & U.S.A., Shell Filling; 1941 (4 mos.), D.I.L., engr. consulting layout equipt. cartridge prod. units; with D.I.L. as follows: 1941 (5 mos.), Bouchard Works, responsible for phases of operation of interconnected mass production lies processing explosives; 1941-43, supt., superv. organizing of staff engrs. chemists; also engaged in prod. planning methods engrg., process develpt.; 1943-45, supt., quality control; 1945-47, prod. mgr. i/c plant layout, General Steel Wares Ltd.; 1947 to date, manuftg. supt., Market Street Works, Massey-Harris, Brantford. (St.1940, Jr.1944).

References: C. R. Young, C. G. Williams, M. S. Macgillivray, A. T. Hurter, J. D. Chisholm, G. R. Henderson, H. G. Ambrose.

FARAGO—WILLIAM JAMES, of Kitchener, Ont. Born at Plunkett, Sask., on July 11, 1916. Educ.: B.Sc. (Mech.) Sask. 1941; R.P.E., Ont.; 1941-42, methods & time study engr., McKinnon Ind. Ltd., St. Catharines, Ont.; 1942-43, time study engr. i/c method improvement, plant layout, some structural work, Kelsey Wheel Co.; 1943-45, Lieut. R.C.E.M.E., overseas i/c Light Aid Detachment: 6 mos. Brigade Tech. Liaison Officer in Canada; with Electrohome Ind. Ltd., 1945 mech. engr.; at present, liaison engr. between prod. & engrg. depts., also in advisory capacity to mech. design section. (St.1941, Jr.1944).

References: I. M. Fraser, N. B. Hutcheon, J. G. Hoba, H. T. Brunskill, W. R. Staples.

FOOTE—SAMUEL DAVID, of Calgary, Alta. Born at Stouffville, on Oct. 7, 1914. Educ.: B.A.Sc. (Civil) Toronto, 1937; R.P.E., Alta.; 1937-40, rodman Canadian National Railways; 1940-42, engr. H.E.P.C. of Ont.; 1942 to date, plant engr. Calgary Refinery, British American Oil Co. Ltd. (Jr.1939).

References: H. E. Hansen, O. H. Hoover, R. Barnecut, G. R. Pritchard.

GUY—ROSS THOMAS, of Toronto. Born at St. Thomas, Ont., on Oct. 2, 1915. Educ.: B.Sc. (Mech.) Queen's, 1941; R.P.E., Ont.; summer work, 1937-40, rodman, dftsman, transit work, cost estimates, New York Central Railroad Co., St. Thomas, Ont.; with General Motors Ltd. as follows: 1941-43, sr. detailer then project engr., Oshawa, Ont.; 1943-45, project engr. liaison engr. between G.M. & Dept. of Munitions & Supply, Ottawa; also tech. observer for G.M. at Normoyle Ordnance Depot, San Antonio, Texas; 1945-47, production mgr. Collett-Sproule Ltd. (paper box mfgr.); at present, mech. engr., plant layout, design, special equipt. installn. of new bottling line in Toronto plant, revisions, alterations to existing plants, Coca Cola Ltd. (St.1940, Jr.1943).

References: J. M. Courtright, A. Jackson, M. W. Huggins, I. S. Widdifield, D. S. Ellis, R. A. Low, D. M. Jemmett, L. M. Hunter.

HARGRAVE—JOHN HUXLEY, of Port Arthur, Ont. Born at Medicine Hat, Alta., on May 13th, 1918. Educ.: B.Sc. (Civil) Alberta, 1941; summer work with P.F.R.A. as follows: 1938, dftsman.; 1939, field dftsman.; 1940, instru'man, pipe line survey, airport construction, Dept. of Transport, Lethbridge; 1941, structural designing engr. C. D. Howe Co. Ltd., Port Arthur, Ont.; 1942-46, O/C 115th Cdn Meteorlogical Section, rank Captain, R.C.E.; 1946 to date, structural designing engr. C. D. Howe Co. Ltd. (St.1941, Jr.1946).

References: R. M. Hardy, J. M. Fleming, H. M. Olson, W. C. Byers, C. M. Moore, J. N. McNeil, H. Os.

LARIVIERE—MARCEL GERARD, of Montreal. Born at Montreal, on Dec. 9, 1914. Educ.: B.Eng. (Civil) McGill, 1938; R.P.E., Que.; summer work, 1934, city survey; 1935, geological survey, Burlington, Vermont; 1936, cost dept. General Steel Wares, Mtl.; 1936-37, taught school, Feller Institute; 1937, survey for U.S. Dept. of Agriculture, asst. supt., constrn. of Highway at Vergennes, Vermont; 1937-38, field engr. Lalonde & Valois, Consulting Engrs., highway location, constrn. surveys for viaduct and tunnel; 1938-39, field engr. Janin Construction Co., Mtl., reconstructrn. of wharf and shed 28 Quebec Harbour; 1939 (6 mos.) field engr. Beauharnois Light, Heat & Power Co.; 1939-46, civil engr. Dept. of Public Works, Ottawa, wharves, dredging, surveys, inspectns. designing; 1946-47, designing engr., Beauharnois Light, Heat & Power Co.; 1947-48, Surveyer, Nenniger & Chenevert, constr. eng.; with Ross Patterson, Townsend & Heughan, (architects); at present, reinforced concrete designer, Stadler Hurter Consulting Engrs. (St.1935, Jr.1943).

References: J. W. Roland, J. A. Lalonde, J. P. Lalonde, G. Townsend, L. B. McCurdy, J. G. Chenevert, C. G. Kingsmill.

McAULAY—GRAHAM FALCONBRIDGE, of Calgary, Alta. Born at Edmonton, Dec. 9, 1914. Educ.: B.Sc. (Civil) Alberta, 1939; R.P.E., Alta.; summer 1938, rodman City of Edmonton; 1939, jr. engr. Can. Kellogg Co. on Imperial Oil Refinery; 1940, construction engr., power plant, i/c structural design, detailing & field work of reinforced concrete for new Water Treatment Plant & Power Plant Extension; 1948 to date, constrn. engr. Poole Construction Co. Ltd. Calgary. (St.1937, Jr.1941).

References: I. F. Morrison, R. M. Hardy, L. A. Thorrsen, W. I. McFarland, J. E. Poole.

MACDONALD—RODERICK EDWARD, of Ottawa, Ont. Born at Florence, N.S., on May 15, 1917. Educ.: B.Sc. Acadia University, 1939; 1939-41, chemist, Chemical Laboratories, Dom. Iron and Steel Co., Sydney, N.S.; 1941-45, army & constrn. engrg. chemical warfare (Cdn. Army Engrs.); 1945-46, jr. engr. coke oven dept. Dominion Iron & Steel Co.; 1946-47, chemical engr. Vincent Mining Corp., Toronto; 1947, supt. Phenol & Caustic Plants, Dominion Tar & Chemical Co. Ltd., Toronto; 1947, chemist ore dressing laboratories, Bureau Mines & Resources, Ottawa; 1948, directorate engr. develpt. Army Headquarters, Ottawa. (Jr.1946).

References: C. M. Anson, W. E. Bown, Y. C. Barrington, M. W. Booth, A. J. Kerry.

MANSEAU—MARCEL, of Montreal. Born at Maskinonge, Que., on March 22, 1918. Educ.: B.S.Sc. (C.E.) Ecole Poly. 1941; R.P.E., Que. 1941 (3 mos.) aeronautical engrg. inspection R.C.A.F.; 1941-43, stationed at Canadian Car & Fdry., Turcot Works, Mtl.; 1943-46, industrial engr. Noorduyn Aviation Ltd., Mtl.; 1943-46, asst. prof. part time, engrg. drawing & descriptive geometry, Ecole Poly.; at present, senior engr. Stevenson & Kellogg Ltd., Management Engineers, Mtl. (St.1938, Jr.1946).

References: P. Kellogg, L. R. Ord, J. Lefort, J. A. Laughton, D. C. Dobbin, I. Brouillet, H. Gaudefroy.

MORGAN—JOHN WILLIS, of Toronto. Born at Lethbridge, Alta., on April 1, 1917. Educ.: B.Sc. (Chem. Engrg.) Alberta, 1939; R.P.E., Ont.; with the British American Oil Co. Ltd.; 1939-41, chemist, Calgary Refinery; 1941-42, chemist, Toronto Refinery; 1942-46, process engr. head office; 1946-48, economic planning; at present, chief economic planning engr. Toronto. (Jr.1944).

References: I. S. Widdifield, E. R. Graydon, J. M. Courtright, R. H. Self.

MORGAN—RALPH T., of Three Rivers, Que. Born at Montreal, on Dec. 28, 1912. Educ.: B.Eng. McGill, 1935; summer 1931, erection crew, Babcock & Wilcox; with the Canadian International Paper Co. as follows: 1935-37, control dept.; 1937-41, engrg. dept. dftg.; 1941-44, mill engr.; 1944-45, New Brunswick Inter. Paper Co.; 1944-45, mill engr.; 1945-47, asst. plant engr.; at present, asst. plant engr. C.I.P. Co., Three Rivers, Que. (Jr.1937).

References: C. F. Walker, C. H. Champion, J. Wickenden, W. T. Bennett, A. H. Chisholm.

NEAR—JAMES DAILEY, of Toronto. Born at Stratford, Ont., on Dec. 27, 1915. Educ.: B.A.Sc. (Civil) Toronto, 1941; R.P.E., Ont.; summer work with Dept. of Highways of Ont.; 1937, 1938 & 1939, rod & chainman; 1940, timekeeper & cost accountant with the R.C.E. overseas; 1941-45, Lieut.; 1945-46, Captain; with the Dept. of Works, City of Toronto; 1946-48, roadway engr. i/c estimating & survey branches. (St.1940, Jr.1943).

References: M. A. Stewart, R. F. Legget, J. E. Isbester, D. F. McCarthy, L. A. Lee, F. E. Wellwood, W. P. Near.

OTT—HELMUTH GEORGE, of Montreal. Born at Berlin, Germany, on Dec. 19, 1923; Educ.: B.Eng. (Civil) McGill, 1945; summer work as follows: 1941, chainman Quebec Highways Dept.; 1942, student, Algoma Steel Corp.; 1943, (one month) instru'man, Dept. of Tarnsport Civ. Av.; 1943 (one month) eng. aide, U.S. P.R.A. Alaska Highway; 1944, instru'man, Dept. of Mines & Resources; 1945, asst. chief of party, D. of M. & R., Ottawa; 1945-46, field engr. Atlas Construction Co. Ltd., Mtl.; 1946 to date, office engr., preparation of estimates & cost analyses, occasional inspection of jobs & preparation of contracts, Gunite & Waterproofing Ltd., Mtl. (St.1946, Jr.1947).

References: G. J. Dodd, R. DeL. French, H. R. Montgomery, A. R. Chadwick, J. R. Mills.

SMITH—ODRIC HENRY, of Toronto. Born at Toronto, on March 19, 1911. Educ.: B.Eng. (Mech.) McGill, 1935; R.P.E., Ont.; 1926-37, railway constrn., industrial & textile work; 1937-41, designing engr. & dftsman., outside superv., Walter J. Armstrong; Consulting Engr.; 1941-45, Major, R.C.E.M.E.; 1945-46, Walter J. Armstrong; 1946-48, associate, K. R. Rybka, Consulting Engr., mech. & elect. equipt. of buildings. (St.1935, Jr.1946).

References: K. R. Rybka, E. A. Cross, C. D. Carruthers, F. R. Pope, J. M. Oxley.

SWERDFEGER—JOHN H., of Vancouver, B.C. Born at Innisfail, Alta., on Nov. 30, 1922. Educ.: B.A.Sc. (Civil) B.C., 1944; R.P.E., B.C.; summer work as follows: 1941, field work, Dominion Construction Co., Vancouver; 1942, jr. engr. Public Works of Canada, New Westminster, B.C.; 1943, R.C.N.V.R.; 1944-45, jr. eng. International Pacific Salmon Fisheries Commission; 1945-48, engr. i/c office, Edw. F. Carter, Consulting Engr., Vancouver, B.C.; 1945 to date, senior structural designer, British Columbia Electric Rly. Co., Vancouver, B.C. (St.1941, Jr.1946).

References: E. F. Carter, J. R. Lyall, A. E. Gordon, W. G. Grimble, A. D. Creer.

WURTELE—DOUGLAS BARNETT, of Ottawa. Born at Croydon, England, on Sept. 10, 1919. Educ.: Graduate R.M.C., 1939; B.Sc. (Aero Engrg.), Toronto, 1948; with the Dominion Government as follows: 1930, mining survey, linesman; 1939, aerodrome survey; 1947-48, experimental & proving establishment of R.C.A.F.; interrupted by two seven months periods at Univ. of Toronto; at present, project engr., experimental & proving establishment, (R.C.A.F.). (Jr. 1946).

References: H. Parkin, T. R. Louden, M. Huggins, C. W. Crossland, A. Ross.

TRANSFERRED FROM THE CLASS OF STUDENT

OLAFSON—HAROLD SIGMAR, of Montreal. Born at Riverton, Manitoba, on June 15, 1918. Educ.: B.Sc. (Elec.) Manitoba, 1941; R.P.E., Ont.; 1941-42, str. engr., Bell Telephone Co.; 1942-46, Lieut.-Capt. Royal Cdn. Corps of Signals; 1946-47, asst. engr., plant dept.; engr. grade three, office of asst. vice-president, engrg., Bell Telephone Co. (St. 1940)

References: E. P. Fetherstonhaugh, W. H. Slinn, A. R. Colman, H. F. Bush, G. H. Herriot, H. C. Nourse.

WALKER—ADAM STEWART, of Montreal. Born at Aberdeen, Scotland, on Nov. 5, 1914. Educ.: B.Sc. Sir George Williams College, 1943; with Canadian Pacific Rly. Co. as follows: 1936-40, dftsman; 1940-42, chief dftsman.; 1942-43, asst. engr. i/c dftng. & staff engrg. of railway public address, train announcing systems; 1943-45, special studies engr. C.S.A. work relating to communications inside plant engrg. announcing systems; 1945 to date, equipt. engr. engrg. of all comm. equipt., C.P.R. Communications Dept. (St.1942).

References: L. A. W. East, R. W. Dobridge, S. T. Fisher, C. B. Fisher, C. E. Frost, G. MacLeod.

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

JUNIOR RESEARCH CHEMIST required by a manufacturer in Central Ontario to be trained in Research work. Salary open. Apply to File No. 1017-V.

MECHANICAL

GRADUATE ENGINEER preferably mechanical background and some industrial experience required for general duties by a Montreal manufacturer. Salary around $300.00. Apply to File No. 1011-V.

MECHANICAL ENGINEER required by a large industrial concern in the Province of Quebec. Good chance for advancement. Salary open. Apply to File No. 1014-V.

MECHANICAL ENGINEER required by large industrial concern in Montreal for the design of major electrical products. Salary according to qualifications. Apply to File No. 1016-V.

SENIOR MECHANICAL DRAUGHTSMAN for work in Ottawa. Ten years experience required in simple design layout and detail drawings for steam power plants, steam and hot water heating, ventilation and air conditioning. Four year contract if suitable. Reply in confidence, outlining experience and stating salary expected. Apply to File No. 1045-V.

METALLURGICAL

PHYSICAL METALLURGIST required by Ontario Research Foundation. Should be University graduate with from 3 to 5 years practical experience and should preferably have had some experience in electrolytic refining of metals. Salary commensurate with experience. Apply to File No. 1013-V.

MISCELLANEOUS

SALES ENGINEER required by Company manufacturing electrical switchgear, to represent them in Alberta and Sask. Salary and commission. A man with an aggressive personality and experience in this line of product can assure himself of a good income. Apply to File No. 1018-V.

SALES ENGINEER, recent graduate, mechanical background, required by Canadian manufacturer. Must be free to travel. Location Ontario. Salary $235. to $250. Apply to File No. 1019-V.

GRADUATE ENGINEER, preferably mechanical or chemical, required for sales engineering in the Toronto area. Should have some experience in sales and maintenance engineering. Salary open. Apply to File No. 1020-V.

MECHANICAL OR ELECTRICAL ENGINEER age about 35 years with experience in building construction and machinery, maintenance and repair, capable of taking over the engineering and maintenance service in a large textile mill in Province of Quebec. Salary open. Apply to File No. 1021-V.

SENIOR INDUSTRIAL ENGINEER required by firm in Province of Quebec. Duties include: Wage incentives, method studies, cost reduction etc. Should be graduate in mining or mechanical engineering. Salary open. Apply to File No. 1023-V.

GRADUATE ENGINEER mechanical or electrical background required to set up and organize a new department for a Canadian manufacturer. Must have plant and production experience. Preferably under 35 years. Salary open. Apply to File No. 1025-V.

FORESTRY ENGINEERS, recent graduates also class of 1949 required for extensive logging operations in Province of Quebec. Preferably but not necessarily bilingual. Current salaries paid. Apply to File No. 1026-V.

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open. Apply to File No. 1027-V.

GRADUATE ENGINEERS with mechanical and light structural experience, applicable to designing and detailing of conveyors, who are interested in establishing themselves with a well established growing concern to learn business in preparation for future advancement. Situated near Toronto. Salary open. Apply to File No. 1028-V.

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

CHEMICAL

CHEMICAL ENGINEER — with about two years experience required by large Pulp and Paper Mill in Province of Quebec. Salary $250. per month. Apply to File No. 4199-V.

CIVIL

RECENT GRADUATE, preferably civil, with some construction experience required for construction inspection work by large oil company in the West. Work will involve extensive travel and long periods absent from headquarters. This position provides opportunity for advancement. Salary open. Apply to. File No. 1005-V.

CIVIL ENGINEER, construction experience, Bailey bridging in the army preferred, to supervise erection and inspection of Bailey structures on projects in Ontario. Salary open. Apply to File No. 1007-V.

CIVIL ENGINEER — recent graduate with up to one year's experience since graduation. Preferably single man. Required by Northern Ontario Paper Mill. Salary around $250. Apply to File No. 4158-V.

CIVIL ENGINEER with extensive experience in the use and design of Structural Steel. Duties primarily Public Relations with Architects, Engineers and Public Bodies and he will be required to act as Secretary of a Dominion association. Headquarters Toronto. Salary $4,800. up. Apply to File No. 4201-V.

CIVIL ENGINEER required for Consulting Engineer and Land Surveyor's office in Western Ontario. Must be able to make urban and rural surveys, layout of sewers, waterworks and pavements, etc. Will applicants please state qualifications and references. Salary open. Apply to File No. 4204-V.

CIVIL ENGINEER with considerable experience in structural steel and reinforced concrete design. Preferably bilingual. Required in Montreal. Must be veteran with overseas service. Applicant should state age, experience and salary expected. Apply to File No. 4205-V.

CIVIL ENGINEER required for South America. Must be single and between the ages of 25-40 years. Duties include: Supervise field survey parties doing triangulation and control work, perform draughting and layout work for construction projects as well as miscellaneous minor and major construction projects. Salary $390. U.S. currency. Apply to File No. 4221-V.

ELECTRICAL

ELECTRICAL ENGINEERS preferably with some experience in paper industry required by large Pulp and Paper mill to work under Electrical Superintendent. Salary $300 to $350. per month. Apply to File No. 4199-V.

RECENT GRADUATE IN ELECTRICAL ENGINEERING required by an industrial organization in Montreal. Salary open. Apply to File No. 4214-V.

ELECTRICAL ENGINEER, recent graduate, required as Assistant Professor in Electrical Engineering and work would be largely supervision of Laboratory classes. Salary $2,500. to start, summers free to take other employment. Location Maritimes. Apply to File No. 4218-V.

ELECTRICAL ENGINEER required by consulting office. Should have at least seven years experience in layouts for substations, switching and motor distribution. Permanent position and good salary for right man. Location Northern Ontario mining district. Apply to File No. 4220-V.

ELECTRICAL DRAUGHTSMAN required by consulting firm. One capable of making detailed plans and diagrams from preliminary drawings prepared by designers. Work consists of layouts for substations, switching and motor distribution systems. Permanent position. Location Northern Ontario. Salary open. Apply to File No. 4220-V.

ELECTRICAL DISTRIBUTION SUPERVISOR required for South America. Preferably single and 35 years of age or more, with 10 years industrial experience. Duties include direct supervision of all power transmission and distribution lines, transformer stations, lighting installations, etc. Must have ability to direct and lead other skilled personnel. Salary $450. U.S. currency. Apply to File No. 4221-V.

MECHANICAL

MECHANICAL ENGINEERS with 3 to 5 years experience in mechanical design and general plant engineering, as well as field work required by a firm in Quebec. Salary open. Apply to File No. 1001-V.

MECHANICAL ENGINEER required by firm in Province of Quebec, to work mostly on mill design and layouts of new mill and improvements to others. Salary open. Apply to File No. 1001-V.

MECHANICAL ENGINEER required as assistant superintendent for small establishment employing 60 men. Must have complete knowledge of machine shop methods in precision work capable of making accurate estimates machines times preparatory to bidding. Salary open. Apply to File No. 1002-V.

MECHANICAL ENGINEER for design and development work in large Montreal food industry. Must have 5 to 10 years experience including some structural work. State age and full experience. Salary open. Apply to File No. 1008-V.

MECHANICAL ENGINEER, recent graduate, required for manufacturing and related duties with well established reputable paper company. Salary open. Apply to File No. 4172-V.

MECHANICAL MAINTENANCE ENGINEER with twelve to fifteen years experience required by Toronto office of Canadian firm. Must be between the ages of 35 and 40 and preferably located in the Toronto area. Salary open. Apply to File No. 4191-V.

MECHANICAL ENGINEER with about five years experience in the design of tractors and related accessories required as Automotive Engineer by one of Canada's leading manufacturers of heavy mechanical equipment. Salary open. Apply to File No. 4206-V.

MECHANICAL ENGINEER with at least ten years experience in general mechanical design in heavy engineering required by a large manufacturer in Montreal. Salary open. Apply to File No. 4206-V.

MECHANICAL ENGINEER with a minimum of five years experience in the design of hydraulic turbines, penstocks, surge tanks and associated hydraulic equipment required by well established firm in Montreal. Salary open. Apply to File No. 4206-V.

JUNIOR MECHANICAL ENGINEER required by Canadian manufacturer in Toronto for general duties. Must be highly competent. Salary open. Apply to File No. 4219-V.

SENIOR MECHANICAL ENGINEER required by a Canadian manufacturer. Must have at least twenty years experience and would be responsible for all mechanical work in General Engineering Division. Salary open. Apply to File No. 4219-V.

METALLURGY

METALLURGICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No. 3942-V.

MINING

MINING ENGINEERS for design and layout work also some field work required by firm in Province of Quebec. Salary open. Apply to File No. 1001-V.

MISCELLANEOUS

SALES ENGINEER required by well-known manufacture's representative, long established, handling electrical and engineering equipment including power and lighting transformers, to take charge of Montreal office. Bilingual preferred. Salary in accordance with experience. Apply to File No. 1006-V.

HEATING AND VENTILATING ENGINEER, graduate, required for Montreal Head Office of a Canadian Company for design, specification and layout of air conditioning, ventilating, fan and duct work for industrial processes, factories, offices, dust removal collecting systems, etc. Supervision of field installations, testing, and making estimates. At least five years experience with the above. Must be familiar with all kinds of heating systems, relative apparatus and equipment with sheet metal air duct work. Apply to File No. 1015-V.

GRADUATE ENGINEER required by Pulp and Paper Mill in Province of Quebec. Must have extensive experience in general maintenance, design and development of pulp and paper mill equipment. Excellent future advancement. Salary $6,000. to $9,000., depending on qualifications. Apply to File No. 4161-V.

STRUCTURAL DRAUGHTSMEN required by Alberta firm. One able to check all classes of structures and tanks. Another able to detail all types of structures. A third able to detail light structures and general handling machinery. Must be experienced. Salary open. Apply to File No. 4167-V.

SALES ENGINEERS, one for Ontario and one for Quebec, required by tool and quality steel Branch Sales Office. Applicant should have some metallurgical training, some experience in tool and die manufacture, good personality and should own own car. Salary open. Apply to File No. 4170-V.

MECHANICAL OR ELECTRICAL ENGINEER, bilingual, experienced in standard investigations and observations. Time-study training not necessary, required by Montreal firm. Salary open. Apply to File No. 4174-V.

GRADUATE ENGINEER required by an oil company in the Maritimes, must have sufficient experience in the oil business and the educational qualifications to enable him to determine the specifications of oils required for various industrial machinery. Salary open. Apply to File No. 4178-V.

CONSTRUCTION ENGINEER capable of supervising sundry engineering jobs and pipelines for oil company in the Maritimes. Salary open. Apply to File No. 4178-V.

PLANT MAINTENANCE ENGINEER, mechanical background, extensive experience in pulp and paper preferably kraft. Required to take charge of kraft mill maintenance in province of Quebec. Executive ability. Salary open. Apply to File No. 4179-V.

GRADUATE ENGINEER required for veneer and plywood plant in the Maritimes. Must be fully qualified to assume responsibility for the management, production and general supervision of the plant. Salary open. Apply to File No. 4180-V.

MAINTENANCE MANAGER required for large hospital in the Maritimes for maintenance and operation of power plant, buildings and equipment. Salary open. Apply to File No. 4186-V.

RECENT GRADUATE required by a large National Organization. Must have the following qualifications: Good appearance, personality, leadership and initiative. Salary $2,400. Apply to File No. 4194-V.

SALES ENGINEER, mechanical background, must be thoroughly experienced and capable of developing and maintaining connections of old established firm in road builders, contractors and industrial machinery equipment. Must possess executive ability and have command of the French language. Salary open. Apply to File No. 4203-V.

MECHANICAL OR CIVIL ENGINEER with four to five years experience in stress analysis of mechanical and structural equipment required by a large manufacturer in Montreal. Salary open. Apply to File No. 4206-V.

INSTRUCTORS AND DEMONSTRATORS required by a Canadian University for session beginning September 20th, 1948, particularly in Electrical Engineering and in Engineering Problems and Drawing. Salary open. Apply to File No. 4209-V.

SENIOR STAFF MEMBER required by Canadian University. Must have degree and industrial experience to teach Fluid Mechanics, Internal Combustion Engines, Refrigeration, Heating and Ventilation, all at IV year level. Salary open. Apply to File No. 4210-V.

VILLAGE ENGINEER required by Village of Crystal Beach, Ontario. Applicants state qualifications and salary expected. Apply to File No. 4215-V.

SENIOR DRAUGHTSMAN with from 3 to 5 years experience required by an oil company in the Montreal area. Preferably under 35 years of age. Salary $250. to $300. per month. Apply to File No. 4216-V.

GRADUATE ENGINEER with broad experience is required by a manufacturer in Toronto. Must have experience in the design of small and large steam boilers together with their associate equipment, plate work and pressure vessel experience are essentials. Salary open. Apply to File No. 4219-V.

HYDRAULIC ENGINEER at least 30 years of age with experience in hydraulic turbine design, Pelton Wheel design, hydraulic valve design and preferably with experience in river control required in Toronto by Canadian manufacturer. Salary open. Apply to File No. 4219-V.

DRAUGHTSMAN required by manufacturer in Toronto. Standard draughting training is essential with a minimum of five years of actual paper mill machinery experience in the development and layout of the mill and its equipment. Salary open. Apply to File No. 4219-V.

Situations Wanted

CIVIL AND MECHANICAL ENGINEER, M.E.I.C., age 42, B.Sc. Civil Graduate work in industrial engineering at McGill University. Seventeen years experience in following field: Manufacture of welding rod and hard-facing alloys, installation of incentive bonus systems. Production planning on the manufacture of shells and shell parts. Design and construction of explosive proving equipment. Superintendent during construction of shell filling plants. Other experience covering oil refining, contracting, and installation of pulp and paper mill equipment. Interested in position with responsible firm or partnership with consultant. Home in Montreal area. Apply to File No. 981-W.

STRUCTURAL ENGINEER, M.E.I.C., P.Eng., experienced in design work and preparation of drawings for wood, structural steel and reinforced concrete structures. Interested in position or partnership with consulting engineering firm in Toronto, Hamilton or other city in the interlake region. Apply to File No. 1031-W.

PRODUCTION ENGINEER, M.E.I.C., P.Eng., McGill '33, (Electrical), age 38, married. Experience includes all phases Production Engineering, standard costs, budgetary control, time study, method improvements, financial reports, sales and general engineering. Desire position pertaining to foregoing fields. Available immediately. Location Quebec or Ontario. Apply to File No. 1186-W.

ELECTRICAL ENGINEER, M.E.I.C., Alberta 1931, P.Eng., Ontario, married. Experience in Engineering Department of large industrial plants and as Field Engineer on various plant and power construction projects. During the war was Senior Engineer on design of Auxiliary Electrical equipment for Radar units and sub-contract work. Desire permanent position requiring initiative with good future prospects preferably in Ontario. Apply to File No. 1249-W.

GRADUATE ELECTRICAL ENGINEER, M.E.I.C., age 31, with seven years experience in electronics and radio, including radar and microwave techniques, and three years experience in industrial and utility engineering and management, desires permanent, responsible position Montreal, Ottawa, Toronto region preferred. Apply to File No. 1689-W.

CHEMICAL ENGINEER, M.E.I.C., graduate of McGill, age 33, married, bilingual, presently located in Montreal, experienced in production and process control of dairy equipment, aluminum plant pot-rooms, gas scrubbing plant. Last three years in charge of lubricant and fuel oil sales in marketing organization of major oil company. Desires responsible position with well established firm leading to management. Available in November, 1948. Apply to File No. 1932-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. Que., has structural, mechanical, chemical and mining experience. Qualifications merit consideration for responsible position, contract work on design, associate with consulting engineer. Location is Montreal but would locate elsewhere. Interests are structural design, mechanical trades for buildings, power development, steam plant, process plant design, machine and tool design, pulp and paper plant engineering and engineering research. Would consider position as resident engineer, or municipal engineer. Apply to file No. 1935-W.

INDUSTRIAL AND CIVIL ENGINEER, M.E.I.C., B.A.Sc., P.Eng., Quebec, age 39, married, fluently bilingual. Seeks position as Industrial Engineer, Executive, Town Engineer, Sales Engineer. Experience in motion and time study, methods, process development, production control, costing, plant maintenance, highway engineering, municipal engineering, sales. Available on short notice. Apply to File No. 2157-W.

INDUSTRIAL ENGINEER, M.E.I.C., age 34. Five years practical experience in plant production and efficiency. Desires part time employment. Montreal area. Apply to File No. 2158-W.

EXECUTIVE ASSISTANT ENGINEER, M.E.I.C., background of Engineering, production, Business Organization, Cost Control, and Management. Age 37, married, and preference for permanent association with enterprise in Montreal area. Apply to File No. 2228-W.

MECHANICAL ENGINEER, Jr.E.I.C., is interested in short term projects, duration one month or more. Location anywhere. Production works, incentives, re-design, surveys, layouts, job evaluation, methods and materials handling. Salary desired $500 a month. Apply to File No. 2338-W.

CIVIL ENGINEER, Jr.E.I.C., McGill, '45, married, with experience in surveying and construction. Presently employed with small construction concern in the preparation of estimates, records and cost analyses. Experienced in writing contracts and specifications. Bilingual. Seeking responsible position in Montreal or Ottawa areas. Apply to File No. 2405-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.Eng., McGill '46, age 24, single. Presently employed as a machinist with a large concern. Employment in the past includes positions in tool design, air conditioning and methods engineering. Seeks responsible position with firm in production or shop management. Available on short notice. Apply to File No. 2707-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Eng., McGill 1943, (Honours), P.Eng., Quebec, desires position in Montreal or Ontario. Willing to travel. Interested in Commercial Aspects and Sales Engineering. Apply to File No. 2727-W.

ELECTRICAL ENGINEER, M.E.I.C., P.Eng., graduate '44, age 27, single. Presently employed near Montreal, 8 years of engineering experience, machine tool engineering on Batch Production. Fabrication and assembly methods. Production supervision, research, methods improvement in power transmission equipment. Layout estimating and installation of power apparatus and auxiliaries. Am seeking more exacting and progressive position with expanding organization located anywhere. Apply to File No. 2876-W.

ENGINEER, M.E.I.C., P.E., Queen's '37, varied experience in Mining and Industrial work; 4½ years with R.C.A.F. as engineer officer. Desires position with progressive firm offering responsibility and opportunity. Interested particularly in mining, manufacturing and processing of chemicals and industrial minerals. Location in B.C. or Alberta preferably. Apply to File No. 2892-W.

GRADUATE ELECTRICAL ENGINEER, M.E.I.C., McGill '24, Prof. Eng., Quebec. Over 20 years experience in high voltage transmission line, design and construction. Interested in part time or temporary position in general engineering or transmission linework. Location preferably Montreal or in B.C. At present residing in Montreal area. Due to certain physical defects the type of work that can be undertaken is limited. Available at once. Apply to File No. 2918-W.

MECHANICAL AND INDUSTRIAL ENGINEER, M.E.I.C, Ph.D. (Engineering, London), A.M.I.Mech.E., P.Eng., age 36, eleven years diversified industrial experience, desires position with duties involving: methods studies, research, development, engineering economics, management techniques, advisory service to the Board of Directors and similar. Apply to File No. 2929-W.

CHEMICAL, S.E.I.C., B.A.Sc., Toronto, '46, ex-Signal Corps, age 24. Reliable, diligent, conscientious, aggressive, bilingual. Experience in the rubber, distilling, and heavy chemical fields; in such phases as process and product control, design and engineering and industrial research. Presently employed but seeks an opening with a progressive company wherein he will have more scope in engineering work. Apply to File No. 2936-W.

GRADUATE ENGINEER, S.E.I.C., Man. '47. Presently engaged in plant layout and field supervision. Experienced in mechanical and electrical construction and maintenance. Responsible position desired in business and production engineering in progressive firm. Apply to File No. 2975-W.

CIVIL ENGINEER, M.E.I.C., B.A.Sc., P.Eng., (Ont.), age 44, single. Past experience includes administrative executive and sales engineering in metal products, building materials and subcontract work in construction industry. Also held responsible position in personnel administration. Desires permanent position requiring initiative with good future prospects. Apply to File No. 2983-W.

SALES ENGINEER, Jr.E.I.C., B.Sc., graduate in Electrical Engineering, Queen's, married. 2½ years in sales department of electrical manufacturer, anxious to move to probably a smaller company in Ontario or Montreal. Product need not be of an electrical nature, but that type preferred. Apply to File No. 3030-W.

ENGINEERING EXECUTIVE, A.I.E.E., A.F.R.Ae.S., with outstanding record in England seeks position of scope and responsibility in Canada. First class academic qualifications and exceptional experience at high level in aircraft and precision mechanical engineering fields, comprising design and development, works management, manufacturing methods, production control, administration and sales. Apply to File No. 3033-W.

MECHANICAL ENGINEER, A.M.Inst.C.E., age 38. Manager in charge of small works in England designing, building and servicing special agricultural machinery and tractors (crop-spraying), keen to emigrate to suitable administrative position. Well educated, heavy engineering (steam) experience, special ability for craftsman training and selection. Apply to File No. 3039-W.

GRADUATE CIVIL ENGINEER, Jr.E.I.C., Alberta '43, veteran, with experience in construction, purchasing, sales desires position of an engineering nature with responsible firm or with consulting engineer. Alberta or B.C. preferred but would accept elsewhere. Available on reasonable notice to present employer. Apply to File No. 3040-W.

CHEMICAL ENGINEER, Jr.E.I.C., B.E. (Chem.), Sask. '44, former P.Eng (Ont.) and M.C.I.C., married, veteran, with experience in process development, desires position in that field. Engaged in post-graduate study at Mass. Inst. of Technology, leading to degree of S.M. (Chemical Engineering Practise). Available February, 1949. Apply to File No. 3041-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng. (Quebec). 15 years of shop practice in maintenance and locomotive repair; 5 years machinery design, including welded vessels, process piping and pulp mill layout. Seeking responsible position, preferably in Montreal area. Available on short notice. Apply to File No. 3045-W.

SENIOR METALLURGIST, M.E.I.C., graduate, age 36. Fifteen years diversified experience in heavy steel mills, production, research and quality control. Practical experience of departmental management. Desires supervisory position of responsibility, preferably with progressive firm; married, two children. Apply to File No. 3046-W.

PART TIME WORK: Graduate Chemical Engineer, B.Sc. (Chem. Eng.), Jr.E.I.C., M.C.I.C. Now doing graduate work in Montreal. In Royal Canadian Engineers since graduation with experience in legal investigations, stores and works. Desirous of obtaining part time work conducting Technical literary research or other technical work within limitations. Suggest could be useful to small out of town firm desiring advantages of Montreal libraries and Montreal representative. Apply to File No. 3049-W.

GRADUATE ELECTRICAL ENGINEER, M.E.I.C., P.Eng., Alberta, B.Sc. (Honors), Alberta, M.A.Sc., at Toronto. Married, age 25, 3 years experience in electric power utilization, some generation and distribution; 2 years as officer in electrical branch, R.C.N.V.R. supervision of electrical installations by civilian electricians. Particularly interested in permanent position in Western Canada. Available on one month notice. Apply to File No. 3050-W.

SALES ENGINEER, M.E.I.C., P.Eng., N.S. and P.Q., B.Sc. Married, age 44, 7 years railway construction, 8 years sales manager large gas and electric utility, 5 years R.C.N.V.R., 5 years naval architect. Desirous of moving to South America, wishes position as sales representative preferably with manufacturer of marine equipment. Apply to File No. 3057-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng.Q., G.I.Mech. E.; A.M.I.Loco. E. (Great Britain). Aged 30. Married. 6 years Locomotive design and Construction, machine shop production and assembly. 5½ years Engineer officer, Royal Air Force—rank Squadron Leader, Chief Technical Officer. Employed 18 month in Province of Quebec. Desires change to position with more responsibility and opportunity for advancement. Preferably Southern Ontario or Western Canada. Apply to File No. 3059-W.

Building Research

Engineers and Architects interested in the application of research to building and associated engineering problems are invited to enquire about employment possibilities with the newly formed Division of Building Research of the National Research Council. An enquiring mind is an essential; experience in building work in Canada is really necessary; bilingualism would be helpful. Salaries depend upon training and experience; opportunities for useful work are unlimited. Enquiries should be addressed to the Director, Division of Building Research, National Research Council, Ottawa.

FOREIGN TRADE REPRESENTATIVE FOR MIDDLE EAST AND FAR EAST FOR ONE OF CANADA'S LARGEST CHEMICAL MANUFACTURERS

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Should have extensive experience and knowledge in establishing important contacts in overseas markets.

Canadian citizen, preferably 38 years or over, knowledge of French. Should be prepared to live abroad.

Must show ability to have earned at least $8,000. in similar position.

Outstanding opportunity for right man. Apply to File No. 1046-V.

Business & Industrial Briefs

A Digest of Information received by The Editor

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.

A specification sheet describing a new gasoline-engine-powered chain saw is now available from McCulloch Motors Corp., 6101 W. Century Blvd., Los Angeles 45. Power of the saw is 5-hp. and blade lengths of 20-, 36-, 48- and 60-inches can be furnished. Applications of the saw are extensive in lumbering, construction, railroad, mining, farming and in other industries where wood cutting and land clearing is important. Ask for chain saw specification sheet.

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Concrete and Building Specialties Ltd., 42 Leyton Avenue, Toronto, offers descriptive pamphlets on "Sure Grip Form Ties and Spreaders" and "Williams Form Clamps".

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Leeds and Northrup Company, 4911 Stenton Avenue, Philadelphia 44, Pa., offers a 24-page catalogue No. ND4B (which replaces catalogue N-OOB) dealing with the L & N line of air-actuated controls.

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The Aluminum Co. of Canada Limited, Sun Life Building, Montreal, Que., has released an interesting publication entitled "Machining Aluminum". The publication contains technical data on the machinability of various aluminium alloys, the coolants and lubricants used, and the tools and techniques required for turning, shaping, milling, drilling and other machining operations. It carries excellent illustrations. Much of the technical material is summarized in tabular form for easy reference.

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The Farval Corporation, 3249 East Eightieth St., Cleveland 4, Ohio, offers the 1948 edition of a two-colour bulletin, "Studies in Centralized Lubrication".

Copies are available from the Company or through the Canadian representatives, Peacock Brothers Limited, Ville La Salle, Montreal. Ask for Farval Bulletin No. 25.

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The ILG Electric Ventilating Company of Chicago, Ill., offers a new catalogue on ILG Self-Cooled Motor Propeller Fans. Three types of modern-styled propeller fans are featured in a range of sizes and capacities to handle the requirements of the majority of exhaust fan applications.

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The International Nickel Co. of Canada Limited, 25 King St., West, Toronto 1, Ontario, offers the following interesting and informative publications: "Salt as a Corrosion Problem", a publication which emphasizes the advantages of nickel alloys in salt applications; "Fuel Into Food", in which is described the use of Monel equipment for producing ammonium sulphate as a by-product of coking coal. The problem of preventing corrosion during the manufacture of ammonium sulphate is also dealt with in this publication. "Nisiloy for Gray Iron Castings" gives specifications and information on this new alloying element which can be added in the ladle to produce machinability in cast iron.

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The Canadian Ohio Brass Company Limited, Niagara Falls, Ont., offers a brochure on the "O-B Type-KG Permissible Distribution Box".

Acting as a portable "switch panel" for mechanized operations, the O-B Type-KG distribution box is built to handle the power requirements of two branch circuits. Mining men in particular are already familiar with the O-B three-circuit permissible box. The new KG is similar in design and construction. It is designed for 250 and 550 volt d.-c.

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A new bulletin, "Electronic Controls", containing a listing of standard instrument models manufactured by the Wheelco Instruments Company, 847 W. Harrison Street, Chicago, has recently been released.

Copies of this condensed catalogue illustrating and describing the Company's line of indicators, controllers, recorders and combustion safeguards will be sent in response to letters written on an official letterhead. Ask for Bulletin Z6500.

•

The Hamilton Bridge Co. Limited, Hamilton, Ont., are now manufacturing the Dempster Balester. This line of baling presses is very well known in the United States. A well illustrated and informative pamphlet is available. Ask for Dempster Balester, Brochure No. 7008.

•

A new six-page bulletin fully describing the latest in Ettco-Emrick Tapping and Threading Attachments for drill presses has been released by the Ettco Tool Co. of 594 Johnson Ave., Brooklyn, N.Y.

The bulletin lists seven sizes of attachments made by this Company. Ask for Bulletin No. 22.

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Bulletin A-550 issued by the Aget-Detroit Company, 329 Main at Washington, Ann Arbor, Mich., contains a description of a large capacity dust collection system for handling rubber, and wood dusts, chips, lint and similar large bulking dusts.

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South Bend Lathe Works, 425 East Madison Street, South Bend, Indiana has produced a new catalogue No. 400 which is devoted exclusively to the South Bend 14-inch precision drill presses, drill press attachments and accessories.

Bench and floor models of these new drill presses are shown in the catalogue, which also contains illustrations and descriptions of motors, controls, extra spindles and other drill press accessories. Brief specifications and U.S. prices are listed.

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Bepco Canada Limited, 4018 St. Catherine St. W., Montreal 6, Que., will be pleased to place the name of any "Journal" reader on the mailing list for the "Bepco Journal". This publication is used to describe operation and construction of the equipment, distributed by the Company in Canada. The October 1948 issue is devoted to a description of the "Harland" Drive recently installed by the Powell River Co.

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The Lincoln Electric Co. of Canada Ltd., 179 Wicksteed Ave., Leaside, Ont., offers the use of a sound-colour motion picture entitled "Designing Machinery for Arc Welding".

The film is in full colour. The running time is fifteen minutes and the print is on 16 mm. sound-color film. Transportation costs must be paid by the user.

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The Bristol Co. of Canada Ltd., 71 Duchess Street, Toronto 2, has available copies of their catalogue No. 854, which covers Bristol's Hex Socket Screws. The publication is 11″ by 8½″. It has 36 pages, and is printed in two colours.

Appointments and Transfers

W. F. Sinclair has been appointed to the newly-created post of general supervisor of Diesel equipment, Canadian Pacific Railway. Mr. Sinclair will be located in Montreal.

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L. T. MacNaughton of Imperial Oil Limited is on a special assignment with International Petroleum Company Ltd. He is co-ordinating work on engineering problems. Mr. MacNaughton's former post at ICO Refinery has been filled by Charles Scrymgeour, M.E.I.C., formerly superintendent of the Company's Montreal refinery. E. Keith Lewis, M.E.I.C., is the new superintendent of the Montreal refinery.

•

L. L. W. Ashcroft has been appointed manager of a new C.G.E. office and warehouse in Sudbury. The new building contains 9,000 square feet of floor space and is equipped with the most modern lighting and air conditioning devices. The warehouse has been established to serve North Bay, Sault Ste. Marie and Manitoulin areas.

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P. S. Young has been appointed United Kingdom trade commissioner for British Columbia and Alberta. He will make his headquarters at Vancouver. Since February 1947, Mr. Young has been stationed in the United Kingdom Trade Commissioner's office in Montreal.

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W. A. Irvine has been appointed manager of the new Montreal Works of the Canadian General Electric Co.

Geo. W. Ferrier has been appointed Montreal manager of the Bristol Company of Canada Limited. Larry E. Henne, Jr.E.I.C., formerly of Northern Electric Co. Ltd., will serve on Mr. Ferrier's staff.

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George Wellesly Lawrence has been elected president of the Canadian Electrical Manufacturers Association. Mr. Lawrence is president and general manager of Sangamo Co. Ltd., Toronto, and chairman of the special advisory committee on power conservation for Toronto.

•

G. A. Lowles has joined the Canadian sales engineering staff of the International Nickel Company of Canada Ltd., C. E. Macdonald, manager of Canadian sales announces. A graduate in chemical engineering from McGill University, with a background of 11 years in industrial sales and production, Mr. Lowles will handle sales development in chemical and allied industries.

•

C. M. Lovsted and Co. (Canada) Ltd., 1016 Mainland Street, Vancouver, B.C., has been appointed British Columbia representative of B. J. Coghlin Co. Ltd., Montreal, spring manufacturers. This firm is a wholesale dealer of railway and logging equipment and will be a sales agent for the entire range of Coghlin products.

New Equipment and Development

The C. A. Dunham Co. Ltd., Toronto, Ont., is introducing the "Dunham" Baseboard Convector Radiator unit, suitable for either hot water or steam.

The unit has been designed to replace the ordinary baseboard trim. It has a sheet steel back which provides a frictionless sweep for the air which is heated by a single copper tube with steel fins. The unit is fitted with a steel front panel which serves as a radiant heating member and warms the floor some distance from the wall. The manufacturer claims that this design accomplishes many other desirable features such as "low outlet velocity of heated air which minimizes wall discolouration"—"small difference in air temperatures between floor and ceiling".

Technical data is available on application.

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Due to the power shortage in Ontario, Ferranti Electric Ltd., Mount Dennis, Toronto 15, has changed the work week to commence on Tuesdays and end on Saturdays. The plant is closed on Sundays and Mondays. Formerly the working week was Monday through Friday. A skeleton staff will be maintained in the office and sales department on Monday to handle emergencies.

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Albi-R,—which is claimed to be the only fire-retardant coating listed and approved by Underwriters Laboratories—is now being distributed in Canada by Building Products Ltd. Developed in the United States during the war, Albi-R was widely used by the armed forces. It is now employed extensively by many Government departments and by a very wide list of U.S. industries and institutions as well as in the home field.

The manufacturer claims that Albi-R differs considerably from ordinary high-pigment types of non-combustible paints. It is stated that not only is it non-inflammable but its most important feature is that when it is exposed to intense heat or flame a tough thick cellular mat is formed which effectively insulates the protected surface and checks flame spread. In a recent test, two sheets of 24-gauge steel were exposed to an acetylene flame of approximately 1800° F. One sheet was coated with Albi-R and the other was uncoated. "After thirty minutes' exposure the uncoated steel recorded a temperature of over 1300° F. on a thermo-couple placed at the back. The metal coated with Albi-R recorded a temperature of only 383° F."

This product is an interior coating which gives a hard white flat finish. It may be tinted to any colour by adding pigments before applying. It may be overpainted with ordinary oil paints which do not affect its fire-retardant properties.

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Twin Disc Clutch Co. announces a new hydraulic power transmission unit the Hydro-Sheave Drive.

It is claimed that the Hydro-Sheave Drive is a hydraulic-conversion device for small electric motors and internal combustion engines. The basis of the new unit is a Twin Disc small hydraulic coupling, "long successful in smothering shocks and smoothing flow of power from motors or engines in the ¾ to 25 hp. range." Complete details may be obtained from the Hydraulic Division of the company which is located at Rockford Illinois.

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Porter Cable Machine Co., 1714 N. Salina Street, Syracuse 8, N.Y., has announced a multi-purpose tool, the D-6 which has been designed for tough jobs in industry. It is claimed that it will grind, polish, drill and cut by a simple change of attachments. It will drill holes in metal up to ¼ in. and wood up to ½ in. The drill chuck has been designed for use with numerous standard attachments. For complete details apply to the manufacturer.

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Canadian General Electric Co. Ltd., 212 King St. W., Toronto 1, has available "an improved, compact, precision instrument for controlling photographic exposures which require time intervals of 3 seconds to 60 minutes".

•

Production of a new three ton capacity crane, Model H3, has just been announced by the Hydrocrane Division of Bucyrus-Erie Company, 7923 West Greenfield Avenue, Milwaukee 14, Wisconsin. The new unit is designed for the economical handling of small jobs on which the use of a conventional crane-excavator would be uneconomical.

•

The Northern Electric Company Ltd., has now occupied the new Company building on Guy and Dorchester Streets, Montreal. The building is 220 feet by 240 feet, two storeys high and has provision for an additional storey. It will be used exclusively for warehousing purposes.

•

Cooper-Bessemer Corporation, Mount Vernon, Ohio, has announced the adaption of Cooper-Bessemer's Turboflow development to the four-cycle gas engine, with improvements, it is claimed, "that produce 14 per cent more power while cutting fuel cost by at least 20 per cent."

The development is described by the Company's engineers, to be one of the most significant in the gas engine field in 20 years. First announcement of this development was made by Cooper-Bessemer a year ago in connection with the two-cycle natural gas engine. This is the first time that the principle has been successfully applied to the widely used four cycle engine. "The newest Turboflow is expected to be on the Cooper-Bessemer production line by July 1, of 1949," said Gordon Lefebvre, president and general manager of the Company.

•

The Canadian Liquid Air Company has stated that exceptionally enthusiastic field reports are being received on their new C-48 electrode. This mild steel electrode, which is manufactured in the Company's Montreal plant, incorporates a number of major improvements that have met with the approval of the practical welders.

The manufacturer claims the following advantages for the new C-48. "Smoother welds, particularly in vertical downhand position. Great reduction in spatter. Residual slag removes itself. The new flux coating is extremely tenacious and gives greater penetration."

Independent Pneumatic Tool Co., Aurora, Ill., announces a new Wagon Drill, Model BW-1, equipped with the new Thor Model 15, 1¼" Drifter Rock Drill.

A feature of the new drill is a single reversible pneumatic motor that feeds and raises the drill, thus eliminating the necessity of a hoist. Complete details are available from the manufacturer.

The Canadian Standards Association has announced that the following organizations have taken sustaining memberships: Coleman Lamp & Stove Co., Underwood, The Bank of Toronto, Remington Rand Ltd. Gypsum Lime and Alabastine, Hinde & Dauch Paper Co., Rowe Packaging, Wilson & Cousins, Hamilton Gear & Machine Co. Ltd., Babcock-Wilcox & Goldie-McCulloch Ltd., Turnbull Elevator, Lincoln Electric, National Cash Register, Thor-Canadian Company and National Iron Corporation.

Membership in the Association is open to any company, commercial association, public utility or individual wishing to benefit from the advantages of standardization and uniformity of processes, procedure and engineering.

The Ogilvie Press, 691 Fulton Street, Brooklyn 17, N.Y., has available samples of "Bondtex", a special paper made for tracing. A feature of this paper is that it is ruled in one quarter inch squares which, although clearly discernible to the initial user, will not show on the print made from the sketch. Limited quantities of this paper are available for trial purposes.

The Consolidated Mining and Smelting Company of Canada, in a release issued on October 16th, stated that the Campbell shear had been intersected in the east drive on the 2300 foot level of their Con Mine at Yellowknife, N.W.T.

A joint agreement between Frederic Flader Inc., North Tonawanda, N.Y., and Clark Bros. Co. Inc., Olean, N.Y., has been effected whereby Clark Bros Co. Inc., will manufacture and distribute gas turbines and axial compressors of the Flader design for general industrial use. The agreement contemplates that Flader will be responsible for research, engineering and design and that Clark Bros. Co. Inc., will manufacture and market these products. It is claimed that the Flader axial flow compressor is based on a new principle of design and Clark expects to develop a wide market for application in the mining, petroleum and chemical fields which the company presently serves.

Robertson-Irwin Limited is the registered name of a company which has been formed as the result of the amalgamation of H. H. Robertson Co. Ltd. and Thomas Irwin & Son Ltd. Associated for many years, the two companies will continue under the new name to serve the construction industry and the industrial steel products field. T. A. Irwin, is president and general manager of the company. A. S. Hallamore is comptroller. W. G. Enouy, M.E.I.C., is sales manager of the Robertson division and J. H. Thomson, sales manager of the Irwin division. Head office of the new Company is located in Hamilton and district sales offices will be maintained in Toronto, Montreal and Hamilton.

The nutritional aspects of glyceridic and edible oils, and the large part they are playing in the national economy, was examined at the fall convention of the American Oil Chemists' Society which was held in New York City, November 15th to 18th.

Johnson and Phillips Ltd., Charlton, London, England, has announced the manufacture of an aluminum sheathed electrical transmission cable. Although it has not yet been possible to extrude aluminum continuously, directly around the cable, as is done with lead, this handicap has been overcome by threading the insulated cable into long lengths of extruded sheathing and joining the sheathing to provide "endless" cable in standard lengths. The aluminum, it is claimed, "provides a weight saving of 26-60% in unarmoured cable and 25-30% in steel armoured cable."

The Hamilton Bridge Co. Ltd., Hamilton, Ont., has just completed a new addition to their machine shop. The extension is 100' x 120' and additional equipment is being installed to permit a wider range of machine shop work. In addition to the manufacture of some new lines of machinery the new plant will enable the company to undertake an increased volume of contract machine work.

The Special Products Section of the Canadian General Electric Co. Ltd. has announced the introduction of a new recording vibrometer. It measures and records frequency, displacement and wave shape of mechanical vibration.

This new equipment is built to operate either when mounted on a fixed base or held in the hands. It weighs 7 lbs. and is less than 8 inches in length. It records both steady-state and transient vibrations. It was developed for application in testing all types of reciprocating and rotating machinery within a vibration frequency range of 10 to 120 cycles per second.

On September 14, the Canadian Westinghouse Company opened a branch in Calgary, Alberta. The opening ceremonies were performed in the presence of invited guests of the Company and representatives of the electrical industry. They were welcomed by H. J. McEwen, M.E.I.C., Alberta district manager; S. W. Brown, service department manager from the head office of the Company; and L. Schofield, the district engineer.

The building will house sales departments, engineering and service offices. It is fully equipped for repair work and the main warehouse covers 10,000 square feet of floor space. It is located at 940 Eighth Avenue West. Construction is of brick and steel with aluminum trim.

Three new voltage stabilizer units have been added to Canadian General Electric's standard automatic voltage stabilizer line. The new units are 115-volt, 60-cycle designs in 15-, 25- and 50- va ratings. Low case height and small size make them particularly suitable for shallow depth installations. Detailed information is contained in bulletin CEA-3634 which may be obtained on application to the Specialty Transformer Section of Canadian General Electric Co., 212 King Street West, Toronto.

In a summary of the activities of Canadian Car and Foundry Company, published in the Company's house magazine, the Canadian Car Journal, it is stated that the Company's plants are working to capacity.

Despite the steel shortages, it is stated, good progress is being made on the Canadian National and Canadian Pacific car orders and that, contingent upon the material situation, work can soon commence for railway equipment for the South African Railways. It is estimated that this order and those of the Canadian railways will keep the plants of the company occupied well into 1950.

The Company is shifting the manufacture of street cars from the Montreal area to the Fort William plant. This change has been made to facilitate the production of railway cars in Montreal.

The cumulative shipments of manufactured goods by the Company at the end of the third quarter of 1948 were over twice as large as shipments for the corresponding period in 1947.

A new small sized unit for high production earthmoving on small projects has been added to the line of earthmoving equipment manufactured by R. G. LeTourneau, Inc., Peoria, Illinois. This new unit is known as the "Model D Roadster Tournapull".

"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

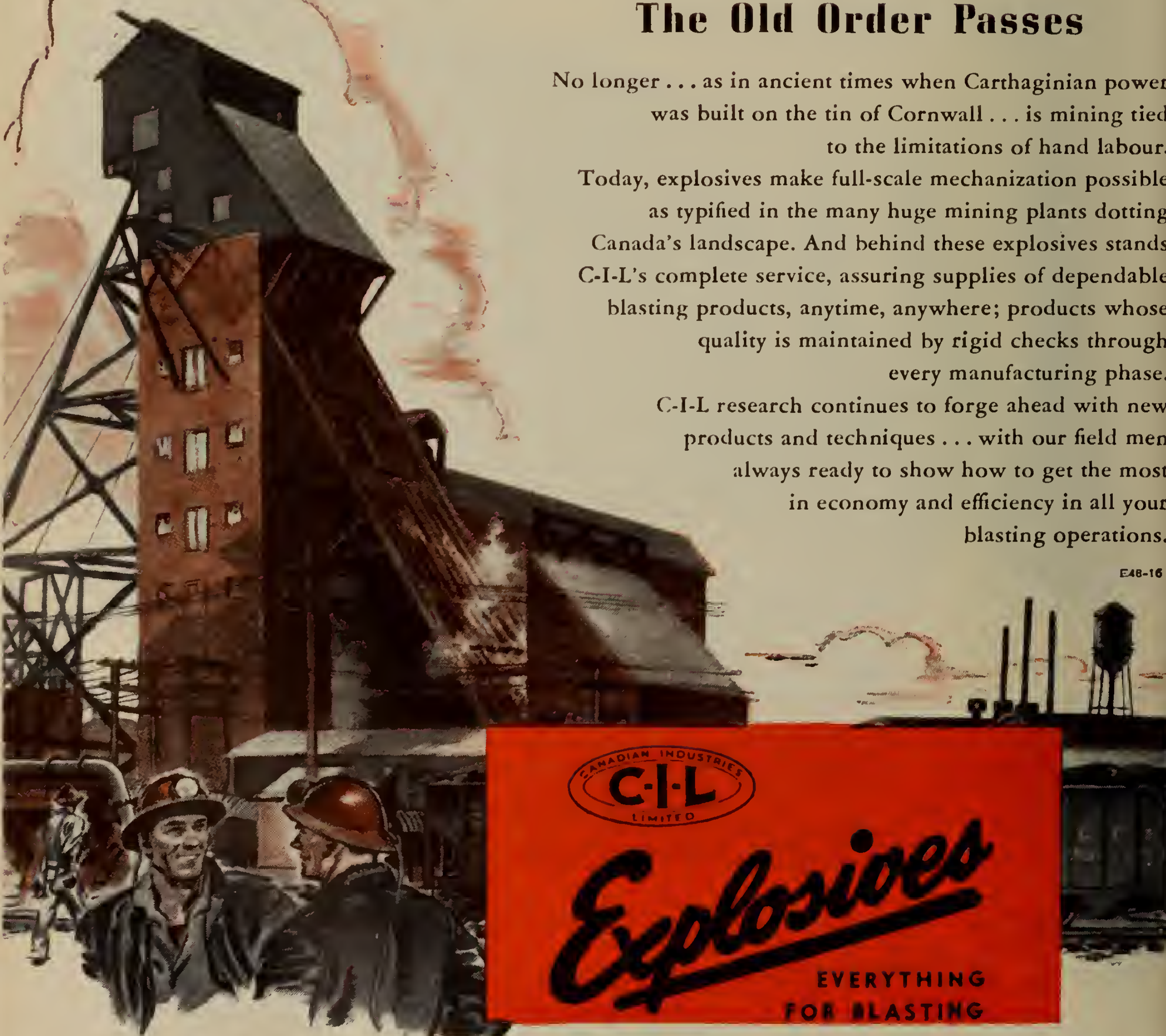
TIN
for the
LEGIONS
of
HANNIBAL

The Old Order Passes

No longer . . . as in ancient times when Carthaginian power was built on the tin of Cornwall . . . is mining tied to the limitations of hand labour. Today, explosives make full-scale mechanization possible as typified in the many huge mining plants dotting Canada's landscape. And behind these explosives stands C-I-L's complete service, assuring supplies of dependable blasting products, anytime, anywhere; products whose quality is maintained by rigid checks through every manufacturing phase.

C-I-L research continues to forge ahead with new products and techniques . . . with our field men always ready to show how to get the most in economy and efficiency in all your blasting operations.

E48-16



New "Seven Up" Building at 191 Fleet Street, Mount Royal, P.Q.

Architects: LUKE, LITTLE & MACE

General Contractors: ANGLIN-NORCROSS (QUEBEC) LIMITED

Windows by *Fenestra*

More daylight, better ventilation, is admitted into this new and entirely modern building because Fenestra Steel Sash was specified and installed throughout.

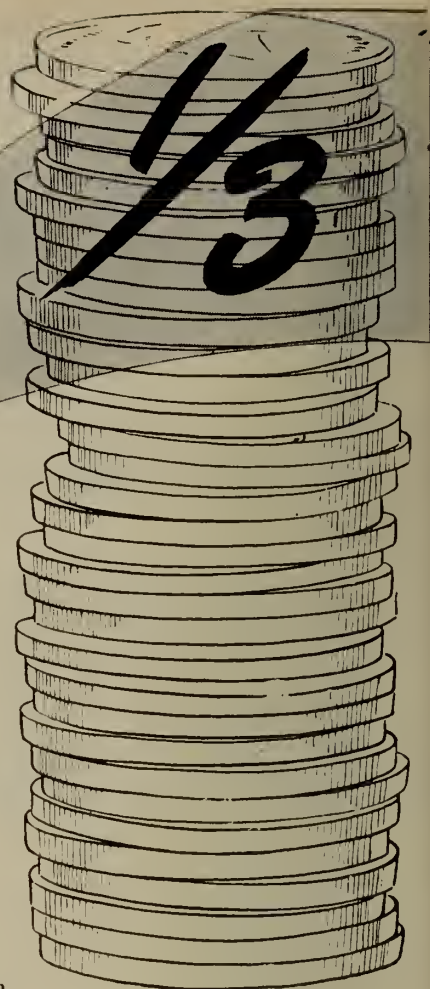
These windows are low cost because of product standardization—low in installation costs because sizes are co-ordinated with dimensions of other wall materials—low in maintenance costs because they have to meet the unvarying high-quality standards of all Fenestra products. Let us help you determine the best types and sizes for your individual needs.

CANADIAN METAL WINDOW
& STEEL PRODUCTS LIMITED

160 River St.,
TORONTO

4862 Wilson Ave.,
MONTREAL

Heat Comfort with Economy!



With Dunham Differential Heating there is no premium paid for achieving the ultimate in heat comfort. Evidence of definite savings in fuel dollars, amounting to more than 30% after modernization of old installations, is on record and will be furnished upon request.

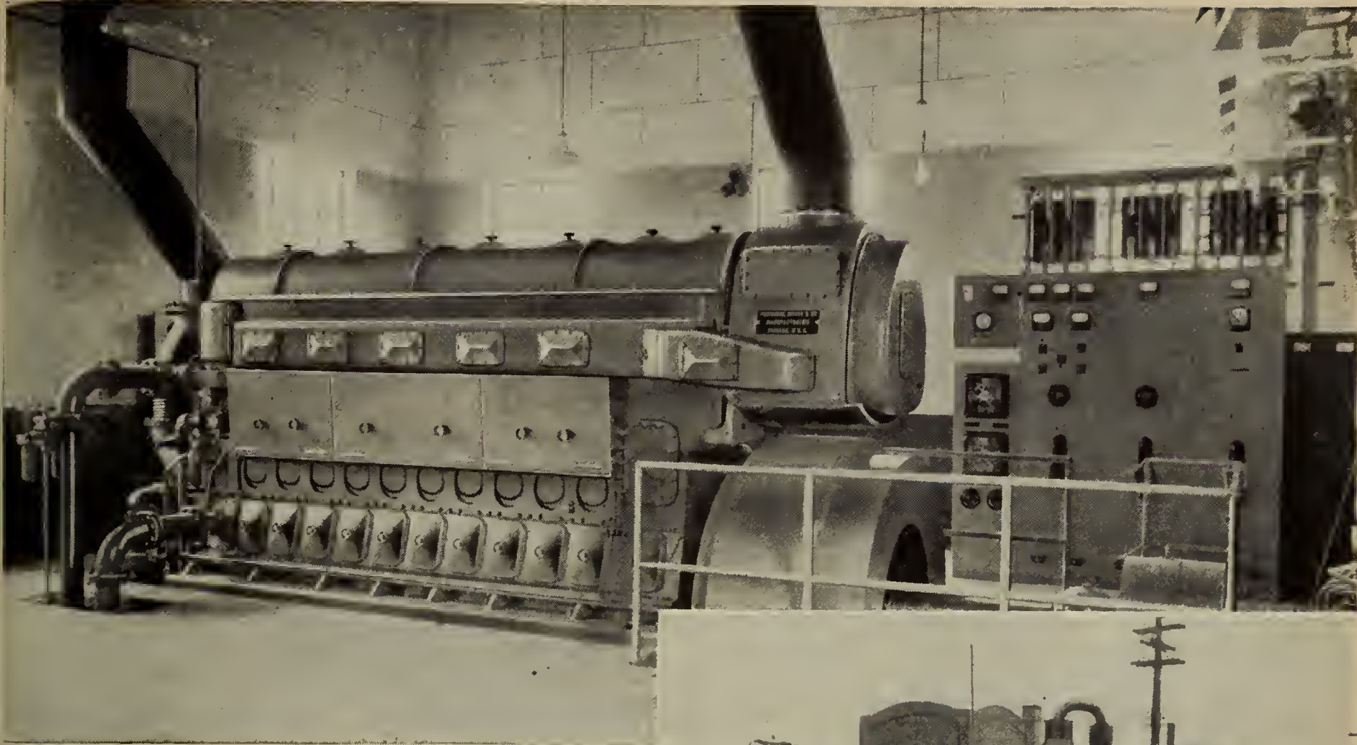
Once installed, this system operates with a minimum of attention and maintenance.

Dunham Differential Heating provides maximum heat comfort with the utmost economy. The supply of steam is continuous and in the proper amounts to meet changing demands. Thus, the discomfort and waste caused by "on and off", cycling or pulsating heat supply are avoided.

Dunham engineers will collaborate on installation of Dunham Differential Heating in new buildings and make recommendations for modernization of present systems. C. A. Dunham Co. Ltd., 1523 Davenport Rd., Toronto 4, Ontario. Sales Offices in Halifax, Quebec City, Montreal, Sherbrooke, Ottawa, Toronto, Hamilton, Winnipeg, Calgary and Vancouver.

The DUNHAM HEATING SERVICE

THE PRIME FUNCTION OF HEAT IN A BUILDING IS TO PROVIDE COMFORT



FAIRBANKS-MORSE DIESELS power TOWN OF CAMPBELLTON

Faced with a serious power shortage, the Town of Campbellton, N.B., turned to Fairbanks-Morse for a permanent solution to their power problem. F-M Engineers surveyed the situation and installed the world-famous "Model 38" Opposed-Piston Diesel with a rated horsepower of 1600 and a direct connected alternator with a rated capacity of 1136 kilowatts.*

"Model 38" — in addition to its importance in the field of municipal power and pumping service — is one of the most popular engines used in modern streamlined Diesel locomotives.

In the Fairbanks-Morse Opposed-Piston Diesel, each cylinder contains not just one — but two pistons. The two pistons are driven apart by a central explosion. No power is dissipated against cylinder heads. This basically different design is the primary reason for the light weight per horsepower.

**This unit went into operation in May 1948. Another unit a 360 H.P. Type "V" was installed in 1946 and is still in service.*

The CANADIAN Fairbanks-Morse COMPANY Limited

HALIFAX SAINT JOHN QUEBEC MONTREAL OTTAWA TORONTO WINDSOR
FORT WILLIAM WINNIPEG REGINA SASKATOON EDMONTON CALGARY VANCOUVER VICTORIA

Professional Cards

Professional Cards
(Continued)

Photogenic... that's us!

ARTISTS ADMIRE the camer*ability* of the Eagle "Chemi-Sealed" TURQUOISE pencil. Its deep black marks photograph to perfection . . . and retain every subtlety of the original drawing through any process of reproduction.

DRAFTSMEN DELIGHT in the extreme opacity of TURQUOISE lines. They guarantee sharp reproduction of your tracing by blue print, black print, or other method of duplication.

Here's the reason:

The particles of Electronic graphite in TURQUOISE leads are refined to 1/25,000th of an inch . . . formed under enormous pressure . . . and vitrified at white heat. The result is a cellular structure so extremely fine and uniform that the point deposits *more graphite* more evenly on the paper.

EAGLE PENCIL COMPANY
OF CANADA LIMITED
217 Bay Street • Toronto 1

*Trade Mark Registered

FOR PERFECT REPRODUCTIONS

try Eagle TURQUOISE. Write us for a free sample, naming this magazine, your dealer and the grade you desire. Ernest Eagle will be glad to send it, with our compliments.

10¢ each. Less in quantities

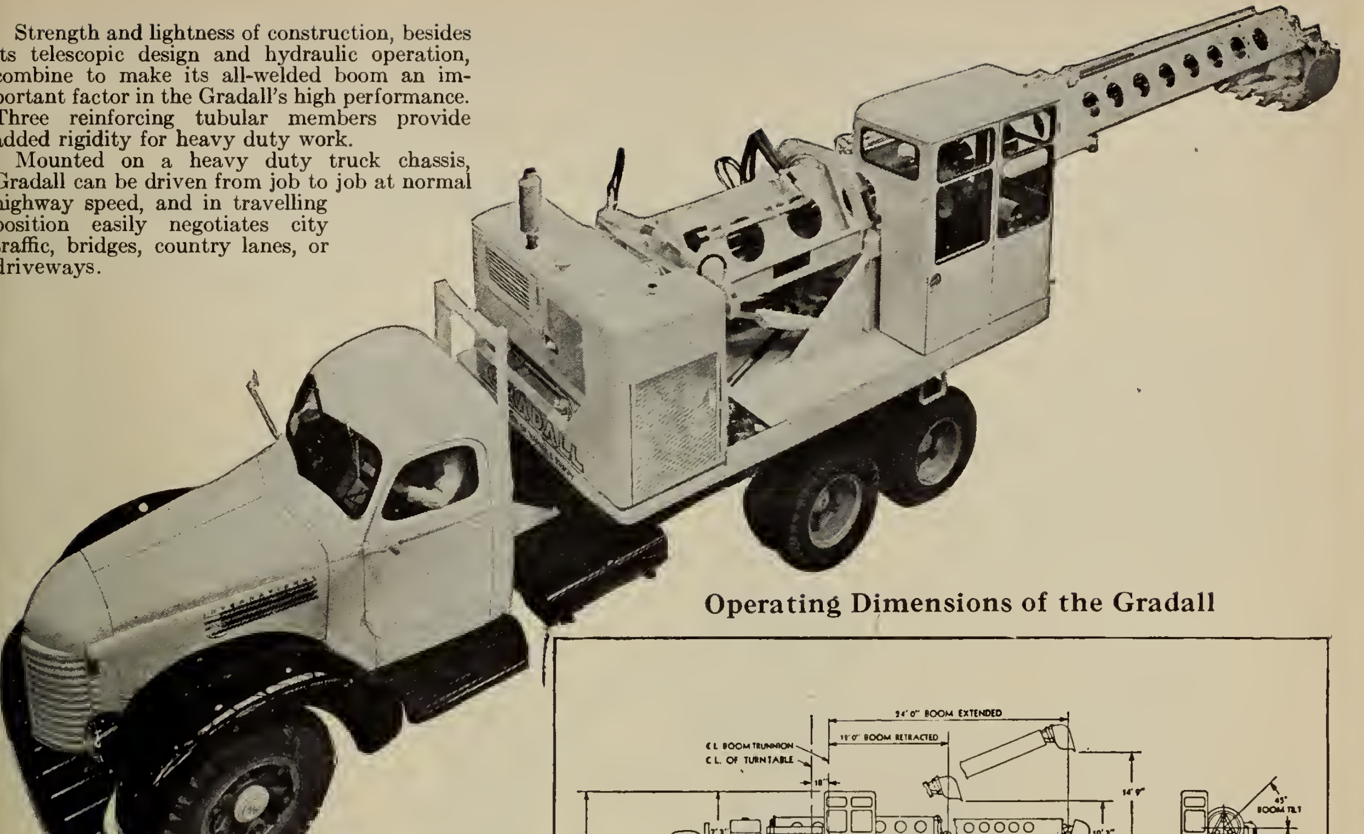
*EAGLE *"CHEMI-SEALED"
(SUPER BONDED)

*TURQUOISE

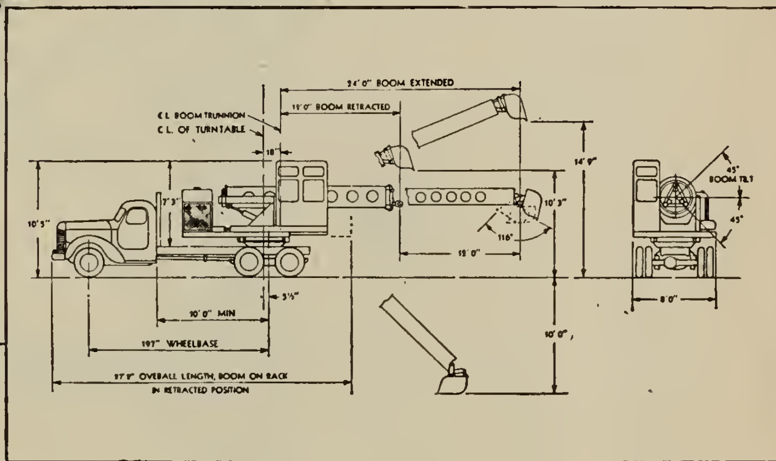
DRAWING PENCILS AND LEADS

Strength and lightness of construction, besides its telescopic design and hydraulic operation, combine to make its all-welded boom an important factor in the Gradall's high performance. Three reinforcing tubular members provide added rigidity for heavy duty work.

Mounted on a heavy duty truck chassis, Gradall can be driven from job to job at normal highway speed, and in travelling position easily negotiates city traffic, bridges, country lanes, or driveways.



Operating Dimensions of the Gradall



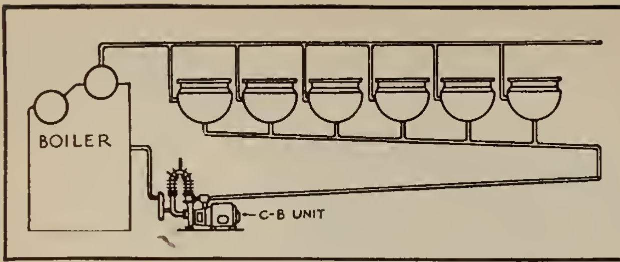
CANADIAN DISTRIBUTORS

W. L. BALLENTINE CO. LIMITED
Head Office: 380 Fleet Street, TORONTO 2B.
Branches: OTTAWA & LONDON

CHAS. CUSSON LIMITED
Head Office: 284 Ontario St. W., MONTREAL 18
Branches: QUEBEC CITY & VAL d'OR

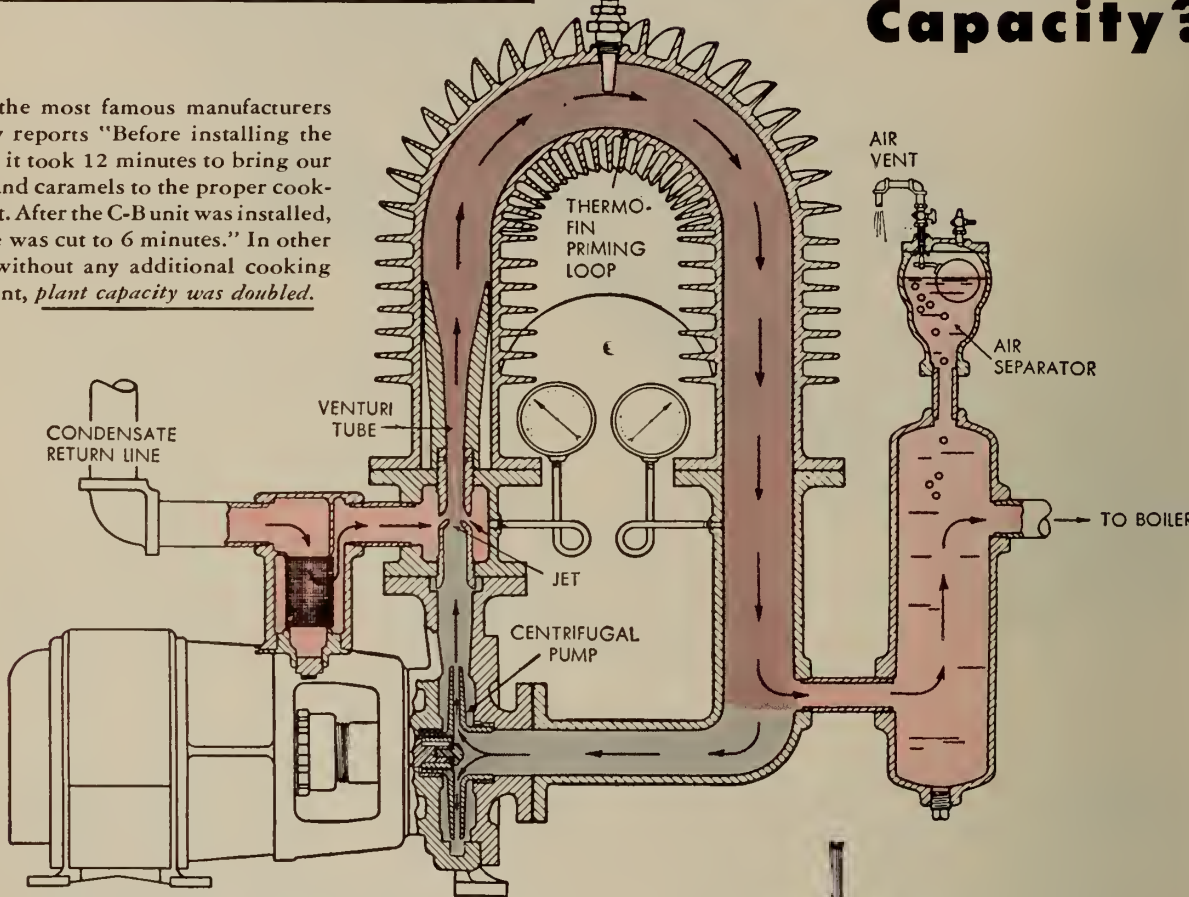
KANE-MARR LIMITED
Head Office: 701 Henry Avenue, WINNIPEG
Branch: KENORA, ONT.

ASK YOUR NEAREST DISTRIBUTOR FOR COMPLETE DETAILS



How Can This Simple Pump Double a Plant's Capacity?

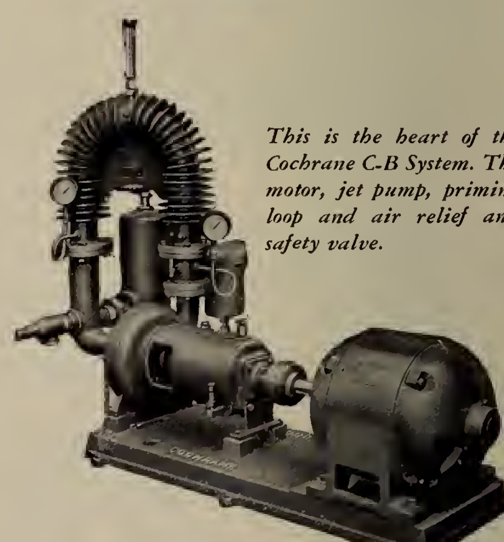
One of the most famous manufacturers of candy reports "Before installing the C-B unit it took 12 minutes to bring our creams and caramels to the proper cooking point. After the C-B unit was installed, this time was cut to 6 minutes." In other words, without any additional cooking equipment, *plant capacity was doubled.*



COCHRANE
C-B SYSTEM

The most remarkable results in the field of process cooking, drying, heating, etc. are being obtained by this new method of utilizing or saving the heat units contained in the condensate draining from the process equipment, and returning every Btu possible back to the boiler. The C-B System, a "closed" system based on the aspirator or injector principle, has been proven in over 400 installations in the past 7 years. Results are almost unbelievable. Write for Bulletin No. 3250.

This is the heart of the Cochrane C-B System. The motor, jet pump, priming loop and air relief and safety valve.



48-EM-2

CONDENSATE RETURNED TO BOILERS AT HIGH PRESSURE AND HIGH TEMPERATURE

SOLD IN CANADA BY

CANADIAN GENERAL ELECTRIC CO LTD

HEAD OFFICE — TORONTO

Index to Advertisers

The revenue derived from the sale of advertising space assists the Institute in publishing the *Journal* on a regular monthly basis. Listed below are the names of the Companies and Individuals whose advertisements appear in this issue.

NOVEMBER 1948

On your jobs...in your plant

WE WILL PROVE THIS-

Under today's conditions there are many production and maintenance operations on which Ingersoll-Rand Air Power equipment saves enough to pay for itself *in a matter of days.*

Air-Driven Impact Wrench on an automobile production job

PAID FOR ITSELF—IN 10 DAYS

Air-Buck Riveter on clutch & brake band fabricating job

PAID FOR ITSELF—IN 15 DAYS

Air-Powered Screwdriver on meter assembly job

SAVED $20,800 IN FIRST YEAR

At no cost to you, C-I-R field engineers will make a job study with actual Air Tool performance tests on your own operations in your own plant. You can use the equipment yourself, try it in any way you like, keep your own time and cost records. Then you will know how much it can save you and how soon it will pay for itself on your jobs. To have this job study made in your plant, call your C-I-R branch office now.

Similar studies in many plants have proven this important fact; Ingersoll-Rand Air Power equipment which, a few years ago, saved enough to pay for itself in 30 days, now pays for itself in only 18 days on the same operations under today's conditions.

These examples show the time in which typical I-R AIR POWER EQUIPMENT paid for itself in actual use on production and maintenance jobs because AIR TOOLS enable the workman to do more with less effort.

AIR POWER

Key to Lower Production Costs

Canadian Ingersoll-Rand Company Limited

HEAD OFFICE: MONTREAL, QUE......WORKS: SHERBROOKE, QUE.

BRANCH OFFICES: SYDNEY SHERBROOKE MONTREAL TORONTO KIRKLAND LAKE TIMMINS WINNIPEG CALGARY NELSON VANCOUVER

APC15

THE ENGINEERING JOURNAL

VOLUME 31
NUMBER 12

DECEMBER
1948

PUBLISHED
MONTHLY
BY

THE ENGINEERING INSTITUTE of CANADA

1936 First! Dominion Introduces Royal Cord Hose with Exclusive Winder Process!

1946 Dominion Presents Complete Line M.L.P. Hose!

1949 Now! Dominion Presents

P.L.P. HOSE

POLED LEAD PRESS

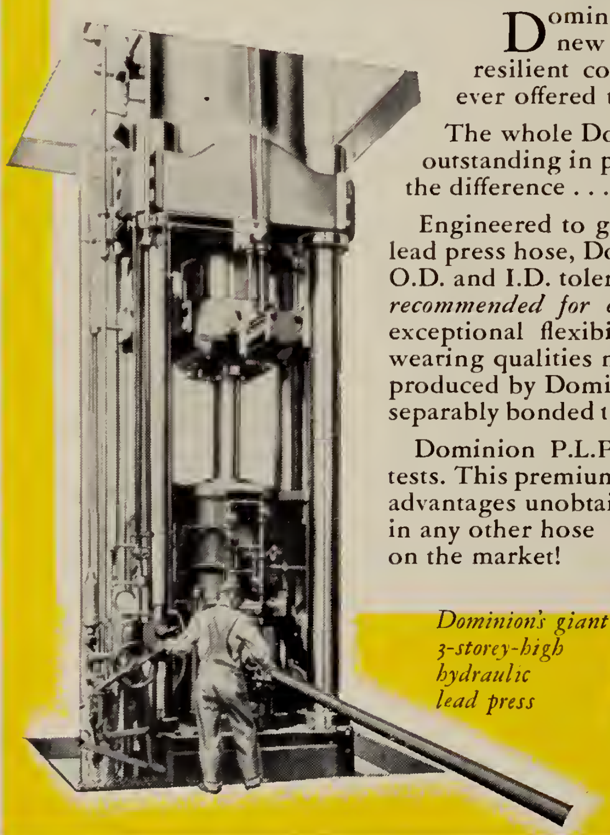
Canada's Most Spectacular Advance in Decades of Hose Making!

Dominion rings up another great "first" — the sensational, new Dominion P.L.P. Hose with distinctive brown, live, resilient cover! It's the greatest advance in hose development ever offered to Canadian industry!

The whole Dominion P.L.P. Hose family is radically new in design, outstanding in performance. You can *see* the difference . . . you can *feel* the difference . . . from streamlined, brown cover to super-smooth tube!

Engineered to give the most desirable features of both pole made and lead press hose, Dominion P.L.P. Hose is compact, rugged, built to close O.D. and I.D. tolerances — *and 30% to 50% lighter than conventional hose recommended for equivalent service!* Its exclusive new cover provides exceptional flexibility, superior resiliency and durability resulting in wearing qualities never before possible. Improved cushion-cord carcass, produced by Dominion's exclusive "winder" process, combined with inseparably bonded tube and cover, gives P.L.P. Hose unparalleled strength.

Dominion P.L.P. Hose has proved its superiority in exhaustive field tests. This premium product offers advantages unobtainable in any other hose on the market!



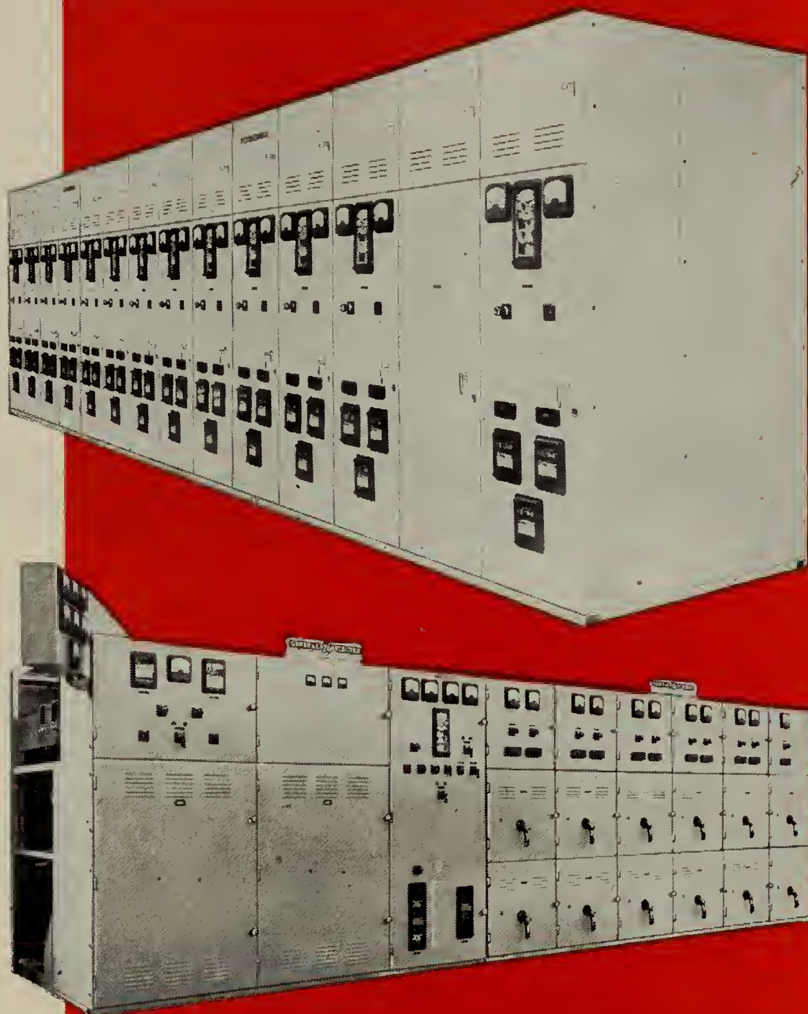
Dominion's giant 3-storey-high hydraulic lead press

Look for announcement of the first members of this great new P.L.P. Hose Family— Shortly

DOMINION RUBBER COMPANY LIMITED

ENGINEERED RUBBER PRODUCTS FOR EVERY INDUSTRY

ROLL ... SLIDE .. JACK ... and CONNECT



GENERAL ELECTRIC

METAL ENCLOSED SWITCHGEAR

Saves time — Saves money

● G-E Metal Enclosed Switchgear is factory-built and pre-assembled with matched components and balanced design to give you ease of installation. Simply roll it on the job, slide in place, jack it up and connect. Completely metal enclosed G-E Switchgear reduces hazard to personnel. Removable breakers give you easy maintenance and liberal insulation provides service continuity.

G-E Switchgear provides a self-contained, strategically located, complete control of your electrical requirements, thus reducing station costs.

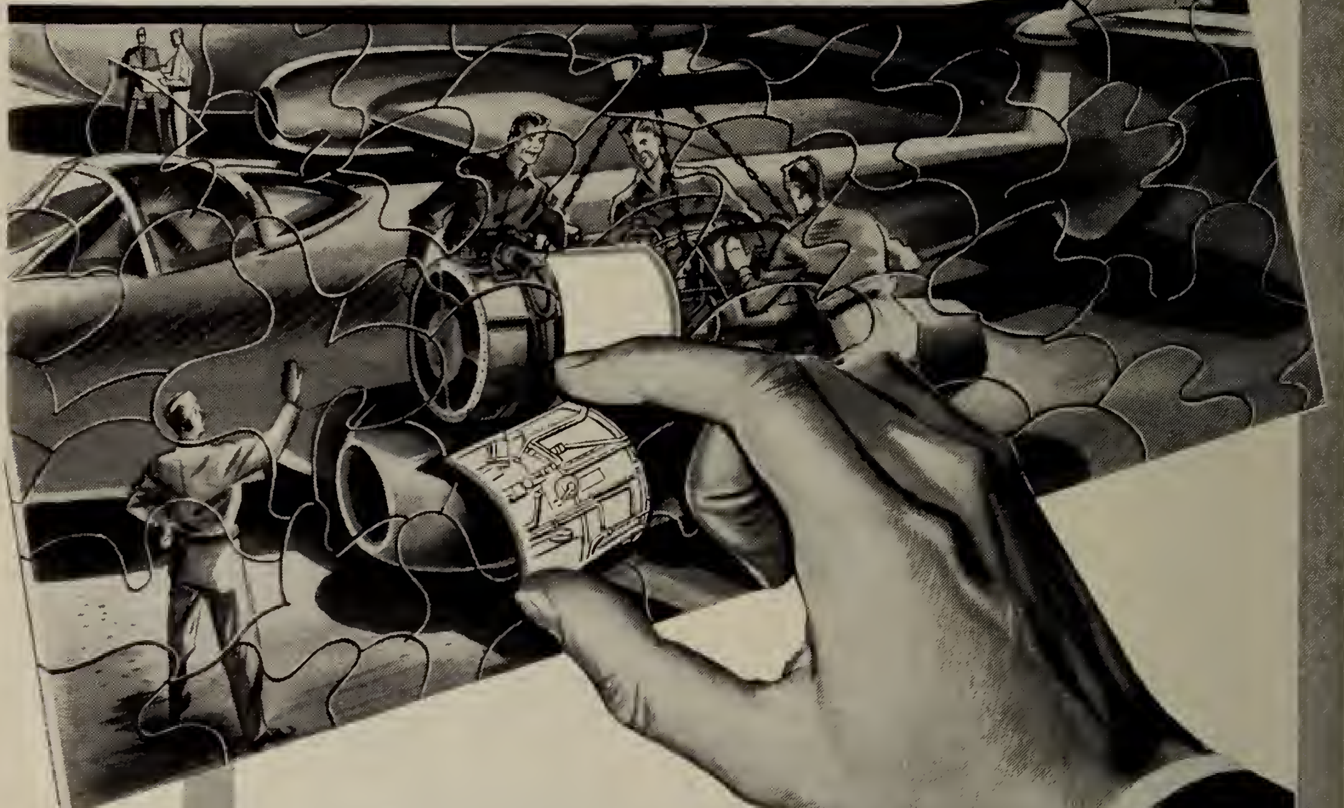
Write your nearest C-G-E office for information on how G-E Metal Enclosed Switchgear can simplify your plant power distribution.

48-CA-2

CANADIAN GENERAL ELECTRIC CO LTD

HEAD OFFICE: TORONTO

Put MAGNESIUM in *Your* production picture



The word *Magnesium* is appearing with ever-increasing frequency on the drafting tables and specification sheets of Canadian industry.

Every day, in hundreds of different ways Canadian industry is capitalizing on Magnesium—the world's lightest structural metal.

Magnesium has a prominent role in Canada's rapidly-developing aircraft industry. Magnesium's lightness speeds production and increases pay load. Magnesium's dimensional stability means consistent performance.

Put Magnesium into your production picture. The highest quality products can only be ensured by high purity Domal Magnesium. Increase the acceptability and saleability of your products by taking advantage of the high purity characteristics of this metal.

There is a place for Magnesium in your industry—our engineering staff is at your disposal—write Sales Dept.

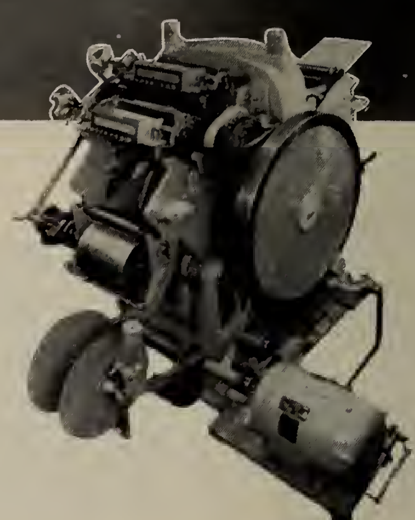
Dominion Magnesium Limited

67 YONGE STREET TORONTO CANADA

24-8

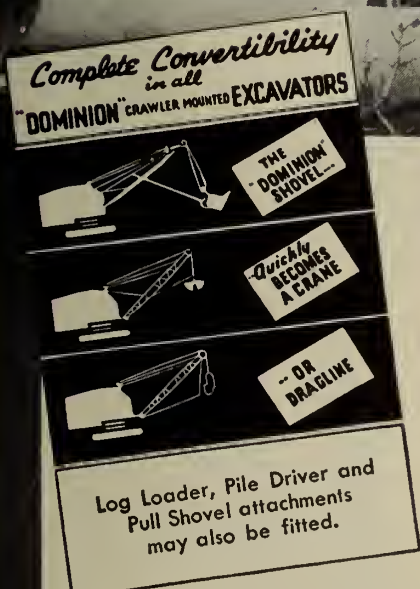
Nickel Alloy Steels are tough at low temperatures
THE BRITTLE BEHAVIOR OF many steels at low temperatures renders them liable to fracture when subjected to shock or impact. Steels alloyed with 3½ to 5% nickel remain tough at temperatures down to −150°F. Send for data sheets concerning "Properties of Nickel Alloy Steels at Low Temperatures."
Temperature - Degrees Centigrade
− 150
− 100
− 50
0
50% Nickel (Austenitic)
Nickel (Pearlitic)
0% Nickel
− 300
− 200
− 100
0
Room
Resistance to Impact
THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED
25 KING STREET WEST, TORONTO
EMBLEM OF INCO SERVICE
TRADE MARK


CANADIAN VICKERS



DOMINION Machines...

Dipper Capacities
3/8 to 2 cubic yards



Efficient...

Dependable...

Built in Canada...

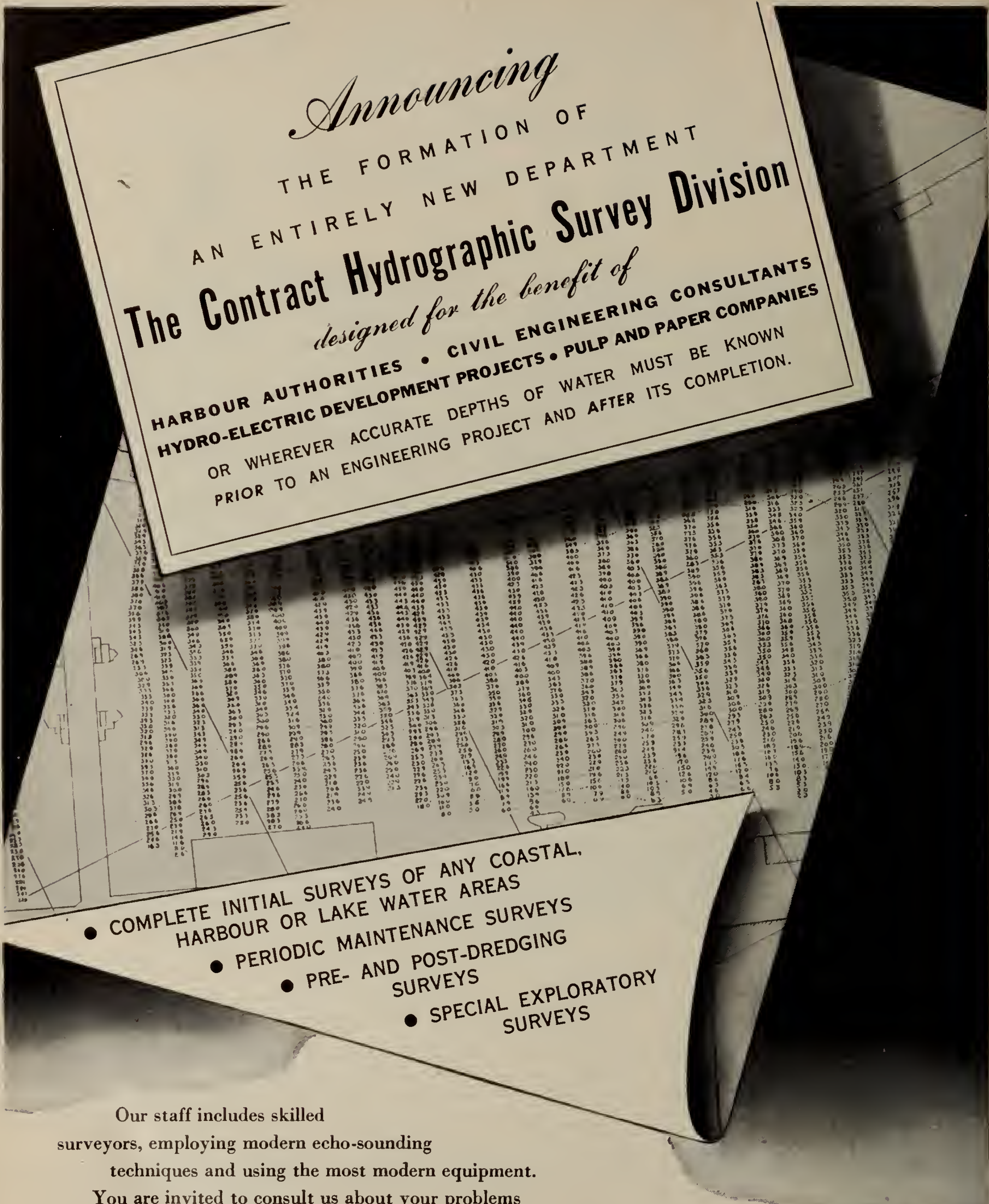
...are GOOD Machines

They're quality engineered, these Dominion machines—made efficient and dependable through the skill and the technical know-how of the men who build them.

And they're Canadian-made—designed and built in the Dominion shops at Montreal. This means a lot when parts and factory service are needed quickly.

For descriptive bulletins and other information write P.O. Box 220, Montreal.

DOMINION HOIST & SHOVEL
COMPANY LIMITED
MONTREAL QUE.


Announcing
THE FORMATION OF
AN ENTIRELY NEW DEPARTMENT
The Contract Hydrographic Survey Division
designed for the benefit of
HARBOUR AUTHORITIES • CIVIL ENGINEERING CONSULTANTS
HYDRO-ELECTRIC DEVELOPMENT PROJECTS • PULP AND PAPER COMPANIES
OR WHEREVER ACCURATE DEPTHS OF WATER MUST BE KNOWN
PRIOR TO AN ENGINEERING PROJECT AND AFTER ITS COMPLETION.
• COMPLETE INITIAL SURVEYS OF ANY COASTAL, HARBOUR OR LAKE WATER AREAS
• PERIODIC MAINTENANCE SURVEYS
• PRE- AND POST-DREDGING SURVEYS
• SPECIAL EXPLORATORY SURVEYS

SEE OTHER SIDE

MORE CARE HERE

These are the steps taken to build into windings and insulation of English Electric Motors the utmost possible protection against moisture and abrasion.

1. There is a coating of polyvar insulating material on the wire itself.
2. Ends of coils are held and protected by tape which absorbs the insulating varnish.
3. Phase insulation is provided, consisting of two layers of heavy varnished cloth.
4. Slot cells of pressed paper and varnished cloth extending well beyond stator iron insulate coils from the stator.
5. A "middle stick" separates coils in the slot.
6. A channel-shaped "wedge" of hard insulating material closes the top of the slot cell, completely shutting out foreign matter and holding the wires rigidly in place.
7. The completely wound stator is given several dips and bakes in special insulating varnish.

LONGER SERVICE HERE

Because "the life of the insulation is the life of the motor," such extra precautions to ensure long life of insulation pay dividends in longer useful life of English Electric Motors. In addition to the steps enumerated above, other precautions are taken where motors are required to work under unusually moist or difficult conditions.

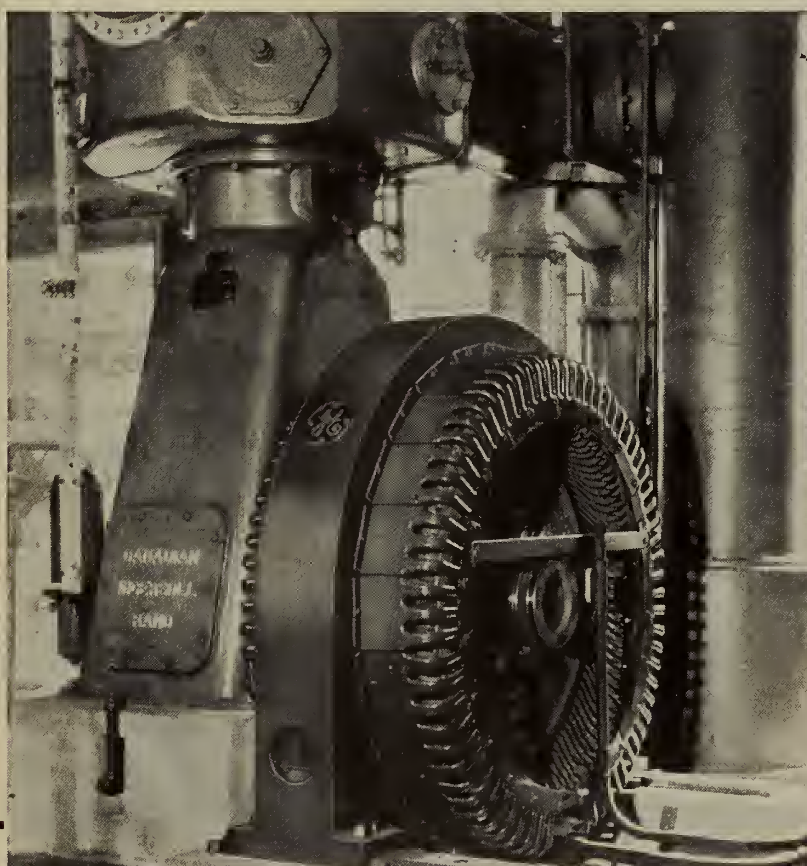
English Electric Motors of every type are available for all conditions of service. See the nearest English Electric representative.

ENGLISH ELECTRIC
COMPANY OF CANADA, LIMITED

HEAD OFFICE AND FACTORY ST. CATHARINES ONT.
District Offices: MONTREAL, OTTAWA, TORONTO, KIRKLAND LAKE, WINNIPEG, CALGARY, VANCOUVER
Represented by: FOULIS & BENNETT ELECTRIC LIMITED, HALIFAX; L. W. MERCIER, QUEBEC, P. Q.

GENERAL ELECTRIC
SYNCHRONOUS MOTORS

LOWER COMPRESSION COSTS
INCREASE PLANT EFFICIENCY
SAVE VITALLY NEEDED POWER



G-E Synchronous Motor 375 hp, 300 rpm, 4000 volt, 3 phase, 25 cycle driving a compressor at Dominion Forge and Stamping Co. Ltd., Walkerville, Ont.

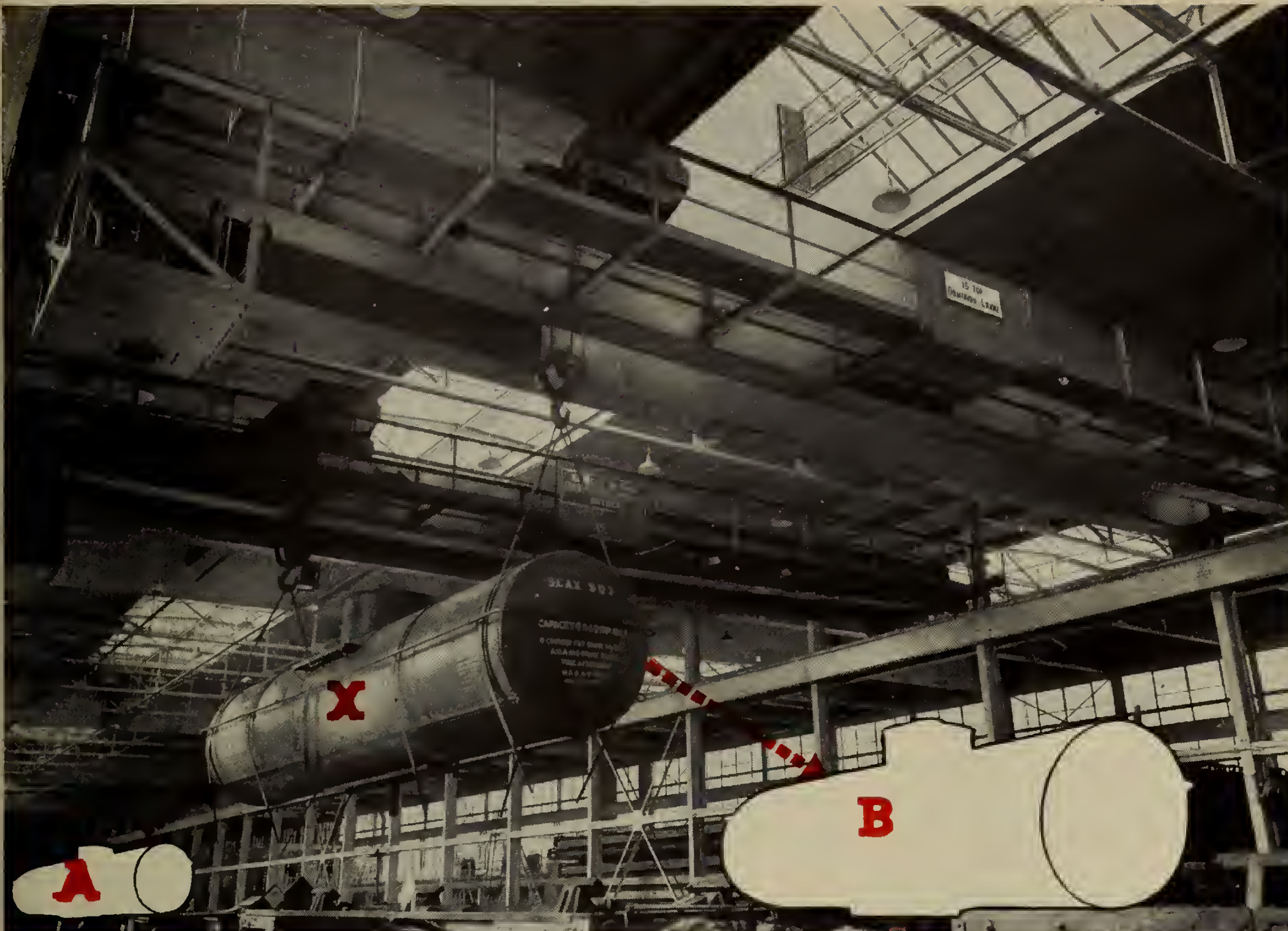
HERE are synchronous motors that are built mechanically and electrically strong. They have welded frames and high dielectric strength insulation. The mechanical arrangement, flywheel effect, and starting torque are tailored to the requirements of the compressor manufacturer.

G-E Synchronous Motors with their inherent high efficiency, their ability to improve power-factor conditions in your plant, will lower compression costs, increase plant efficiency and effect savings in power.

CANADIAN GENERAL ELECTRIC CO. LTD

HEAD OFFICE—TORONTO

48-AH-2



Two 15 ton Dominion Bridge cranes combine to lift a tank at the Dominion Works of Canadian Car and Foundry Company, Limited.

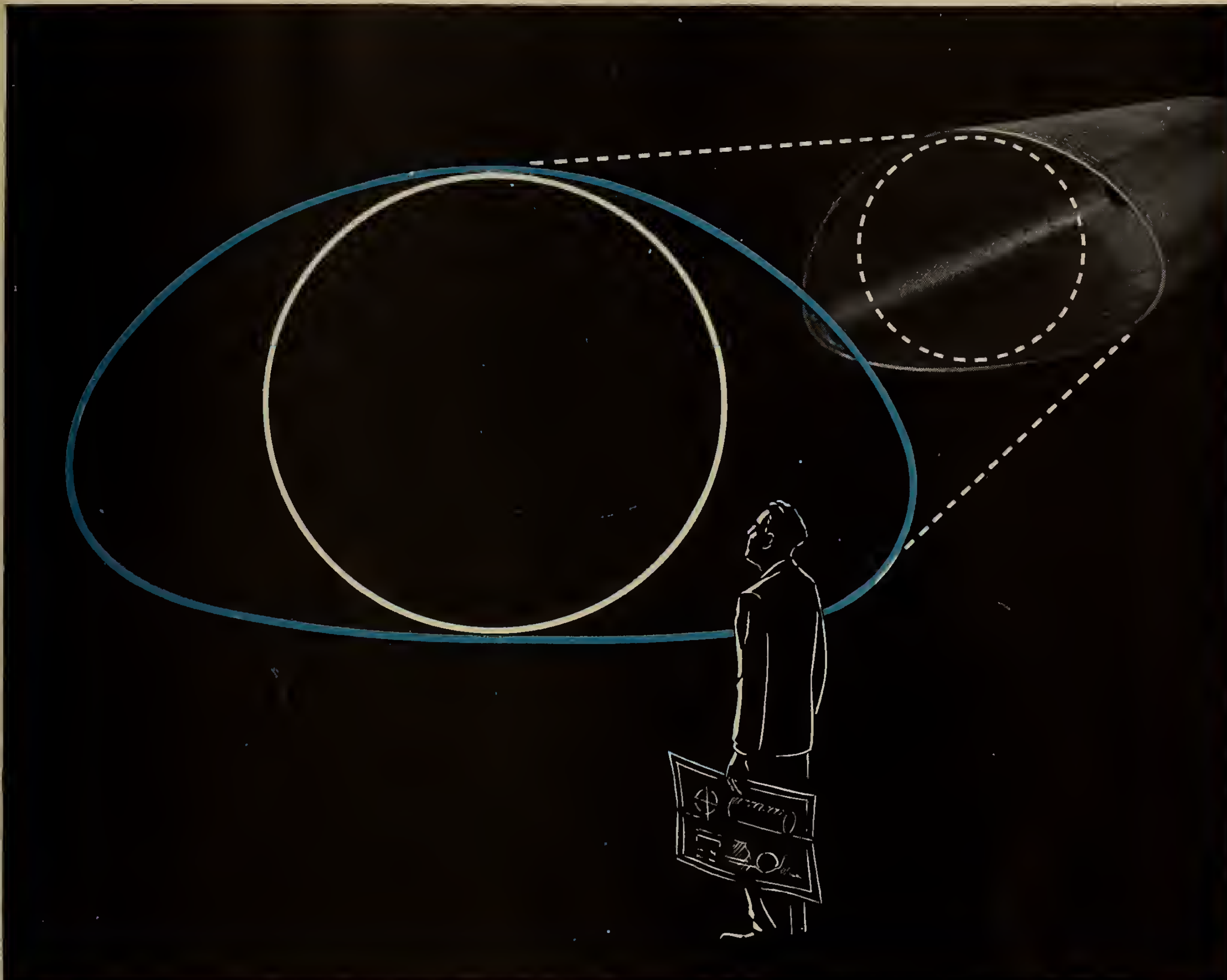
Moving X *from* A *to* B

This is an everyday problem in industry—a problem which is easy to solve *provided* the right equipment is available. To move loads efficiently a fraction of an inch or several hundred feet it is essential that the equipment be built for the job. Dominion Bridge Company has been building cranes and other handling equipment for over half a century and maintains a large design staff for this purpose. You are invited to make practical use of our experience in the handling of bulk materials and single units.

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.


"DOUBLE BARREL"
DEPENDABILITY!
ONE-TIME SHIPPER
REPEAT SHIPPER



"Stop Thinking in Circles!"

Corrugated Metal Pipe
Paved Invert Pipe
MULTI PLATE Pipe and Arches
ARMCO HEL-COR Pipe
PIPE-ARCH
Spiral Welded Steel Pipe & Fittings
ARMCO Tunnel Liner Plates
ARMCO Sheet Piling
STEELOX Buildings
Perforated Pipe for Sub-drainage
ARMCO Bin Type Retaining Walls
IRVING Subway Grating
IRVING Open Steel Bridge Decking

Good advice at times—and Armco engineers took it! They reasoned: "If a drainage 'pipe' could have the advantages of a wide-bottom 'arch', that would really be achievement. Let's see what can be done."

After years of research—the Armco Pipe-Arch—a new type of corrugated metal drainage structure with the greatest effective waterway area at the bottom—for fast run-off—yet with the advantages of a pipe culvert: easy to handle and install, ample strength under shallow cover, long individual lengths joined by sturdy couplers.

To take care of storm water faster, or for limited headroom, think of Pipe-Arches.

For literature write 56 George Street, Guelph, Ontario

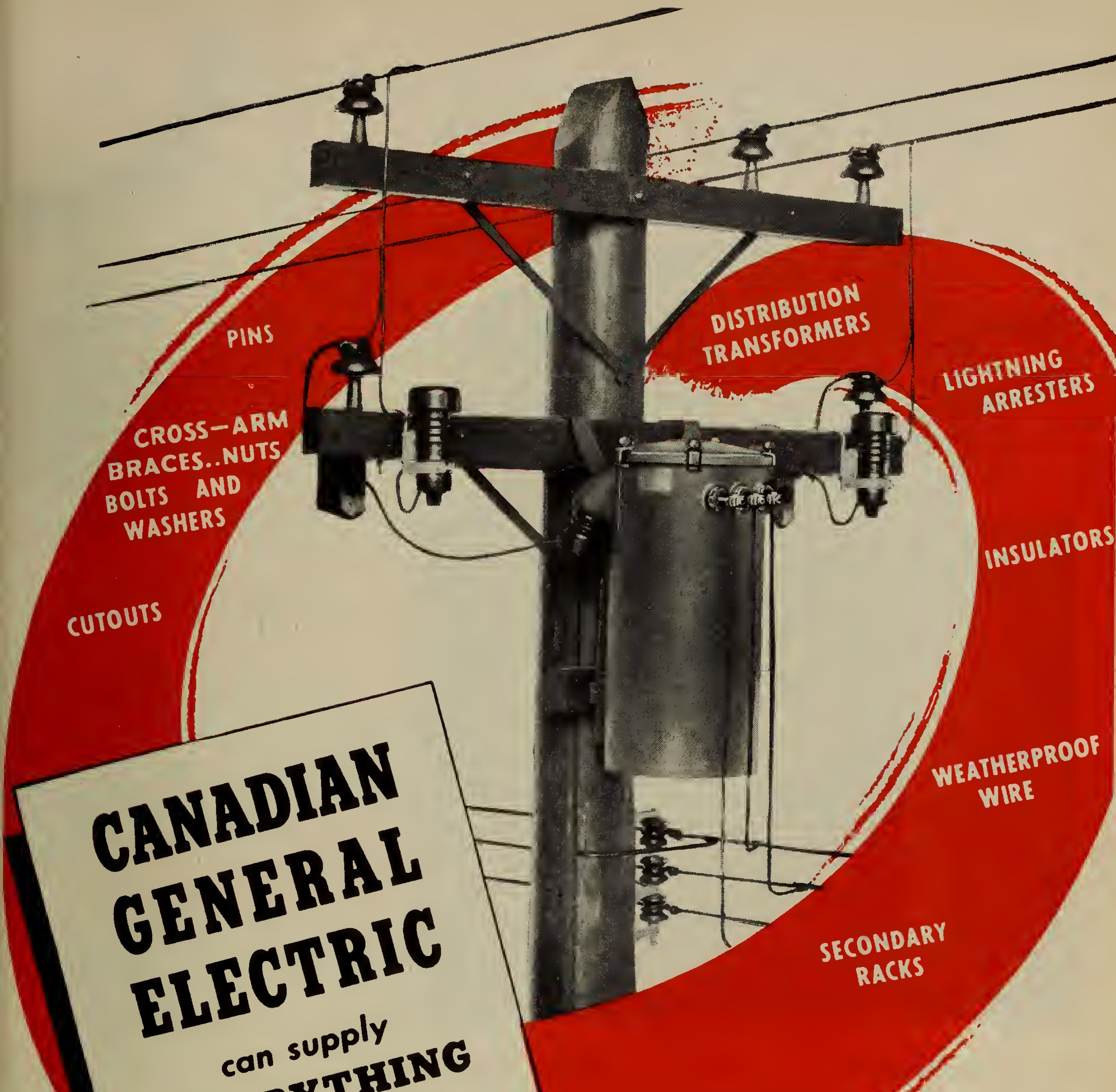
ARMCO

ARMCO DRAINAGE & METAL PRODUCTS
OF CANADA LTD.
GUELPH

LENNOXVILLE **WINNIPEG**
REGINA **EDMONTON** **CALGARY** **VANCOUVER**

159-8

As the white outline indicates, a standard unit of much greater frame size would be required to do the work of Speedaire.



PINS
DISTRIBUTION TRANSFORMERS
LIGHTNING ARRESTERS
CROSS-ARM BRACES..NUTS BOLTS AND WASHERS
INSULATORS
CUTOUTS
WEATHERPROOF WIRE
SECONDARY RACKS

Are you using the right product in the right place?

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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."

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CONTENTS

11,000 copies of this issue printed

COVER PICTURE

Canada's pulp and paper industry is of vital importance to her economy. This fact was never more evident than under present conditions when the supply of American dollars is a governing factor in the standard of living of every Canadian citizen.

The cover picture was chosen because it effectively illustrates one of the reasons why the Industry has been able to attain its present proportions. Engineers have made great progress in the mechanization of woods operations and this phase of the industry is under particular scrutiny at the moment.

It is to be one of the subjects for discussion at the Institute's 1949 annual meeting in Quebec City.

Photo courtesy International Harvester Company of Canada, Limited

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The Engineering Institute of Canada

Incorporated 1887

OFFICE OF THE PRESIDENT

VANCOUVER, B.C.

I wish all the members of the Institute, their wives, families and associates a pleasant and prosperous New Year. One of the most enjoyable of all the duties pertaining to the presidency is the opportunity of visiting the Branches, of renewing old friendships and making new ones, of observing at first hand the useful contributions made by the Engineers in their respective communities. My wife and I have been guests of twenty of the Branches and are most grateful for the warm reception and bounteous hospitality that we received all along the line. We look forward to visits with the other Branches on our way to the annual meeting in Quebec, where we hope to meet again a goodly number of our many friends from Sydney to Victoria.

J. N. Finlayson.

PRESIDENT

WARTIME AERONAUTICAL RESEARCH & DEVELOPMENT IN GERMANY

by J. J. Green, F.R.Ae.S., M.E.I.C., *Air Transport Board, Ottawa*
R. D. Hiscocks, M.E.I.C., *The de Havilland Aircraft of Canada Limited, Toronto*
J. L. Orr, A.F.R.Ae.S., *National Research Council, Ottawa*

Part III

The Aerodynamic Research Establishment at Göttingen *(Continued)*

Institute for Unsteady Fluid Motion

This Institute was responsible for basic work on flutter and vibration. Little flight testing was engaged in but when this was carried out, the conventional practice of employing unbalanced rotating weights, located at various points on the aircraft, was employed for investigating the vibration characteristics of the structure. Much theoretical work had been done, but as yet no solution had been found for calculating the critical flutter speed within a reasonable margin. For complex problems, where the validity of the necessary assumptions was doubtful, it was preferred to employ flutter models made of " Vinidur " plastic, which reproduces the characteristics of aircraft structural materials and is easily fabricated, being thermoplastic.

During the war, many troubles were experienced with oscillations of the control surface spring tabs. Considerable study had been devoted to this problem, but it was considered that the best solution was to eliminate such tabs. The flutter of wings with large sweepback presents new problems, and a good deal of theoretical work had recently been concerned with this. The major problem in present times was the calculation of aerodynamic flutter derivatives applicable to flight at subsonic and sonic speeds. It was stated that all of the German aircraft firms maintained flutter departments, which kept vibration difficulties on prototypes of new designs to a minimum.

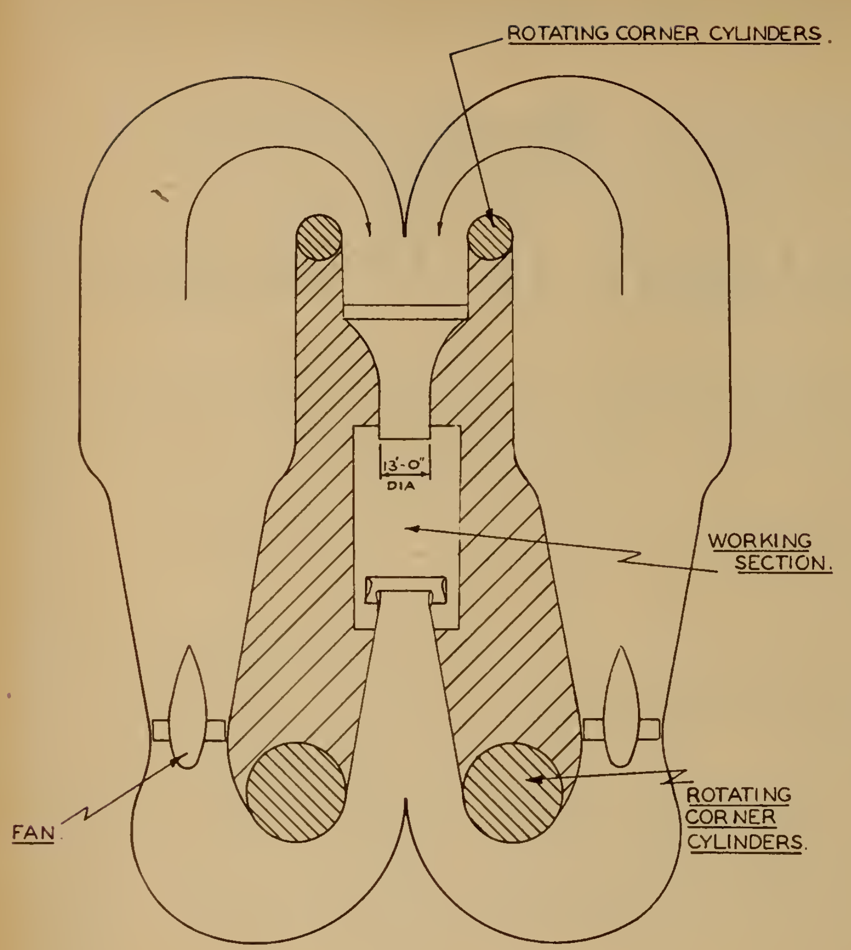
Most of the experimental work of this Institute was carried out in water tunnels, which permitted the use of a wide range of Reynolds numbers, combined with the ability to vary the inertia and elastic constants over large ranges as well. Three water tunnels were available; a small horizontal tunnel 8 in. by 16 in., a vertical tunnel identical with the horizontal one, and a large horizontal tunnel, 5 ft. by 4 ft. The primary purpose of these tunnels was to render the flow characteristics visible, which was accomplished by the injection

EDITOR'S NOTE

Late in 1945 a group of Canadian scientists and engineers visited Germany to investigate scientific and technological achievements of our former enemies. The authors of this paper, at that time on the staff of the National Research Council, were assigned to the field of aeronautics.

The report submitted by these scientists was long and comprehensive, but, in spite of heavy demands on their time, they have prepared a condensation specially for the JOURNAL. Even in this condensed form the report is of necessity being published in four instalments. When all four parts have been published it is hoped a consolidated reprint will be available for those interested in preserving the report in its entirety.

In this third instalment the description of the Gottingen Aerodynamic Research Establishment is concluded. Sections covered include Institutes for Unsteady Fluid Motion, Low Temperature Research, Meteorology, Wings, Propellers, Wind Screens, Instruments, Jet Engines, Supercooling, Regenerative Heat Exchangers and Coal Utilization for Gas Turbines. The Kaiser Wilhelm Institute for Flow Mechanics is also described.



LARGE REFRIGERATED HIGH ALTITUDE TUNNEL.

FIG. 29

of aniline dyes, air bubbles, or aluminum filings. One and three-component balances of the hydraulic capsule type were used for force measurements.

In addition to a very extensive flutter investigation, studies have been made on flow and pressure distribution associated with oscillating aerofoils and aerofoils with oscillating flaps. Other work included a study of the flow in wing and fuselage radiator ducts; boundary layer transition and separation over aerofoils, including the effects of boundary layer suction; the effects of airscrew slipstream on flow over wings and nacelles; and an investigation of vortices from wing tips and airscrews. The impression was gained that flow studies were carried out in the water tunnels as a preliminary to wind tunnel tests, the results serving as a guide for the design of the larger and more expensive wind tunnel models.

Institute for Low Temperature Research

Aircraft De-icing Research

The A.V.A. was the sole establishment responsible for research on aircraft icing in Germany and this had engaged their attention during the past ten years. In addition to the laboratory facilities and icing tunnels provided at Göttingen, flight tests of de-icing equipment under natural icing conditions over the Alps were carried out from Munich Airport, in conjunction with the Luftwaffe. Meteorological flights were made from Prague and there was a cold weather experimental ground station in Norway where simulated icing tests of propellers were undertaken. The A.V.A. was also responsible for the design of de-icing installations on new aircraft and prototype flight testing.

Most of the fundamental icing research had been carried out initially in a small icing tunnel, subsequent confirmation of the final results being obtained in flight. This tunnel was of simple design, of the NPL type, comprising an open return tunnel enclosed in an insulated chamber. The closed working section was 40 in. by 16 in. and speeds of 230 ft. per sec. were obtained with an 80 kw. electric drive. Effective cooling of the airstream was obtained by means of a calcium chloride spray, cooled by an ammonia refrigeration system to give a minimum tunnel temperature of —30°C. The chemical spray had the disadvantage of causing serious corrosion, necessitating careful protective treatment of the tunnel parts. Ice was formed by the injection of a water spray from heated pneumatic nozzles (Fig. 33).

A magnificent, large, refrigerated and pressurized tunnel was under construction, for high altitude tests of jet and rocket motors, as well as for icing tests. The open working section was 10 ft. by 6½ ft. and a speed of 425 ft. per sec. was obtainable, using four fans having a total driving power of 1640 kw. The layout of this tunnel is shown in Fig. 29, and it will be seen to include many novel aerodynamic features. Perhaps the most interesting feature was the absence of turning vanes. These were replaced by rotating cylinders at each of the four corners, which prevented separation of the boundary layer from the inner walls and thereby enabled the air to turn the corners with practically no aerodynamic losses. In addition to overcoming the icing problem associated with turning vanes, this scheme also permitted the use of a very short diffuser length, giving a compact tunnel, thereby reducing refrigeration requirements. The refrigeration comprised a 4-stage ammonia system with a driving power of 2150 kw. giving a minimum tunnel temperature of – 55°C. The tunnel could be evacuated to 0.1 atmospheres pressure by means of three 4-stage centrifugal compressors, which would also exhaust the products of combustion from jet engines which were to be tested here.

The concrete walls of this tunnel were 5 feet thick and were covered with cork insulation 12 inches thick. Unfortunately as the tunnel was nearing completion in 1942, a spark from a welding torch ignited the cork insulation and the entire tunnel section was damaged beyond repair.

Meteorology

Three fundamental types of ice were recognized as follows: Glaze ice, occurring at temperatures near 0°C. with free water contents up to 4 grams per cubic metre and droplet sizes up to 50 microns; Rime ice, occurring at temperatures below − 8°C. with free water contents up to 2 grams per cubic meter and droplet sizes up to 16 microns; and an intermediate type called "doubleheaded" or "hammerhead". An interesting point was that the maximum free water content had never been observed to exceed the saturation water vapour content of the air at any given temperature. Droplet sizes and water content were measured by using a multicylinder method to collect ice samples or alternatively by measuring the amount of power required to maintain a given dry surface temperature on an electrically heated cylinder.

Wings

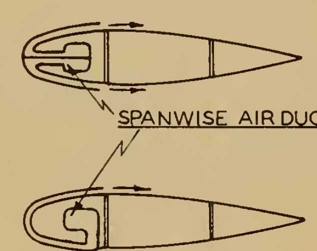
The air heating system for wing de-icing was originally developed here in 1938, and was subsequently fitted as standard equipment on most German military aircraft. Considerable operational experience had been gained and it was considered that this system was entirely satisfactory. Originally, hot air was supplied from heat exchangers on the engine exhaust system, but owing to weight and corrosion difficulties this had been replaced by the use of exhaust gases diluted with 90 per cent air. This gave a resultant mixture temperature of 120°C., which was circulated through the wing heating system with no apparent adverse effects on the structure. For the heating of empennage and other parts remote from the engines, a ram-operated combustion heater was developed.

In the original installations, the hot air duct was applied externally to the wing leading edge, the heating gases being discharged tangentially into the boundary layer aft of the heated area (Fig. 30). With this configuration it was necessary to separate the heating air into two parts, owing to the differing discharge pressures on the top and bottom wing surfaces.

An alternative scheme is also shown in Fig. 30 where the air is discharged only on the top surface of the wing. No serious adverse performance effects from the discharge of air into the boundary layer had been observed. The foregoing schemes were used where existing wing structures were modified, whereas, if considered in the design stage, it was possible to employ internal heating systems (Fig. 31). Where feasible, the air after passage through the leading edge double skin was dumped into the afterbody of the wing and escaped at the aileron or flap openings. Where the presence of fuel tanks in the wing or wing structure precludes this method, the second scheme shown could be employed where the air is discharged into the boundary layer on the upper surface of the wing.

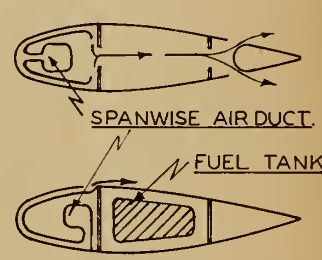
For fighter aircraft, where air heating systems could not be fitted for structural and space reasons, an interesting electrical ice-shedding system had been developed. This consisted of a wire type heater element imbedded in plastic or rubber layers, cemented to the leading edge of the wing, the necessary power being supplied from an unregulated standard engine-driven generator at 50 volts d-c. A heat concentration of 6.5 watts per square inch was applied continuously to a "parting" strip of 0.8 in. width, located on the stagnation line, while a power input of 2.6 watts per square inch was intermittently applied for 30 seconds in every 3 minutes to the "shedding" strips, which extended aft to about 15 per cent chord on both surfaces as illustrated in Fig. 32. The cyclic application of power to the shedding area melted a thin layer of ice at the interface and permitted removal of the ice cap by the aerodynamic forces.

Considerable work on de-icing pastes and lacquers had been carried out in the early days, over 200 compounds being tested. It was concluded that this method could not afford adequate protection for aircraft, due to the removal of the



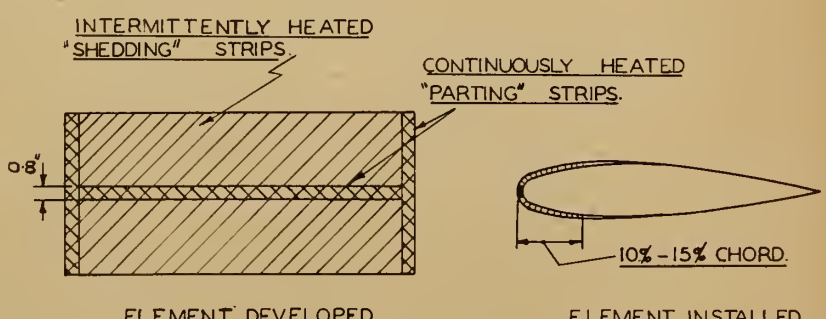
EXTERNAL AIR HEATING SYSTEMS FOR WING ANTI-ICING

FIG. 30



INTERNAL AIR HEATING SYSTEMS FOR WING ANTI-ICING.

FIG. 31



ELECTRO-THERMAL CYCLIC HEATING SYSTEM FOR WING DE-ICING.

FIG. 32

active ingredients by flight through rain or cloud. A glycol paste, however, had been developed for use on the V-1 buzz bombs where it was difficult to provide any other means of protection. Tests of a glycol distribution system similar to the British TKS system had been made, but the quantities of fluid required were found to be prohibitive, while the pneumatic wing overshoes, developed by Goodrich, were considered to be only partially satisfactory.

Propellers

Considerable work had been done originally in an attempt to develop the alcohol distribution system for propellers with wooden blades, using submerged distribution tubes. However, the Germans had learned of the development by the National Research Council in Canada of the electro-thermal method of propeller de-icing and had decided to use this method exclusively at the cessation of hostilities. For this purpose they developed a wire mesh type of heater element protected by a thin metal sheath, which was riveted to the leading edge of the propeller blade. They had attempted to use conducting rubber as at N.R.C. but without success. Here, heat was applied cyclically to the entire area, a power concentration of 9 watts per sq. in. being used on the leading edge and 4 watts per sq. in. on the remainder, extending aft to 25 per cent chord. The cycles employed were 20 seconds every 2 minutes to the leading edge and one minute every six minutes to the after portions. Power was supplied from the regular aircraft supply through slip rings, and although a hub generator scheme had been designed, it was not placed in production owing to manufacturing difficulties.

Windscreens

Electrically heated windscreens were fitted as standard on most military aircraft, where it was required both for internal mist prevention and for external ice prevention. The heater element consisted of extremely fine wires, 0.002 in. in diameter spaced at 0.02 in. intervals, imbedded in the plastic interlayer, giving a power input of 6.5 watts per square in.

Instruments

The standard pitot head was provided with the conventional electric heating system consuming 150 watts. A special "ice-resistant" unheated type of pitot head was developed for use on the V-1 (Fig. 34), the total head tube facing rearward into a forward-facing cup, designed so as to delay blockage by ice.

No automatic ice detectors were used for warning the pilot, the de-icing equipment being switched on by the pilot whenever the outside air temperature fell to 0°C. Several interesting methods of ice detection had been tried at A.V.A., including one in which the variation in the frequency of vibraton of a membrane was employed, and another in which a beam of light is progressively extinguished as the ice thickens, thereby actuating a photronic cell.

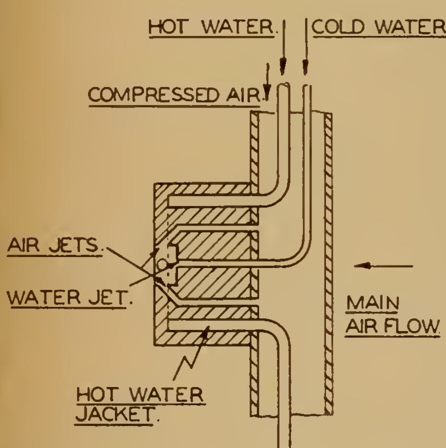
Jet Engines

Tentative designs had been prepared for the heating of the jet engine surfaces by hot air and electrical means, but these were very complex and had not been developed owing to the mechanical and production difficulties. The most promising method under development appeared to be the use of an electrically heated grid, the grid having a conical shape (Fig. 35), so that a certain amount of the ice formation might be blown off by the airstream under severe conditions.

As a temporary expedient, an unheated cup type ice guard (Fig. 36), similar to that fitted to reciprocating engine air intakes, had been developed whereby the forward-facing screens become blocked under icing conditions, so that air is taken in through an alternative shielded air intake providing water separation by centrifugal action.

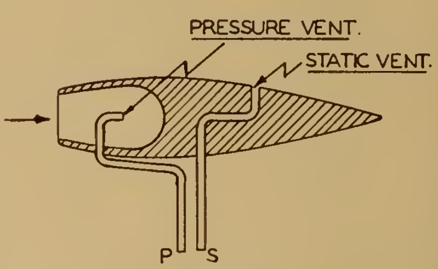
Supercooling of Water

Some interesting experiments on the supercooling of water have been carried out in which it had been found possible to lower the temperature to − 70°C before spon-



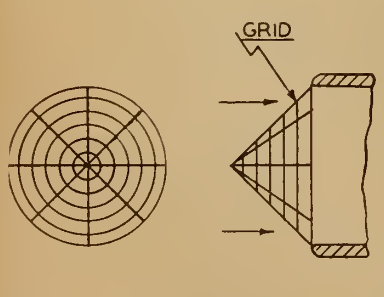
JACKETTED PNEUMATIC WATER SPRAY NOZZLES

FIG 33



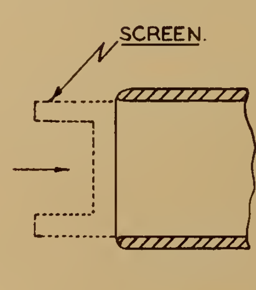
ICE-RESISTANT PITOT HEAD FOR V1.

FIG 34



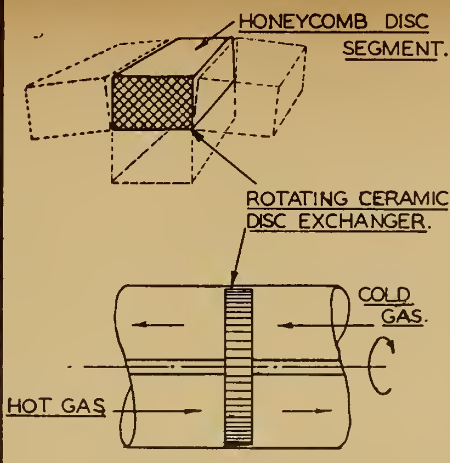
ELECTRICALLY HEATED CONICAL ICE GUARD FOR JET ENGINES.

FIG. 35

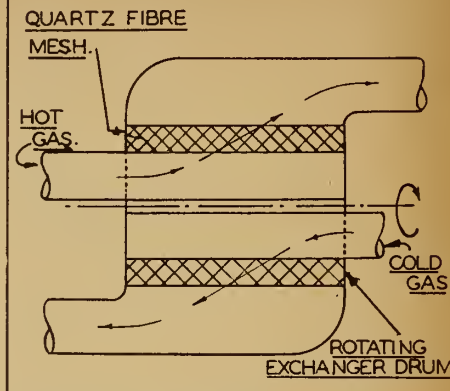


UNHEATED CUP TYPE ICE GUARD FOR JET ENGINES.

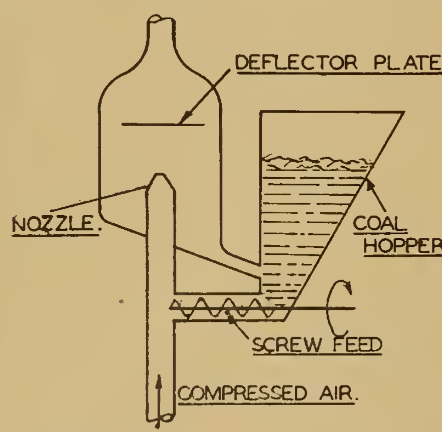
FIG. 36



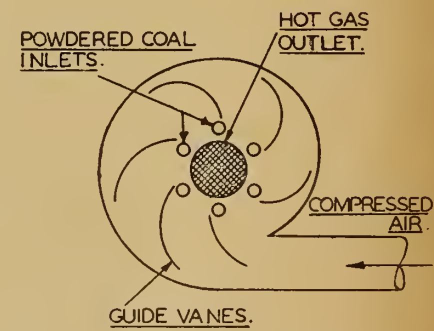
AXIAL FLOW REGENERATIVE
HEAT EXCHANGER.
FIG. 37



RADIAL FLOW REGENERATIVE
HEAT EXCHANGER.
FIG. 38



PNEUMATIC COAL PULVERIZER
FOR GAS TURBINE.
FIG. 39



SCROLL TYPE COMBUSTION
CHAMBER FOR GAS TURBINE.
FIG. 40

taneous freezing occurred. This was accomplished by subjecting the water to successive melting and refreezing, accompanied by continuous agitation. It was found that the spontaneous freezing temperature dropped by steps rather than by uniform progression. This was explained on the basis of the pulverizing of the precipitation nuclei after several freezings.

Another interesting fact was that even with ordinary tap water, it was found that after supercooling, freezing could only be initiated by the introduction of an ice crystal, all other crystals and particles, including quartz which has a similar crystalline structure to ice, failing to initiate freezing.

Regenerative Heat Exchanger For Gas Turbines

Arising out of the work of this laboratory on aircraft de-icing, the problem of heat exchangers for improving the efficiency of gas turbines by recovering heat from the exhaust gases was considered. It was concluded that a counter-flow type of exchanger would be best. A revolutionary innovation in heat exchangers was developed, whereby the heat transfer material is alternately exposed to the heating gases and the cooling gases. In the axial flow version, the heat exchanger consists of a series of ceramic honeycomb segments mounted on the disc of a large rotor, one half of which is exposed to hot gas flow in one direction, while the other half is exposed to cold gas flow in the opposite direction (Fig. 37). A unique method of fabricating the ceramic honeycomb was employed, in which cores of a plastic material were used during formation, being subsequently burned out, leaving tubular passages for the gases. As an alternative, the ceramic may be extruded in the desired form.

A radial flow type (Fig. 38), was also developed, which employed a series of meshes built up from stranded quartz fibre. This type usually involved radial flow as opposed to the axial flow required with the parallel flow type.

With either of these heat exchangers a heat transfer effectiveness of 95 per cent was claimed, giving an extremely low weight of 0.33 lb. per hp. As an example of the improvements in efficiency to be expected with the regenerative heat exchanger on a gas turbine engine, a comparison was made on the Messerschmitt Me264 long range aircraft. For the same range of 11,200 miles at a cruising-speed of 620 miles per hour, at an altitude of 32,800 feet, and carrying the same useful load of 11,000 lbs., the following table illustrates the great saving in fuel weight and aircraft weight to be effected.

Engine Type	Fuel Weight	Gross Weight
Piston . . .	51,500 lbs.	101,000 lbs.
Turbine . .	20,100 lbs.	56,500 lbs.

(with regenerative heat exchanger)

Coal Utilization for Gas Turbines

Considerable research was directed toward the possibility of utilizing the plentiful supplies of coal available in Germany to overcome the shortage of petroleum required for operating gas turbines, both in the air and on the ground. The first attempts were directed toward mixing approximately one third of powdered coal into fuel oil and injecting it into the combustion chamber as usual, but further efforts were directed to the use of 100 per cent coal.

A method of producing blocks of compressed coal powder and subsequently degassing the powder gave satisfactory combustion characteristics, the removal of the gas eliminating the swelling which usually occurs with such compressed coal, and which would seriously interfere with airflow over the plates. An engine utilizing plates of compressed coal was developed for the V-1 bomb, but was not used in service. The plates employed were about 2 in. wide by ½ in. thick, and were arranged edge-on to the airflow. This compressed coal could be employed for gas turbines by utilizing a gas producer in which the coal was burned to produce the necessary combustible gas.

Another method of utilizing coal

for gas turbines employed a special pneumatic nozzle for pulverizing the coal. The lumps of coal were injected into a vertical air jet supplied with air under 4 atmospheres pressure, which then passed through a nozzle having a contraction ratio of 10:1 (Fig. 39). The resulting high accelerations in the jet caused the smaller particles to speed up and the impact of the smaller particles upon the larger ones tended to break up the larger particles.

The jet was arranged vertically as illustrated, so that the particles impinged upon a plate, the larger ones falling to the bottom of the chamber for recirculation, while the smaller, having diameters of 0.008 in. or less, were carried in the air blast to the combusion chamber. The combustion chamber comprised a scroll-type casing with central guide vanes (Fig. 40). The compressed air entered the outside of the casing while the coal dust was injected at the centre where combustion occurred, the products of combustion leaving the chamber at the centre. Owing to the centrifugal action, the coal particles could not leave the chamber, while the lighter ash particles were swept out by the exhaust gases.

In view of the considerably higher thermal efficiences which are possible with gas turbines, it would appear that the possibilities for utilizing low grade coal, which have been opened up by the A.V.A. experiments, might be of extreme value to Canada for transportation and other power applications.

Kaiser Wilhelm Institute for Flow Mechanics

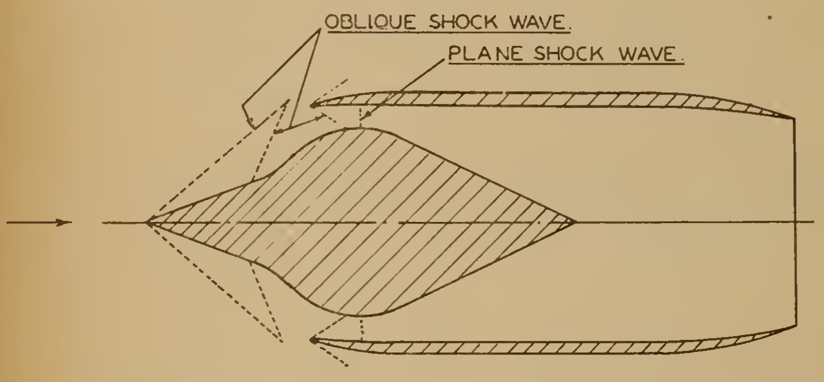
This Laboratory, which is a branch of the privately-endowed Kaiser Wilhelm Institute, is located on the grounds of the A.V.A. at Göttingen. At one time it was a part of the A.V.A. but its official connection with the A.V.A. was severed in 1933. However, there is a very close co-ordination between the K.W.I. and A.V.A., Prandtl, the director of the K.W.I., being one of the governors of the A.V.A. The work of the K.W.I. was entirely basic in character, and included both the hydrodynamic and aerodynamic problems associated with meteorology and oceanography, as well as aircraft and watercraft of all kinds.

One of the most interesting pieces of equipment at the K.W.I. was a cavitation tunnel having a free water jet, 8 in. by 6 in., enclosed in an air chamber, in which the pressure could be reduced. A speed of 165 feet per second was provided by an electric drive of only 50 hp. By reducing the air pressure in the jet, cavitation bubbles could be produced at moderately low water speeds. The tunnel was originally intended for torpedo studies, but was mainly utilized in the study of problems associated with projectiles, bombs and high speed aircraft.

For instance, photographs of the cavitation bubble profiles were used as a guide to the best shape of aircraft fuselages and nacelles to be free of compressibility troubles at high speeds. In this way optimum shapes for given subsonic speeds could be derived. The tunnel was also used to investigate compressibility troubles on existing aircraft, using partial models. For example, on the Messerschmitt 262, which gave considerable trouble near the wing root, the formation of the cavitation bubble indicated the region where the compressibility effects were occurring and the shape of the bubble was used as the basis for a fairing which would eliminate the trouble.

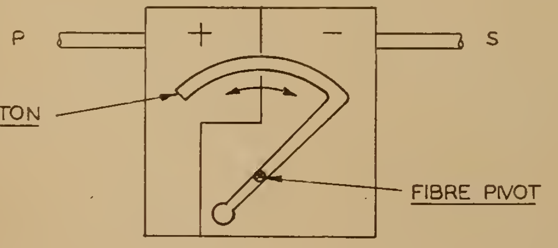
A small supersonic wind tunnel, having a working section 8 in. by 2 in., giving a Mach number of 2, was being used for an investigation of compressible flow over curved walls. It was in this tunnel that Oswatitsch was doing some very interesting work on diffusers for supersonic propulsive ducts, in the course of which he developed a special diffuser having a central conical plug (Fig. 41), which accomplished the compression of the entering air, through a series of

(*Continued on page 637*)



OSWATITSCH SUPERSONIC DIFFUSER FOR RAMJET ENGINES

FIG. 41



REICHARDT ULTRA-LOW PRESSURE MANOMETER.

FIG 42

ECONOMIC & ECONOMICAL ASPECTS *of* FARM ELECTRIFICATION

by

F. T. Gale, M.E.I.C.

Superintendent of Rural Electrification, Calgary Power Company, Calgary, Alberta

A paper presented at the Annual General and Professional Meeting of The Engineering Institute of Canada, Banff, Alberta, June 4, 1948

In this paper the author describes the various uses to which electric energy is applied in farming, and the contribution it makes towards better living for the farmer. The need for guidance and education of our farm population as to the benefits of electrification is stressed. The coming of an industrial agricultural revolution is predicted as electrification of farms becomes more widespread. Examples of power services per farm in Alberta are given, as well as methods of assessing charges. The formation of Cooperative Associations for furthering the extension of electric power service to farm areas is discussed.

The two adjectives, " economic " and " economical " have a particular attraction in their application to this phase of farm electrification. An economic consideration is usually thought of as one in which the laws of supply and demand have had free play, and an economical consideration one that is not extravagant. In more general interpretation, the first generally means a cost consideration not too low for self support and the second, one not too high for the farmer—consumer.

It is well to remind ourselves that this problem obviously varies more or less with the density of farms. The cost of line construction per farm is much less in areas where there are four or five farms to the mile, than in those where there are only one or two farms per mile. It varies with the type of farming. It has been proved that on a dairy farm of thirty milking cows, electricity can save one hired man's time and that, along with improved quality given to the milk by refrigeration, could quite easily spell the difference between success and failure. On a large grain farm the uses for energy are not quite so obvious.

Again there is variation in the amount of support which may be provided from other industry. The electrification of the most easily reached fifty per cent of the farms in Alberta would require new capital equal to the capital investment of existing facilities supplying all present domestic, commercial and industrial load. If these farms had an average monthly use of 100 kilowatt hours, they would use less than 4 per cent of the energy generated last year (considering only the systems that would supply the farm load).

This capital figure is somewhere in the neighborhood of forty million dollars. The $40 millions would not mean so much to a system that plans to spend about $20 millions on a frequency conversion in a very small area. (This $40 millions is about 8 per cent of the Ontario Hydro's total capitalization) but you can well imagine the poser it presents to us when it represents 100 per cent of the present capitalization.

There are also variations in the problem due to political considerations. It might be said then, that Ontario's problem is not necessarily that of Manitoba, and naturally this part of the discussion will be intentionally colored by experience here in Alberta. In thumbing through a collection of articles on this subject of Farm Electrification, one finds more than the usual amount of romantic phraseology—most of it stems from the enthusiasm of those of us engaged in the distribution of energy, attempting to justify our economics. We must satisfy the farmer, the investor, the taxpayer, the politician, and ourselves as engineers, that this job of electrifying farms is being planned in a manner that can be justified.

It is not a difficult matter to determine costs, particularly those of farm power-line construction, operation, and amortization. The difficulty lies in apportioning the proper share of these costs, not to productive farm work, but to such indeterminate things as social betterment and indirect effect on urban living. This indirect effect was emphasized in Mr. Palmer's paper (see " Irrigation in Western Canada " by A. E. Palmer, The Eng. Journal Sept. 1948) when he said that one person on an irrigated farm created business to support one and one-half urban persons.

Objectives of Farm Electrification

At the outset we do realize that farming is more than this country's most important industry, more than a primary industry and leading business; it is a way of life. The purpose of electrifying this industry then is also more than to improve and increase farm production. Its other purpose is to free the farm home from household drudgery, and to make rural living more pleasant. If you have carried a smoky lantern with a cracked chimney to do your chores in its half light, or been afraid to turn your back on two of your squabbling offspring because of the fire hazard of an upset oil lamp, or if you have packed water into the house and out again in a bucket on wash-day,—you will know which of these two reasons for farm electrification is of primary importance to the farmer at present.

Farm electrification, like electrification of other industry, starts from improved lighting. In the case of other industry, however, the use of electricity has been developed by economic necessity; in the case of farming the use of electricity is developing first through the convenience and farm-home-comfort stage, in other words, the non-income-producing stage. This results in the demand for service exceeding the willingness and perhaps the ability to pay for it. It results in the thought that installation costs and energy rates are prices paid for luxury or convenience, instead of being mostly elements of farm production costs.

It seems that the struggle has been to get electric service to the farmer *and then* when it is there, teach him how to use the service at a profit to himself and, of course, in doing this establish the necessary works as self-supporting. As an example of this trend of thought, we do not have to exercise our imaginations much to realize the value of a small a-c welder on the present day highly mechanized farm. Welding a broken member of a machine might be a matter of minutes, while if the part had to be disassembled, taken to town for mending and re-assembled, it might mean days lost at a time when hours spell the difference between profit and disastrous loss.

To mix a metaphor slightly—the economic cart is before the horse—the availability of electricity makes a-c welding possible instead of the demand for a-c welding on the farm requiring electric service. The fact that the market has to be almost completely supplied before it can be developed causes nine-tenths of the economic problems of rural electrification. The supplier of electricity to farmers is faced with extremely heavy expenditures for line construction and educational programs without much hope that these expenditures will come near being self-supporting for a few years.

Guidance and Education Needed

In going back over the development of farm electrification, we read that there have been many false starts but no complete stops in the electrification of rural Canada. It is now an accepted fact that the job is to be completed as rapidly as material and labor will permit. There is of necessity then no period which can be taken by the farmers of any particular area to watch their neighbors develop the use of electrical income producing tools, no period such as was taken to accept the tractor as a replacement for horses.

The reasons are two-fold; first, because the construction of lines to the few who usually pioneer advanced ideas is financially out of the question. More than fifty per cent acceptance is necessary to bring the line construction cost per farm within the realm of financial possibility; and second, because though electricity is accepted first for its luxury use and is heavily subsidized to make this possible, that use cannot remain its only one or even its chief use unless farm electrification is to remain under the shadow of perpetual subsidy and eventual failure.

It is the luxury use of things that goes first when savings have to be made. It might be argued here that a farmer is not going to do without his lights and household appliances once he has experienced their use. Unfortunately our record of casualties in the thirties does not bear this out. However, I do not think we need be too pessimistic on this score, because I believe the responsibility for these casualties rests at least partly with the suppliers, in not providing more guidance to the farmer in the field of profitable farm use of electricity.

On the other hand too much emphasis cannot be placed on the need for this guidance—we must not think that once electricity is on a farm, it will be harnessed for work without education. Even now with all agencies working to teach the farmer, and with the farmer in the best financial position he has ever been in, less than one electrified farm in five in all Canada has a water pressure system and inside plumbing. This might seem incredible to people in a building with a tub in every room. This thought advances a further economic consideration; how much can we afford *not* to put substantial funds into an educational programme, and should part of this cost be borne by the tax-payer through the Department of Agriculture and other Government educational agencies?

We subscribe whole-heartedly to the benefits that accrue to the electrified farm. We agree that farm electrification is the concern of all Canadians, not just that of the Utilities and Manufacturers. This is not altogether altruistic or unselfish because suppliers of electricity, be they Governments or Power Companies can, in the long run, be no more prosperous than those they serve. Certainly our prairie economy is very much dependent on the farmer.

However, the farmer is very susceptible to price changes not easily controlled, and an agricultural depression would undoubtedly cause many to give up the use of electricity if their use of it had not progressed beyond the convenience stage. Or if their voices were combined for a lowering of rates, it would cause the tariff to fall below the sustaining level. In both cases, the result would be the same, the wiping out of invested capital.

The construction of hard surfaced roads did not precede the automobile. Yet the development of electrical farm distribution systems does not follow a natural parallel to road development as might be expected. It is necessary to build electrical distribution facilities of a capacity to more than take care of their initial convenience use. They must be constructed with consideration for reasonable future demand, and to give a continuity and reliability of service that modern power equipment requires. It is fairly obvious that at the outset convenience use will not support this kind of line. The removal of the risk element described above, to attract capital and the quick development of the efficient productive use of electrical energy to sustain it, appear to be the answer.

A Coming Agricultural Industrial Revolution

Do you realize that in our lifetime the farm field operations have been improved by mechanization beyond early imagination. Such things as the horse-drawn binder, the old sulky plow, have given way to the self-propelled combine and the one way disk. Labor in grain growing has been reduced from an average of one man-hour per bushel to less than one man-hour for twenty bushels. Surely we can look forward to a similar agricultural industrial revolution made possible by electricity; a similar reduction in the muscle power and increase in efficiency and production. We are on the threshold of this development now, and here in the West helping ourselves over the threshold is an economic problem of some dimension.

The economical uses of electricity in farming operations have been proven beyond dispute. In these days of scarce, costly, and indifferent help, electricity can be the most efficient hired hand. It will prepare feeds, milk cows, cool milk, dry hay, clean barns, heat water for cleaning, provide automatic water under pressure, provide protection against disease through the use of ultra violet light, increase egg production, send more pigs and sheep to market through the use of brooders.

These jobs can be enumerated without end. They are jobs which require initial capital to set them up electrically, but jobs which pay real dividends in the form of increased and improved production. We conclude that rural electrification or the utilization of electricity on farms is more of an agricultural problem than an electrical one, and just as the development of field machinery is producing amazing production results, so will the development of devices to use electricity change the face of farming.

Power Service Per Farm In Alberta

Let us reduce the problem of power supply to farms down to a few figures: In Alberta, the average farm within 15 to 20 miles of a transmission line requires ¾ of a mile of distribution line, a 3 kva. transformer, meter, etc. and a share of switching and step-down substation. The average cost of this share of a distribution system is between $750 and $800 for material, labor, engineering, and very nominal overheads. A group farm distribution system of this kind is 6900-volt, single phase, two wire grounded neutral type, and every known economy of construction is used; 450 feet average span on Class 6, 35 foot butt-treated cedar poles, using high strength No. 4 ACSR, No. 6 and No. 8 Steel, no individual transformer fusing, and co-ordinated arc gaps with small automatic oil circuit reclosers. Pole metering with no-fuz secondary breakers is used.

Lines are designed so that their regulation is not more than 15 per cent with a voltage drop not greater than 10 per cent. (This has so far not exceeded 5 per cent drop). A line supplying 100 farms is designed to operate within these limits when the coincident demand is one kw. per farm. The lines are so designed that their capacities may be progressively increased through the addition of regulators and capacitors, the changing of conductor sizes without changing supports, or the stringing of three phase. Our existing 22000-volt lines are tapped with a 50 kva. substation every six or eight miles, and the 6900 volt distribution system built out on either side to distances up to 25 miles, and branched like a tree to supply the farms. Our systems are planned after similar ones in the United States, with what changes we could make to lighten construction costs and improve operating conditions.

There is no doubt that if these farm lines were built originally to take care of their eventual load 15 years from now, when they can be self supporting, the cost of building them would necessitate rates which would discourage their present acceptance to the point where they could not be built at all. Even now those suppliers of electricity who are supplying areas where there are less than two farms to the mile (ours is less than 1½ per mile) are finding the going a little rough, unless the public treasury can be relied on to smooth things a little. On many systems the percentage of farm to industrial business is very very small, and hence industry can support the farm electrification program. On other systems the industrial centres are served by municipally owned electrical works which are separate from the rural supply, and of course cannot be called upon for subsidy.

To further complicate the matter, a very low rate must be given to the farmer for promotional purposes. The difficulty of encouraging the investor to supply the funds for construction of farm electrical systems is realized when we break down the per farm cost per month to support the $800.00 worth of capital investment. Since investment money has reached the low in returns and is now on the way up, it is fair to assume that 5 per cent would be as low a figure as this work could command and even then, in view of the risk involved would probably require backing of other assets. Investment capital probably would demand a depreciation of around 3 per cent. This makes a capital charge of 8 per cent or $5.33 per month, to which must be added operating costs and cost of energy and taxes. If this rate is to be lowered eventually, then a further charge for return of capital must be levied. The result is a fantastic figure.

In the United States the Federal Government has developed the R.E.A. plan of supplying construction capital to Rural Electrification Co-operative Associations, as an answer to these high capital costs. Money is lent at a very nominal rate of 2 per cent. Interest and capital are repayable in 35 years, except that payments are deferred for the first 5 years of the loan. A mortgage on the works is taken as security.

Co-operative Associations Being Tried

Similarly, here in Alberta where our density of farms is light—our best areas compare with what is left to electrify in the States today—we are now trying the Co-operative Association as an experiment. In 1943 we began a program of electrifying large groups of farms. At that time we asked each farmer for a contribution of $100.00 towards the average $600.00 cost of construction. In the face of roughly 1/3 increase in construction costs we were unable to continue the low promotional rate on which this plan began. Changing the rate to take care of the rise in cost would have made an already precarious situation worse. The casualties in times of agricultural depression would, we think, not only have destroyed the invested capital, but would be a deterrent to the whole plan.

The Co-operative plan in which the farmer owned the system appeared to be a partial answer. Unfortunately there is no source of 2 per cent money in this country. Fortunately, however, the average farmer is in the best financial position he has ever been in, and is able to find the money for construction out of his own earnings. It is encouraging that in some 40 Associations that have been formed he is willing to find it. Some assistance is necessary in a few cases, but in the main the farmer has been willing to assume the obligation. By making the outlay at the start, not only are the capital carrying charges eliminated, but the depreciation reserve necessary is considerably reduced, due to the fact that capital risk is not a factor. It is not difficult to convince the farmer of this advantage, and only in the odd case is it necessary to convince a man that financing a power line which he owns is not much different than financing his automobile, tractor or other piece of farm equipment.

Naturally Co-operatives of this sort must have some directing body. Co-operatives generally come under the jurisdiction of the Provincial Government director of Co-operatives; Electrical Co-ops. also come under the jurisdiction of the Provincial Board of Public Utility Commissioners, just as do other distributors of this service, and the Provincial Power Commission. However, in order to facilitate the construction of the rural systems, and their operation once they have been built, the Power Company has incorporated a subsidiary known as Farm Electric Services Ltd. This company was formed for one purpose—to organize, construct and operate farm systems at cost. It is hoped that the directors of Farm Electric Services will represent the Power Company, the Farmers Co-operatives and a Government appointee.

According to the Provincial Co-operatives Act any 10 farmers may form an Association. Usually an interested few obtain preliminary information from us and then call a meeting of the people in the area in which they are interested. If the meeting is interested, a provisional Board of Directors for a co-operative association is elected. It is the duty of this Board to survey the area, making sure that everyone within natural boundaries is given a chance to become a member of the R.E.A. Sometimes a small deposit of $50.00 is asked for as evidence of good faith. The information gathered by the Board is sent in to Farm Electric Services. The Service Company satisfies itself that the area selected by the Co-operatives has natural boundaries that conform to economic construction and complete coverage of the farms. Care is taken to see that service has been offered to everyone in the area, and no attempt made to lighten the cost by "cream-skimming" those farms closely grouped and neglecting those not so fortunately situated.

How Assessments of Costs Are Made

After proper mapping, an estimate of the cost is prepared and presented to the Board of Directors. If they consider this acceptable, a public meeting is called at which a representative of the Service Company outlines the cost, the Association-Member contract and other matters and details of the operation of the system. If these are acceptable, the Co-operative Association is duly registered with the Government by the Service Company and the directors of the Association proceed to collect their members' contribution towards construction cost and to sign the contracts.

Each member within the limits set pays an equal share, regardless of his distance from the road allowance, etc. The limits usually set are: An average of not more than ¾ miles of line per farm with a limit of 1¼ miles for any individual farm. Farms requiring more than 1¼ miles of line can obtain the service by paying for the additional cost as well as the average share.

A rough guide on which the farmer can make his own approximation of cost is given as follows:

Farm transmission line — 12c per foot or $634.00 per mile.

Average cost of farm connection to this line — $250.00 each including 3 kw. transformer, meter, guys, etc.)

Share of main substation and switching in 100 farm area — $40.00.

Total cost per farm where the average is one farm every ¾ mile is then $765.00.

All material, labor and engineering costs are included except brush cutting. The farmer is encouraged to contribute as much of the labor as possible and is paid for the work which he does. It might be added here that to wire and only moderately equip the average farm to use electricity will require an outlay of an amount equivalent to the line costs at least.

The Service Company undertakes to build the farm lines at cost which is subject to the Co-op. or Government audit. To provide assistance to those who are not in a position to put up all of the cash the Co-op. may borrow a Provincial Government backed loan at 4 per cent.

Building a Reserve

The service Company also undertakes to operate these systems at cost, making use of the Power Company facilities and personnel where it is economical to do so. At the present time, for ¾ mile of line and 3-kw. transformer, the cost of operation is $2.00 per farm per month, plus 50c per month for a reserve fund to take care of inadequacy, renewals and extensive storm damage, and liability. The costs of operation are pooled for all co-operatives, and the costs of liability and storm damage are shared equally by all Co-ops.

Now it is realized that 50c a month or $180.00 in 30 years, even if not drawn on in that time, is an inadequate amount to take care of inadequacy, renewals, storm damage, liability, on an outlay of between $750.00 and $800.00. It is planned to build this reserve through crediting it with surplus funds. For example, there is a requirement that no future farm can be connected to the lines for less than the average share. Now a farm along an existing line might contribute the average cost of $750.00, but the actual cost might be only $250.00. The surplus $500.00 would be credited to the reserve fund.

In this description most of the details have had to be neglected. However, an attempt has been made to point out some of the more common economic difficulties of farm electrification with a possible solution which is being attempted here. The problem is of extreme importance to this agricultural province and to those of us engaged in the work.

Discussion

J. E. Bagshaw[1]

Mr. Gale, in his talk, has pointed out the economic obstacle to farm electrification on the prairies, and has indicated the possible transfer of electric distribution lines from the Power Company to the Farmer.

The Prairie Provinces' entrance into the field of farm electrification was fortunately deliberate and well planned. The prairie power companies, including both private and publicly owned bodies, got together and agreed on a uniform type of construction which was low in cost yet substantial. They agreed to standardize on many items, such as transformers, meter boxes, conductors, etc., and to use the same materials. In this way, we have all benefited and kept costs to a minimum. At a general meeting of E.I.C. held in Winnipeg in 1945 these methods of construction were discussed by Mr. E. G. Kelly of Canadian Utilities Limited and Mr. J. W. Tomlinson of the Manitoba Power Commission. The methods outlined then have been adhered to by the various companies.

However, the average costs, which at that time were about $600 per farm, have now risen to the point where it will probably cost in the neighborhood of $780 in 1948. At the original figure of $600 per farm this business was not self supporting and now, with the construction costs up, farm electrification extensions are definitely a losing proposition to power supply concerns under present conditions and at the present revenues that are available from farm areas. One solution, as Mr. Gale has said, is to get the farmer to pay for his own lines. While this solution gets you out of one hole, it gently deposits you into another for, if a farmer has to contribute $750 to line construction costs and a like amount, as has been suggested, for wiring and appliances, he has an investment that certainly all farmers cannot or will not be able to raise. The cash must be found for the line construction, and so it seems that the wiring and appliances will receive a minimum of attention.

This would not be so bad if it were not for the fact that through this latter medium comes the future revenue. If a farmer can't buy electrical equipment and hasn't a good wiring job, he cannot use the electricity to advantage. And, of course, those farmers who are not making full use of electricity are the first to discontinue service in times of low incomes. Our experience has been that a farmer who has the electrified equipment can operate it so much more economically that he can do the chore any other way, that he cannot afford to use any other method. This keeps him on the line when his income is low.

At Swalwell, Alberta, which is our Experimental Area No. 1 constructed in 1944, most of the farmers have a dairy " set-up ", and sell milk to a local cheese factory. They have small farms, so are more thickly settled, which means more farms per mile of line. Here we now have nearly two farms per mile of line and, counting a small hamlet served, have about three customers per mile. In the first year of operation, the revenue per mile of line was $190 and in the third year it is $254. Kilowatt hours have increased from 1200 per farm in 1945 to 1800 in 1947, a 50 per cent increase. Active load building was conducted in this area and the farmers are well aware of benefits to be obtained from electricity. As equipment becomes available, we expect a further large increase in revenue here. If all farm areas were equal to this, there would not be an economic problem. The peak substation demand here averages 720 watts per customer.

Our No. 2 Area is a mixed farming district; the farms are farther apart, and it takes three quarters of a mile of line to serve each farm. The revenue per mile of line three years ago was $104 and this last year it was $139, so you can see how far behind the dairy area this is, and how much slower it is developing. This is probably an average district and typical of many on the prairies. The k.w.h. consumption per farm in 1945 was 700 and in 1947 it was 970. Load promotion was also actively conducted by our rural representative in this district, but the results were not as good. The peak demand here averaged 620 watts per customer, as compared with 720 watts in the dairy area, yet the k.w.h. consumption per customer was only about half as great.

In another mixed farming district, Area No. 4 on which we have only one full year's operating experience, we find the figures are just about the same as our No. 2 Area in its first year of operation. In Area No. 5, a straight grain growing district where the farms were large, we had only one customer per mile and naturally the construction costs were much higher, yet the revenues are lower. In the past twelve months the revenue per mile of line was only $77. From this you can judge the variety of conditions existing in the farm areas of the prairies, and the reason we are so concerned with the economic problem.

As regards the Farmer owned Co-Operative arrangement being tried out by the Company Mr. Gale represents, it is not a nice arrangement to have the lines owned by your customer; however, when such lines are a liability, it may be the best solution to this great problem.

[1] Canadian Utilities Limited, Edmonton, Alta.

Wartime Aeronautical Research & Development in Germany

(*Continued from page 632*)

three oblique and one plane shock waves, with remarkably low losses. Another related project was the study of muzzle brakes for guns.

The remaining equipment at K.W.I. was being used for fundamental scientific work. A study of the effects of vertical temperature gradients on laminar air flow was being made in a special convection channel which would have application to meteorological and hydraulic problems. Other studies being carried out, in a special laminar flow tunnel having a glass wall, included boundary layer transition phenomena, and the effect of surface roughness and pressure gradients on skin friction. An open jet wind tunnel was being used to study mixing at jet boundaries and, in another tunnel, the effect of ground topography on surface winds was being investigated.

The interesting Reichardt ultra-low pressure manometer of the piston type (Fig. 42), having a sensitivity of 0.00001 in. of water, was developed here.

(To Be Continued.)

WAITING FOR THE DAYLIGHT

by

F. Cyril James

Principal and Vice-Chancellor, McGill University, Montreal

An address delivered before the Newcomen Society in Montreal, October 21, 1948

The Early Days

More than two centuries have passed since 1710 when Thomas Newcomen of Dartmouth, in that pleasant county of Devon, constructed the "first self-acting steam-engine" in order to pump water out of coal mines, and it must be a matter of sadness to the members of this Society that he died in London before he was able to obtain a patent on his invention.

Those early years of the eighteenth century seem very distant. When Newcomen was making his steam engine, Isaac Watts had just published his book of *Hymns* and Bishop Berkeley was correcting the proofs of his *Principles of Human Knowledge.* The Duke of Marlborough, great ancestor of Mr. Winston Churchill, had defeated French armies in the historic battles of Blenheim, Ramillies, Oudenarde and Malplaquet during the five years before that steam engine was born; and although the British expedition against Port Royal in 1707 had been unsuccessful, the Treaty of Utrecht was soon to give Great Britain its first foothold in Canada. In those older British colonies that are now a part of the United States, the first paper money was issued in New York (and the first post-office opened) in the very year when Thomas Newcomen perfected his engine. Yale College was less than ten years old, and Indian wars were ravaging the Carolinas.

There was no modern plumbing in the stately Blenheim Palace that Vanbrugh soon designed as a gift from the people of England to the victorious Marlborough, and the great Duke, like his Queen, travelled in a springless coach, rather similar to that which had carried Queen Elizabeth, or Julius Caesar. But the Industrial Revolution was already stirring. The demand for iron and steel was growing, and since the forests of England were exhausted and charcoal had become expensive, Newcomen must invent a steam engine to drain the mines in order that coal production could be increased. Necessity, great mother of Invention, was bringing wondrous things to birth.

It is a wise man who can read the signs aright when revolutionary forces begin to operate. The courtiers who attended Queen Anne were not much worried by industrial processes; but two generations later there were many Englishmen, in the reign of George III, who found the Industrial Revolution more important than that other revolution — the War of Independence — which was laying the political foundations of the United States! It was in 1776, a

The Newcomen Society of England was founded in 1920 with the object of fostering research and study of the history of material civilization throughout the world. Because such an objective comes very close to the work and to the hearts of engineers, the Society's membership is built up largely of engineers, physicists and industrialists.

To be invited to speak at a Newcomen dinner is a high honour indeed. At the meeting in Montreal on October 21, 1948, the honour was shared by Dr. Karl T. Compton, president of Massachusetts Institute of Technology, and Dr. F. Cyril James, principal and vice-chancellor of McGill University. Dr. James' address is published here and the Journal hopes to be able to publish Dr. Compton's speech in an early issue.

Permission to publish these Newcomen addresses has been extended by Dr. Charles Penrose, senior vice-president of the Society for North America.

year memorable in the political history of this continent, that a young mechanic at the University of Glasgow (contemporary of James McGill, who founded our University) improved Newcomen's engine to such an extent, by economizing in the use of fuel, that it could be used far away from the coal-pits.

To that idea of Thomas Newcomen, and its successive development by James Watt and many others, the modern world owes its prosperity and comfort. It may be that during the coming years of this atomic age we shall witness even greater changes, but it was the steam engine that freed mankind from the thralldom of the Middle Ages. Steam augmented the strength of the human arm. It multiplied the output of factories and knit the nations of the world together by railways and steamships. If we remember Newcomen as the original begetter of this revolutionary use of power, as we must remember him whenever this Society meets, we should also remember that James Watt, in partnership with Matthew Boulton, laid the foundation of that engineering profession whose development Dr. Compton has so splendidly described.

A Golden Age

To this audience I need not describe the successive stages of the industrial revolution. You are familiar with them. I should like to emphasize the fact, however, that, by the second half of the nineteenth century, the use of power and machinery had enriched mankind beyond the dreams of avarice. The great Exhibition, opened by Albert, Prince Consort, in 1851, seemed to usher in the golden age of mankind. Individual initiative flourished, political democracy was expanding the sphere of its operation, the standard of living of the average family was rising and most men were confident that all things were working out together for good in the best of all possible worlds. Seldom has mankind been as confident, or as prosperous! Although everyone was not *A Man of Property,* you can catch the flavour of the age in Galsworthy's *Forsyte Saga*. On one side of the Atlantic it was reflected in the Diamond Jubilee of Queen Victoria: on the other it inspired the doctrine of "Manifest Destiny" that awaited with enthusiasm the opportunities of the twentieth century.

How distant that daylight seems! As we look backward to the glad confidence of that period, we sometimes feel, perhaps, as one of my friends suggested to me the other day, that the years from McKinley's election in 1896 to the panic of 1907 were the golden age of the modern world. Was there any other period in human history when so many people lived peacefully and prosperously on the face of this earth?

The Gathering Storm

Dark night has fallen on our western civilization since those days. As we look backwards we can see the gathering dusk of rearmament and national antagonism during the years immediately before 1914. Men had thought a major war to be impossible; but war came, and mankind experienced all the misery of Armageddon for four long years. We half expected dawn to break after the victory of 1918; and for a few years we deceived ourselves with confident expectations that there would arise a world "fit for heroes to live in". We realize now that those expectations were ill-founded. Although the phrase "cold war" had not been invented, we experienced the reality of bitter international antagonisms after the financial crash of 1929. The darkness deepened during the 'thirties, and became tenebrous, almost to the point of despair during the bitter years of struggle from which we have just emerged. Even now, three years after the celebrations of victory in Europe and Japan, the dawn has not yet come. In Palestine and in India, men are still fighting bitterly. Assassination, rather than the ballot-box, determines the succession to leadership in those countries while, in Berlin, we are conscious that the "cold war" has reached an intensity which reveals its significance as a determinant of the pattern of human life in our western world for many years to come.

During those years of confident prosperity in the nineteenth century, men delighted to amuse themselves with forecasting the shape of things to come. Jules Verne prophesied the feats of men armed by the steadily growing knowledge of science, indicating more than once that these powers might be turned to illegal and even anti-social purposes. Mr. H. G. Wells took up the theme, and delineated the grim outlines of the society that might develop, while "Saki" enlarged on the potential dangers of national complacency. Yet none of these, I think, would have dared to sketch the kind of reality with which we are familiar today. If any bright young author had attempted to describe the horrors of Belsen or Buchenwald in 1944, or the Siberian slave camps of 1948 (to say nothing of the daily dull routine of the lives of millions of people who live within the nations that create such establishments) a wiser and more urbane publisher would have refused to invest his money in such a book. A voyage to the moon, the depredations of an *Iron Pirate,* or even the conquest of England by Imperial Germany (made ridiculous in its sequel by the patriotism of boy scouts), these things were within the scope of imagination and, to use a phrase that would have annoyed the Edwardians, of "reader-interest". But any factual description of the things that have happened in this generation would have seemed beyond all the bounds of thought.

State or Individual?

Why has the night fallen so deeply? We still possess all the scientific knowledge and technological skill that made the world so fair a place in the times of our grandfathers. Indeed, we have added greatly to their store of knowledge, augmenting the steam engine with electricity, internal combustion, and nowadays atomic energy. Why have we lost their confidence in the continuance of human freedom and prosperity? Why are we trembling in our dreams, afraid that the true dawn of world peace may never come?

Mr. H. G. Wells, in *The Croquet Player,* one of the last of his novels, suggests that we are haunted by the ghosts of Cain and all the ancient malefactors, ghosts that rise from the ground to madden us and visit the penalties of their own crimes upon their descendants. There may be a germ of truth in that idea, if we can convince ourselves that institutions, as well as individuals, can haunt us.

The fundamental basis of nineteenth century optimism was to be found in the combination of steadily increasing human liberty with mounting economic prosperity. The two were inextricably interwoven. That century was singularly free from the menace of imperial megalomania. The menace of Napoleon had been dispelled at Waterloo, and the Duke of Wellington, who had once led Europe to the victory of free peoples, was an old man when he attended the Great Exhibition of 1851. The threat of the young German Empire had not yet begun to develop. Liberalism and democracy were the sunlight of the new day. Despotism seemed to be old-fashioned, and men believed confidently that their new-found freedom was the foundation of a better world. In every corner of the world new constitutions were adopted. Serfdom was abolished in Russia. The Reichstag and the Duma put on the ancient mantle of the Mother of Parliaments.

Today we continue triumphantly our economic march. Our productivity is rising to new heights. But we are terrified at the growing loss of human freedom and fearful that we, too, must be engulfed in the black night of revived slavery. The ghosts of the old totalitarian empires stalk the earth once more, and we face the menace which our ancestors escaped when they sent Napoleon to St. Helena. The modern totalitarian state, whether it be the Italy and Germany of yesteryear or the Soviet Russia of today, is no new invention. It is the direct descendant of that old Roman *Imperium* but it has lost the dignity, the *gravitas,* of the Roman power, so that its grossness and stark brutality stand out the more clearly. Rome, which began as a republic, tried in the Augustan Age to combine liberty with empire. It failed to do so, and the modern inheritors of the old imperial concept have from the outset decided that human liberty must be jettisoned in order that the glory of the state, and its power, may be perpetually enhanced.

Might or Right?

Man's memory of autarchic empire, of ruthless totalitarian government dominating its own people by repression and its neighbours by conquest, stretches back to the early days of the human race, to Hammurabi, in Babylon, when Abraham was young. The succession of empires through Assyrian, Hellenistic, Roman, Caroligian, Spanish, French, German and Italian rulers is continuous to our own day. Soviet Russia is but the latest of the totalitarian powers to seek world dominion. Its ambitions, like its methods, are not new. They are very old. For thousands of years it has seemed to man, caught in the web of military conquest, that Might must sadly be recognized as Right. Power is the final arbitration. Why kick against the pricks? Why not make terms? Why not appease the potential conqueror in order that we of this generation at least may live out our lives in peace, and leave our descendants to solve their own problems?

It is a tenable doctrine, if one has no spiritual courage and no care for posterity. It is the doctrine of the Danegeld, of Munich. But it was not the philosophy of Pitt in the face of Napoleon, or of Abraham Lincoln during the dark days of the Civil War.

Democratic Failures

Three times at least, in the history of mankind, democratic institutions have come to birth. Twice they were blotted out of existence by imperial conquest and gave place to a new imposition of the old despotism. The fate of this third experiment depends upon you and me—the free peoples of the democratic nations.

Of the first attempt to achieve democracy we still know very little, and the archaeological record unfolds slowly. More than six thousand years ago free men lived in independent cities in Mesopotamia, electing their own leaders and governing the community by their joint efforts. We know that when they fell to quarreling among themselves the leaders retained power for life, to hand on to their sons, and democracy was swallowed up in a totalitarian empire that lasted more than two thousand years.

That first attempt failed because men could not live up to the responsibilities of democracy in the face of repeated crises. But there was a second, splendid attempt to create a democratic society in the cities of the Greek Peninsula during the second half of the last millenium before Christ. You know the history of that effort. Its splendour is comprised in the names of Pericles and Solon, Sophocles and Aristophanes, Phidias and Plato. Its tragedy is recorded in the failure to use power wisely, in fratricidal strife among the cities and in the ultimate military conquest of all of them by the Macedonian dictator whose son laid the foundations of the Hellenistic Empire and built the road along which Rome was soon to travel.

Twice in man's history democracy was unable to survive and empire triumphed. On two occasions, free men failed to measure up to the tests, and democracy was followed by long centuries of imperial autarchy. You and I, the free peoples of this generation, must, I repeat, decide whether the third attempt is also doomed to failure.

Can Democracy Survive?

I need not describe the political history of the democracy that we now enjoy. Its roots go deep into English history, but its traditions have been enriched by the peoples of the United States, Canada, France, and many another country. We have a common tradition —a priceless tradition that recognizes the value of the individual and protects his liberties.

We have splendidly defended this tradition during the long months, the long years, of the recent war. But our task is not yet finished. Russia, which has never known nor understood democracy throughout its history, is ambitious for power and world dominion. It is not a conflict between Russia and the Western powers that finds its focus on the airfields around Berlin at this moment. It is a conflict between two philosophies of life. If human liberty is really precious to us, it is no exaggeration to say that the forces of light are engaged in battle with the forces of darkness—and we are waiting for daylight to bring the final triumph of human freedom.

Waiting for the daylight! The simile is apt. But we must do more than wait: we must work. Democracy was not developed by men and women who left things to chance. The record of man's increasing freedom is the story of persistent human struggle, of unending perseverance. The torch is in our hands to carry forward.

If we are alive to our responsibilities, let us first of all take stock of the situation. The outlook is not as black as it sometimes seems. Democracy has not been completely extinguished in any country where it was firmly established before 1914. The autarchy of the Soviets is not much different from the autocracy of the Czars, and Stalin is closer kin to Ivan the Terrible than to Karl Marx. Russian policy today is not greatly different from that with which our grandfathers reckoned. In central and southern Europe, where the Treaty of Versailles carved new nations out of the Empires of Hapsburg and Hohenzollern, democracy was at best a tender plant. The present situation is serious. We have lost the fruit of two or three generations. But it is not hopeless. It is no worse than that which our ancestors successfully confronted, and our task is not an impossible one.

Realizing the fact, we can see clearly the two things that we must do in our generation, if we hope to bring the world closer to that ultimate ideal in which all men and women shall be free. We must strengthen democracy in our own countries, and we must coordinate the efforts of all the democratic nations throughout the world.

Domestically, we sometimes forget the extent to which the pattern of democratic society is changing. We have subscribed to the ancient rule that in times of acute emergency all power and responsibility must be vested in the state, but we have forgotten that democracy is lost if the individual does not again assume his full responsibility as soon as the emergency is past. The pattern of human freedom is diverse, not uniform. It depends upon the wholehearted efforts of every man and woman.

May I read you a short paragraph from the Chancellor Dunning Lecture recently delivered at Queen's University by Dr. T. E. Jessop?

> "We are deserting the voluntary principle and are following the state principle. . . . When a people turns over its problems easily to the state, it is not really shouldering them in a collective way. It is getting rid of troublesome matters by laying them on a small group of men, the government of that day. It deals with them by proxy; in other words, it — the people — does not deal with them at all. At most, it will dip its hands into its pockets to pay in taxation the cost of the solutions, sometimes with surprise and resentment at there being any cost. . . . The trouble with contemporary democracies is that the government has far too much to do and the citizens far too little."

Democracy An Attitude

Do not those sentences shed light upon the present situation in Canada, in the United States of America, in Great Britain? "Democracy is an attitude, not a constitution". How many of us can place our hands on our hearts and testify that we have done all that we could for the educational institutions, the hospitals, the welfare of the afflicted, the efficiency of government — both in our local communities and in the nation of which we are citizens? How much of our time and attention have we given to them? Have we given of our treasure as generously on a voluntary basis for all these things as we shall have to give compulsorily in taxation if they are left to the government? Democracy will be safe in its own countries when each of us consciously assumes his full responsibility, so that these questions can be answered by a great shout of confident initiative — a shout comparable to that which would have answered them in Canada and the United States a hundred years ago.

But our preparation for the day which is now dawning must extend beyond the task of putting our domestic house in order. No country can live to itself. If the democracies of the world do not stand together, democracy must perish under the steady pressure of a dictatorship that, by virtue of its stark ruthlessness and brutal force, is ambitious to undertake the task of world government. Let us remember that twice in human history democracies surrendered to dictatorship rather than cooperate in the task of solving their own problems.

Cooperation Essential

Democracy is a code of human conduct, a philosophy of government, a way of life. The strength of democracy in the world will grow when nations with similar ideals work together wholeheartedly, whether they are bound by treaty or not. The pattern of our association cannot be that tradition of rigid federalism which has characterized the history of the United States. The nations of the world are not ready for a federal constitution—perhaps they never will be ready. But, in the British Commonwealth of Nations we have an alternative pattern. The members are sovereign states, proud of their independence, bound together not by force nor by the meticulous provisions of a treaty, but by a common way of life. The collaboration of Great Britain and France during the nineteenth century, like the friendly relationships between Canada and the United States, proves that this concept can extend beyond the limits of the British Empire, and Winston Churchill is at this moment advocating the same method of cooperation for the nations of Western Europe.

A Challenge to Us

The peoples of the world look to us—the American and Canadian peoples of North America—for leadership. They are waiting for the daylight — many of them despairingly, in such places as Prague and Riga, where they can do little to help themselves. Will we measure up to the challenge? Let us do more than wait. Let us accept the facts of our situation realistically and work for the dawn. Let us make our own democracy more perfect, so that it refutes the ideologies that assail it. If we do that, if we stand together with the other democracies of the world in a common determination to preserve our liberties, there is no force on earth that threatens our welfare. The dawn will come, to usher in a day more gloriously brilliant for all mankind than that nineteenth century dawn to which we now look back.

□ □ □

Campbell River Power Development

by

Kenneth Reid, M.E.I.C.

City Electrical Engineer, City of Victoria, B.C.

On Vancouver Island, one hundred and eighty miles by road north of Victoria, B.C., is Campbell River, the scene of British Columbia's latest power development currently being built by the British Columbia Power Commission.

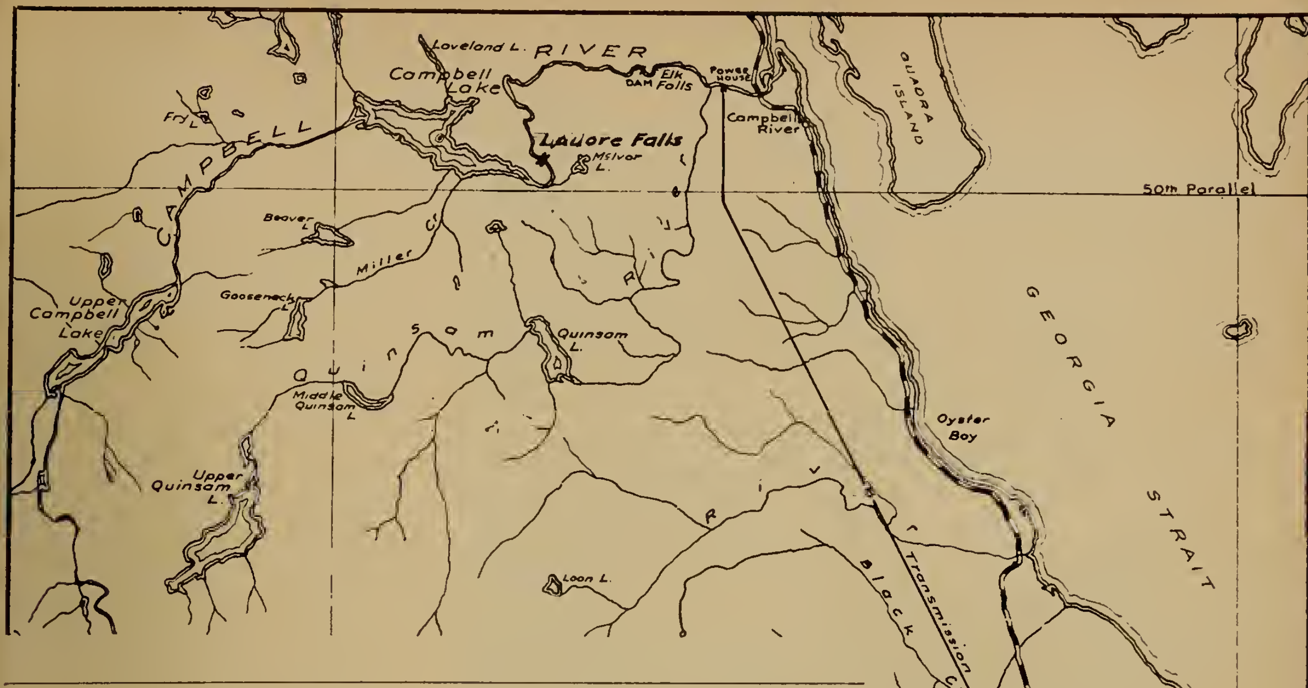
In its final form, the plant will comprise six units of 25,000 hp. each. The first two generators commenced operation on January 11, 1948, and the third and fourth units will be in operation in the near future. The last pair of units will be installed as the load develops. The head is 406 ft.

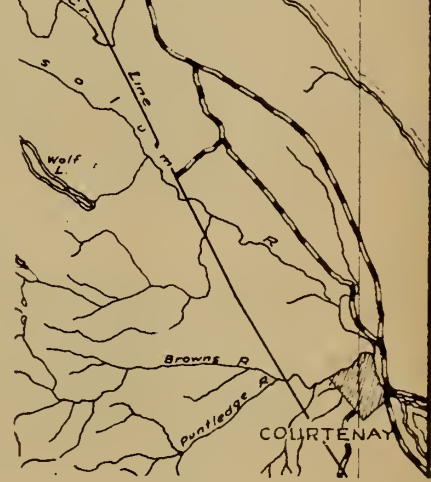
The B.C. Power Commission

The British Columbia Power Commission had its origin in the "Electric Power Act" of March 28, 1945, the purpose of which was the improvement of the supply of electric service to the province. The Commission itself has not unlimited funds available. The government of B.C. advances the capital and the Commission must pay its own way through returns received for electric service on a 40 year amortisation plan.

Of the 65 producers of electric power in B.C., 60 lack adequate generation or distribution capacity and are financially unable to improve their systems. Rates in the province were found to vary from 23 cents per kwh in isolated areas to 2 cents per kwh in metropolitan centres. By June 1947 the Commission had absorbed twelve plants and was operating in fifteen separate areas serving more than 25,000 customers. The equipment or the organization is by no means complete yet. The Campbell River development is the first major source of new power developed by the Commission and it is expected that the plant there will be developing 100,000 hp. by the end of this year. The ultimate capacity of this development is 150,000 hp.

Above, general view of main dam, showing mixing plant, present river channel and new bed of river below sluices.





The Campbell River

The firm of H. G. Acres and Company, consulting engineers of Niagara Falls was retained by the Commission to review all available power resources on Vancouver Island, and to determine and recommend a potential source of power capable of supplying the growing demand. Their report showed that of the six principal sources of power available on Vancouver Island the Campbell River site was outstanding in its suitability for economic development. It is located practically on the transverse centre line of the Island, and from the standpoint of load growth in the north as well as in the south half of the Island, it holds the best strategic position.

Campbell River has its source in the central island group of mountains. Several of the highest peaks lie within or border upon its watershed, which covers an area of 542 square miles. A major portion of the drainage area is within the boundaries of the provincial reserve of Strathcona Park. Draining the snow fields and glaciers of this area the river flows first through Buttle Lake (storage No. 1), which has an area of about twelve square miles. Some ten miles downstream in a northerly direction is upper Campbell Lake (Storage No. 2), and seven or eight miles further downstream again is Lower Campbell Lake (Storage No. 3). From here to the sea, there is a series of sharp descents and rapids, and it is on this stretch that sufficient head may be utilized for a first class water power development.

Leaving Lower Campbell Lake, the river falls some twenty-eight feet in a distance of 4,000 feet, while at Ladore Falls a drop of twenty-two feet occurs. Immediately below Lower Campbell Lake, a head of about 75 ft. can be obtained at Ladore Falls. Below Irene Pool, an enlargement of the river six miles below the Falls, the river flows through a steep canyon, dropping successively through Bear, Moose, Deer, and finally Elk Falls, eventually emerging from this rocky canyon at Trout Pool. The normal drop in gradient at low water from Irene Pool to Trout Pool is some 400 feet. Below Trout Pool the river flows rapidly over a bed of gravel and boulders for a distance of about 2½ miles to Discovery Passage. It is in the area between Irene Pool and Trout Pool that the Campbell River plant is being built.

In June 1947 some sixty members of the Victoria Branch visited the Campbell River Power Development of the British Columbia Power Commission. Mr. Reid submitted this paper shortly afterward but space requirements precluded its publication until the present issue of the Journal. The first two units at Campbell River commenced operation on January 11 of this year and work is nearing completion to enable the third and fourth generators to be put into service. The author gives an account of the objectives of the B.C. Power Commission and its plans for developing the Campbell River as well as details and descriptions of the plant at Irene Pool and Elk Falls.

At the official ceremonies on Dec. 15, 1947, the plant was named "The John Hart Development" after the Premier of British Columbia whose government created the British Columbia Power Commission.

Programme of Development

The development of Campbell River is planned in stages corresponding to the anticipated growth in demand for energy. Stage one, phase one, consists of the construction of head works and intake at Irene Pool, together with a surge tank and a closed conduit of sufficient size to operate two 25,000 hp. units. Stage one also provides for the construction of the first bay of the power house to house one unit, and the installation of this unit. Phase two consists of the completion of the second power house bay and the installation of the second unit. The third and final phase of stage one provides for the construction of the dam at Ladore Falls to raise the level of the waters of Campbell Lake.

In July, 1945, approval was given and work commenced on the first stage. Authorization was given to install the first unit and to complete one circuit of a 132 kv. transmission line from the plant to Nanaimo, a distance of ninety transmission miles, as well as for the provision of a tap-off from Dunsmuir to Alberni and Port Alberni. The plant is designed for further development according to the anticipated requirements of the future, and provision has been made for the installation of other units as required. The capacity of the first unit will be required to supply the Vancouver Island customers of the Commission and other demands, including the new pulp mill now under construction at Port Alberni for Messrs. Bloedel, Stewart and Welsh, Ltd.

Surveys were also made of suitable access roads, and, after careful review of existing wharfage facilities, arrangements were made to construct an unloading wharf with a grid at Duncan Bay, about five miles from the power house site. All materials and equipment required for the project, with the exception of lumber and aggregate, will pass over this wharf. Rail head is at Courtenay, about 32 miles to the south.

The immediate market for power under the Commission's authorized programme consists of the present demand of services formerly operated by the Nanaimo-Duncan Utilities, Ltd., and the new pulp mill at Alberni. As there is a large potential market from other sources on Vancouver Island, it is anticipated that the demand in the first year may exceed the capacity of the first unit. This necessitates, therefore, the completion of the second unit as early as is economically feasible after the completion of the first unit, bringing the total capacity up to 50,000 hp. The Commission would then have two units on which to depend for adequate peak load capacity. This would complete phase two of stage one.

Construction of power house at Trout Pool, showing entrance to two of six turbine units and location of centre penstock and wye.

Structures

Ladore Falls Dam

A detailed description of the project should logically start with the storage dam at Ladore Falls, the structure furthest upstream, and proceed down river to the power house at Trout Pool.

At Ladore Falls a reinforced concrete dam is ultimately to be constructed, the deck elevation of which will be at elevation 589.0. Crest elevation 554 feet. This dam will contain three rectangular sluice or waste gates, together capable of discharging 50,000 c.f.s. The maximum recorded flood is 30,300 c.f.s. Near the base of the dam there will be three 8 ft. diameter regulating valves, electrically controlled from the generating station at Trout Pool.

These valves will be used to discharge water stored in Lower Campbell Lake, and the intakes of the two 8 ft. valves have been designed so that, if it is found desirable at a later date to erect a generating station, the two intakes will be available by removing the valves from the lower ends of the discharge pipes. Sluice gates and regulating valves will be electrically operated by remote control from the generating station. Valve position indications and water levels will be electrically transmitted to the power house by means of Selsyn indicators and lead-covered paired telephone cables.

The work at Ladore Falls will include the removal of about 11,000 cubic yards of rock and the placing of 30,600 cubic yards of concrete. The dam will raise the level of Lower Campbell Lake by about 58 feet, and will produce storage such that a regulated flow of 1800 c.f.s. will be available. Ladore Falls will admit of a later installation of turbines to develop the ultimate flow of 2500 c.f.s., at a head varying from 67 to 125 feet.

The Main Dam

This structure at Irene Pool, is of the concrete gravity type, with wing walls of sealed earth embankments. The dam will be 650 feet long at the crest, with base thicknesses varying from a maximum of 100 feet in the bed of the stream, to 78 feet at the base of the sluice section and 55 feet at the ends of the structure. The high water elevation was established at elevation 459.0 and the horizontal centre line of the turbines in the powerhouse at 56.0 geodetic datum.

Approximately 45,000 cubic yards of concrete will be required for the construction of this dam. Incorporated in it are three sluice gates capable of discharging a flood flow of 50,000 c.f.s., as in the case of the structure to be built later at Ladore Falls. These gates will also be electrically controlled, but for emergency use a gasoline engine-driven alternating current generator will also be installed.

Powerhouse and penstock in foreground. Switching station and operators' cottages at rear.

Inspection Tour of the Work In Progress

At the time of the Victoria Branch visit the head dam at Irene Pool was nearing completion. The various aspects of the dam were of real interest—the interlocking steel piling being driven by steam hammer to bed rock in the earth wings of the dam, the concrete mixing plant and the Rex Pumpcrete machine pumping fresh concrete through a 6 inch pipe line to the waiting forms. Another point of interest was the old B.C. Forest Service bridge, now dwarfed by the huge dam immediately above it. This bridge was built by the Forest Service with the aid of single unemployed men as a relief project in the early thirties. This old bridge across the river will be replaced by a new roadway on the crest of the dam.

Powerhouse, penstock and surge tank.

Intake and Penstocks

The reinforced concrete intake structure is located at a point about 1500 feet beyond the southern end of the dam. This structure is connected to the south end of the dam by means of a sheet pile sealed earth dam. The earth for this dam was obtained from the cut made immediately towards the power house to accommodate the wood stave penstocks. There will ultimately be three penstocks, each 12 ft. in diameter.

Two fixed roller type rectangular intake gates control the discharge into a steel wye, to one leg of which is connected a wood stave conduit. Each gate is 16 feet square. The rollers have self-lubricating bronze bearings, and turn on fixed chrome nickel steel pins, the rollers having slightly crowned faces to take care of gate deflection. To prevent icing, provision is made for the insertion of electric heaters in ducts at and for the full length of the roller paths, if found necessary.

Normally the gate speeds are uniformly controlled by squirrel cage motors so that they close at from 3 to 4 f.p.m. Emergency closure however may be secured by means of push button control from the power house, under which condition the gate will fall of its own weight, the lowering speed being controlled by means of a centrifugal fan mounted on the motor shaft. Under normal opening operation, a gate is raised 6 inches until the water passages are filled. Limit switches are provided to stop the gate at this 6-inch position, also at the full open position. There is a limit switch to stop the gate at the 6-inch position during the lowering operation.

The three sluice gates are of the rectangular roller type, 30 ft. 6 inches square. They have a 33 ft. lift, with individual raising screw hoists. The lifting speed is 2½ feet per minute. Provision is made so that the gates are self-locking in any suspended position, and an electric brake is provided in addition. High torque squirrel cage motors are used with push button controls. Sluice and intake gate positions and water levels are electrically transmitted to the power house similarly to those from Ladore Falls.

From the intake structure, a wood stave penstock extends for two thirds of a mile at a gradient of 3 feet per thousand. Steel cradles set on reinforced concrete bases support the pipe. Owing to an abrupt drop in grade of approximately 185 feet, water is conducted for the remaining half mile distance to the power house in a 12-inch steel pipe. This pipe terminates in a steel wye on the upstream side of the power house. It is of welded construction supported on cradles similar to those used for the wood stave penstock.

Over 390,000 cubic yards of earth and 40,000 cubic yards of rock were excavated in the preparation of the penstock and pipe line courses.

During the Victoria Branch visit, it was noted with interest that the details of the intake section, penstocks and head-gates of the six main intakes were designed by D. H. R. Blake, S.E.I.C., a student engineer with the Vancouver Engineering Works Ltd., and son of J. H. Blake, mechanical engineer of the B.C. Forest Service and member of the Victoria Branch who accompanied the party.

Surge Tank

To provide for pressure changes in the pipe line and penstock, a differential surge tank is erected near the power house. This structure is over 300 feet in height, and since its base is at elevation 200, or about 100 feet above the power house roof, it is an imposing affair in appearance. Surge tanks for the first and third pipes will be offset, as there will not be sufficient space directly over the pipes. The second pipe is presently being installed.

The Power House

The power house is of substantial construction, with concrete substructure, steel frame and concrete wall superstructure with pre-cast slab roof. As each bay of the power house is completed, a certain amount of foundation work will be carried on in the next succeeding bay or bays. The amount of such work will depend on the unwatering problems of the power house site as a whole.

Turbines

The two arms of the wye terminate with hydraulically operated butterfly valves. Each arm is connected to a Francis vertical type reaction turbine. These turbines, of which there will ultimately be six, are rated at 28,000 h.p. each at 327.3 r.p.m. The runners are of steel, cast in one piece. The back of each runner vane is faced with stainless steel. The water passages at the entrance to the runner are renewable, wearing plates being secured to the lower face of

(Continued on page 654)

View of main dam. Irene Pool in background. Old B.C. Forest Service Bridge in foreground.

Discussion of

PRAIRIE WATER PROBLEMS

These discussions were not published with the papers in the September issue of the *Journal* because of space restrictions and because some of them were not available at the time. The subject is of importance not only to engineers but to Canadians everywhere and further comment is invited — for publication or for consideration by the Institute's Committee on Prairie Water Problems.

C. E. Webb, M.E.I.C.[1]

In his paper "The Water Resources of Alberta" (*Eng Journal*, Sept. 1948) Mr. Ben Russell has outlined concisely the present overall water supply situation in the province of Alberta. Compared to Manitoba, whose water problems were explained by Mr. D. M. Stephens, Alberta appears to be more favoured in this respect.

The author has summarized the pertinent water legislation of the province, outlining the various Dominion and Provincial acts governing the use of the water resources. The classification of surface waters and the delineation of principal drainage areas are helpful in considering the remainder of the paper which, like Mr. Stephens' paper, leads one to the conclusion that co-ordinated planning of the water resources of the Prairie Provinces as a unit is becoming increasingly essential.

It is apparent that such a coordinated plan would require the distribution of the available water supply in such a manner that no one essential use of water would be expanded at the expense of another equally essential use. In other words, the use of water directly for irrigation, and for power production to be used in pumping water for irrigation, cannot be extended indefinitely at the expense of production of electrical energy for other uses—or vice versa. Saskatchewan and Manitoba are deficient in other forms of fuel which enhances the value of hydro-electric power for industrial and domestic use.

An Inter-provincial Committee with adequate technical representation thereon appears essential to administer the overall allocation of water resources of the three Prairie Provinces. No comprehensive plan of optimum development can be worked out without careful consideration by such a committee of the most economic uses of the water available.

Mr. Stephens has presented a thought-provoking paper (The Saskatchewan River and Manitoba's Water Problem,, — *Eng. Journal*, Sept. 1948). Due to their location in a region of deficient water supply, the three Prairie Provinces must be vitally interested in seeing that the supply available to them is utilized to the optimum advantage for all concerned. Manitoba is probably the worst situated of these three provinces, in that its principal water supply is from a river system which has already traversed much of the area of two "dry" provinces. This condition, combined with Manitoba's flat terrain, suggests that the time is at hand for co-ordinated planning of the water resources of the Prairie Provinces, on the basis of the greatest benefits to the local and national economies.

Such a procedure appears to require a radical departure from the principle that each province should administer its own water rights. However, the parallel to the problem of transboundary waters between the United States and Canada is obvious. This problem led to the Boundary Water Treaty of 1909 and the organizing of the International Joint Commission. It is apparent that the organization of a form of Interprovincial Joint Board or Commission composed largely of technical personnel would be highly desirable to administer the overall allocation of available water to these three provinces, having in mind its most advantageous use. Allocation of water within each province could continue to be handled by the appropriate provincial authorities.

F. R. Burfield, M.E.I.C.[2]

I think that anyone unfamiliar with the subject, who listened to the Prairie Water Problems papers and discussion would get the impression that the granting of water rights had been in a chaotic condition since the transfer of the natural resources from the Dominion to the provinces of Alberta and Saskatchewan in 1930. This is not the case.

Granting of water rights in the two provinces has actually continued in the same manner since 1930 as it did before. Each province has respected the other's grants, and no stream crossing the boundary has been over-appropriated by one at the expense of existing rights in the other. This is the system to which lip service has been paid by several speakers, and then repudiated by statements of what they thought should be done.

If the function of a Water Board will be to apportion the water mathematically between the provinces then, in my opinion, its institution is a retrograde step. A mathematical division may be necessary between sovereign governments such as Canada and the U.S.A., but between provinces, readiness to make beneficial use of the water should be the requirement for obtaining a right to it.

Actually what is to be apportioned is not water but Dominion government aid. At the present time the cost of construction of irrigation undertakings is not borne by the operators—it is borne in very large part by the Dominion Government. There may be good political, even statesmanlike, reasons why federal aid should not be given entirely to one province even

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[2] Chief Engineer, Water Resources Branch, Alberta Government, Edmonton.

though the best or cheapest irrigation may be concentrated there. The practical result is that division of water is necessarily subservient to division of federal aid. This will be decided by politicians not by a water board.

The lower courses of the Saskatchewan and the Nelson lie in that part of the North-West Territories added to Manitoba in 1912. Water administration was retained by the Dominion; perhaps it still is. There are no records of any water rights having been granted up to 1930.

Mr. Stephens' plea for floods to continue is something almost unique. We engineers are inclined to think that anything we can do to iron out river fluctuations is so much gained. I personally, have been somewhat concerned about the tendency of irrigation interests to take the last drop out of the streams at low stages but to let the floods go on.

In spite of reservoirs and re-afforestation, I expect this to continue. That is to say, the disparity between flood and low stages will increase. The whole cycle will be on a lower absolute plane so that the agricultural and hay lands in Manitoba will creep down on the fur farming lands, which in turn will encroach on the duck and fish areas. This would seem to be a gain rather than a loss.

Mr. Stephens' study of the economic effects of diverting 4,207,000 acre-feet of water from the Saskatchewan River provokes some rather fascinating speculations. He values the water power lost at between $19 and $25 millions per annum. If that water were used to irrigate 2,539,000 acres of sugar beets, the farmers would get four hundred million dollars for one year's crop at present prices. Of course irrigating two and a half million acres of sugar beets is a fanciful idea, but so at present is the utilization of two million horsepower on the Nelson River. If we take a reasonable figure of $20.00 per acre per annum as the increased value of crops due to irrigation we arrive at $50,000,000 or about twice the value of the water power.

In an earlier part of his paper Mr. Stephens stresses the economic value of storage in Manitoba's lake basins. I do not want to deprecate the value of lakes but, when we are discussing the economic value of water and turning it into dollars and cents, we should not lose sight of the fact that the evaporation from the 13,303 square miles in the three big Manitoba lakes must be more than three times as much as the suggested four million acre-feet for irrigation.

I think that some parts of Mr. Stanley's paper rather ignore the fact that the irrigation interests have definite property rights in the waters of the Bow River. These are based on a system of priority and the Dominion Irrigation Act specified that licenses were to be numbered as applications were received, and each licensee would be entitled to receive the whole of the supply to which his license entitled him before any licensee whose license bears a higher number has any claim to a supply.

To require the old licensees to fill their reservoirs at such times as it is convenient to the power interests to empty theirs is about the same as taking land without compensation. This is not by any means a theoretical question; the irrigation licensees need the short periods of open weather when they do not have to deliver water, to do repair work on their canals. If winter operation of canals is possible, hydro-electric power might be developed that way, rather than requiring irrigation canals to be so used.

Planning sounds like an excellent idea, and it would be that, if planners were gifted with wisdom above their fellows. Unfortunately, experience would indicate that they are not. The collective wisdom of the people backing their judgment with their own wealth seems to show more foresight than the planners.

A. E. Palmer[3]

I fully agree with Mr. Burfield that the water of the Saskatchewan River System cannot, at this stage, be intelligently apportioned to the various Provinces simply because no one is wise enough to foresee the best future use for these waters. Undoubtedly, the proper method would be to study each application for water diversion in the light of the knowledge existing at the time.

It would seem advisable to make a detailed study of the possibilities of diverting water from the Churchill River System into the Saskatchewan to supply part of Manitoba's needs.

[3] Superintendent, Dominion Experimental Station, Lethbridge.

T. D. Stanley, M.E.I.C.[4]

As I am personally interested in the use of water for power, which does not deplete the total flow of the rivers, I will not comment on Mr. Burfield's discussion on the division of waters between the Provinces. However, I feel that in his reference to my paper he is taking a very extreme view of the situation. It is not a matter of ignoring the fact that irrigation interests have been set up, nor is it a case of operating power reservoirs for the convenience of the power interests. It is a matter of so handling the available water, which in total is not depleted by its use for hydro plants, in such a manner that the maximum possible benefit may be obtained for all. If, in order to do this, it is necessary to operate irrigation canals at seasons of the year other than those that have been customary in the past, I think it only right that this should be done. If, by changing the times at which water is put into storage, more beneficial use may be made of the total water available, then I believe such changes should be made.

In regard to operating hydro-electric power canals in the wintertime, I would like to point out that the Cascade Development includes a two and one-half mile canal, and the proposed Spray Lakes Development will include a much longer canal. Information is being gathered on the possibilities of using power canals in the winter time on other proposed developments. At certain seasons of the year when it is possible to operate canals, more water is available from hydro storage than is normally available in the river, and peak flows which would otherwise be passed by the irrigation projects are stored for use at a more opportune time.

Ben Russell, M.E.I.C.[5]

If Mr. Burfield is correct that the papers presented give the impression that the granting of water rights is in a chaotic condition, this is very unfortunate because such is not the case. However, I cannot recall anything in the papers which might create such an impression. As more and more appropriations are made in the respec-

[4] Production Superintendent, Calgary Power Ltd., Calgary, Alta.

[5] Director of Water Resources, Province of Alberta, Edmonton, Alta.

tive Provinces, particularly for large diversions for irrigation, it is natural to expect that some conflict of interests will arise. It is my opinion that such conflict can be largely avoided by a Water Board appointed at this time.

I do not think the function of the Board should or will be to apportion water by some rule as suspected by Mr. Burfield, but rather in the best interests of the drainage basins as a whole. I would hope that the Board in its recommendations would give consideration mainly to the most economical and beneficial uses of the waters to be appropriated. If, however, there should be a tendency in the allocation of funds, to distribute such funds by Provinces rather than by projects, then I think the Water Board would at least have the effect of curbing any such tendencies. A Board composed mostly of those who have to do with the actual administration of streams should be most competent to judge the merits or demerits of the respective projects and I believe that the recommendations of such a Board will be respected by the Governments.

I would not interpret anything in Mr. Stephens' paper to suggest opposition to stream regulation and I think it quite natural that the Manitoba officials should become a little apprehensive as to Manitoba's position, partly because it is at the lower end of the streams and partly because of the publicity which has been given to a number of large diversions proposed in Alberta and Saskatchewan. I am quite sure, however, that while Mr. Stephens in his paper endeavoured to make sure that Manitoba's interests would not be overlooked, he did not intend to make a plea for the continuation of floods.

With regard to the economics of the various uses of the waters, whether for irrigation, power, or any other purpose, I think this can be safely left to the Water Board and I do not think that any speculation as to the future uses of the streams should be too fanciful for the consideration of the Board.

I cannot see the point in referring to the huge water losses in the three big lakes in Manitoba. These lakes have always been there and I do not think anybody would suggest that we should dry them up in order to avoid losses. I think we will have to recognize that any depletion of the streams in Alberta and Saskatchewan will decrease the power production possibilities of the Nelson River. It will, therefore be necessary for the Board to endeavour to assess the respective values of the water, whether for irrigation in Alberta or Saskatchewan, or for water power purposes in Manitoba.

I am not sure just what part of Mr. Stanley's paper is referred to by Mr. Burfield, but whether or not the paper can be interpreted as suggested by Mr. Burfield there will be no conflict between irrigation and water power interests on the Bow River under the presently proposed plans of development.

With regard to the last paragraph of Mr. Burfield's discussion, it is my opinion that some planning is advisable even in a democratic country. Even if it is true that the collective wisdom of the people is more reliable than the planners, some planning is necessary for the consideration and judgment of the people or their respective Governments.

Discussion of RECENT CANADIAN RADAR

J. L. Rannie, M.E.I.C.[1]

Mr. B. G. Ballard, M.E.I.C., in his informative article **Recent Canadian Radar**, *(The Engineering Journal, July, 1948)* gives a few highlights on the development of radar research and a description of some of the electronic equipment used on this type of work. He outlines several applications of these new developments to surveying and other technical fields.

Shoran, a development of radar, has been attracting the attention of geodesists and photogrammatrists both in Europe and North America during the last few years. It may be of interest to enlarge on its application to the geodetic problem of providing accurately positioned points for the control of mapping and other engineering projects in the huge area of Northern Canada in which geodetic triangulation has not yet been carried out.

By the use of Shoran principles the distance between points on the earth's surface from 100 to 350 miles apart have been measured with a precision approaching that of second-order triangulation. A network of triangulation may be laid down, the lengths of the triangle sides measured by Shoran, and the angles of the triangles and the geographical positions of the stations can then be calculated. This is the reverse of ordinary triangulation methods in which the angles are measured and the lengths of the sides calculated. The precision of Shoran measurements to date has been of the order of 1 part in 25,000 or better. Further research can doubtless provide a higher degree of precision.

As indicated by Mr. Ballard, the Shoran method depends primarily on the extremely accurate measurement of the interval of time required for a radio signal to pass from one point to another and return. As the speed of propagation of radio waves is approximately equivalent to that of light, 186,000 miles per second, the time intervals involved in measuring distances of several hundred miles are of the order of one or two thousandths of a second. The unit of time measurement adopted for position fixation work is the microsecond, equal to 1/1,000,000 of a second of time, corresponding approximately to a linear distance of 1,000 feet on the earth's surface.

As the allowable error in distance measurements on second-order geodetic triangulation lines is of the order of 1/40,000 (about 13 feet in 100 miles) it follows that the time intervals must be determined to a small fraction of a microsecond if the Shoran method is to measure distances as accurately as geodetic triangulation. Recent comparisons of Shoran measurements with distances determined by primary geodetic triangulation indicate that there may be a more or less accidental error of 20 or more feet irrespective of the length of the line. For this reason, Shoran is not suitable for the *really accurate* measurement of very short distances.

[1] Dominion Geodesist, Geodetic Survey of Canada, Ottawa.

The actual measurements of the time intervals are made electronically. On instruments of recent design, the measured distances to stations may be read directly in miles and fractions of a mile on illuminated rotary dials. During the reading of the dials, the instrument must be kept carefully adjusted by aligning visually the traces of the form of the incoming radio waves with a stationary zero mark on the face of a cathode ray tube.

The most accurate method of length determination is the "line-crossing" method. Shoran ground equipment is set up at the ends of the line to be measured. Another instrument is installed in a plane which flies back and forth across the line near the midway point. The Shoran transmitters are tuned to such high frequencies that the emitted pulses have quasi-optical characteristics; for this reason there must be an unobstructed path between the plane and the ground stations; for 300-mile lines the plane may have to fly at a height of 10,000 to 15,000 feet to secure this necessary condition. Each time the plane approaches the line, a movie camera is set in operation to record the dial readings showing the distances to the ground stations, together with the readings of various accessory instruments. As the plane approaches the line-crossing, the sum of the distances from the plane to the ground stations, as indicated by the dial readings, decreases in value until a minimum is reached when the plane is directly over the line. After crossing the line, the sum of the dial readings increases in value.

The photographic film record of the dial readings is used in a mathematical analysis to determine the accurate value of the minimum distance between the ground stations. To the distances thus derived, corrections must be applied for variations in the meteorological conditions which affect the speed of propagation of the radio waves; other corrections are applied for elevation of the plane and ground stations above sea level. Twenty or more line-crossings are made to reduce as far as possible the above mentioned accidental errors of measurement.

When the sides of all the triangles involved in a Shoran triangulation scheme have been measured, it is found that the measured lengths will not exactly satisfy certain mathematical conditions involved in the geometrical figures constituting the net. A mathematical adjustment of all the measured lengths is then made, so that the errors of measurement may be reduced to a minimum and all the geometrical conditions satisfied. When the adjusted lengths are determined, the angles of the triangles and the geographical positions of the stations are computed. Various methods are available for making the above adjustments and calculations.

As in standard triangulation, so in Shoran, it is essential that more lines be measured than the minimum required to calculate preliminary positions of Shoran triangulation stations. A series of simple triangles is the minimum. The more surplus lines measured, the more reliable will be the lengths derived from the adjustment of the measured length data mentioned above.

Shoran triangulation with 100 to 300-mile sides is particularly adapted to the development of northern Canada in a short time. Standard triangulation has been confined to the settled areas of southern Canada, and its extension to the huge northern areas would take many years, owing to the short summer season, difficulties of transport and short triangulation sides averaging 20 miles in length. Shoran appears to be one of the answers to the need of early development.

The Shoran method has another decided advantage — clear weather is not essential, and cloudy or hazy weather offers little handicap. Indeed the original Shoran apparatus was developed during the war for precision bombing from high over the overcast. In this case remote control points were employed whose distances from the target were pre-calculated. When a point was reached such that these pre-calculated distances were indicated on the dials, the bombs were released (with very satisfactory results, it is said). Obviously the reverse of this technique has had an application to aerial photography, using the dial distances from remote control points to indicate the positions of the photographic plane.

It must not be inferred, however, that Shoran can replace the standard methods of triangulation. For ground control for large-scale mapping and for the development of engineering projects where high accuracy is required, standard triangulation remains unsurpassed. Standard triangulation will also be required to "fill in" ground control between widely-spaced Shoran stations where more dense control is required.

FROM MONTH TO MONTH

News of the Institute and other Societies, Comments and Correspondence, Elections and Transfers

The Sixty-third 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 1949 will be convened at Headquarters at eight o'clock p.m. on Thursday, January 27th, 1949, 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 Chateau Frontenac, Quebec City, on Wednesday, May 11, 1949, at 8:15 o'clock p.m.

International Conference of Engineers

Recently a conference was held in London at the invitation of The Institution of Civil Engineers, The Institution of Mechanical Engineers and The Institution of Electrical Engineers, with representatives of the following engineering institutions:—

Belgium — Société Royale Belge des Ingénieurs et des Industriels.

Denmark — Dansk Ingenirforeningen.

France — Société des Ingénieurs Civils de France.

Holland — Koninklijk Instituut van Ingenieurs.

Norway — Den Norske Ingeniorforening.

Sweden — Svenska Teknologföreningen.

Switzerland — Schweizerischer Ingenieur und Architekten-Verein.

United States of America — Engineers Joint Council:—

American Society of Civil Engineers.

American Institution of Mining and Metallurgical Engineers.

American Society of Mechanical Engineers.

American Institute of Electrical Engineers.

American Institute of Chemical Engineers.

Great Britain —

Institution of Civil Engineers.

Institution of Mechanical Engineers.

Institution of Electrical Engineers.

By prior arrangement, the Institute and other Professional Societies in the British Commonwealth were represented at the conference by the three British Institutions.

The Conference considered various questions concerned with the operation and policy of their Institutions and how, by developing more intimate collaboration and an exchange of facilities and information, they could more effectively accomplish the purposes for which they were founded.

Early reports indicate that the Conference was a great success. It is hoped that eventually the conclusions of the meetings may be published in the *Journal.*

Engineers and Senators

A report on the recent ballot for election to the Senate of the University of Toronto reveals that several members of the Institute have been successful candidates for representation of the Faculty of Applied Science and Engineering. These are R. L. Dobbin, Peterborough; J. S. Galbraith, Midland; T. H. Hogg, Toronto; J. C. Keith, Windsor; H. W. Tate, Toronto, and J. J. Traill, Toronto. The two other successful candidates are M. B. Hastings and E. J. Tyrell.

The *Journal* is happy to congratulate all these gentlemen and to express its appreciation of their work on behalf of the profession.

Meetings of Other Societies

Construction executives from all parts of Canada will convene at the Royal York Hotel, Toronto, commencing January 23rd, 1949, and continuing through to the 26th, when the *Canadian Construction Association* will hold its 31st Annual Meeting.

Construction leaders will direct attention to labour and material shortages, construction costs, low-cost housing, management efficiency, new techniques, immigration, labour relations, apprenticeship, building research, road building and public projects planning.

Headquarters of the Association are at the Ottawa Electric Bldg., Ottawa, Ont.

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
McMaster University.	1st	17															17
Dalhousie University.	1st	33 (3)															33 (3)
	2nd	47 (20)															47 (20)
	3rd	86 (55)															86 (55)
Total		166 (78)															166 (78)
Saint Mary's College, Halifax.	1st	25															25
	2nd	11															11
	3rd	8															8
Total		44 (3)															44 (3)
St. Francis Xavier.	1st	65 (10)															65 (10)
	2nd	75 (19)															75 (19)
	3rd	70 (31)															70 (31)
Total		210 (60)															210 (60)
N.S. Tech. College.	3rd					24 (14)	62 (32)	40 (23)					74 (42)		14 (13)		214 (124)
	4th					8 (3)	41 (14)	30 (8)					50 (21)		12 (9)		141 (55)*
Total						32 (17)	103 (46)	70 (31)					124 (63)		26 (22)		355 (179)
Acadia University.	1st	37 (1)															37 (1)
	2nd	33 (19)															33 (19)
	3rd	51 (35)															51 (35)
Total		121 (55)															121 (55)
Mount Allison University.	1st	32															32
	2nd	53															53
	3rd	60															60
Total		145 (41)															145 (41)
University of New Brunswick.	1st						43 (5)	40 (6)									83 (11)
	2nd						50 (23)	39 (20)									89 (43)
	3rd						92 (60)	84 (46)									176 (106)
	4th						67 (50)	59 (41)									126 (91)*
Total							252 (138)	222 (113)									474 (251)
Laval University, Quebec.	1st	81 (4)															81 (4)
	2nd					13 (4)	26 (1)	27 (4)				7 (3)	6 (3)	2	7		88 (15)
	3rd					13 (2)		26 (3)				1		2	10 (2)		52 (7)
	4th					10 (1)		13				4		2	6 (1)		35 (2)*
Total		81 (4)				36 (7)	26 (1)	66 (7)				12 (3)	6 (3)	6	23 (3)		256 (28)
Ecole Polytechnique	1st	131 (3)															131 (3)
	2nd	103 (8)															103 (8)
	3rd	85 (13)															85 (13)
	4th					6	45 (1)			21(2)					6		78 (3)
	5th					4	26 (1)			29(1)					6		65 (2)*
Total		319 (24)				10	71 (2)			50(3)					12		462 (29)
McGill	1st	227 (74)															227 (74)
	2nd					64 (41)	56 (36)	68 (51)					100 (70)	13 (10)	19 (13)	27 (13)	347 (234)
	3rd					78 (52)	103 (68)	135 (109)					175 (136)	17 (11)	23 (21)	16 (11)	547 (408)
	4th					54 (30)	79 (46)	54 (37)					101 (67)	11 (7)	8 (8)	11 (8)	318 (203)*
Total		227 (74)				196(123)	238 (150)	257 (197)					376 (273)	41 (28)	50 (42)	54 (32)	1439 (919)
Ottawa University.	1st	28 (5)															28 (5)
	2nd					2 (2)	3 (1)	7 (2)				2	3	1	1		19 (5)
Total		28 (5)				2 (2)	3 (1)	7 (2)				2	3	1	1		47 (10)
Carlton College.	1st	38 (8)															38 (8)
	2nd	30 (19)															30 (19)
Total		68 (27)															68 (27)
Queen's University.	1st	230 (57)															230 (57)
	2nd	312 (153)															312 (153)
	3rd					56 (35)	46 (39)	70 (54)				12 (10)	61 (50)	18 (17)	17 (15)	18 (7)	298 (227)
	4th					46 (33)	53 (41)	63 (46)				16 (12)	95 (77)	20 (18)	21 (20)	29 (18)	343(265)†*
Total		542 (210)				102 (68)	99 (80)	133 (100)				28 (22)	156 (127)	38 (35)	38 (35)	47 (25)	1183 (702)
Toronto	1st		23 (8)		5 (0)	91 (18)	95 (26)	85 (32)	51 (18)			14 (5)	94 (43)	13 (6)	15 (5)	37 (4)	523 (165)
	2nd		35 (26)		11 (7)	124 (71)	182 (119)	182 (138)	84 (50)			31 (18)	232 (173)	21 (20)	23 (16)	48 (27)	973 (665)
	3rd		65 (49)		8 (4)	168(111)	166 (118)	208 (181)	87 (62)			32 (25)	275 (216)	40 (30)	32 (23)	86 (58)	1167 (877)
	4th		55 (47)		11(11)	150(106)	158 (126)	220 (181)	97 (85)			46 (41)	232 (188)	33 (27)	51 (45)	79 (56)	1132 (913)*
Total			178(130)		35(22)	533(306)	601 (389)	695 (532)	319(215)			123(89)	833 (620)	107 (83)	121 (89)	250(145)	3795(2620)
Manitoba	1st	143 (31)															143 (31)
	2nd	152 (92)															152 (92)
	3rd						75 (43)	115 (88)					80 (56)				270 (187)
	4th						61 (37)	90 (58)					55 (32)				206 (127)*
Total		295 (123)					136 (80)	205 (146)					135 (88)				771 (437)

*Indicates those graduating in 1949—Total 3,309 (2,281).

†Includes 1949 grads (210) and grads of special summer session, Oct. 1948 (133).

NOTE—The figures shown in brackets indicate, in each case, the number of veterans included in the figure immediately preceding.

REGISTRATION IN ENGINEERING AT CANADIAN UNIVERSITIES—Continued

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	170 (12)	.....	....	....	....	....	....	......	...	.....	......	....	......	......	......	170 (12)
	2nd	112 (24)	......	....	....	14	....	....	......	...	.....	......	....	......	......	13 (4)	139 (28)
	3rd	....	......	24(12)	7 (5)	23 (14)	52 (32)	49 (35)	......	...	.....	12 (6)	85 (54)	......	......	20 (10)	272 (168)
	4th	....	......	40(26)	16 (8)	31 (15)	54 (33)	59 (43)	......	...	.....	31 (28)	108 (66)	......	......	22 (15)	361 (234)*
Total.......	....	282 (36)	......	64(38)	23(13)	68 (29)	106 (65)	108 (78)	......	...	.....	43 (34)	193 (120)	......	......	55 (29)	942 (442)
Alberta.	1st	176 (40)	......	....	....	....	....	....	......	...	.....	......	....	......	......	......	176 (40)
	2nd	....	......	....	....	80 (44)	49 (26)	61 (38)	......	...	.....	......	....	......	21 (14)	......	211 (122)
	3rd	....	......	....	....	84 (65)	90 (68)	83 (63)	......	...	.....	......	....	......	37 (31)	10 (5)	304 (232)
	4th	....	......	....	....	58 (46)	62 (49)	54 (46)	......	...	.....	......	....	......	52 (45)	10 (7)	236 (193)*
Total.......	....	176 (40)	......	....	....	222(155)	201 (143)	198 (147)	......	...	.....	......	....	......	110 (90)	20 (12)	927 (587)
British Columbia.	1st	265 (72)	......	....	....	....	....	....	......	...	12 (2)	......	....	......	......	......	277 (74)
	2nd	428 (226)	......	....	....	....	....	....	......	...	27(16)	......	....	......	......	......	455 (242)
	3rd	....	......	11 (8)	....	78 (45)	98 (71)	114 (77)	......	...	22(18)	36 (25)	140 (100)	24 (19)	33 (24)	7 (4)	563 (391)
	4th	....	......	11 (9)	....	40 (25)	63 (35)	63 (38)	......	...	22(15)	20 (10)	82 (45)	16 (8)	14 (7)	15 (4)	346 (196)*
Total.....:	....	693 (298)	......	22(17)	....	118 (70)	161 (106)	177 (115)	......	...	83(51)	56 (35)	222 (145)	40 (27)	47 (31)	22 (8)	1641 (903)
Grand Total	....	3414 (1078)	178(130)	86(55)	58(35)	1319(777)	1997(1201)	2138(1468)	319(215)	50([illegible])	83(51)	264(183)	2048(1439)	233(173)	428(312)	448(251)	13063 (7371)

*Indicates those graduating in 194~~8~~9—Total ~~1,736~~. 3311 ‡Alberta includes Petroleum Engineering, 2nd Year 27 (18), 3rd Year 18 (15).
†Alberta includes Irrigation Engineering, 3rd Year 3 (2).
NOTE—The figures shown in brackets indicate, in each case, the number of veterans included in the figure immediately preceding.

This tabulation has for some years been a feature of the December *Journal* and has a particular value in this period of intense activity in all spheres of engineering. It will indicate to employers of engineers the prospects of finding the engineers they require in the next few years and it will guide the prospective engineering graduates in determining how keen may be the competition for engineering jobs if the present intense activity should slacken.

Last year's table indicated that the peak of veteran enrolment had been reached. The figures this year show a definite decline in this category. As expected new veteran enrolment in first year is down considerably in every university although non-veteran registration continues at a high level. There does not appear to be much variation in the popularity of the various branches of engineering.

The normal reduction in numbers is evident from year to year which would seem to indicate that the universities are continuing to maintain high standards of scholarship.

World Power Conference Statistics

The Fourth Statistical Year Book of the World Power Conference has been released recently. It is reviewed elsewhere in this *Journal* (page 663). Persons interested in securing a copy may do so through the Engineering Institute at 2050 Mansfield Street, Montreal 2. The price is $9.50 including postage and exchange on your cheque.

This is the first book to be issued since 1936 and therefore contains figures for eleven years.

There will be some very interesting discussions at the 1949 Annual Meeting. Here are some of the subjects:

Mechanization of Woods Operations
Electronic Control of Paper Machines
The Aluminum Bridge at Arvida
Quebec's Iron and Titanium Developments
Television
Management

● ***The dates are* MAY 11-13 . . . *at the***
CHATEAU FRONTENAC, QUEBEC

Campbell River Power Development

(*Continued from page 646*)

the head cover, and to the upper face of the lower distributor ring.

The gate operating mechanism is protected by shearing pins from possible damage due to the entrance of foreign objects. Woodward governors are used, having a safety shutdown device capable of moving the gates through full travel in three seconds.

Generators

The generators are 3-phase, 60-cycle, 13,200-volts, rated at 25,000 kva. at 0.8 power factor. They are of the three-bearing type, with top thrust bearing and direct connected main and pilot exciters. There is no switching at generator voltage other than that required for the station and local services. Each generator is self-ventilating and uses approximately 50,000 cubic feet of air per minute for ventilation at full load.

Transmission Line

The three phase transmission line is of the loop or closed circuit design, so protected that if trouble occurs in one section it will isolate itself and continue to supply electricity into the other sections not affected. The conductors of the transmission line are seven eighths of an inch in diameter, with twenty strands of aluminum and a sixteen-stranded steel core.

There are approximately 650 towers in the line, spaced about six per mile. These are 85 feet in height, and for erection purposes, the ruling span was 1,000 feet for the Alberni tap, and 1,200 feet for the main line. The longest span is 2,200 feet over the Qualicum River. All changes in direction above 9 deg. are turned on dead end structures.

The towers are of earth grillage footing type, the base of each leg terminating in a galvanized grid about five feet square, set to lie parallel to the surface grade, and at a depth of 8 feet. Galvanizing complies with the standard 6 dip test. The total weight of steel is just under 6 million lb., the average weight of the standard 85-ft. tower being 8,300 lb., and of the anchor tower, 16,800 lb.

The tower line is located along the centre of a 90 ft. right of way, completely cleared. In addition, any trees outside the right of way, which, in falling, could endanger the line, have been removed. There were 30,800 of such trees to be disposed of and anyone with knowledge of the size of Vancouver Island trees will appreciate what this meant.

Substations

As stated earlier, there are two substations, one each at Alberni and Nanaimo. At Alberni, the design provides for two banks, each comprising three single phase transformers. The initial capacity is 15,000 kva. A distribution switchboard of several panels is installed at this station, and, in designing the building for its enclosure, it was deemed advisable to provide space for an indoor type synchronous condenser.

At Nanaimo, no local distribution will be required, and this station will step the voltage down to 60 kv. the voltage of the existing transmission lines in the Nanaimo Area. The transformer capacity at Nanaimo is 15,000 ka. in three single phase units.

Acknowledgements

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J. B. Curran, reporter, Nanaimo Free Press, Nanaimo.

Personals

Notes of the Personal Activities of Members of the Institute

Professor J. J. O'Neill, M.E.I.C., dean of faculty of engineering at McGill University, Montreal, has been appointed vice-principal of the University. The vice-principal is to assist Dr. F. Cyril James, principal and vice-chancellor, in the general academic work of the University and will be in direct and active charge of the detailed planning of the Physical Sciences Centre. Vice-Principal O'Neill is also Dawson professor of geology, and chairman of the department of geological sciences.

He is from Port Colborne, Ont. He entered McGill where he obtained a B.Sc. degree in mining, and an M.Sc. in geology. He then went to Yale University, New Haven, Conn., where he won a Ph.D., and continued his post-graduate work at the University of Wisconsin in geology. Returning to Canada, he joined the staff of McGill as a lecturer in 1921. He was promoted to assistant professor in 1924, associate professor in 1927, Daw-

Photo by Blank & Stoller, Montreal.

Dean J. J. O'Neill, M.E.I.C.

son professor in 1929, dean of the science division in 1935, dean of the faculty of graduate studies in 1939, and dean of the faculty of engineering in 1942.

During his earlier years he was active in field work. He was a member of the Canadian Arctic Expedition in 1913-1916. From 1920 to 1921 he was engaged in geological work in British India and Kashmir. He has done consulting work in all the Canadian provinces.

Vice-Principal O'Neill is a member of the Professional Engineers of Quebec, the Canadian Institute of Mining and Metallurgy, the American Institute of Mining, the Geological Society of America, the Society of Economic Geologists, the Canadian Association of Geologists. He is vice-chairman of the Board of Governors of the Arctic Institute of North America, and a Fellow of the Royal Society of Canada.

Paul F. Sise, M.E.I.C., president of Northern Electric Company Ltd. for the past twenty-nine years, tendered his resignation at a meeting of the board of directors held on October 28. Mr. Sise's resignation became effective November 30, at which time he became chairman of the board of directors.

Photo by Associated Screen News Ltd., Montreal.
Paul F. Sise, M.E.I.C.

Col. R. Dickson Harkness, M.E.I.C., succeeds Mr. Sise as president of the Company. He was vice-president, general manager and director since 1938.

Mr. Sise joined the Northern Electric and Manufacturing Company in Montreal in 1904. He became managing director in 1910, and four years later, when this company merged with the Imperial Wire and Cable Company to become Northern Electric Company Limited, he was appointed vice-president and general manager. After serving with the Canadian army overseas during the first Great War, Mr. Sise returned to Canada in 1919 and in the same year became president of the company.

After temporary employment for two summers as an operator in the company's telephone shops, Col. Harkness' regular service with Northern Electric began in 1913 in what was then known as the general manufacturing department. At the outbreak of war in 1914 he enlisted in the army. He served with distinction overseas during the entire period of the war, rising from private to major, and was awarded the D.S.O. and the M.C. His interest in military affairs continued after the end of the war and his ability and further service were again recognized in his later promotion to the rank of colonel.

In 1919, Col. Harkness returned to Northern Electric as assistant cable sales manager in Montreal. He was appointed district manager in Winnipeg in 1925, and later in the same year, returned to Montreal as telephone contract manager. In 1928 he became general commercial manager and was appointed to his present position in 1938.

W. D. Jewett, M.E.I.C., of Montreal, has been elected president of the Canadian Exporters' Association. He had been a director of the Association for some time and was elected to the post of vice-president in 1946.

Mr. Jewett has been actively engaged in the export field since his appointment in 1945 to the position of export manager for Dominion Bridge Company Limited. He studied engineering at University of Toronto, graduating in 1923, joined Dominion Bridge then, and has held numerous responsibilities in engineering design, field engineering, sales and advertising.

Mr. Jewett is now on a second visit

Photo by Associated Screen News Ltd., Montreal.
Col. R. Dickson Harkness, M.E.I.C.

to the South American Republics and, following his return, will deliver an account of his visit to several branches of the Exporters' Association.

P. R. Sandwell, M.E.I.C., of Vancouver, and H. W. Beecher of Seattle, Wash., have announced the formation of the firm, Beecher and Sandwell, for the practice of consulting engineering.

Mr. Beecher has been heat and power consultant for the Powell River Company Limited of Vancouver.

Mr. Sandwell, a 1935 graduate of the University of British Columbia, has been engaged in the pulp and paper field since graduation. His activities have extended to Ontario, Quebec, and Australia. He has been chief engineer for Powell River Company Limited, which company has announced that Beecher and Sandwell have been retained as general consultants.

W. L. Dutton, M.E.I.C., has been appointed operations manager of Union Gas Company of Canada Limited, Chatham, Ont.

Mr. Dutton was with the Company as

W. D. Jewett, M.E.I.C.

a student, and rejoined it upon graduation in civil engineering from the University of Toronto in 1931. Since that time he has worked in all branches of the engineering department, and was its head at the time of his present appointment.

Mr. Dutton, joined the Reserve Army in 1923 and enlisted on the mobilization of the Kent Regiment. He served in Europe with the rank of lieutenant-colonel and was awarded the O.B.E. He returned to the Company on his discharge in November, 1945. Since then he has been commanding officer of the Kent Regiment Reserve, a position he has just relinquished owing to pressure of civilian duties.

H. J. McEwen, M.E.I.C., whose 35th anniversary of service in Calgary for the Canadian Westinghouse Company, coincided with the recent official opening of new extended premises of the Company there, is Alberta district manager.

A graduate in electrical engineering of Toronto University, he has taken an active part in the extension of the Company's service in the west since his arrival in Calgary as sales engineer in 1913. He was placed in charge of sales of the company in that Province, and in 1919 was appointed branch manager, later receiving his present appointment.

Mr. McEwen has been active in Institute affairs, serving as chairman of the Calgary Branch in 1942.

A. A. Buchanan, M.E.I.C., is a wing commander in the R.C.A.F. He has been transferred to England for a two-year post-graduate course in aeronautical engineering at the City and Guilds College of the Imperial College of Science and Technology, University of London. A graduate in mechanical engineering of McGill University, Montreal, class of 1939, Wing-Commander Buchanan joined the R.C.A.F. soon after graduation.

R. A. Coombes, M.E.I.C., has been elected chairman of the Niagara Peninsula Branch of the Institute. He is a switchgear engineer at English Electric Company, St. Catharines, Ont.

Mr. Coombes is from North Devon, N.B., a graduate of University of New Brunswick, having received a B.Sc. degree in 1942. From 1942 to 1945 he was in the R.C.N.V.R., serving as a naval engineer. He entered the English Electric Company in 1946.

W. A. Newman, M.E.I.C., of Montreal, manager of the Canadian Pacific Railway's department of research, received honours recently from two American organizations.

The American Society for Metals, in convention at Philadelphia, selected him to receive their distinguished service award, citing his "valuable contribution to the advancement and progress of alloy steel."

W. A. Newman, M.E.I.C.

The Engineering Foundation, which provides grants from its endowments for research work, appointed him at its annual meeting in New York as a member of its research procedure committee.

Mr. Newman's work in alloy steel goes back to 1918 when he conducted the Canadian Pacific's development of heat-treated alloy steel frames for locomotives and the use of alloy steel plates for pressure vessels.

E. D'Appolonia, M.E.I.C., was awarded the degree of doctor of philosophy in civil engineering in October last by the University of Illinois. Since September 1, 1948, Dr. D'Appolonia has been assistant professor of civil engineering at Carnegie Institute of Technology, Pittsburgh, Penn.

He attended the University of Alberta, and after receiving a B.Sc. degree in civil engineering in 1942, he taught at the university until 1946, when he received the degree of master of science.

Lt.-Col. R. E. Wilkins, M.E.I.C., who relinquished command of the Royal Canadian School of Military Engineering in September, 1947, was posted to the Directorate of Works and Accommodation, Ottawa. He recently took his discharge from the Canadian Army and is employed as a logging engineer with B.C. Forest Products Limited, at Port Renfrew, B.C.

Col. Wilkins graduated from Royal Military College, Kingston, in 1935, and received the degree of B.Sc. from Queen's University a year later. In 1936, a lieutenant in the R.C.E., he was stationed at Esquimalt, B.C. He served later at Sydney, N.S., at National Defence Headquarters, Ottawa, and at Halifax. He went overseas in 1942 with the rank of major. Returning, he was made commandant of the R.C.S.M.E. at Chilliwack, in 1946, with the rank of lieutenant colonel.

A. G. Hibbard, M.E.I.C., has been promoted from assistant roadmaster, Montreal Terminals Division, Canadian Pacific Railway, to roadmaster on the Smiths Falls Division, with headquarters at Union Station, Ottawa. Mr. Hibbard graduated from McGill University in 1941 with the degree of B.Eng. He joined C.P.R. that year.

David Whittaker, M.E.I.C., is at Mattawa, Ont., assistant supervising surveyor on the relocating of some 40 miles of Canadian Pacific Railway in the interests of the Hydro Electric Power Commission of Ontario. His headquarters are at H.E.P.C., Toronto.

David Whittaker, M.E.I.C., is at Mattawa, the Roads Department of the Province of Quebec, but has entered the Public Works Department, technical division of the City of Montreal.

Mr. Quintal graduated in 1944 from Ecole Polytechnique with the degree of M.A.Sc. He entered the Highway Department that year as an engineer in the soils department.

A. P. Wiles, JR.E.I.C., has been appointed municipal engineer of Richmond, B.C. He was previously at University of Saskatchewan, instructing and doing research work since 1946, when he graduated with the degree of B.Sc. in engineering physics.

C. H. Olson, S.E.I.C., is with the Hudsons Bay Oil and Gas Company Limited in Calgary, Alta. Mr. Olson graduated in civil engineering at University of Alberta in 1947.

J. A. Paxton, S.E.I.C., **J. P. Watkins,** and **L. R. Coleman,** S.E.I.C., of the University of Saskatchewan, received scholarships recently. On October 13, President J. S. Thomson of the University presented Massey-Harris scholarships to the total value of $1,000 to these three senior engineering students who had worked with the Company during the past summer.

Bob Butler, S.E.I.C., is president of the Students' Representative Council of the University of Saskatchewan this year. He is a fourth year student in mechanical engineering. **Stan Rakosh,** S.E.I.C., is leader of the Student Engineering Society of University of Saskatchewan for the current year.

Visitors to Headquarters

F. E. Bronson, M.E.I.C., Ottawa, chairman of the Federal District Planning Commission on November 9.

Norman Eager, M.E.I.C., general manager of Burlington Steel Company Limited, Hamilton, Ont., on November 10.

G. K. Bell, Wilton and Bell, consulting engineers, Westminster, London, England, on November 17.

Dr. T. H. Hogg, M.E.I.C., consulting engineer, Toronto, Ont., on November 22.

Obituaries

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

Dr. Daniel W. Mead, HON.M.E.I.C., one of America's outstanding engineers and professor emeritus of hydraulic and sanitary engineering at the University of Wisconsin, died at his home in Madison, Wisconsin, on October 13, 1948. He had been in ill health for several years.

For many years Dr. Mead was associated with the late C. V. Seastone under the firm name of Mead and Seastone, consulting engineers. After retiring as a member of the firm, he continued as a consultant. Dr. Mead was also senior member of the engineering firm of Mead and Scheidenham, New York City.

He joined the staff of the University of Wisconsin in 1904 and served as part time professor until 1932 when he retired as professor emeritus. After his retirement from the University he continued to give lectures for five years. During the entire time he served the University he was also engaged as a consulting engineer. He built water works in Rockford and Fort Worth, Tex., Danville and Moline, Ill., and supervised the building of the Kilbourn and Prairie du Sacs hydro-electric plants.

Dr. Daniel W. Mead, Hon.M.E.I.C.

Dr. Mead was much in demand as consultant. In 1914 he was named as a member of the Red Cross commission to China, on flood protection of the Huni River. He spent six months in

Canada. In 1922 President Coolidge appointed him to the Colorado river board to pass on the Boulder Canyon Project. He was also named chairman of a committee to make a study of the conditions of Madison and surrounding lakes. He served at one time on the Mississippi flood control committee of the U.S. Chamber of Commerce.

In Madison he served as chairman of the Wisconsin section of the American Waterworks Association and was later elected an honorary member of the national group. He was a past president of the American Society of Civil Engineers and was made an honorary member of the Society in 1931. He was a life member of the Western Society of Engineers, which presented him with the Washington award in recognition of "devoted, unselfish and prominent service in advancing human progress." He also held membership in the Wisconsin Society of Professional Engineers, was a fellow of the American Institute of Electrical Engineers, and was a member of the board of the American Society of Mechanical Engineers.

In 1941 Dr. Mead was awarded an honorary citation by State College, Pa. In 1931 he had been granted the degree of LL.D. by University of Wisconsin. He was the author of several engineering publications. In 1937 the American Society of Engineers presented him with the Norman Medal for his paper on "Waterpower Development of the St. Lawrence River."

Dr. Mead was born at Fulton, in New York State, in 1862. He graduated from Cornell University in 1884, after which he took a position with the U.S. Geological Survey. In 1885 he became city engineer for Rockford, Ill. Two years later he resigned to become general manager of the Rockford Construction Company. In 1896 he opened an office as a consulting engineer on hydraulic works and power plants. He later joined Mr. Seastone in Madison.

"*The Wisconsin State Journal*", commenting on the loss of Dr. Mead to the profession, referred to him as "one of the World's giants". That the Engineering Institute of Canada has shared in that estimation was signified by the conferring upon Dr. Mead in 1944 of an Honorary Membership. He attended the Annual Meeting in Quebec City in 1944 to receive the certificate in person.

William Chase Thomson, M.E.I.C., senior engineer of the Department of Public Works, Province of Quebec, who died at his home in Quebec recently, was a student member of the Institute at its foundation in 1887 as the Canadian Society of Civil Engineers.

Born in Saint John, N.B., in 1866, he was with the Intercolonial Railway in the chief engineer's office at Moncton, N.B., when he joined the Institute. He had already done railway work in Nova Scotia for the Great American and European Short Line Railway and in Maine for the New Brunswick Railway.

In 1891 he joined the King Bridge Company, Cleveland, Ohio, designers of railway and highway bridges, and three years later joined Dominion Bridge Company Limited, Montreal, where he remained for many years.

In 1915 while a consulting engineer in Montreal, he went to Le Pas, Manitoba, in connection with the Kettle Rapids Bridge on the Hudson's Bay Railroad. As a consulting engineer he worked for the Canadian Pacific Railway on the design of the tower of the famous Chateau Frontenac in Quebec City. He also represented the Cleveland Bridge Company of Darlington, England.

From 1925 to 1927 he was a structural engineer for the Canadian Section of the Joint Board of Engineers studying development of the St. Lawrence River. In 1927 he accepted an appointment as designer for Dominion Bridge Company, Lachine, Que. In 1932 he was with the Lake St. Louis Bridge Corporation, as consulting engineer. Joining the Department of Public Works of Quebec in 1938, he was on the engineering staff, being named senior engineer in 1946.

Mr. Thomson transferred to Associate Member of the Institute in 1894, and to Member in 1900. He became a Life Member in 1936.

Prof. Ernest A. Stone, M.E.I.C., well-known civil engineer passed away in hospital in Toronto, on October 9, 1948, after a short illness. He had resided in Toronto from 1943, and had retired a year ago from consulting work.

Born at Charlottetown, P.E.I., in 1870, in 1891 he graduated with honours from McGill University with a degree in engineering. He entered railway work the same year as assistant engineer on construction of the Montreal-Ottawa line. Then for two years he was an engineer for Canada Switch Manufacturing Company Limited. In 1894 he was awarded a masters degree in engineering by McGill, and thereafter did engineering work for Canadian Pacific Railway, until 1899 when he joined the Lake Superior Power Company. He later worked for Canadian Electro-Chemical Company; and for the Canada Foundry Co. Ltd.

He joined the staff of Dalhousie University as a professor in civil engineering, and later transferred to the University of New Brunswick, where he served for three years as dean of applied science.

Entering private practice in Vancouver, he designed many structural steel plants of note, and built the famous bridge which spans the Fraser River at Lytton, B.C. During this time he also lectured at University of British Columbia.

During World War I, he became associated with Queen's University and, while there, received an invitation to occupy the chair of engineering at the Chinese Government university of Tang Sing. Later he accepted a similar offer from King's College, Windsor, N.S., where he was awarded an honorary degree for his outstanding work in engineering. He was asked at one time to teach in Bergen, Norway, but preferred to remain in Canada.

Professor Stone designed structural steel plants for Hepburn Company during World War II, and since the war he had done consulting work in reinforced concrete.

Professor Stone was a Life Member of the Engineering Institute from 1930. He had joined as a Student in 1888, transferring to Associate Member in 1895, and to Member in 1906.

Professor Stone's scholastic record at McGill was rivalled by that of his son, also a gold medallist on graduation. Captain Rendle Stone, M.B.E., who was British vice-consul at Detroit, U.S.A., predeceased his father.

Major J. C. Macdonald, M.E.I.C., whose accidental death on October 11, 1948, has been reported with regret from Victoria, was born in Londonderry, N.S., in 1880.

Major Macdonald, a veteran of the South African War, studied engineering at Dalhousie University, receiving the degree of bachelor of engineering in 1906. For several years he worked on railway construction in British Columbia for the Canadian Pacific Railway, and the Grand Trunk Pacific. He worked also in New Brunswick and Northern Ontario on similar work. In British Columbia he did preliminary work on the Second Narrows Bridge at Vancouver; and on the staff of Cleveland & Cameron, Vancouver, he was in charge of installation of municipal water systems in Richmond and Burnaby, B.C. He continued in general practice with that firm, where his work included development of mining properties.

In 1914 he went overseas with the Canadian Engineers, attained the rank of major, and returned in 1919 when he was placed in command of the Canadian Engineer Depot in Vancouver. He had been mentioned in despatches and had been awarded the Military Cross.

On his release later in 1919, he was given charge by the Department of Lands of B.C., of the reorganization of the irrigation systems in the interior of the Province. In 1926 he was named comptroller of water rights for the Province of B.C. In 1939 he resigned that post, to act on the newly established British Columbia Public Utilities Commission. He remained with the Commission until his death.

Major MacDonald joined the Institute as a Student in 1908, transferring to Associate Member in 1912, and to Member in 1923. He was made a Life Member in 1947.

John Gerard O'Donnell, M.E.I.C., of Quebec City died at his home on October 31, 1948.

Mr. O'Donnell was born in Quebec City in 1889 and was educated at Quebec Seminary and McGill University, receiving from the latter in 1916 the degree of B.Sc. in civil engineering.

After graduating he served with the Imperial Ministry of Munitions as testing engineer; with the Canada Foundries & Forgings of Welland, Ont., as chief inspector; with the Davie Shipbuilding Co. at Lauzon, Que., as assistant engineer in charge of wharf construction; with the National Shipbuilding Corporation of Three Rivers, as engineer in charge of the construction of shipways; and with the Jos. Gosselin Co. Ltd., general contractors, of Quebec, as chief engineer.

In 1922 Mr. O'Donnell entered the service of the Quebec Provincial Government and was called upon to organize the Maintenance Branch of Bridges in the Department of Public Works. He was given charge of this branch and served as maintenance engineer until 1945 when, due to ill health, he was obliged to relinquish his arduous duties. The branch was then divided into two parts with an engineer in charge of the Montreal territory and another in charge of the Quebec territory. Mr.

O'Donnell remained in the service as consulting engineer until 1947 when his failing health obliged him to retire. Mr. O'Donnell joined the Institute in 1916 as a Junior, transferring to Associate Member in 1921, and to Member in 1940.

Albert George Garner, M.E.I.C., consulting engineer of Stratford, Ont., died in an automobile accident on October 1, 1948.

Mr. Garner was born in London, England, in 1883, where he studied building construction. He did some engineering work in London but came to Canada in 1907. He joined the staff of the Stratford Bridge and Iron Works, Stratford, in 1909, as chief draughtsman. He was named chief engineer in 1913, and held the post of vice-president and chief engineer from 1918 to 1926. He then joined the McGregor-McIntyre organization as a sales engineer, and was later connected in that capacity with the Dominion Bridge Company, and with the engineering and contracting department of the Hamilton Bridge Company. Meanwhile, from 1931 he had also been in private practice in Stratford. This practice was maintained up to Mr. Garner's death.

Mr. Garner was active in civic affairs, having served at one time on the Public Utility Commission. He was an honorary life member of the Canadian Legion. He had been a Member of the Engineering Institute from 1945.

NEWS of the BRANCHES

Activities of the Twenty-eight Branches of the Institute and abstracts of papers presented at their meetings

Cornwall

G. G. M. Eastwood, M.E.I.C.
Secretary-Treasurer

T. B. Webster, M.E.I.C.
Branch News Editor

An interesting lecture entitled **Modern Water Treatment** was presented on October 17 by J. D. Lee, assistant professor of civil engineering at Queen's University. Branch Chairman R. H. Wallace presided over the short business meeting preceding the lecture. Mr. Nesbitt, chairman of the Civic Affairs Committee, outlined the work done by his committee and appealed to all members for co-operation and assistance in studies of water purification and sewage disposal.

Professor Lee declared that water treatment is the most important problem facing a community and that water is the cheapest utility. To satisfy domestic users, water must be safe and pleasant to drink; and to satisfy industrial users, it must be non-scale-forming and non-corrosive.

A typical water treatment plant performing complete treatment was shown by means of lantern slides. Water enters a settling tank from a lake or river and chemicals are added after the first low-head pumps. The treatment varies with the quality of the raw water supply and the degree of purity desired but the chemicals added may be aluminum sulphate, activated charcoal, chlorine and ammonia. The water passes to a sedimentation tank where coagulated solids may settle. In the second stage of treatment, lime, chlorine, and ammonia may be added before the water passes sand filter beds. From these filters, the water drops to a clear well and filtered water storage and is ready for pumping to the city mains. In modern stations, control panels ease the work of the operator, and measure and record the treatment.

In the discussion following the lecture, Professor Lee spoke of the Brantford water treatment where the addition of fluorides to water to inhibit dental decay is being practised. When asked if the St. Lawrence Power Project would be detrimental to Cornwall's water supply due to the elimination of aeration in the Longue Sault Rapids, Professor Lee replied, "While the adage 'Running water purifies itself' is true, it is also true that stagnant water purifies itself more quickly."

Edmonton

E. K. Cumming, M.E.I.C.
Secretary-Treasurer

On October 14 and 15, 1948, Dean J. N. Finlayson, president of the Institute, visited the Edmonton Branch. He was entertained by the executive of the Edmonton Branch at a luncheon held at the Mayfair Golf and Country Club. In the evening, Dean Finlayson addressed the members of the Edmonton Branch at a dinner meeting held in the Macdonald Hotel. The following day he was shown the Leduc oilfield by Dean R. M. Hardy, and in the evening he addressed the Engineering Students' Society of the University of Alberta.

In his address to the branch members at the dinner meeting, Dean Finlayson expressed regret at not being able to attend the First Annual Engineers' Ball. He thanked the Branch for its cordial welcome on his arrival in Edmonton and went on to describe his trip in the East, mentioning the power shortage in Ontario and Quebec, the proposed bridge across the Strait of Canso and other engineering projects. He stated that in all parts of Canada people expressed a high regard for the engineering profession. The president then discussed ideas currently under the attention of Council, including ways and means of improving the *Journal*, widening of the field of membership, and the endeavour of Dominion Council to bring representatives of all engineering groups around a conference table to discuss mutual problems. Dean Finlayson stressed the fact that engineers should speak with a united voice. In closing he asked that the Branches pass on to Council any ideas which they might have with regard to policies of the Institute.

The speaker was introduced by one of his former students, Dean R. M. Hardy, of the University of Alberta and a vote of thanks was moved by Mr. C. W. Carry, another former student. Both men expressed admiration of the President's public speaking ability and members at the meeting showed their hearty agreement.

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On Friday evening, October 8, members of the engineering profession in the City of Edmonton, and their friends, attended the Engineers' First Annual Ball in the Trocadero Ballroom. This Ball, the first of its kind to be held in Edmonton, was sponsored by the Edmonton Branches of The Engineering Institute of Canada and the Military Engineers Association of Canada.

Members of the Association of Professional Engineers of Alberta, and the Edmonton Branches of the Canadian Institute of Mining and Metallurgy and the Chemical Institute of Canada were invited to attend. About four hundred people attended, making this function a real success. Guests were received by H. W. Tye, chairman of the Edmonton Branch of the E.I.C. and Mrs. Tye, and Mr. and Mrs. J. E. Cranswick. Invited guests included: Hon. N. E. Tanner, minister of lands and mines for the Province of Alberta; B. M. Hill, president, Canadian Electrical Association; J. E. Oberholtzer, chairman, Chemical Institute of Canada; C. S. Clendening, president, Association of Professional Engineers of Alberta; R. M. Hardy, dean, Faculty of Engineering, University of Alberta; R. M. Watson, chairman, Edmonton Branch of the Canadian Institute of Mining and Metallurgy; Lt. Col. J. S. Beeman, command engineer officer, Western Army Command; G/C M. M. Hendrick, senior air staff officer, R.C.A.F., North West Air

Command; D. D. Dick, president, Engineering Students' Society, University of Alberta.

As a result of the success of this First Ball, the members of the engineering profession in Edmonton hope that it may be made an annual event.

Kingston

D. L. Rigsby, M.E.I.C.
Secretary-Treasurer

G. L. Macpherson of Sarnia, president of the Professional Engineers Association of Ontario, addressed a joint meeting of the Association of Professional Engineers of Ontario and the Kingston Branch of The Engineering Institute of Canada.

Mr. Macpherson sketched the growth of the engineering profession generally, and in Ontario particularly. To the E.I.C., established in 1887, every engineer owes a great debt, Mr. Macpherson said. He spoke of legislation benefiting public interest primarily, and, secondarily, engineers themselves. This year a code of ethics has been incorporated into Association by-laws. Benefits of the Association include "The Professional Engineer," a plan of group insurance, initiated this year; and plans for medical services are now under consideration. The association also awards several scholarships to engineering students in two Ontario universities.

"The industrial organization . . . without engineering personnel is out of date and it is doubtful if it can survive," said Mr. Macpherson.

Col. L. F. Grant, past president of the E.I.C., introduced Mr. Macpherson.

Col. T. M. Medland, executive director of the Ontario Association described in detail some activities carried on by the Association to protect the public from persons who may not be qualified to do work which they undertake.

Legislation, Col. Medland said, is being watched to see that careful consideration is given to all items affecting the engineering profession and engineers, since the legal aspects of engineering are becoming more important as time goes on.

A discussion period which followed covered such topics as activities of the association with respect to undergraduate engineers and engineers in politics.

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On Tuesday, November 10, Brig. Geoffrey Walsh, M.E.I.C., commander of the Eastern Ontario Area, addressed the Kingston Branch of the Institute on the subject of **The Alaska Highway.**

The speaker, introduced by Lt. Col. W. S. Hunt, officer commanding, R.C.E. M.E. Barriefield, stressed the technical difficulties encountered in the construction of the Alaska Highway, and described the organization required in the construction and maintenance of this large project. The nature of the terrain, the climate, and the general difficulties in transportation, were described. A discussion period followed this most interesting talk.

The technicolour film "Men Against Rock", produced by the Gardner-Denver Company, was shown at this meeting. The film features heavy rock excavation on four large United States projects, including highways, dams, canals, and tunnels and showed current methods used in the construction of these services. C. D. Rees of the Gardner-Denver Company, Toronto, was present to discuss the film.

Niagara Peninsula

J. J. Miller, M.E.I.C.
Secretary-Treasurer
C. A. O. Dell, M.E.I.C.
Branch News Editor

Over fifty members and friends of the Niagara Peninsula Branch were conducted on a tour through the Ontario Paper Company mill at Thorold, Ont., on Thursday, Oct. 21. The arrangement was made through the kind co-operation of Mr. R. Comette divisional manager of the Company.

The visitors convened in the auditorium of the company's new office building, where each person was provided with an elementary flow sheet and an index of the various machines in the plant. Parties of seven or eight were provided with guides and, starting at the docks where pulpwood is unloaded from lake boats, were provided a panoramic view of the complete paper making process. At 6.00 p.m. all parties assembled in the company's dining room where a very fine dinner was served. Later the visitors again assembled in the auditorium and heard the very interesting address of Dr. Sankey of the Ontario Paper Company.

Dr. Sankey was able to throw into sharp relief some of the major problems of the paper making industry and also to bring to light the very important position of this industry in Canadian economy as a provider of United States dollars.

Comparing the groundwood pulp making process with the sulphite process, the speaker stated that one hundred pounds of wood will resolve into about ninety-eight pounds of groundwood fibre, while the same quantity of wood will result in only forty-eight pounds of fibre suitable for newsprint under the sulphite process, but both types of fibre are necessary for successful paper making. The long sulphite fibre forms the foundation mesh and the short groundwood fibre forms the filler for the newsprint sheet.

One of the most important requisites of a pulp mixture as used in modern high-speed paper making machines is that it must be free draining. This property is provided by the long fibre sulphite pulp. The importance of free drainage becomes self evident when it is realized that one pound of paper at the dry end of a paper making machine is made from roughly two hundred pounds of soupy pulp which enters at the wet end of the machine. With paper coming off the machine at the rate of fifteen hundred to seventeen hundred feet per minute it is necessary to remove most of the one hundred ninety-nine pounds of water in one to two seconds.

Production of one ton of paper requires roughly the use of two hundred tons of water, and a short calculation will serve to illustrate the magnitude of quantities handled in the paper machines of a paper mill. For example, a mill producing 500 tons of paper per day must handle 100,000 tons or 200 million pounds of water per day.

After Mr. Sankey's address several films were shown which illustrated the paper making industry and other subjects.

Peterborough

J. M. King, M.E.I.C.
Secretary-Treasurer
J. C. Allan, M.E.I.C.
Branch News Editor

The 29th annual dinner of the Peterborough Branch was held at the Peterborough Golf and Country Club on the occasion of the President's visit on September 24. G. C. Tollington, chairman of the branch introduced Mr. Roy from the Kingston Branch and asked him to introduce the members of a visiting group from Kingston who were heartily welcomed.

C. E. Sisson, A. L. Killaly and M. G. Saunders briefly addressed the branch with news of the progress of other branches. G. R. Langley then introduced Dean J. N. Finlayson, president of the Institute as speaker of the evening.

Dean Finlayson spoke of his pleasure at meeting former pupils from several engineering colleges at Peterborough and wove a story around the large U.B.C. crest behind him with its motto "*Tuum Est*".

Of particular interest was news of the growth of the Branch at Arvida and the buoyant optimism among engineers in that developing area.

Dr. Finlayson called on Canadian scientists to concentrate more on fundamental research. While America has developed applied science to an extraordinary degree, the fundamental research on which most of it is built has come from Europe. As a result of the war British researches have been interrupted, German research men scattered and in Russia the work of scientists is kept secret.

Mr. Tollington thanked the president for his inspiring address and called on General Secretary L. A. Wright for a brief report on the progress of the Institute, to conclude the evening.

Saguenay

J. E. Dyck, M.E.I.C.
Acting Secretary-Treasurer

Some Aspects of Distribution Cables, was the topic of an address by P. J. Croft to the Saguenay Branch on October 28, 1948. Mr. Croft is chief engineer for the Canada Wire and Cable Company Limited, Montreal, Quebec.

In his address Mr. Croft pointed out that distribution cables are expected to give trouble free service over long periods and that the conditions under which these cables have to operate vary considerably in different installations. As a result the insulating materials used to cover the conductors might be expected to withstand considerable flexing, extreme temperatures, moisture and oil conditions in addition to having the necessary dielectric and insulating properties. Since considerable research has been done on insulating materials, Mr. Croft pointed out that a suitable conductor covering can be provided for any particular condition. He added that his company is in a position to recommend the best cable, providing the conditions under which the cable would have to operate are clearly defined.

Mr. Croft showed, by means of slides, the properties of numerous synthetic insulating materials, comparing these in each case with natural rubber. The properties compared were: tensile strength, elongation, resistance to cold, heat, ozone, oil, sunlight, flame and moisture, as well as dielectric strength, insulation resistance and dielectric constant. He pointed out that to prevent failure of an insulating material the dissipation of heat must be sufficient so that a thermal balance is set up before the conductor temperature reaches the point at which the insulation loses it's original properties.

Mr. Croft, before closing showed slides illustrating underground transmission lines as applied to new housing projects.

H. R. Fee thanked the speaker on behalf of the Branch.

Montreal

The Junior Section and the Branch Membership Committee are to be congratulated on the results of their efforts to obtain an increase in the Student Membership. This matter was reviewed last year and it was found that the number of Student Members was far from satisfactory. To overcome this situation, Mr. J. B. Challies agreed to give a talk to the engineering undergraduates at McGill and in addition the various professors were interviewed. The results of the steps taken have been most encouraging in that more than 300 student members have been obtained from McGill University alone.

The symposium on Community Planning which was to be presented on December the 16th has been postponed until February the 3rd, 1949. This change in the programme has been made in order to permit members to attend a lecture by Mr. Lewis Mumford of New York, which is being given under the auspices of the McGill Extension Course. Mr. Mumford's lecture deals with Community Planning and is entitled **The Achievement of Utopias.** Members of McGill Extension Course have been invited to attend Mr. Cousineau's lecture on February the 3rd, 1949 and arrangements are now being made to obtain a larger hall, as it is felt that there will not be sufficient accommodation at Headquarters to seat all those interested.

Members are reminded of the Annual Meeting which will take place on January the 27th, 1949, and of the Dance which is to be held at the Mount Royal Hotel on February the 11th, 1949 Tickets for the Dance will be sold in advance and it is hoped that an attendance of over 500 will be obtained.

Members are requested to advise Headquarters of any change in address so that they will be sure of receiving notices of meetings and other information in regard to Branch Activities.

MONTREAL JUNIOR SECTION OYSTER PARTY

Upper photo—Clockwise around the table are: Jim Rutter, Len Deshaw, Ted Trott, Mel. Bentham, Geo. Morrison, "Mac" MacBride, Jim Scott, Everett Magnusson and Neil Neufeld.

Lower—As the illustration indicates, Irving Tait kept official tally on Norman Coke's consumption. Mr. Coke's modesty prohibits the printing of the official total.

Junior Section

Leo Scharry, Jr.E.I.C.
Secretary-Treasurer

Since the last issue of the *Journal*, activities have been proceeding at a very fast pace in the Section. The executive committee very gratefully accepts the notable increase in attendance as a tribute to the efforts of the many committees who provide meetings of interest to the membership. However, so far this year there has not been one meeting at which the attendance was more than 10 per cent.

The following is a summary of the recent activities of the Section.

On October 18, Mr. W. J. Robinson of Minneapolis-Honeywell spoke on the **Magic of Heating Controls,** and with charts and instruments he demonstrated to the audience the fine results to be had with controls that properly operate.

The Oyster Party on October 29 will be remembered by all those who showed their encouragement in the best tangible way—by attending it. The praise received by the Committee justifies the organization of another party next year, but on a bigger scale. It was a stag party with 100 members attending. As an experiment it came off with a bang!

The Second Ladies' Film Night on November 1 was so successful that the Executive have already drawn up plans for the next one and will add something new to the activities, if circumstances permit. The attendance was approximately 125 with 40 ladies present.

For Students Night on November 15, four speakers were chosen from ten candidates. Two students from Ecole

Top—We pulled the executive away from their shells long enough to take this picture. Bill Smith, Junior Section councillor; Norman Coke, Branch chairman; Irving Tait, Branch vice-chairman; (in rear) J. A. Beauchemin; Paul Salvas, Junior Section chairman; Huet Massue; Leo Scharry, secretary of the Junior Section.

Centre—We haven't been able to identify the first and third oyster enthusiasts but the remainder (clockwise around the table) are: second, Sid Thomas; fourth, Bob Wright; and from his left, A. Cohen, Don Lappi, Bruce Tirrell, Gord. Jeffrey, H. Hunter, Bill Smith and Art Phelan. Leo Scharry, with the beret, is coaching the attack on the obstinate bivalves.

Bottom—A clue to the success of the party was the enthusiasm with which the Junior executives themselves went after the oysters. Reading clockwise around the table, Bill Smith; Leo Scharry; Assistant General Secretary Doug Laird; Paul Salvas; John McPherson, vice-chairman of the Junior Section; Ian Mann; Bob Griesbach, past-chairman of the Junior Section; and J. C. Blair-McGuffy, a recent arrival from the old country.

Polytechnique and two from McGill gave 12 minute talks. Jules A. Tourillon (Polytechnique) spoke on: **The Improvement of the Richelieu Waterway. Tunnelling to Freedom** was the topic discussed by G. D. Harvey (McGill). Clement D. Ratelle (Polytechnique) gave an account of his work on **Brake Lining and Clutches.** J. H. Wright (McGill) had chosen as his subject **Aluminum as a Ship Building Material.**

The Richelieu Chambre de Commerce des Jeunes had delegated a committee of 6 members to attend the talk by Jules A. Tourillon. The evening concluded with the showing of a 30-minute coloured film on Mexico.

The interest shown in the public speaking classes has been more than expected so new quarters have had to be located. At present, each Tuesday night at 8 p.m. at the Ecole Polytechnique, the class is monitored by Mr. De Costa and Mr. Morrison. The procedure is to divide the class and provide each member with the opportunity to stand up and speak. Individual advice is given by the monitors. New members are accepted at any time. For further information, please phone Mr. Morrison at PL. 2211, local 359.

We would like to bring to the attention of all the membership that a magnificent campaign for new members at McGill was held a few weeks ago. The success of this drive was amazing. The Junior Section wishes to extend to the 350 new members a fraternal welcome.

Saskatchewan

D. W. Houston, M.E.I.C.
Secretary-Treasurer

R. Bing-Wo, M.E.I.C.
Branch News Editor

Regina Section

The first joint meeting of the 1948-49 season for the Saskatchewan Branch of the Institute and the Association of Professional Engineers of Saskatchewan was held on Friday, October 22, in the Kitchener Hotel, Regina. Professor A. H. Douglas, vice president of the Branch, was chairman of the meeting. S. R. Muirhead, manager, Saskatchewan Government Telephones, was in charge of "Telephone Night", the main event of the evening.

There were approximately fifty members and guests present. Special guests present and seated at the head table were the Hon. I. C. Nollett, minister of agriculture and a director of the Saskatchewan Government Telephones, and Messrs. J. A. Young, E. Black, also directors of telephones.

Mr. Muirhead gave a very interesting resumé of the difficulties being encountered by the Telephones Department, and how these are being met. At the present time there are some 7,900 telephones on the waiting list. In the last eight months, 3,660 instruments were installed. This rate of 457 per month compares with an average of 151 per month in 1939-1940. There were 4,830,000 long distance messages completed from September, 1947, to August, 1948, of which 204,000 were trans-Canada. During the same period of 1939-1940 there were only 2,310,000 messages completed.

In the present year, to date, some 4,500 circuit miles of new long distance wire have been completed and another 2,500 to 3,000 miles are expected to be installed by the end of the year.

A very interesting film, "Telephone Courtesy", was then shown.

The evening was climaxed by a conducted tour of the Lorne Street Telephone Exchange. The group was shown through the building from the generator and battery room to the long distance toll room. The functioning and operation of various pieces of telephonic equipment was explained and a large number of interesting questions were asked.

The appreciation and thanks of the group was ably expressed by A. B. Olson, Association councillor from Saskatoon.

Saskatoon Section

J. B. Mantle, M.E.I.C.
Secretary

The Saskatoon Section resumed its activities for the year on October 13 with a dinner meeting. The Section was honoured on that occasion by having Institute President J. N. Finlayson as guest speaker.

Dean Finlayson began by recalling some of his early life in Pictou County, Nova Scotia and the growth of the steel industry at Sydney. He related some of his experiences during his present tour of branches and everywhere noted great interest in two particular aspects of Saskatchewan engineering. The harmonious joint operation of the Institute and Association, as well as the recent forward steps with respect to the Engineers Act in the province were looked upon with envy by other branches. In discussing the young engineer and engineering education, President Finlayson suggested that a profound knowledge of technical subjects could provide the much sought after "engineering culture" and would also better suit the engineer to pure research. He was very pleased with the degree of co-operation that the engineering faculties were receiving from practising engineers and contractors.

The gathering was well attended, 70 members and student members being present. This was thought to be a record number for a dinner meeting. Howard Douglas extended a warm welcome to the many student-members attending.

On Oct. 13th, President and Mrs. Finlayson spent a busy day in Saskatoon. In the afternoon the president addressed a group of 450 third and fourth year engineering students at the University. At that time he presented the Institute prize and certificate to chemical engineering student C. J. Brounstein. Later in the afternoon he was present at a round-table discussion with members of the faculty of engineering and conveyed to the group many valuable ideas on engineering education. That evening he was guest speaker at a dinner meeting of the local section of the Institute and Association.

Mrs. Finlayson was guest of honour at a tea in the home of Mrs. I. M. Fraser. Some 50 engineers' wives were present, among them several from out-of-town points who were in Saskatoon accompanying their husbands to the conference of the Western Canada Association of Highway Officials.

Sarnia

B. B. Hillary, M.E.I.C.
Secretary-Treasurer

The Branch was pleased to welcome President J. N. Finlayson in Sarnia, in October. On the morning of the 5th, the president was taken on a tour of local plants including the Imperial Oil Limited, Polymer Corporation Limited and the Dow Chemical of Canada, Limited.

President Finlayson at Sarnia. Left to right, G. R. Henderson, Mrs. Vance, Mrs. Finlayson, the president, Mrs. Henderson, Vice-President J. A. Vance.

A luncheon was held at St. Clair Inn, which is about twelve miles down the St. Clair River from Sarnia. For transportation one of the local businessmen supplied his large cabin cruiser which provided a most enjoyable cruise. The President enjoyed himself immensely at the helm of the "Gennie K". The party included Vice-President and Mrs. Vance of Woodstock. The luncheon and the return voyage occupied the better part of the afternoon.

In the evening cocktails were served at the Golf Club where the president had the opportunity of greeting and chatting with most of the members of the Sarnia Branch and their wives. This was followed by dinner and the president's address.

The next morning Dean Finlayson motored to Windsor with Mr. and Mrs. Vance.

Toronto

R. A. Muller, M.E.I.C.
Secretary-Treasurer

Junior Section

David Beattie, Jr.E.I.C.
Publicity Chairman

The first meeting of the season was held on Thursday, November 11 in the Electrical Building of the University of Toronto. The new executive was introduced to the membership for the first time by the Chairman, Kenneth A. Brown.

The speakers of the evening were very well received by an audience of about 100. G. F. C. Weedon spoke on **Communications in field and industry** emphasizing the possibility of utilizing modern electronic gadgets to facilitate the progress of engineering projects. He illustrated his talk with slides and typical equipment. F. R. Duncan followed, discussing **Applications of law to engineering.** The topic proved very interesting, as indicated by the vigorous questioning of the speaker during the discussion period which followed. D. H. W. Kirkwood then offered a review of atomic energy development, under the title, **Some Aspects of Atomic Energy.** The philosophical as well as the scientific application of this new discovery was emphasized by the speaker. The thanks of all present were tendered by the section's vice-chairman, T. Ivory.

Vancouver

Alan M. Eyre, Jr.E.I.C.
Secretary-Treasurer

Stuart Lefeaux, Jr.E.I.C.
Branch News Editor

On Wednesday, October 20th, the Vancouver Branch was favoured with an address by F. G. Kerry, of Montreal, **The Production and Industrial Application of Tonnage Oxygen.**

Mr. Kerry was introduced by Fred Adams, local manager of the Canadian Liquid Air Company Limited. He is manager of the Development and Engineering department of the Canadian Liquid Air Company Limited. During the past year he has done considerable research work on tonnage oxygen uses in steel production.

Mr. Kerry limited his address to an outline of recent developments in the production and use of cheap industrial oxygen. The oxygen used commercially for steel cutting, etc., must have a purity of 99.5 per cent or better and must be stored in cylinders.

Industrial or "tonnage" oxygen as produced in the recently developed plants has a maximum purity of 95 per cent and is suitable only for metallurgical and chemical operations; it is not economically feasible to store tonnage oxygen as the process is continuous and the capacity 500 to 1,000 tons per day.

In the production of steel by the open-hearth process, the use of tonnage oxygen as a primary element in combustion and not as an air-enriching agent has proved highly efficient and speedy. Oxygen-enriched air for Bessemer furnaces has increased the amount of scrap that can be handled and has reduced the blow-time necessary. Pyritic smelting has been proved practical with the use of tonnage quantities of cheap oxygen.

Other uses for tonnage oxygen include: enriching of producer gas, cracking of methane and propane, the production of synthetic gasoline. The high capital investment involved and the high production output of tonnage oxygen plants are the important limiting factors in their use.

The speaker concluded that the ever-increasing shortages of primary materials and rising labor costs are quickly turning tonnage oxygen from an academic curiosity into a necessity.

Many interesting questions were fired at Mr. Kerry and a lively discussion ensued. H. T. Libby, thanked the speaker for the excellent address. The chairman announced the branch field trip to Chilliwack on November 6th as guests of the R.C.E.

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On Saturday, November 6, forty-four members of the Vancouver Branch travelled by chartered bus to the Royal Canadian School of Military Engineering at Chilliwack. The party was met by Lieutenant-Colonel L. G. C. Lilley, D.S.O., R.C.E. and fellow officers who welcomed the members in the officers mess. After toasting the Army, the members were served a hearty lunch and the chairman outlined the inspection trip for the afternoon.

Colonel Lilley explained the operation of the school and outlined the dispersal of the 650 personnel. The school is at present the only R.C.E. corps active force training camp operating in Canada. The work of the school includes basic training, trades training, N.C.O. qualifying courses, officer qualifying courses, C.O.T.C. summer training and reserve force summer training. Recruits are given six months basic training and six months trades training before being sent to a works unit as a helper or a tradesman, group one.

The members formed five parties to be guided by Major N. Sadlier-Brown, Major A. J. Abbott, Major S. B. Sweeney, M.C., Major R. T. Miller, and Major R. H. Young.

The members returned to the officers' quarters for a welcome cup of coffee and sandwiches before boarding the bus for Vancouver. The feeling of those present was summed up by Colonel Lilley who stated that the exchange of visits and ideas by the civilian and military engineers makes for better understanding and progress in the profession. P. B. Stroyan, on behalf of the Vancouver Branch, thanked Colonel Lilley and his staff for the excellent hospitality and programme shown the members.

Victoria

S. H. Frame, M.E.I.C.
Secretary-Treasurer

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

Mining Coal under the Sea was the topic of an interesting address given by Dr. F. W. Gray to the Victoria branch on October 22nd.

Dr. Gray, who was assistant general manager of the Dominion Steel and Coal Corporation at Sydney, from 1927 to 1945, dealt in particular with this field.

Although containing only 3 per cent of Canada's coal resources, the Sydney fields have in the past contributed from 50 to 100 per cent of the total Canadian coal output. Its ten submarine collieries at present produce 5 million tons annually which is about one third of the country's production. It has been estimated that this rate of production can be maintained for a period of from 150 to 180 years. This rate cannot be exceeded without seriously limiting the ultimate yield of the mine. Such a limitation is not generally known by the public.

The Sydney under-sea mines stretch along a coastal frontage of 20 miles with working faces extending seaward a maximum distance of 4 miles. This working face, like the front line of an advancing army, is dependent upon its lines of communication. Mine cars filled at the face must be delivered to the surface, unloaded and returned. A continuous circulation of fresh air must be available at the face and in turn, the spent air intermixed with the existing gases, must be forced out.

Dr. Gray estimated that the penetration seaward might eventually reach 10 miles. However, with increasing distance, transportation of the miners becomes the main problem and present rate of travel places the economical limit at 6½ miles. The allowable over lap depth for the mine is estimated to be 4000 feet, which is considerably greater that the existing overlap and it will not be approached even for maximum penetration. Other problems of under sea mining include power, transmission and haulage.

Canada's only bituminious coal supplies, once the Sydney fields have been exhausted will be west of the foothills of the Rockies. It is therefore necessary, from a national point of view, to win all the coal possible from the under sea field for the longest possible future.

Finally, the speaker pointed out that the recent cut in the importation of U.S. steel, would indicate the importance of the Sydney fields, in connection with the iron ore deposits under Conception Bay on Newfoundland. This iron ore, also won entirely under the sea, is melted in the blast furnaces at Sydney. Such a combination, with its defence implications, does not exist elsewhere in our country.

LIBRARY NOTES

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEWS

STATISTICAL YEAR-BOOK OF THE WORLD POWER CONFERENCE: No. 4 — Data on Resources and Annual Statistics for 1936-1946.

Edited by Frederick Brown. London, World Power Conference, 1948. 212 pp., tables, cloth, 45 shillings, net. (Distributed in Canada by The Engineering Institute of Canada, 2050 Mansfield Street, Montreal 2, Que.)

Reviewed by Huet Massue, M.E.I.C.*

The first post war issue of the Statistical Year-Book of the World Power Conference is the most comprehensive collection of power statistics yet published by that organization. It contains information on the resources, production and utilization of solid, liquid and gaseous fuels as well as water power and electricity. The statistics, the latest available, cover the years 1936 to 1946 and relate to more than sixty countries with such continental and world totals as it was practicable to calculate. No other organization could furnish a more authoritative collection of comparable information. The World Power Conference being a federation of national committees, made up in general of representatives of government, industry, and science, is indeed in a unique position to make such a contribution.

Owing to the war, data for some mid-European countries could not always be included and recent information regarding the U.S.S.R. is not available. The introduction, in addition to indicating the scope of the year-book and giving certain definitions, shows the area and the population of the countries concerned.

SOLID FUELS—coals, brown coal, lignite, peat, coke and other manufactured fuels and wood—are dealt with in the second section. Of the world proven reserves, Europe is found to contain 90% of the coal and 66% of the brown coal and lignite On the other hand, of the probable world total reserves, America is indicated as having 42% of the coal, 75% of the brown coal and lignite and 10% of the peat.

The United States, with 539 million metric tons of coal produced in 1946, leads all the countries of the world. With 193 million tons the United Kingdom came second, Germany was third with 66 and France fourth with 47 million tons. While, in comparison with 1936, the production of 1946 was 20% higher in the United States and 5% higher in France, it was lower by 17% in the United Kingdom and by 65% in Germany.

WOOD—Forest areas in the U.S.S.R.,

**Statistical Engineer, Shawinigan Water & Power Co., Montreal, Que.*

at 634 million hectares, are somewhat larger than the 607 million hectares in the United States. In Europe there are 131 million hectares of forest, Asia has 153 and Africa 127. Annual wood cutting is by far the largest in the United States; the 377 billion cubic meters of solid volumes of products in 1943 compare with 60 for Canada, 44 for Sweden and 36 for France.

LIQUID FUELS—petroleum, benzoles and alcohols—are analyzed in the third section. With 273 millions of kilolitres, the production of petroleum in the United States far exceeds the production of any other country. In Canada the production only amounts to some 10 million kilolitres; in France and in the United Kingdom it amounts to about 3 million

GASEOUS FUELS—natural and manufactured—are considered in the fourth section. With 159 billion cubic meters of production of natural gas in 1944, the United States lead the world. Of the countries recently reporting, Canada is second with 1.3 billion and Argentine third with 0.7 billion. The 36 billion cubic meters of manufactured gas in the United States compare with 18 billions in the United Kingdom and 8 billions in Poland.

WATER POWER AND ELECTRICITY are studied in the fifth and last section. Water power resources, at arithmetical mean flow, are indicated to amount to 82 million kilowatts in the United States, 54 in Canada, 20 in Norway, 16 in Sweden, 12 in Italy and 8 million in France. The capacity of installed water wheels amounts to 14 million kilowatts in the United States, 7.4 in Canada, 4.9 in Italy, about 3.4 in France, 2.7 in Switzerland and 2.4 millions in both Norway and Sweden.

Since 1936 the production of electricity has increased all over the world. In the United States it grew from 109 to 223 billion kilowatt-hours, in Canada from 25 to 41 billion kilowatt-hours. In Great Britain it also nearly doubled by increasing from 20.5 to 41.3 billion kilowatt-hours. In Norway and Sweden it also more than doubled during the period by increasing from 3.2 and 5.0 billion kilowatt-hours to 6.7 and 10.4 billion kilowatt-hours respectively.

In short the Statistical Year Book No. 4 of the World Power Conference will be a valuable addition to any library.

CHAMBERS' TECHNICAL DICTIONARY, rev. ed.:

C. F. Tweney and L. E. C. Hughes. N.Y., Toronto, Macmillan, 1944. 975 pp., illus., 8¼ x 5¾ in., cloth, $6.00 in Cana a.

A good technical dictionary is an indispensable reference tool for all engineers, as well as for students and technically-minded laymen. Included in this dictionary are terms used in pure and applied science, medicine, the chief manufacturing industries, engineering, construction and the mechanic trades. The scope is defined in its preface, and it is claimed that in engineering, the terms used in every branch, including metallurgy, are fully dealt with. The editors stress that in electrical engineering, due consideration has been given to such newly-developed and ever-changing subjects as electrical communication, telephony, radio, television, acoustics and cinematography.

Each term is clearly listed in bold face type. In all cases the specific branch of science or technology to which the term belongs is given. Definition is not confined to single words, but also to numerous short phrases, such as "control room", "electroplating generator", and "pillar drill". Alternative meanings are noted; "see" references, linking related terms, are abundant; pronunciation of words is indicated. Where illustration of a meaning is necessary, as for instance in the case of a formula or an organic chemical compound, such an illustration is included, although this does not occur frequently. An appendix contains the Greek alphabet, a table of chemical elements with their properties, and various other chemical, botanical, and zoological tables

In such wide, varied, and rapidly-changing fields as the technical ones, it is difficult, but it is also indispensable, to find a comprehensive dictionary that adequately fulfils its purpose. While this dictionary was published in 1944, and therefore lacks the very latest developments, it has been found, in five months continual use in the Library of the Engineering Institute of Canada, the most complete and satisfactory of its size and range in the engineering field. It is practically all-inclusive, and the definitions are excellent in conciseness and clarity.

N.T.

LIBRARY REGULATIONS

Hours

	Oct-May	June-Sept
Mon-Fri	9–6	9–5
Thurs (Oct-Mar)	9–8	9–5
Sat (closed Jy-Aug)	9–12	9–12

Bibliographies and Extensive Literary Searches

Short subject bibliographies will be compiled on request.

Extensive searches will be made at a charge per hour of $1.50 to members, and $2.50 to non-members.

Indicate which required
Be specific

Borrowing and Purchasing

Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

A library deposit of $5.00, at par in Montreal, is required before items may be borrowed.

All carrying charges are payable by the individual. Except in the case of library deposits, payment should not be made in advance.

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

ABSTRACTS

INSTITUTION OF ELECTRICAL ENGINEERS

Summaries of Papers to be read in London, first half session 1948-49

Waterworks Power Plant Practice; the Costs of Alternative Steam, Diesel and Electrically Operated Machinery,

T. P. Wakeford.

Outlines kinds of machinery available; capital charges, cost of plant; means of calculating running costs. Estimated annual charges of six stations are set out in tabular form followed by some notes on the results obtained.

Factors Influencing the Design of High Voltage Air-Blast Circuit Breakers,

C. H. Flurscheim and E. L. L'Estrange.

Deals especially with 66-264 kv. Discusses effect of air pressure and storage on breaking capacity rating; limitations and advantages of multi-break interruption, and the special advantages possible with air-blast breakers in connection with automatic high-speed reclosure, insulation, and maintenance requirements.

Application of the Recurrent Surge Oscillograph to the Study of Surge Phenomena in Transformers,

E. L. White and W. Nethercot.

Evaluates recurrent surge oscillograph for transformer investigations. Discusses methods of applying oscillograph and its position with regard to transformer research.

ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Aeronautical Engineering Index, 1947:
Institute of the Aeronautical Sciences, New York, 1948. 258 pp., paper.

Cobalt:
Roland S Young. New York, Reinhold, 1948. 181 pp., illus., cloth. (American Chemical Society Monograph No. 108).

Concise History of Mathematics:
Dirk J. Struik New York, Dover, 1948. 2 vols., illus., cloth.

Cybernetics; or Control and Communication in the Animal and the Machine:
Norbert Wiener. New York, Wiley, Technology Press, 1948. 194 pp., illus., cloth.

Documentation:
S. C. Bradford. London, Crosby Lockwood, 1948. 156 pp., illus., cloth.

Education for Professional Responsibility:
Inter-Professions Conference on Education for Professional Responsibility. Pittsburgh, Carnegie Press, Carnegie Institute of Technology, 1948. 207 pp., illus., fabrikoid.

Half-Hours with Great Scientists; the Story of Physics:
Charles G. Fraser. Toronto, University of Toronto Press; New York, Reinhold, 1948. 527 pp., illus., cloth.

Literature Search on Dry Cell Technology, with Special Reference to Manganese Dioxide and Methods for its Synthesis:
Marjorie Bolen and B. H. Weil, sponsored by Battery Branch, Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey. Atlanta, Georgia, Georgia Institute of Technology, State Engineering Experiment Station, 1948. 700 pp., fabrikoid. (Georgia Institute of Technology. State Engineering Experiment Station. Special Report No. 27).

Radio at Ultra-High Frequencies, Volume II (1940-47):

Alfred N. Goldsmith, and others. Princeton, New Jersey, Radio Corporation of America, RCA Laboratories Division, 1948. 485 pp., illus., cloth.

Sources of Engineering Information:

Blanche H. Dalton. Berkeley and Los Angeles, University of California Press, 1948. 109 pp., cloth.

Specifications and Law on Engineering Works:

Walter C. Sadler. New York, Wiley; London, Chapman and Hall, 1948. 493 pp., cloth.

Strength of Light Alloy Struts:

J. F. Baker and J. W. Roderick. London, Aluminium Development Association, 1948. 148 pp., illus., cardboard. (Aluminium Development Association Research Report No. 3).

Theory and Calculation of Alternating Currents:

B. C. Lee. London, Spon, 1948. 150 pp., illus., cloth.

Traffic Design of Parking Garages:

Edmund R. Ricker. Saugatuck, Conn., Eno Foundation for Highway Traffic Control, 1948. 182 pp., illus., paper.

PROCEEDINGS, TRANSACTIONS, ANNUALS, ETC.

Export Catalogue and Buyers' Guide, 1948:

Engineering Industries Association, London, 1948.

International Management Congress, Eighth; Stockholm:

Proceedings of the Congress, Volume III, 1947.

National Conference on Industrial Hydraulics:

Proceedings of the Third Annual Meeting, 1947.

National Council of State Boards of Engineering Examiners:

Proceedings of the Twenty-Seventh Annual Meeting, 1948.

North-East Coast Institution of Engineers and Shipbuilders:

Transactions, Volume 64, 1948.

Ontario Hydro-Electric Power Commission:

Fortieth Annual Report, 1947.

World Power Conference:

Statistical Year-Book of the World Power Conference, No. 4—Data on Resources and Annual Statistics, 1936-46.

TECHNICAL BULLETINS, ETC.

Edison Electric Institute. Publications:

No. Q-8—Single-Phase Motor Starting Current Rules.

Engineering Societies Library. ESL Bibliographies:

No. 2—Bibliography on Prestressed Reinforced Concrete

Institute of Metals. Reprints:

Constitution of Aluminium-Magnesium-Zinc-Chromium Alloys at 460°C., K. Little, J. H. Axon, and W. Hume-Rothery.—Promotion and Acceleration of Metallic Corrosion by Micro-Organisms, T. Howard Rogers.—Solubility of Hydrogen in Liquid and Solid Aluminium, C. E. Ransley and H. Neufeld.—Working Behaviour of Phosphorus-Deoxidized Coppers Containing Bismuth, A. P. C. Hallowes.

Institution of Electrical Engineers. Proof Sheets:

...Direct-Current Transmission, and the Role of the British Electrical Industry...—...High-Voltage Air-Blast Circuit-Breakers. — . . . Radar Synthetic Training Devices for the R.A.F.—Storage System for Use with Binary-Digital Computing Machines.

Institution of Mechanical Engineers. Advance Copies:

Address by the Chairman of the Automobile Division.—...Compression Shock as in Turbine and Compressor Blade Passages.— . . . Gear-Hobbing-Machine-Tables.—...High-Pressure Steam Power Plant.—Presidential Address.—...Thermodynamic Cycles in Internal Combustion Engines and Turbines.

International Civil Aviation Organization. First North Pacific Regional Air Navigation Meeting. Publications:

Final Reports of Committees on Aerodromes and Ground Aids, Air Traffic Control, Communications, General, Meteorological, Search and Rescue, and Subcommittee 1 of General.

...Second European - Mediterranean Regional Air Navigation Meeting:

Final Reports of Committees on Communications, General, Meteorological, Search and Rescue, and Subcommittee 1 of General.

Kungl. Tekniska Hogskolans. Handlingar:

Nr 17—On Accuracy of Sieve Analyses made by means of Sieving Machines, Sture Mortsell.—Nr 18—Waves in Compressible Media—I. Basic Equations, II—Plane Continuous Waves, by W. Weibull.—Nr 20—Theoretical Investigation of the Effect of Capillary Suction on Transfer of Moisture in Hygroscopic Materials, C. H. Johansson.—Nr 21—On Distillates from Fir Stumps—Part I. Fir Tar and Oils from Fir Tar, Part II. Neutral Substances Present in Fir Tar and Oils from Fir Tar, Nils Hellstrom—Nr 22—Theory and Applications of Trochotrons, H. Alfven and others.

New York State College of Ceramics. Ceramic Research Department. Bulletins:

No. 3—Rock Salt for Ice and Snow Control, C. R. Amberg and L. E. Williams.

North-East Coast Institution of Engineers and Shipbuilders. Advance Copies:

Thermodynamics in the Making, S. S. Cook.

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No. 77—Company Wage Policies; a Survey of Patterns and Experience, Richard A. Lester.

...Selected References:

No. 24—Technological Change under Collective Agreements.

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No. 11—Building Methods and Building Costs in Stockholm, 1883-1939, H. J. Danielsson and Mejse Jacobsson

STANDARDS, SPECIFICATIONS, ETC.

American Institute of Electrical Engineers. Standards:

AIEE No. 551—October 1948—Master Test Code for Temperature Measurement Of Electric Apparatus (Published for Trial Use).

British Standards Institution. Standards:

BS 15:1948—Structural Steel.—BS 348: 1948—Compressed Natural Rock Asphalt.—BS 460 & 1205:1948—Cast Iron Rainwater Goods.—BS 1438:1948—Media for Biological Percolating Filters.—BS 1446:1948—Mastic Asphalt (Natural Rock Asphalt Aggregate) for Roads and Footways.—BS 1447:1948—Mastic Asphalt (Limestone Aggregate) for Roads and Footways.

...Codes of Practice:

CP(B)787—Flues for Domestic Appliances Burning Solid Fuel.—CP(B)788—Gas Fired Boilers for Central Heating by Hot Water.—CP(B)790—Staff Location Systems.—CP(B)792—Chemical Extinguishers and other Hand Appliances.

Canadian Standards Association. Specifications:

CSA Z7-1 Series-1948—Specifications for Motion Picture Photography.

PAMPHLETS, ETC.

Beacon Laboratories:

Texas Company, Beacon, New York, 1948.

Climatic Summaries for Selected Meteorological Stations in Canada, Newfoundland and Labrador; Volume II—Humidity, Wind Speed and Direction:

C. C. Boughner and M. K. Thomas. Toronto, Canadian Department of Transport, Meteorological Division, 1948.

Community Planning is Common Sense!

Community Planning Association of Canada, Ottawa, 1948.

St. Lawrence Waterway:

J G. G. Kerry, MEIC. (Reprinted from Shipping Register and Shipbuilder, Sept. 1948).

BOOK NOTES

The Institute does not assume responsibility for any statements made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

BRITISH STANDARDS INSTITUTION. STANDARDS.

London, the Institution, 1948.

BS 1440:1948 — Endless V-Belt Drives. 3/-.

Deals with endless V-belts having an included angle of 40° and consisting of rubber and textile materials; and with V-groove pulleys, used primarily for power transmission for industrial purposes.

BS 1441:1948 — Galvanized High Tensile Steel Wire for Armouring Submarine Cables. 2/-.

Covers wire in sizes ranging from 0.134 inches to 0.083 inches. Methods of test, test requirements and tolerances are specified and details are provided relating to selection of test samples, retests, galvanizing, size and weight of coils and packing and identification.

BS 1442:1948 — Galvanized Mild Steel Wire for Armouring Cables. *2/–.*

Covers wire ranging in size from 0.400 inches to 0.028 inches, and includes the same information as BS 1441.

BS 1443:1948 — Sizes of X-Ray Film and Intensifying Screens. *2/–.*

Specifies minimum and maximum cutting sizes for X-ray film and intensifying screens, and also provides for a standard minimum size of cassettes; care has been taken to ensure that films and screens of these sizes will be capable of satisfactory use in all existing equipment.

BS 1452:1948 — Grey Iron Castings. *2/6–.*

Covers the requirements of seven grades of iron castings, the grades being numbered in accordance with their tensile strength on a 1.2 inch diameter test bar.

CANADA'S NEW NORTHWEST.

North Pacific Planning Project. Ottawa, King's Printer, 1947. 155 pp., illus., 11¼ x 8½ in , paper, $1.00.

This book is the result of a survey that was begun in co-operation with the United States "to study the possibilities for the economic development of the Region (Canadian North Pacific and Alaska) for the benefit of the two countries . . .". The U.S. withdrew, but studies of the Canadian section have continued. The aim of the book was to set out a broad picture with more particularized discussion of its natural features and resources, its people and their way of life, its climatic conditions, its industry and its channels of transportation, present and potential. Conclusions have been drawn on which are based suggestions for policies.

CANADIAN STANDARDS ASSOCIATION. STANDARDS.

Ottawa, the Association.

C22. 2No. 83-1948.—Canadian Electrical Code—Pt. II—Specification No. 83—Construction and Test of Electrical Metallic Tubing. *50c.*

This specification covers electrical metallic tubing fabricated from mild steel (ferrous), or from some other suitable metal such as aluminum or copper-alloy (non-ferrous). These are minimum requirements. They are based upon records of tests and field experience and are subject to revision as further experience and investigation may show to be necessary or desirable.

CANADIAN TRADE INDEX, 1948.

Canadian Manufacturers' Association, Toronto, 1948. 1122 pp., illus., 10¼ x 6½ in., cloth, $6.00.

The object of the Canadian Trade Index is to provide buyers and sellers of Canada and ninety other countries with a directory of products manufactured in Canada and the names of the firms making them. It includes an alphabetical list of approximately 10,000 manufacturing firms with addresses, branches, brands and trade names, cable addresses and foreign representatives, and a classified list of thousands of industrial products with the names of firms manufacturing them. It also contains a Special Export Section giving basic information in regard to government services, foreign trade controls, methods, financing, price quotations, and British Empire tariff preferences.

CONDENSATION IN AN EXPERIMENTAL PANEL COOLING INSTALLATION.

A. D. Kent. Ottawa, National Research Council, 1948. 14 pp., illus , 10½ x 8¼ in., paper, 25c.

This publication is the result of experiments with a panel cooling system employing wrought iron pipes embedded in a plaster ceiling for the purpose of studying the amount of condensation on the ceiling. Results were obtained which indicate how the amount of condensation can be materially reduced for the same cooling effect.

DICTIONARY OF TERMS USED IN THE PAPER, PRINTING AND ALLIED INDUSTRIES.

Gerard H. Lafontaine. Toronto, Howard Smith Paper Mills, 1948. 110 pp., 11 x 8½ in., paper.

This is a dictionary of the technical language that has developed in connection with the paper and printing industries. French equivalents to the terms are included, with an index to them. The definitions are concise and in many cases contain examples. The book concludes with a short history of papermaking.

FBI REGISTER OF BRITISH MANUFACTURERS, 20th ed., 1947-48.

Iliffe, for the Federation of British Industries, London, 1948. 646 pp., illus., 9½ x 7¼ in., cloth, 30/–.

This is the first post-war edition of this index and lists some 5000 firms and 5250 classes of products and services. One section is devoted to products with their manufacturers; another lists the firms that are members of the FBI, with their addresses and the products manufactured; and a third lists trade names with their identification and a reproduction of trade-marks.

FILING SYSTEMS FOR ENGINEERING OFFICES; A SELECTED LIST OF REFERENCES.

Engineering Societies Library, New York, 1948. 6 pp., 11 x 8½ in., paper, $2.00. (Engineering Societies Library, Bibliography No. 1).

This selected list of references, covering the years 1919 to 1947, has been compiled to aid the engineer who wants information on how to systematize his engineering office files. Forty-one references to books and articles are listed. Information includes author, title, number of pages, publisher (or periodical in which the article appears), and an annotation on the content of each book or article. This is the first of a series of bibliographies on subjects of interest to engineers.

SKID RESISTANCE MEASUREMENTS OF VIRGINIA PAVEMENTS.

T. E. Shelburne and R. L Sheppe. Washington, D.C., Highway Research Board, 1948. 27 pp., illus., 9¾ x 7 in., paper. (U.S. Highway Research Board. Research Report No. 5-B).

The purpose of this study was to obtain data on surface characteristics that could be used as a guide for establishing future design, construction, and maintenance policies. Both good and worn tread synthetic and natural rubber tires were employed. More than 1000 measurements of forward skidding distances on 32 pavement surfaces both in a dry and in a wet condition are reported.

The following notes on new books appear here through the courtesy of The Engineering Societies Library of New York. The books are available at the Institute Library.

ALTERNATING-CURRENT CIRCUIT THEORY.

M. B. Reed. Harper & Brothers, New York, 1948. 603 pp., illus., diagrs., charts, tables, 9½ x 6 in., cloth, $5.50.

This volume contains both fundamentals and applications. Experimental evidence for a theory is followed by a complete mathematical development. Particular attention is paid to the establishment of a working knowledge of reference directions and polarities of currents and voltages. Illustrative examples are used profusely, and there is an extensive list of problems at the end of each chapter.

DESIGN OF MACHINE ELEMENTS.

M. F. Spotts. Prentice-Hall, Inc., New York, 1948. 402 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth. $6.65.

This book opens with a survey of prerequisite theory, and continues with consideration of individual machine elements. Methods based on rational analysis are utilized. Well-known basic theories of design are presented as well as some of the newer methods. Design data usually obtained from catalogs are omitted. The text contains many illustrative examples and solutions, besides a large number of problems to be worked by the student. Each chapter is concluded with a brief bibliography.

DISTILLATION AND RECTIFICATION.

E. Kirschbaum, translated by M. Wulfinghoff. Chemical Publishing Co., Brooklyn and New York, 1948. 426 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $10.00.

Of value to the student and practicing engineer, this book presents both the fundamentals and practical factors. Principles and generally suitable designs have been stressed while numerical and descriptive examples have been referred to specific industries. As far as possible, graphic methods have been used in preference to those requiring involved calculations. Many tables and graphs are included.

ELECTRIC POWER AND GOVERNMENT POLICY, a Survey of the Relations between the Government and the Electric Power Industry.

Twentieth Century Fund, 330 West 42nd St., New York, 1948. 860 pp., charts, maps, tables, 9¼ x 6 in., cloth, $5.00.

This volume is based upon the findings of a comprehensive survey of the relations between government and the electric power industry. The project was designed to give the public an unbiased picture of how these relations have worked out, and develop some constructive plants for a national power policy platform in the interest of the public as a whole.

FIREPROOF CONSTRUCTION.

W. C. Voss. D. Van Nostrand Company, Inc., Toronto, New York, London, 1948. 286 pp., illus., diagrs. charts, tables, 9¼ x 6 in., cloth, $7.50 (in Canada).

Illustrating the accepted fundamental practice in each of the various stages of building construction, this volume supplies a basis for extended discussion and for innovations which do not violate basic principles. Each phase of construction of fire-resistant buildings is considered individually from preliminary work and rock excavation to interior finish and building services. Many diagrams illustrate the text.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

December 20th, 1948

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

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

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

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

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

The Council will consider the applications herein described at the January meeting.

L. Austin Wright, General Secretary.

*The professional requirements are as follows:—

A **Member** shall have been engaged in some branch of engineering for at least six years, which period may include apprenticeship or pupilage in a qualified engineer's office or a term of instruction in a school of engineering recognized by the council. In every case a candidate for election shall have held a position of professional responsibility for at least two years. The occupancy of a chair as professor, assistant professor, associate professor or lecturer in a faculty of applied science or engineering, shall be considered as professional responsibility.

Every candidate who has not graduated from a school of engineering recognized by the council shall be required to pass an examination as prescribed by council, on the theory and practice of engineering, with special reference to the branch of engineering in which he has been engaged.

A **Junior** shall have been engaged in some branch of engineering for at least four years. This period may be reduced to one year, if the candidate for election has graduated from a school of engineering recognized by the council, in which case he shall not remain in the class of Junior beyond the end of the eighth year after graduation.

Every candidate who has not passed the examinations of the third year in a school of engineering recognized by council shall be required to pass an examination in engineering science as prescribed by council. He shall not remain in the class of Junior beyond age thirty.

A Junior may be transferred to Member without payment of transfer fee providing he makes application before the end of the seventh year after graduation or, if a non-graduate, before attaining age twenty-nine, and his application is approved by council.

Council may extend the above limits if in its opinion special circumstances warrant such extension.

A **Student** shall be at least seventeen years of age, and shall present a certificate of having passed an examination equivalent to the final examination of a high school, or the matriculation of an arts or science course in a school of engineering recognized by the council or shall be required to write examinations as prescribed by the council.

He shall be:

a. pursuing a course of instruction in a school of engineering recognized by the council, in which case he shall be transferred to Junior automatically without payment of transfer fee in the second January after graduation, or

b. receiving a practical training in the profession in which case he shall be transferred to Junior without payment of transfer fee providing he makes application before attaining age twenty-five and his application is approved by council.

He shall not remain in the class of Student after he has attained the age of twenty-five, unless in the opinion of council special circumstances warrant the extension of this age limit.

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

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

FOR ADMISSION

BRYANT—JAMES LEWTHWAITE, of Montreal, Que. Born at Ocean Falls, B.C., May 24, 1923. Educ.: B.A.Sc., (Mech.), B.C., 1945., Junior, A.S.M.E.; 1944-45-47, (summers), dftsman., jr. mech. engr., Pacific Mills Ltd.; with Ross Engineering of Canada Limited, Montreal, as follows: 1947-48, sales engr., and at present, design engr., high temp. drying & paper mill heating & ventilating, paper mill dept.

References: R. R. Willis, S. McEachern, P. A. Frattinger, J. N. Finlayson, C. W. E. Locke.

COLLIER—ROBERT DOUGLAS, of Baie Comeau, Que. Born at Brooklyn, N.Y., Jan. 19, 1924. Educ.: B.Eng., (Mech.), McGill, 1948; 1942, assi. engr., Canadian International Paper Co.; 1947 to date, asst. engr., and at present, asst. logging engr. on mech. logging operation, planning, administration, supervision and direct cost control, Quebec North Shore Paper Co., Baie Comeau, Que.

References: J. J. O'Neill, C. A. Robb, J. A. Coote, D. Stairs, C. Mikkelborg.

DAYTON—WILLIAM ARTHUR, of Arvida, Que. Born at Winnipeg, Man., Sept. 5, 1913. Educ.: B.A.Sc., 1937; M.A.Sc., 1938, Univ. of B.C.; 1935-36, surveyor, sampler, Reno Gold Mines; 1938-39, ore dressing, lab. instructor, Univ. of B.C.; 1939-40, engr., Noranda Mines Ltd.; 1940-45, supvr. of guncotton, cordite, sodium azide, T.N.T., acid dept., Canadian Industries Ltd., McMasterville, Que.; 1945-47, asst. to concentrator supt., Noranda Mines Ltd.; with Aluminum Co. of Canada, as follows: 1947-48, supvr., hydrate dept. (ore plant), at present, asst. supt. i/c operation, caustic plant, Arvida, Que.

References: B. E. Bauman, G. M. Mason, E. F. Hartwick, C. J. Tanner, J. E. Dyck, F. A. Dagg.

FERRIES—DAVD, of Winnipeg, Man. Born at Wishaw, Scotland, Nov. 14, 1902. Educ.: Home study & apprent'ship.; R.P.E., Manitoba; 1920-23, jr. dftsman., Canadian Pacific; 1924-25, dftsman., City of Winnipeg Hydro; with Canadian Pacific Railway Co., as follows: 1926-29, dftsman., 1929-42, district dftsman., 1942-47, asst. chief dftsman., 1947 to date, chief dftsman., engrg. dept., Prairie & Pacific region, Winnipeg, Man.

References: F. W. Alexander, J. C. Holden, H. W. McLeod, C. H. Fox, C. V. Antenbring, E. A. Ford.

FOTHERINGHAM—MORSON SCARTH, of Steep Rock Lake, Ont. Born at Quebec, Que., May 8, 1909. Educ.: B.A.Sc., Toronto, 1931; R.P.E., Ontario; Member, C.I.M.M.; 1929 & 1930, (summers), jr. engr., Detroit Canada Tunnel constrn., for Parsons, Klapp, Brinkerhoff & Douglas, New York; with Teck-Hughes Gold Mines Ltd., as follows: 1931-34, engr., 1935-37, chief engr.; 1937, (3 mos.), genl. supt.; 1937-44, genl. supt., Steerola Exploration Co.; Steep Rock Iron Mines Limited, 1944-45, mine mgr., 1945 to date, vice-pres. & genl. mgr.; also vice-pres., Iron Lake Exploration Co., Steep Rock, Ont.

References: T. H. Hogg, F. V. Seibert, J. M. Fleming, G. E. Cole, H. E. T. Haultain, R. B. Chandler, C. D. Howe, C. Camsell.

GRAY—IAN ALEXANDER, of Montreal, Que. Born at Orangeville, Ont., Feb. 7, 1920. Educ.: B.Aero. Engrg., Univ. of Detroit, (acc. ECPD.), 1943; Member, Inst. Aero. Sciences; 1940-43, jr. engr., liasion & stress, Fleet Aircraft; with Canadian Pacific Air Lines, as follows: 1943-44, service engr., 1944, (5 mos.), dist. engr.; 1944-45, Canadian Army; with Canadian Pacific Air Lines, as follows: 1946-47, plant engr., 1947-48, sr. service engr., 1948 to date, assigned to Pacific development as supervisor of engrg. (at Canadair), Montreal, Que.

References: G. E. Otter, D. C. MacCallum, P. W. Gooch, J. T. Dyment.

ISBISTER—JOHN McKECHNIE, of Winnipeg, Man. Born at Winnipeg, Man., Oct. 7, 1911. Educ.: B.Sc., (Civil), Manitoba, 1933; 1928-31, (summers), constrn. surveys, Canadian National Rly.; 1935-37, mucker, timberman, driller, sampler, mine engr., underground shift boss, Argosy Gold Mines Ltd., Casumit Lake, Ont.; 1937, mucker, timberman, driller, mine capt., Mesabi Gold Mines Ltd.; 1937-38, timberman, asst. mine engr., Kirkland Lake Gold Mines Ltd.; 1938 to date, engr., layout, boilermaker, fitter, moulder, melter, etc., asst. plant supt., genl. supt., and presently genl. mgr. & director, Vulcan Iron & Engineering Ltd., Winnipeg, Man.

References: A. E. MacDonald, F. V. Seibert, W. D. Hurst, D. M. Stephens, G. C. Davis, G. R. Fanset, E. P. Fetherstonhaugh.

KRAUS—FELIX M., of Montreal, Que. Born at Zagreb, Yugoslavia, Sept. 2, 1913. Educ.: Diplom Engr., Technical H.S. of Royal Univ. of Zagreb, 1936; Dr. Engr., Polytechnicum, Turin, Italy, 1947; (standing of institutions approved by EIC Examining Board); 1936-42, designing & surveying of structures mostly in reinforced concrete, for B.Superina and F.Sperac; 1945, research work on specified tasks, Swiss Federal Research at Zurich; 1945-48, as consultg. engr. for self; at present, structl. design work, Stadler, Hurter & Co., Montreal, Que.

References: A. T. Hurter, C. J. Jeffreys, P. J. Kunstler, K. R. Meyer, I. Kursbatt.

MAJKA—STANISLAW JOZEF, of Montreal, Que. Born at Cracow, Poland, Aug. 20, 1908. Educ.: Diplom Engr. (Mech.), Univ. of Lwow, (Politechnika Zwowska), Poland, 1937; 1934-38, asst. lecturer, to Prof. Mozer at Univ. of Lwow (chair of Institute of Mechanical Technology of Metal); 1938-39, research engr., Lublin Aircraft Factory, Poland; 1940 (Feb. to June), research engr., Devoitine Aircraft Factory, Toulouse, France; 1940-42, Polish Armed Forces in Great Britain; 1942-48, research engr., responsible for head of divn. of research to obtain accurate thermal data and investigation of failures; personally responsible for develop't. of new methods of temperature control and thermal investigation of aluminum alloys; i/c of plans and erection of high precision heat-treatment lab. and heat-treatment pilot plant, High Duty Alloys, Slough, Bucks., Eng.; October, 1948, left for Canada.

References: J. Korwin-Gosiewski, E. Szczeniowski, J. Krol, Z. Zolkiewicz, J. Krupski.

McCLEAVE—HARRY SPENCER, of Saint John, N.B. Born at Halifax, N.S., March 10, 1924. Educ.: B.Sc., (Elect.), N.B., 1947; 1944 & 1945 (summers), land surveying, N. B. Gas & Oilfields Ltd.; elect. wiring, Richibucto, N.B.; 1947 to date, student engr., N.B. Telephone Co., Saint John, N.B., two year period up in July, 1949, in outside plant dept. which deals with telephone equipt. outside of various bldgs., design, layout and cost estimates of toll lines throughout province.

References: J. M. Redding, A. G. P. McDermott, L. S. Mundee, A. A. Turnbull, R. M. Richardson.

MacDONALD—DONALD JAMES, of Montreal, Que. Born at Balmoral Mills, N.S., Sept. 22, 1901. Educ.: B.Sc., (Elect.), Nova Scotia Tech., 1926; R.P.E., Quebec; 1928-34, elect. engr., Canadian Westinghouse Co., Hamilton, i/c co.'s instlns., N.B. International Paper, and pumping stn., Brantford, Ont.; 1934-36, elect. engr., independent engrg. work—Kirkland Lake, Ont.—design elect. plant, Moffatt Hall Mine; 1936-40, elect. engr., Sutcliffe Co. Ltd., New Liskeard, Ont., asst. to T. S. Armstrong on elect. design for mining plants, substns., power work, i/c field instln., East Malartic Gold Mines, Preston East Dome Gold Mines; 1940-46, elect. engr., Allied Brass and Canada Strip Mill, Montreal; elect. engr., i/c plant, elect. and furnace develop't.; 1946-48, consultg. elect. engr., Montreal, responsible for elect. work on process for two plants built by Murphy Paint Co., Montreal; at present, consultg. engr., 1154 Beaver Hall Hill Sq., Montreal, Que.

References: S. H. Clarke, A. D. Ross, E. E. Orlando, J. H. Dyer, H. C. Brown.

MULLINS—DONALD BEITH, of Montreal, Que. Born at Stonewall, Man., Oct. 29, 1916. Educ.: B.Sc., (Elect.), Manitoba, 1945; 1944-45, area engr., layout plans and genl. mtce. supervision, Defence Industries Limited; with National Breweries Ltd., Montreal, as follows: 1945-47, layout of equipt. work estimates, surveys and studies for constrn. and instln. of equipt., 1947 to date, engr., final surveys and check details of constrn. and instlns. of equipt., alterations and repair projects, design, structure & equipt., iuspecn. of power plants and equipt.

References: A. E. Sargent, H. S. Petford, N. M. Hall, J. H. Palmason, R. W. Moffatt.

SHAVER—JOHN WILLIAM, of Arvida, Que. Born at Ancaster, Ont., Feb. 2, 1923. Educ.: B.A.Sc., (Metall.), Toronto, 1946; during six summers experience was gained in the following work: iron foundry labourer, chemical analyst, lathe drill press operator at General Motors Corp., St. Catharines; automotive parts inspector at Thompson Products, St. Cathatines, Ont.; machine operator Guarantee Silk Dyeing & Finishing Co., St. Catharines; rolling mill and heat treat, furnace operation, Atlas Steels, Welland, Ont.; 1946 to date, Aluminum Co. of Canada, Arvida, Que., during 1947 being trained for supervn. in reduction plant, appointed supvr. in February, 1948, work involves develop't. work in connection with the process, safety, efficient operation of the process, purity of aluminum products, labour relations and costs.

References: F. T. Boutilier, B. E. Bauman, C. J. Tanner, F. A. Dagg, A. C. Johnston.

SILLIMAN—DONALD WYLIE, of Ottawa, Ont. Born at Onconta, N.Y., May 9, 1919. Educ.: B.Sc., (Civil), 1943; M.Sc., (Civil), 1947, Queen's; R.P.E., Ontario; 1941, (summer), levelman on highway location surveys, Ontario Dept. Highways; 1942, (summer), transitman in direct charge of engrg. constrn. of 3½ mile spur and rly mtce., Canadian Pacific Rly.; 1943-45, Lieut., R.C.E.; 1944-45, lecturer in civil engr., Queen's—lectures in surveying, from Sept. 1945 to 1946 (replaced regular professor on leave and had full charge of second year surveying, while assisting with first year surveying; with engrg. dept., City of Ottawa, as follows: 1947, (4 mos.) under direction of C. D. Wight as advisor to Ottawa Planning Area Board, 1947 to date, acted as asst. to J. H. Irvine, M.E.I.C., designing engr. for City of Ottawa—principal duties consisted of design of sewers.

References: D. S. Ellis, J. D. Lee, L. F. Grant, C. D. Wight, J. H. Irvine, W. F. M. Bryce.

TAYLOR—JAMES ALONZO, of Detroit, Mich. Born at Davenport, Iowa, Oct. 8, 1906. Educ.: B.Sc., (Chem. Engrg.), State Univ. of Iowa (acc. ECPD), 1928; grad. asst. in chemistry, Univ. of Pittsburgh, two yrs.; Ph. D. (Dept. of Chem. & Chem. Engrg.), Univ. of Washington (acc. ECPD), 1932; R.P.E., Alberta; Fellow, Chemical Institute of Canada; 1932-34, asst. chem. engr., Northwest Experiment Stn., U.S. Bureau of Mines, Seattle, Wash.; 1934-42, asst. prof., fuel technology, Penn. State College, Pa.; 1942-43, chem. engr., Pittsburgh, Coke & Chemical Co., Neville Island, Pittsburgh, Pa.; 1943-44, chem. engr., Girdler Corp., Votator divn., Louisville, Ky.; 1944-45, chem. eng., Cardox Corp., Chicago, Ill.; 1945-46, chem. engr., Proctor & Gamble Co., Ivorydale, Ohio; 1946-48, professor & head of chem. engrg., Univ. of Alberta; 1948 to date, professor & head, chem. & metall. engrg., Wayne Univ., Detroit, Mich.

For transfer from the class of Junior

CARLSON—ARTHUR JOHN, of Winnipeg, Man. Born at Fort Frances, Ont. on Jan. 26, 1915. Educ.: B.Sc. (Civil) Queen's, 1941; M.A.Sc. Toronto, 1942; summer work as follows: 1937, instru'man Ont. Dept. of Highways; 1940, asst. field engr. Hamilton Bridge Co.; 1940 (Fall) instructor; Queen's Univ. Survey School; 1942-45, district engr. Dept. of Nat'l Health & Welfare, St. Catharines, Ont. and St. John, N.B.; 1945-48, asst. prof., civil engrg. Univ. of Man., Winnipeg. (St. 1940, Jr. 1946)

References: E. P. Fetherstonhaugh, A. E. Macdonald, G. H. Herriot, W. F. Riddell, E. S. Magill.

CHOMYN—MICHAEL WILLIAM of Ottawa, Ont. Born at Sask. on Mar 13, 1921. Educ.: B.Sc. Sask. 1944; M.A.Sc. Toronto, 1944; R.P.E. Ont. summer work, 1941, rodman, dftsman, P.F.R.A.; 1942, instru'man on irrigation projects & survey, P.F.R.A.; 1943, mtc. and instaln., Aluminum Co. of Canada, Kingston; 1944-45, Lieut. R.C.E.M.E.; 1946 to date, senior mech. engr., Dept. of Civil Engrg. & Mtce. (Navy), Ottawa. (St. 1943. Jr. 1946)

References: J. Dick, I. M. Fraser, E. A. Allcutt, H. Klempner, M. W. Huggins.

DIBBLEE—FREDERICK ALLAN of Moncton, N.B. Born at Woodstock, N.B. on Feb. 15, 1913. Educ.: R.M.C. 1935, B.Sc. (Elect.) New Brunswick, 1937; R.P.E. N.B. 1937-38, inspector, Canadian Marconi Factory, Mtl.; 1938, lineman, Northern Ont. Hydro, Timmins, Ont.; 1938-39, electrician, McWatters Gold Mines, Rouyn, Que.; 1939-41, sampler & electr. Noranda Mines; 1941-45, Radar Officer, Flight Lieut. R.C.A.F., commanding ground radar stations in England & middle east; 1946-elect. engr., design, detailed layout elect. equipt. for Pulp and Paper Mills with Stadler Hurter & Co.; at present, elect. engr. grad 2, Air Services Branch, Dept. of Transport, instaln. mtce. admn. work of all radio navigation stations, Moncton. (St. 1937. Jr. 1946)

References: L. F. Grant, A. F. Baird, H. P. Moller, W. C. MacDonald, R. E. Tweedale, R. B. Wotherspoon, J. M. Scott, G. A. Campbell.

EDWARDS—JOHN BEVAN of Trois Rivieres, Que. Born at Sask. on Mar. 6, 1920. Educ.: B.Sc. (Mech.), Sask, 1941; 1941-42, jr. mtc. engr., Defense Industries Ltd. Winnipeg; 1942-46, Lieut. R.C.E.M.E. overseas; 1946-47, layout engr. dftsman, Stadler Hurter Co. Ltd., Mtl.; at present, asst. to plant engr. St. Lawrence Paper Mills Co. Ltd. Trois Rivieres, Que. (St. 1941. Jr. 1946)

References: S. E. Williams, J. B. Sweeney, P. E. McIlhargey, I. M. Fraser, N. B. Hutcheon, G. C. Mann.

ELLIOTT—CLARENCE WILBERT of Calgary, Alta. Born at Peterborough, Ont. on Oct. 1, 1909. Educ.: B.Sc. (Elect.) Alberta, 1938; with Calgary Power Ltd. as follows: 1938-39, floorman at Hydro Plant; 1939-41, apprentice engr.; 1946-48, asst. transmission & distribution engr., Calgary. (St. 1938. Jr. 1940)

References: H. B. LeBourveau, J. N. Ford, D. F. Kobylnyk, S. D. Foote, J. McMillan, H. Randle, D. A. Hansen.

FOREST—CLEMENT of Beauharnois, Que. Born at St. Marie Salome, Que. on Jan. 16, 1915. Educ.: B.A.Sc. (C.E.) Ecole Poly. 1941; R.P.E. Que.; with the Quebec Highway Dept. as follows: 1938-40, instru'man; 1941, instru'man Transport Dept., Civil Aviation Division; with Beauharnois Light, Heat & Power Co.; 1943-44, engr.; 1944-48, field engr. Beauharnois, Que. (St. 1939. Jr. 1942)

References: C. K. Kingsmill, C. H. Pigot, F. Rousseau, F. Willows, E. Prevost, H. F. Abbott, Y. Deguise.

LANE—ROBERT CAMPBELL of Ottawa. Born at Sault Ste. Marie, Ont. on July 5, 1912. Educ.: B.Sc. (Met. Engrg.) Michigan College of Mining & Technology, 1938, (accredited E.C.P.D.), 1938-40, International Nickel Co., research dept.; 1940-46 Canadian Army overseas; 1947 to date, Major grade 2 gnl. staff officer, directorate of weapons & development, army H.Q. Ottawa. (Jr. 1940)

References: J. W. Bishop, A. Mendelsohn, J. R. Dunlop, K. H. McKibbin, C. R. Boehm.

MacDONALD—JOHN THOMSON of Toronto. Born at Toronto on Dec. 8, 1912. Educ.: B.A.S.c Toronto, 1936; R.P.E. Ont.; 1936-39, divisional engr. Gair Co. Canada Ltd.; 1939-40, engr. E. B. Eddy Co. Ltd., Hull; 1940-41, mtce. engr. Spruce Falls Power & Paper Co., Kapuskasing, Ont.; 1941-46, plant engr. Hinde & Dauch Paper Co. Toronto; 1946-48, resident engr. Provincial Paper Ltd.; at present resident engr. i/c all engrg. in four paper mills of Provincial Paper Ltd. eastern divisions. (Jr. 1939)

References: H. Self, E. R. Graydon, T. Dembie, C. R. Young, R. Hewitt, P. W. Gooch, T. N. Loudon.

MARSHALL—WELSFORD ALLAN of Montreal, Que. Born at Ottawa on Jan. 29, 1914. Educ.: B.Sc. (Civil) Queen's, 1938; R.P.E. Que.; 1930-40, Dominion Structural Steel Ltd.; 1940-45, Major, R.C.E.M.E.; 1945 to date, Dominion Structural Steel Ltd. designing engr. (St. 1937. Jr. 1943)

References: L. B. McCurdy, A. K. Hay, R. J. Legget, A. Jackson.

PANGMAN—ARTHUR HENRY of Montreal. Born at Montreal on July 1, 1905. Educ.: B.Sc. (Ch.E.) McGill, 1930; 1929, chemist, Dominion Sugar Refinery; 1930-32, chemist Murphy Varnish Co.; 1932-36 control chemist; 1936-40, purchasing agent, Charles E. Frosst Co. Ltd.; 1941-45, Canadian Army Overseas; 1945-48, production chemical engr., Charles E. Frosst Co. (St. 1935. Jr. 1946)

References: A. S. Dawes, A. Olsen, A. P. Shearwood, G. L. Wiggs, F. W. Taylor-Bailey.

STOPPS—FRANK SIDNEY of London, Ont. Born at Verdun, Que. on Dec. 28, 1916. Educ.: B. Eng. (Mech.) McGill, 1941; R.P.E. Ont.; summer work with Canada Car & Foundry, 1938, machine shop; 1939, drawing office; 1940 drawing office Dominion Bridge; with Dominion Engineering Works Ltd. as follows: 1941-43, Longueuil plant, gig, fixture, & tool detail, design & checking & time study; 1943-44, studying gun design under British Ministry of Supply; 1944-45, tool design, time study & production control; 1945, i/c engrg. dept.; 1946, i/c engr. dept. Canadian Arsenals Ltd., gun div. Longueuil; 1946-48, mech. design, Somerville, Ltd., London, Ont.; at present, chief designer. (St. 1941. Jr. 1945)

References: J. Gilchrist, W. M. Veitch, H. Lamb, A. L. Furanna, J. G. Notman, H. M. Black.

WALKER—ROGER HUGH of Rivers, Man. Born at Theodore, Sask. on Dec. 28, 1918. Educ.: B.Sc. (Civil) Sask, 1941; summer work, 1939, rodman, P.F.R.A. Winnipeg; 1940, rodman Dept. of Transport (Airport); 1941, Lieut. R.C.E.; 1947-48, Capt. Instructor Joint Air School, O.C. airportability section Rivers, Man. (St. 1941. Jr. 1946)

References: H. L. Meuser, H. W. Love, R. A. Spencer, E. K. Phillips, J. C. Traynor, W. H. Ball.

For transfer from the class of Student

DEMBISKE—FREDERIC ERNEST of Prince George, B.C. Born at Edmonton, Alta. on June 7, 1911; Educ.: B.Sc. (Civil) Alta. 1948; summer work with Public Roads Administration, U.S.A.; 1942, chainman, levelman, location survey; 1942-43, asst. instru'man, inspector; with the Dept. Public Works, Alta. as follows: 1945-46, instru'man, asst. engr., hwy. constrn.; 1947, resident hwy engr. Alta.; 1948, asst. resident engr. Dept. of Mines & Resources, Alta.; at present asst. district engr., Dept. of Public Works, Prince George, B.C. (St. 1947)

References: K. M. Cummings, W. W. Preston.

PRITCHARD—HUGH J. of Calgary, Alta. Born at Rosalind, Alta. on April 1, 1912; Educ.: B.Sc. (Civil) Alta. 1948; summer work, 1930:39, chairman checker, rodman, Dept. of Public Works, Edmonton; 1939-41, instru'man, Dept. of Transport, Lethbridge & Edmonton; 1941-45, R.C.A.F.; 1946, instru'man D.P.W.; 1947, resident engr., main highway location, design & constrn.; 1948 to date, engr. grade 3, Eastern Rockies, Forest Conservation Board Calgary. (St. 1947).

References: R. M. Hardy, R. L. Black, R. C. Bell, H. N. Macpherson, A. M. Paull, W. J. S. Dawson.

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 preferably in chemistry or chemical engineering required as Research Officer in Ottawa. Duties mainly preparation of specifications concerned with textiles, leather, rubber and related commodities training in this work will be provided. Salary open. Apply to File No. 1003-V.

CHEMICAL ENGINEER, recent graduate, is needed for production work by chemical manufacturing firm situated in the Province of Quebec. Some experience in chemical production of synthetic resin manufacture would be advantageous. Salary open. Apply to File No. 1064-V.

CIVIL

CIVIL ENGINEER with three or four years experience required by Montreal firm for general duties. Salary open. Apply to File No. 1038-V.

CIVIL ENGINEER required for Consulting Engineers office in Western Canada. Must have extensive experience water, sewer and pavement layouts capable of taking charge office staff and field parties. Partnership offered to right man. Salary open. Apply to File No. 1042-V.

CIVIL ENGINEERING GRADUATES with several years experience in building construction and estimating for permanent senior and junior positions in Winnipeg. Good prospects and pension benefits. Starting salary $250.00 and up per month with yearly increments. Apply to File No. 1061-V.

ELECTRICAL

ELECTRICAL ENGINEER required for Toronto area for engineering and design of power transformers. Salary will be commensurate with ability and experience. Apply to File No. 1035-V.

ELECTRICAL ENGINEER with at least five years experience in Central Station and Substation installation and maintenance required by a Maritime Public Utility. Apply to File No. 1043-V.

MECHANICAL

RECENT GRADUATES in Mechanical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 1029-V.

MECHANICAL ENGINEER recent graduate, required for Engineering Department of a farm implement manufacturer in Ontario. Salary open. Apply to File No. 1030-V.

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for ordinary colliery plant, screening equipment, hoists, simple steel structures etc. Salary $240 up depending upon ability. Apply to File No. 1032-V.

MECHANICAL ENGINEER preferably with a few years experience and some knowledge of pulp and paper required for design and layout by a company in New Brunswick. Salary open. Apply to File No. 1036-V.

SENIOR MECHANICAL DRAUGHTSMAN required by a machinery manufacturer in Central Ontario. Salary open. Apply to File No. 1044-V.

MECHANICAL ENGINEER with industrial background required as sales engineer by a consulting firm in Montreal. Salary $300 up according to experience. Apply to File No. 1049-V.

MECHANICAL ENGINEER thoroughly experienced in machine design with some background and experience in the printing trades required as methods engineer by manufacturer in Ontario. Must also have knowledge of production problems. Salary open. Apply to File No. 1050-V.

MECHANICAL ENGINEER with 5 or more years experience in industry, preferably pulp and paper required by manufacturer in Province of Quebec for duties involving organization of improvements, job schedules, machinery maintenance and some mechanical draughting. Salary $300-$350. Apply to File No. 1052-V.

METALLURGICAL

RECENT GRADUATES in Metallurgical Engineering required by steel fabricating industry in Hamilton. Some knowledge of production operations would be helpful. Salary open. Apply to File No. 1029-V.

MISCELLANEOUS

JUNIOR ENGINEER preferably with civil background required for sales and service by a Montreal manufacturer of water-proofing compounds. Salary open. Apply to File No. 1033-V.

SALES ENGINEER under 35 years of age, preferably with engineering and sales experience required in Toronto, to become a specialist in capacitor sales. Salary according to qualifications and experience. Apply to File No. 1035-V.

GRADUATE ENGINEER with engineering and sales experience required as a street lighting specialist in Toronto area. Position involves direct sales engineering with municipalities and utilities also engineering and production problems, directly concerned with the manufacture of street lighting equipment. Age under 35 years. Salary open. Apply to File No. 1035-V.

SALES ENGINEERS one experienced man also two juniors willing to learn required by an electrical and power house equipment manufacturer in Montreal. Salary open. Apply to File No. 1035-V.

CONCRETE DESIGNERS with experience and preferably under 35 years of age required by construction company in Montreal. Salary open. Apply to File No. 1037-V.

MECHANICAL OR ELECTRICAL ENGINEER required as Montreal representative of a Canadian manufacturer with Headquarters in Ontario. Preferably some sales experience. Salary open. Apply to File No. 1039-V.

JUNIOR ENGINEER preferably with a few years experience required by Construction Company in Montreal. Salary open. Apply to File No. 1040-V.

GRADUATE ENGINEER for urban transportation system 25 to 40 years of age with at least five years experience. Hydro-Elect. plant operation experience essential. Steam or diesel electric generating plants desirable. A knowledge of time and motion study and evaluation would be a definite advantage. Salary open. Please send photograph and full particulars of education and experience. Apply to File No. 1041-V.

FOREIGN TRADE REPRESENTATIVE for Middle and Far East for one of Canada's largest chemical manufacturers. Must have extensive experience and knowledge in establishing important contacts in overseas markets. Canadian citizen. Knowledge of French. Salary $8,000 up. Apply to File No. 1046-V.

JUNIOR ENGINEER mechanical or chemical preferably with industrial background required for general duties by a Montreal firm. Salary open. Apply to File No. 1047-V.

GRADUATE ENGINEER required by a consulting engineer in Montreal. Must have experience in boiler plant design and general knowledge of heating. Salary open. Apply to File No. 1048-V.

DRAUGHTSMAN required by industrial organization in Toronto. Must have plant and structural experience. Salary open. Apply to File No. 1051-V.

MECHANICAL OR CIVIL ENGINEER with 3 or more years experience in industry, preferably pulp and paper required by a manufacturer in Province of Quebec for duties involving study and preparation of improvement projects, such as, installation of machinery, piping, etc. Salary $250 to $300. Apply to File No. 1052-V.

MINING OR METALLURGICAL ENGINEER capable of taking charge of a plant control laboratory for plant and control work, required by a manufacturer in the St. Maurice Valley. Age should be between 30 to 40 years. Salary open. Apply to File No. 1054-V.

SALES MANAGER with executive ability and preferably with knowledge of French required by old established construction equipment sales organization. Engineering training and experience essential, applications treated in strictest confidence. Salary open. Apply to File No. 1056-V.

GRADUATE ENGINEERS required for sales staff of a manufacturer in Montreal. Preferably background in mechanical, chemical or mining engineering. Permanent position and good salary for right man. Apply to File No. 1057-V.

DESIGN ENGINEER for concrete machinery and mixers required by well established Ontario manufacturing company. Good opportunity. Good salary. Apply to File No. 1067-V.

ASSSISTANT PLANT ENGINEER required for textile plant in Montreal. Age 27 to 35 and must have maintenance experience. Salary open. Apply to File No. 1068-V.

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

CHEMICAL

JUNIOR RESEARCH CHEMIST required by a manufacturer in Central Ontario to be trained in Research work. Salary open. Apply to File No. 1017-V.

CIVIL

RECENT GRADUATE, preferably civil, with some construction experience required for construction inspection work by large oil company in the West. Work will involve extensive travel and long periods absent from headquarters. This position provides opportunity for advancement. Salary open. Apply to File No. 1005-V.

CIVIL ENGINEER, recent graduate with up to one year's experience since graduation. Preferably single man. Required by Northern Ontario Paper Mill. Salary around $250. Apply to File No. 4158-V.

CIVIL ENGINEER required for Consulting Engineer and Land Surveyor's office in Western Ontario. Must be able to make urban and rural surveys, layout of sewers, waterworks and pavement, etc. Will applicants please state qualifications and references. Salary open. Apply to File No. 4204-V.

CIVIL ENGINEER with considerable experience in structural steel and reinforced concrete design. Preferably bilingual. Required in Montreal. Must be veteran with overseas service. Applicant should state age, experience and salary expected. Apply to File No. 4205-V.

CIVIL ENGINEER required for South America. Must be single and between the ages of 25-40 years. Duties include: Supervise field survey parties doing triangulation and control work, perform draughting and layout work for construction projects as well as miscellaneous minor and major construction projects. Salary $390. U.S. currency. Apply to File No. 4221-V.

ELECTRICAL

RECENT GRADUATE IN ELECTRICAL ENGINEERING required by an industrial organization in Montreal. Salary open. Apply to File No. 4214-V.

ELECTRICAL ENGINEER required by consulting office. Should have at least seven years experience in layouts for substations, switching and motor distribution. Permanent position and good salary for right man. Location Northern Ontario mining district. Apply to File No. 4220-V.

ELECTRICAL DRAUGHTSMAN required by consulting firm. One capable of making detailed plans and diagrams from preliminary drawings prepared by designers. Work consists of layouts for substations, switching and motor distribution systems. Permanent position. Location Northern Ontario. Salary Open. Apply to File No. 4220-V.

ELECTRICAL DISTRIBUTION SUPERVISOR required for South America. Preferably single and 35 years of age or more, with 10 years industrial experience. Duties include direct supervision of all power transmission and distribution lines, transformer stations, lighting installations, etc. Must have ability to direct and lead other skilled personnel. Salary $450. U.S. currency. Apply to File No. 4221-V.

MECHANICAL

MECHANICAL ENGINEERS with 3 to 5 years experience in mechanical design and general plant engineering, as well as field work required by a firm in Quebec. Salary open. Apply to File No. 1001-V.

MECHANICAL ENGINEER required as assistant superintendent for small establishment employing 60 men. Must have complete knowledge of machine shop methods in precision work capable of making accurate estimates machines' times preparatory to bidding. Salary open. Apply to File No. 1002-V.

MECHANICAL ENGINEER for design and development work in large Montreal food industry. Must have 5 to 10 years experience including some structural work. State age and full experience. Salary open. Apply to File No. 1008-V.

MECHANICAL ENGINEER required by a large industrial concern in the Province of Quebec. Good chances for advancement. Salary open. Apply to File No. 1014-V.

MECHANICAL ENGINEER required by large indsutrial concern in Montreal for the design of major electrical products. Salary according to qualifications. Apply to File No. 1016-V.

SENIOR MECHANICAL DRAUGHTSMAN for work in Ottawa. Ten years experience required in simple design layout and detail drawings for steam power plants, steam and hot water heating, ventilation and air conditioning. Four year contract if suitable. Reply in confidence, outlining experience and stating salary expected. Apply to File No. 1045-V.

MECHANICAL ENGINEER, recent graduate, required for manufacturing and related duties with well established reputable paper company. Salary open. Apply to File No. 4172-V.

MECHANICAL ENGINEER with about five years experience in the design of tractors and related accessories required as Automotive Engineer by one of Canada's leading manufacturers of heavy mechanical equipment. Salary open. Apply to File No. 4206-V.

MECHANICAL ENGINEER with at least ten years experience in general mechanical design in heavy engineering required by a large manufacturer in Montreal. Salary open. Apply to File No. 4206-V.

MECHANICAL ENGINEER with a minimum of five years experience in the design of hydraulic turbines, penstocks, surge tanks and associated hydraulic equipment required by well established firm in Montreal. Salary open. Apply to File No. 4206-V.

JUNIOR MECHANICAL ENGINEER required by Canadian manufacturer in Toronto for general duties. Must be highly competent. Salary open. Apply to File No. 4219-V.

SENIOR MECHANICAL ENGINEER required in Toronto by a Canadian manufacturer. Must have at least twenty years experience and would be responsible for all mechanical work in General Engineering Division. Salary open. Apply to File No. 4219-V.

METALLURGICAL

PHYSICAL METALLURGIST required by Ontario Research Foundation. Should be University graduate with from 3 to 5 years practical experience and should preferably have had some experience in electrolytic refining of metals. Salary commensurate with experience. Apply to File No. 1013-V.

METALLURGICAL ENGINEER required by large metallurgical firm in the Maritimes. Good opportunity for advancement in Research, Development and Production. Salary open. Apply to File No. 3942-V.

MINING

MINING ENGINEERS for design and layout work also some field work required by firm in Province of Quebec. Salary open. Apply to File No. 1001-V.

MISCELLANEOUS

SALES ENGINEER required by well-known manufacture's representative, long established, handling electrical and engineering equipment including power and lighting transformers, to take charge of Montreal office. Bilingual preferred. Salary in accordance with experience. Apply to File No. 1006-V.

HEATING AND VENTILATING ENGINEER, graduate, required for Montreal Head Office of a Canadian Company for design, specification, and layout of air conditioning, ventilating, fan and duct work for industrial processes, factories, offices, dust removal collecting systems, etc. Supervision of field installations, testing, and making estimates. At least five years experience with the above. Must be familiar with all kinds of heating systems, relative apparatus and equipment and with sheet metal air duct work. Apply to File No. 1015-V.

SALES ENGINEER required by Company manufacturing electrical switchgear, to represent them in Alberta and Sask. Salary and commission. A man with an aggressive personality and experience in this line of product can assure himself of a good income. Apply to File No. 1018-V.

SALES ENGINEER, recent graduate, mechanical background, required by Canadian manufacturer. Must be free to travel. Location Ontario. Salary $235 to $250. Apply to File No. 1019-V.

GRADUATE ENGINEER, preferably mechanical or chemical, required for sales engineering in the Toronto area. Should have some experience in sales and maintenance engineering. Salary open. Apply to File No. 1020-V.

MECHANICAL OR ELECTRICAL ENGINEER age about 35 years with experience in building construction and machinery, maintenance and repair, capable of taking over the engineering and maintenance service in a large textile mill in Province of Quebec. Salary open. Apply to File No. 1021-V.

SENIOR INDUSTRIAL ENGINEER required by firm in Province of Quebec. Duties include: Wage incentives, method studies, cost reduction etc. Should be graduate in mining or mechanical engineering. Salary open. Apply to File No. 1023-V.

GRADUATE ENGINEER mechanical or electrical background required to set up and organize a new department for a Canadian manufacturer. Must have plant and production experience. Preferably under 35 years. Salary open. Apply to File No. 1025-V.

FORESTRY ENGINEERS, recent graduates also class of 1949 required for extensive logging operations in Province of Quebec. Preferably but not necessarily bilingual. Current salaries paid. Apply to File No. 1026-V.

STRUCTURAL ENGINEER required by a firm of consulting engineers in Montreal for design work. Must have experience in structural steel and reinforced concrete. Salary open. Apply to File No. 1027-V.

GRADUATE ENGINEERS with mechanical and light structural experience, applicable to designing and detailing of conveyors, who are interested in establishing themselves with a well established growing concern to learn business in preparation for future advancement. Situated near Toronto. Salary open. Apply to File No. 1028-V.

GRADUATE ENGINEER required by Pulp and Paper Mill in Province of Quebec. Must have extensive experience in general maintenance, design and development of pulp and paper mill equipment. Excellent future advancement. Salary $6,000 to $9,000, depending on qualifications. Apply to File No. 4161-V.

STRUCTURAL DRAUGHTSMEN required by Alberta firm. One able to check all classes of structures and tanks. Another able to detail all types of structures. A third able to detail light structures and general handling machinery. Must be experienced. Salary open. Apply to File No. 4167-V.

SALES ENGINEERS, one for Ontario and one for Quebec, required by tool and quality steel Branch Sales Office. Applicant should have some metallurgical training, some experience in tool and die manufacture, good personality and should own car. Salary open. Apply to File No. 4170-V.

MECHANICAL OR ELECTRICAL ENGINEER, bilingual, experienced in standard investigations and observations. Time-study training not necessary, required by Montreal firm. Salary open. Apply to File No. 4174-V.

GRADUATE ENGINEER required by an oil company in the Maritimes, must have sufficient experience in the oil business and the educational qualifications to enable him to determine the specifications of oils required for various industrial machinery. Salary open. Apply to File No. 4178-V.

CONSTRUCTION ENGINEER capable of supervising sundry engineering jobs and pipelines for oil company in the Maritimes. Salary open. Apply to File No. 4178-V.

PLANT MAINTENANCE ENGINEER, mechanical background, extensive experience in pulp and paper preferbly kraft. Required to take charge of kraft mill maintenance in province of Quebec. Executive ability. Salary open. Apply to File No. 4179-V.

GRADUATE ENGINEER required for veneer and plywood plant in the Maritimes. Must be fully qualified to assume responsibility for the management, production and general supervision of the plant. Salary open. Apply to File No. 4180-V.

MAINTENANCE MANAGER required for large hospital in the Maritimes for maintenance and operation of power plant, buildings and equipment. Salary open. Apply to File No. 4186-V.

INDUSTRIAL ENGINEERS, with production experience required by a firm of industrial consultants in Montreal. Preferably with experience in time study, cost control, etc. Salary $400. up according to qualifications. Apply to File No. 4193-V.

RECENT GRADUATE required by a large National Organization. Must have the following qualifications: Good appearance, personality, leadership and initiative. Salary $2,400. Apply to File No. 4194-V.

SALES ENGINEER, mechanical background, must be thoroughly experienced and capable of developing and maintaining connections of old established firm in road builders, contractors and industrial machinery equipment. Must possess executive ability and have command of the French language. Salary open. Apply to File No. 4203-V.

MECHANICAL OR CIVIL ENGINEER with four to five years experience in stress analysis of mechanical and structural equipment required by a large manufacturer in Montreal. Salary open Apply to File No. 4206-V.

INSTRUCTORS AND DEMONSTRATORS required by a Canadian University for session beginning September 20th, 1948, particularly in Electrical Engineering and in Engineering Problems and Drawing. Salary open. Apply to File No. 4209-V.

SENIOR STAFF MEMBER required by Canadian University. Must have degree and industrial experience to teach Fluid Mechanics, Internal Combustion Engines, Refrigeration, Heating and Ventilation, all at IV year level. Salary open. Apply to File No. 4210-V.

VILLAGE ENGINEER required by Village of Crystal Beach, Ontario. Applicants state qualifications and salary expected. Apply to File No. 4215-V.

GRADUATE ENGINEER with broad experience is required by a manufacturer in Toronto. Must have experience in the design of small and large steam boilers together with their associate equipment, plate work and pressure vessel experience are essentials. Salary open. Apply to File No. 4219-V.

Situations Wanted

ELECTRICAL ENGINEER, Jr.E.I.C., B.Sc. (E.E.) Manitoba 1943. Age, 27. Married. Electrical experience with R. C. Signals and 2½ years general electrical experience in industry. Sales training. Presently employed but desires position offering wider scope and opportunity. Preferably Montreal area. Apply to File No. 925-W.

CIVIL AND MECHANICAL ENGINEER, M.E.I.C. Age 42, B.Sc. Civil Graduate work in industrial engineering at McGill University. Seventeen years experience in following field: Manufacture of welding rod and hard-facing alloys, installation of incentive bonus systems. Production planning on the manufacture of shells and shell parts. Design and construction of explosive proving equipment. Superintendent during construction of shell filling plants. Other experience covering oil refining, contracting, and installation of pulp and paper mill equipment. Interested in position with responsible firm or partnership with consultant. Home in Montreal area. Apply to File No. 981-W.

STRUCTURAL ENGINEER, M.E.I.C., P. Eng., experienced in design work and preparation of drawings for wood, structural steel, and reinforced concrete structures. Interested in position or partnership with consulting engineering firm in Toronto, Hamilton or other city in the interlake region, or Vancouver. Apply to File No. 1031-W.

ENGINEER, M.E.I.C. Graduate Civil and Electrical. Age 40. Single. Experience covers engineering and building construction and maintenance, works maintenance, general and heavy construction machinery sales and service, shop management. Past seven years in executive and administrative capacity. Seek wider opportunities or position leading to same in business, engineering, or business engineering. Free to travel, any location including foreign, available one month notice. Apply to File No. 1266-W.

GRADUATE ELECTRICAL ENGINEER, M.E.I.C., age 31, with seven years experience in electronics and radio, including radar and microwave techniques and three years experience in industrial and utility engineering and management, desires permanent, responsible position Montreal, Ottawa, Toronto region preferred. Apply to File No. 1689-W.

CHEMICAL ENGINEER, M.E.I.C., Graduate of McGill, age 33, married, bilingual, presently located in Montreal, experienced in production and process control of dairy equipment, aluminum plant pot-rooms, gas scrubbing plant. Last three years in charge of lubricant and fuel oil sales in marketing organization of major oil company. Desires responsible position with well established firm leading to management. Available in November, 1948. Apply to File No. 1932-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. Que., has structural, mechanical, chemical and mining experience. Qualifications merit consideration for responsible position, contract work on design, associate with consulting engineer. Location is Montreal but would locate elsewhere. Interests are structural design, mechanical trades for buildings, power development, steam plant, process plant design, machine and tool design, pulp and paper plant engineering and engineering research. Would consider position as resident engineer, or municipal engineer. Apply to File No. 1935-W.

INDUSTRIAL ENGINEER, M.E.I.C., age 34. Five years practical experience in Plant production and efficiency. Desires part time employment, Montreal area. Apply to File No. 2158-W.

EXECUTIVE ASSISTANT ENGINEER, M.E.I.C. Background of engineering, production, business organization, cost control, and management. Age 37, married, and preference for permanent association with enterprize in Montreal area. Apply to File No. 2228-W.

MECHANICAL ENGINEER, Jr.E.I.C., is interested in short term projects, duration one month or more. Location anywhere. Production works. Incentives, redesign, surveys, layouts, job evaluation, methods and materials handling. Salary desired $500 a month. Apply to File No. 2338-W.

CIVIL ENGINEER, Jr.E.I.C., McGill, '45, married, with experience in surveying & construction. Presently employed with small construction concern in the preparation of estimates, records & cost analyses. Experienced in writing contracts and specifications. Bilingual. Seeking responsible position in Montreal or Ottawa Areas. Apply to File No. 2405-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.Eng., McGill '46, age 24, single. Presently employed as a machinist with a large concern. Employment in the past includes positions in tool design, air conditioning and methods engineering. Seeks responsible position with firm in production or shop management. Available on short notice. Apply to File No. 2707-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B.Eng., McGill 1943, (Honours) P.Eng. Quebec, desires position in Montreal or Ontario. Willing to travel. Interested in commercial aspects and sales engineering. Apply to File No. 2727-W.

MECHANICAL ENGINEER, Jr.E.I.C., Sask. '46, P.Eng., Ont. 23, married. Experience primarily in Pulp and Paper industry in maintenance engineering, layouts and small construction jobs. Earnestly desires to enter industrial engineering field either with Consulting Engineer of Industrial Methods or Production Department. Location immaterial, available experience most important. Available on one month's notice. Apply to File No. 2795-W.

ELECTRICAL ENGINEER, M.E.I.C., P.Eng., Graduate '44, age 27, single. Presently employed near Montreal, 8 years of Engineering experience, machine tool engineering on Batch Production. Fabrication and assembly methods. Production supervision, research, methods improvement in power transmission equipment. Layout estimating and installation of power apparatus and auxiliaries. Am seeking more exacting and progressive position with expanding organization located anywhere. Apply to File No. 2876-W.

ENGINEER, M.E.I.C., P.E., Queen's '37, varied expierence in Mining and Industrial work; 4½ years with R.C.A.F. as engineer officer. Desires position with progressive firm offering responsibility and opportunity. Interested particularly in mining, manufacturing and processing of chemicals and industrial minerals. Location in B.C. or Alberta preferably. Apply to File No. 2892-W.

MECHANICAL & INDUSTRIAL ENGINEER, Jr.E.I.C., McGill '44, 7 years industrial experience. Welding application and metallurgy, production supervision, production specifications, purchasing, wage incentives, time study, estimating, costing, design. Available 4 weeks notice. Apply to File No. 2920-W.

MECHANICAL AND INDUSTRIAL ENGINEER, M.E.I.C., Ph.D. (Engineering, London), A.M.I.Mech.E., P.Eng., age 36, eleven years diversified industrial experience, desires position with duties involving: methods studies, research, development, engineering economics, management techniques, advisory service to the Board of Directors and similar. Apply to File No. 2929-W.

CHEMICAL, S.E.I.C., B.A.Sc., Toronto, '46, ex-Signal Corps, age 24. Reliable, diligent, conscientious, aggressive, bilingual. Experience in the rubber, distilling, and heavy chemical fields; in such phases as process and product control, design and engineering and industrial research. Presently employed but seeks an opening with a progressive company wherein he will have more scope in engineering work. Apply to File No. 2936-W.

CHEMICAL ENGINEER, M.E.I.C., P.Eng., with considerable mechanical experience in plant construction, piping layouts and welding, 14 years industrial practice on positions of responsibility, desire a change of employment preferably in Montreal area. Bilingual. Apply to File No. 2940-W.

GRADUATE ENGINEER, S.E.I.C., Man. '47. Presently engaged in plant layout and field supervision. Experienced in mechanical and electrical construction and maintenance. Responsible position desired in business and production engineering in progressive firm. Apply to File No. 2975-W.

CIVIL ENGINEER, M.E.I.C., B.A. Sc., P.Eng., (Ont.). Age 44. Single. Past experience includes administrative, executive and sales engineering in metal products, building materials and sub-contract work in construction industry. Also held responsible position in personnel administration. Desires permanent position requiring initiative with good future prospects. Apply to File No. 2983-W.

MECHANICAL ENGINEER, M.E.I.C., P. Eng. (Quebec). 15 years of shop practice in maintenance and locomotive repair; 5 years machinery design, including welded vessels, process piping and pulp mill layout. Seeking responsible position, preferably in Montreal area. Available on short notice. Apply to File No. 3045-W.

SENIOR METALLURGIST, M.E.I.C., Graduate, age 36. Fifteen years diversified experience in heavy steel mills, production, research and quality control. Practical experience of departmental management. Desires supervisory position of responsibility, preferably with progressive firm; married, two children. Apply to File No. 3046-W.

PART TIME WORK: Graduate Chemical Engineer, B.Sc. (Chem. Eng.) Jr.E.I.C., M.C.I.C., now doing graduate work in Montreal. In Royal Canadian Engineers since graduation with experience in legal investigations, stores and works. Desirous of obtaining part time work conducting Technical literary research or other technical work within limitations. Suggest could be useful to small out of town firm desiring advantages of Montreal libraries and Montreal representative. Apply to File No. 3049-W.

GRADUATE ELECTRICAL ENGINEER, M.E.I.C., P.Eng., Alberta, B.Sc. (Honors) Alberta, M.A.Sc. at Toronto. Married, age 25, 3 years experience in electric power utilization, some generation and distribution; 2 years as officer in electrical branch, R.C.N.V.R. supervision of electrical installations by civilians electricians. Particularly interested in permanent position in Western Canada. Available on one month notice. Apply to File No. 3050-W.

SALES ENGINEER, M.E.I.C., P.Eng., N.S. and P.Q., B.Sc., married, age 44, 7 yrs. railway construction. 8 yrs. sales manager large gas and electric utility, 5 yrs. R.C.N.V.R., 5 yrs. naval architect. Desirous of moving to South America, wishes position as sales representative preferably with manufacturer of marine equipment. Apply to File No. 3057-W.

MECHANICAL ENGINEER, M.E.I.C., P. Eng.Q., G.I.Mech.E.; A.M.I.Loco.E. (Great Britain). Aged 30. Married. 6 years Locomotive design and Construction, machine shop production and assembly. 5½ years Engineer Officer, Royal Air Force: rank Squadron Leader, Chief Technical Officer. Employed 18 months in Province of Quebec. Desires change to position with more responsibility and opportunity for advancement. Preferably Southern Ontario or Western Canada. Apply to File No. 3059-W.

MECHANICAL ENGINEER, S.E.I.C., B.A.Sc., Toronto, age 26, single, experience in operation planning and detailing, also sales. Presently employed with Importers as Correspondent and Interpreter. Languages: English and German perfect; French reading knowledge only. Desires employment as industrial engineer, preferably in Toronto area. Apply to File No. 3065-W.

SALES ENGINEER, S.E.I.C. Recent graduate in Mech. Eng., N.S.T.C. At present very successful N.S. Representative of Non-Engineering Organization, also desires to represent Engineering firm as well, part time or full time. Apply to File No. 3068-W.

MECHANICAL ENGINEER, A.M.I.Mech.E., P.Eng.Que., Graduate London 1935; age 37, married. 10 years experience in design, testing and installation supervision of all classes of I.C. engines, supercharging, steam machinery and plant layout in the U.K. 3 years technical executive and administrative experience in policy and production with responsibility of Government level. Trilingual, English, German, Russian. Desires responsible position covering design, administrative or sales with progressive and reliable employers, anywhere in Canada. At present resident in Montreal. Apply to File No. 3069-W.

PART TIME WORK, 3rd Year Electrical Engineer, McGill S.E.I.C. Anxious to obtain part-time employment, preferably in electrical field. Have considerable free time available. Summer experience in textile plant also telegraph department of railroad company. Apply to File No. 3075-W.

SENIOR MECHANICAL ENGINEER, M.E.I.C., B.Eng., McGill '34, desires responsible position with a future. Presently employed with firm of chemical consulting engineers. Previous experience includes several years in charge of airplane design, planning, cost estimating and construction. Accustomed to directing technical staff and shop operations. Apply to File No. 1151-W.

Building Research

Engineers and Architects interested in the application of research to building and associated engineering problems are invited to enquire about employment possibilities with the newly formed Division of Building Research of the National Research Council. An enquiring mind is an essential; experience in building work in Canada is really necessary; bilingualism would be helpful. Salaries depend upon training and experience; opportunities for useful work are unlimited. Enquiries should be addressed to the Director, Division of Building Research, National Research Council, Ottawa.

Engineer

who is interested in hydro-electric investigations and who can carry out current metering and determination of river discharge, install and maintain automatic water level gauges and prepare reports.

•

Assignment in Tropics — three year contract.

•

Apply to File No. 3882-V.

Mechanical Engineer REQUIRED

•

Two or Three Years Experience in Chemical or Allied Industries Essential
Apply in writing giving:
Education, Experience, References, Salary Expected and Photo
to

DOW CHEMICAL OF CANADA LIMITED
P.O. Box "F",
Sarnia, Ontario

CIVIL ENGINEER

•

To act as assistant to Senior Officer of a well-established General Contracting firm in Montreal.

Applicant should have about five years experience and have some knowledge of all phases of building construction.

This is a good opportunity for a person with proper background and training.

Apply
File No. 1038-V

Senior Time Study Men

Must be competent in methods improvement, and have experience in developing standard data on machine tool and other operations. Reply, stating age, experience in detail, present and past employment, references, marital status and salary expected to

FORD MOTOR COMPANY OF CANADA, LIMITED
Windsor, Ontario.

Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

Power Survey and Equipment Limited is the name of a newly incorporated firm which is located at 852 Notre Dame St. West., Montreal. The Company will specialize in electrical tests in industry, municipalities and among other important power consumers by means of graphic wattmeters, voltmeters, ammeters, power factor meters and other recording instruments. They are in the process of publishing a booklet describing their method of eliminating costly power peaks without interfering with the plant's normal operations. They also handle a complete line of peak alarm systems and other equipment including dry type transformers insulated with the recently developed Johns-Manville "Quinterra" heatproof material. A. Dugas, M.E.I.C., is the president.

•

On December 1st work will begin on the breaking up of the former U.S.S. Aircraft carrier "Sable". The scrapping of this vessel will be carried out in the dismantling basin of the Steel Company of Canada, Hamilton, Ontario. It is anticipated that 5000 odd tons of scrap steel will be recovered from her hull and decks. The vessel, which was formerly on the Great Lakes, was towed to Hamilton. Owing to the breadth of the ship it was necessary to shear 16 feet from each side to get her through the canal locks. This work was accomplished by means of oxy-acetylene cutting machines and hand torches.

•

Peacock Brothers Limited, P.O. Box 6070, Montreal, offers complete information on Jerguson Gauges for which they are Canadian representatives.

A recent addition to this well-known line of gauges is a new large chamber gauge which, it is claimed, "gives an accuracy of level reading never before possible". It is intended for use in gauging liquids that boil, where the liquid fluctuates rapidly in the glass.

•

R. G. LeTourneau Inc., Peoria, Illinois, states that they have developed a new type of snow plow for use with their "Model C Tournadozer". Some of the principal specifications of the snow plow are—width at cutting edges of moldboard 12 ft. 3 in.; size of cutting edges (two) ½ in. x 10 in. x 9 ft. 3 in.; width at top of moldboard 13 ft. 7½ in.; height at front of "V" 4 ft. 7½ in.; height at top of moldboard 6 ft. 4⅝ in.; thickness of moldboard 3/16 in.; shoes (three) 8 in. by 14 in.; height moldboard can be raised 5 ft. 6 in.; weight (with Tournadozer) 32,200 lbs.

•

A new design of a power industrial truck with platform 12 feet long and a very low-lift for its capacity is announced by Elwell-Parker Electric Co., Cleveland, Ohio. Complete details may be obtained from the manufacturer.

•

Titanium which combines lightness with strength, is being produced at the Dominion Magnesium Company's Haley plant.

The Company claims that it has developed a process superior to and less expensive than any method used in the United States for the production of this new metal. Company officials are of the opinion that they will eventually be able to produce titanium at a price of $1.50 per pound on quantity production —purity 99.5 per cent plus. In the U.S. the currently offered price of the metal is $5.00 per pound in lots of 100 pounds or more. In describing the operation at Haley the Company emphasizes that the plant at the moment is on pilot scale and that production to full scale proportions can be accomplished in a matter of weeks.

•

The Diamond Core Drill Manufacturers Association, 90 West Street, New York 6, N.Y., has approved and adopted standards for diamond bit and reaming shell dimensions. Details of these standards may be obtained from C. C. Rohrbach, secretary of the Association.

•

Dominion Engineering Works Limited will produce 1000 hp. diesel engines for the diesel-electric locomotives which are being manufactured by the Montreal Locomotive Works. Operations will commence early in 1949. It is estimated that the necessary re-tooling and relocation of plant facilities will cost the Company approximately $750,000.

•

The Canadian Electrical Manufacturers Association, 126 Davenport Road, Toronto 5, reports that considerable progress is being made with respect to the standardization of transformers. Investigations on the standardization of transformer bushings up to and including 69 kv. have been completed and considerable progress has been made with respect to the proposed CEMA specification for three-phase distribution transformers and on the proposed CEMA specification for dry type transformers. The Association's specification for single-phase rural transformers was approved by the Codes and Standards Committee for forwarding to the Canadian Standards Association. Many other important items are under discussion.

•

The use of inert-arc welding is a new development in Canada's growing aluminum fabrication industry.

•

John R. Pheazey, works director of Standard Telephones and Cables, large British manufacturers of telephone equipment visited the Shearer Street, Montreal, and Lachine plants of the Northern Electric Company a few weeks ago. He was accompanied by G. K. Reynolds, superintendent of Northern Electric Lachine Wire and Cable plant and by W. H. Eastlake, manager of the wire and cable division. Other British and Canadian officials were on the tour.

•

What is claimed to be the most modern chemical plant of its type in the world has just been officially opened by Canadian Industries Limited at Hamilton, Ontario. It is a sulphuric acid processing unit of which the construction cost was in excess of one and a quarter million dollars. The new plant has been erected in the Company's present premises on East Burlington Street to replace older units. The plant has been designed to produce 250 tons of acid daily and is expected to increase Canada's annual sulphuric acid production about 30,000 tons to 80,000 tons. Present output of the older units is 50,000 tons annually.

Construction work was carried out by the Pigott Construction Company of Hamilton and supervised by I. R. Tait, M.E.I.C., chief engineer of the company.

Announcement

Commencing with the January 1949 issue of *The Journal* illustrations will be used in Business and Industrial Briefs. For details regarding illustration sizes please communicate with the editor. If engravings are made by *The Journal* these will be charged at cost to the company or individual concerned.

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.

Baldwin Locomotive Works, Philadelphia 42, P.A. offers Bulletin 291, "The ABC-C-C of Simulated Service Testing." It features simple cartoon sketches to emphasize the importance of the effect of dynamic and cyclic stresses on many machine parts and structural members.

•

Bulletin 4340A, a C.G.E. publication which may be obtained from any C.G.E. branch, describes the application and uses of "Glyptal" Cement a C.G.E. product. This general purpose cement is intended for use with wood, glass, china, metals, paper, leather, fabrics, plastics, etc.

•

A new model of the "Audigage" Thickness Detector has been announced by Branson Instruments, Inc., of Danbury, Conn. This instrument is intended for use in taking non-destructive thickness measurements of steel, copper, aluminum, glass, unfilled plastics and other materials *from one side*. Typical applications include tanks, pipes, ship hulls, boilers, pressure vessels and sheetmetals. Copies of the bulletin and further information with respect to the new detector may be obtained from Electrodesign, 445 St. Peter Street, Montreal, Que.

•

The Canadian Machine Tool Builders' Association, Room 1405, 320 Bay Street, Toronto 1, Ont., has prepared a bulletin of machine tools produced in Canada. Copies may be obtained on application to the Association.

•

The Canadian Fairbanks-Morse Co Ltd., 980 St. Antoine Street, Montreal 3, Que., offers Bulletin G-181 issued by the American Brass Company of Waterbury, Connecticut. The bulletin features flexible metal hose and tubing for use in various types of industry.

•

The Canadian General Electric Co. Ltd., has recently published an illustrated pamphlet on its Standard Protected-Type Induction Motor. Requests for the pamphlet—4067D should be addressed to your nearest C.G.E. office.

•

Alpha Metals Inc., 363 Hudson Ave., Brooklyn 1, N.Y., has issued a condensed catalogue of its products. A feature of this four page publication is a comprehensive solder selection guide which lists the sixteen metals that are most frequently soldered. Ask for catalogue No. 201.

•

Crane Limited, P.O. Box 70, Montreal has issued a new forty page hospital catalogue. It is a handy and very complete reference guide to the correct selection of hospital fixtures. Ask for catalogue AdM-8010.

R. G. LeTourneau Inc., Peoria, Ill., has issued two new broadsides. TP-163 lists the complete specifications of the "B. Tournapull" and TD-119 lists the features of size, power and speed available in the "B. Tournadozer".

•

Standard Tube Company Ltd., head office Woodstock, Ont., offers literature describing the "Stan-Steel" Nesting Chairs and Tables. These chairs are particularly suitable for conference rooms, assembly rooms, cafeterias, etc.

•

Atlas Asbestos Co. Ltd., 110 McGill Street, Montreal and also of Toronto, Winnipeg and Vancouver offer a pocket size 20 page booklet in which are described the Company's asbestos gaskets. Ask for "New Gasket Booklet".

•

Orr and Sembower Inc. of Reading, Pennsylvania, has prepared a bulletin, No. 1216, in which is described the "Powermaster" multiple-fuel steam generator. This generator burns light oil, heavy oil or gas and it is a recent development of the company. Complete details are contained in the bulletin.

•

The American Gas Accumulator Company, 1027 Newark Ave., Elizabeth 3, New Jersey, has available copies of bulletin R-1 which describes "Stimsonite" all-plastic reflectors. These reflectors are claimed to be of particular use for railroad and highway signs.

•

Canadian General Electric Co. Ltd. describes, in bulletin No. 4429, which may be obtained from any C.G.E. office, EMT electrical metal tubing. This lightweight, threadless raceway has been designed to meet modern building needs.

•

The Dominion Engineering Co. Ltd., P.O. Box 220, Montreal, will be pleased to add the names of *Journal* readers to their mailing list for the "Dominion Engineer" the Company magazine. The October issue features the mechanical parts of electric mine hoists and the November issue part three of the description of the Company's centrifugal pumps.

•

A 20 page well illustrated booklet on Thyrite Lightning Arresters has been released by Canadian General Electric Co. The publication should be of particular use to utility engineers. It provides complete operation and installation data for this type of arrester. The number of the bulletin is CGEA-1304H. All branches of the Company have copies.

•

Canadian Allis-Chalmers Ltd., 212 King Street West, Toronto 1, Ont., offers "Plain Facts on the care of Rubber V-Belts". The booklet is pocket size and contains 15 pages.

Wheelco Instruments Company, 847 W. Harrison St., Chicago 7, Illinois, offers a 40 page bulletin in which are described the company's thermocouple units. Some excellent technical data and tabulated material are contained in the publication. Ask for bulletin T/C 7.

•

Canadian Liquid Air Company Ltd., 1111 Beaver Hall Hill, Mtl., has issued a brochure on "Premier Welders". Requests for copies should be addressed to the Company's Montreal office.

•

Cobra (Wood Treatment) Ltd. of 84 High Street, Braintree, Essex, England, is now in the process of forming a Canadian Company. Pending completion of arrangements for distribution from Canada the British Company offers copies of the publication "The Cobra Process for the Preservation of Wood Poles".

Appointments and Transfers

F. J. Lockhart has been appointed Toronto district manager for Atlas Steels Limited.

•

John E. Oberholtzer has been appointed deputy minister of industries and labour by the Alberta Provincial Government.

•

W. E. Ross is now assistant to the president of Canadian General Electric Co. Ltd. and A. M. Doyle is manager of the Company's Apparatus Department.

•

F. A. Lucas was recently elected to the board of directors of Peacock Brothers Ltd. Mr. Lucas joined the Company in 1926 and has been district manager for Southern Ontario for the past fifteen years, which post he will continue to hold.

•

George N. Sieger is president, for the year 1948-49, of the American Welding Society. Mr. Sieger is an authority on the principles and practice of resistance welding. He is a past president of the Resistance Welder Manufacturers Association.

•

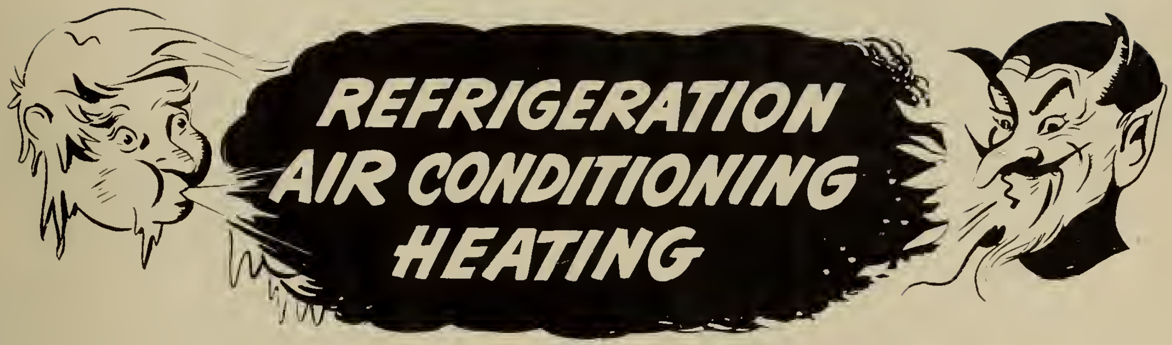
W. M. V. Ash has been appointed president of the Shell Oil Company of Canada Limited. Formerly general manager of United British Oilfields, in Trinidad, B.W.I., Mr. Ash succeeds P. M. Fowlie, who will undertake new administrative duties for the company in London, England.

•

J. W. Milne has been promoted to the post of assistant manager of Canadian General Electric Company's Apparatus Department.

•

W. H. Meyer is now in the Industrial Heating Section of C.G.E.'s supply department.



BETTER VALUE...BETTER PERFORMANCE

- Industrial Refrigeration
- Commercial Refrigeration
- Industrial Heating and Air Conditioning
- Domestic Heating and Air Conditioning

MONCEAU & ROBERT CIE LTÉE

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IMPORTERS OF WELSH AND AMERICAN ANTHRACITES
CANADIAN AND AMERICAN BITUMINOUS COALS · FUEL OIL DISTRIBUTORS

AUTHORIZED DEALERS FOR GENERAL ELECTRIC

1600 Marie Anne St. East, MONTREAL - Tel. AM. 2131

Professional Cards

WANTED!

500,000 VOLUMES

The Canadian Library Association and Canadian Council for Reconstruction through UNESCO have embarked on a march of books to restock the war devastated libraries of Europe.

THE OBJECTIVE IS 500,000 VOLUMES

The drive will be in force between January 15 and February 15. Details of collection arrangements will be announced through the daily press and radio, and in the January issue of the *Journal*.

•

Please check your personal library now and set aside your gift of standard and authoritative works on technical and professional subjects.

•

THE NEED IS URGENT

Index to Advertisers

The revenue derived from the sale of advertising space assists the Institute in publishing the *Journal* on a regular monthly basis. Listed below are the names of the Companies and Individuals whose advertisements appear in this issue.

DECEMBER 1948

NEW

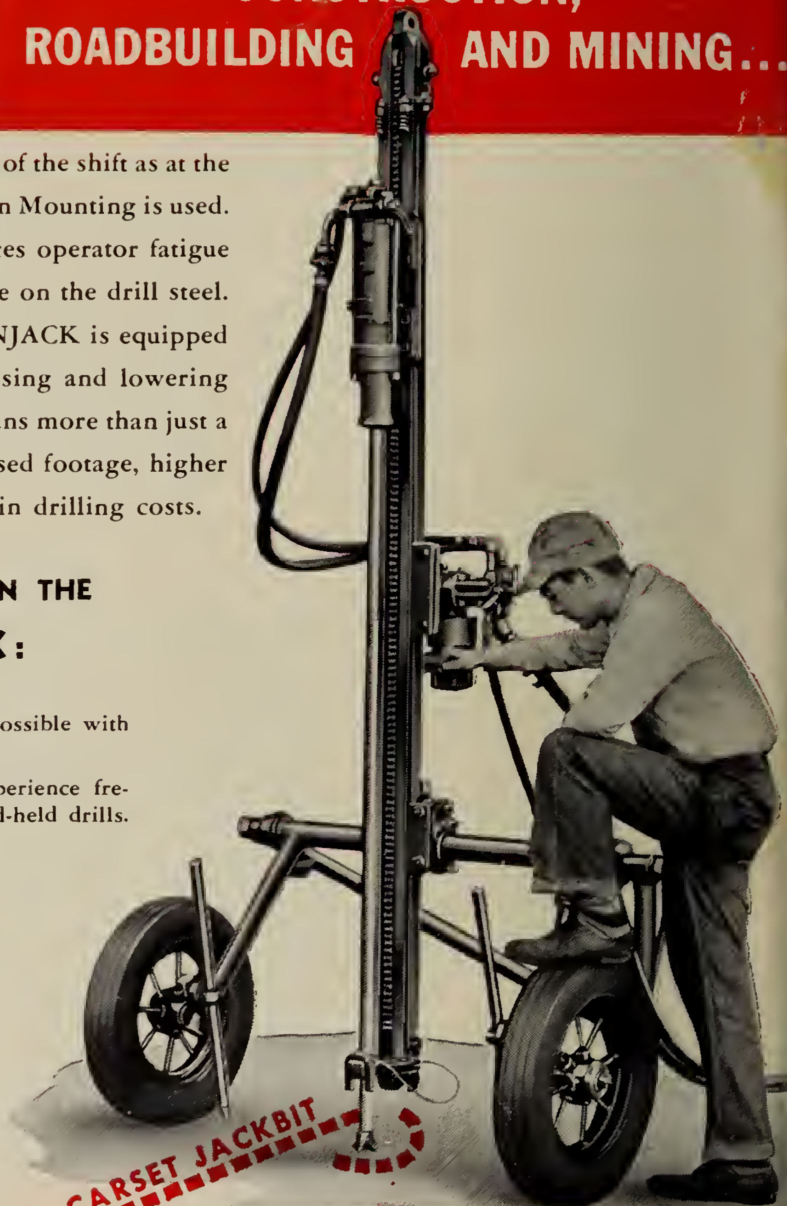
C-I-R WAGONJACK

FOR CUTTING COSTS IN CONSTRUCTION, ROADBUILDING AND MINING...

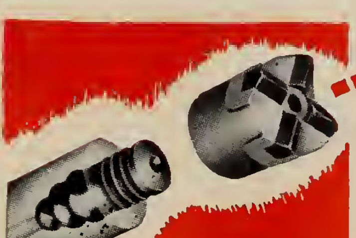
DRILLING is just as fast at the end of the shift as at the beginning when this light Wagon Mounting is used. The elimination of hand holding reduces operator fatigue and ensures continuous correct pressure on the drill steel. A real one-man mounting, the WAGONJACK is equipped with a power-feed arrangement for raising and lowering the frame. The use of this mounting means more than just a saving in manpower — it means increased footage, higher efficiency, and an important reduction in drilling costs.

YOU GET ALL THIS IN THE WAGONJACK:

- Uniform positive feeding pressures not possible with hand-held drills.
- Great savings in air consumption — experience frequently shows double the footage of hand-held drills.
- Long steel changes mean less steel to handle and fewer steels needed on the job.
- A powered steel puller saves many a hole and steel . . . a big help in ravelly or fitchery ground.
- Drill in any direction with equal ease. Toe holes, breast holes, or any variety of setups needed for rough ground are easily available because of the flexibility built into this light wagon mounting. The power arrangement for raising and lowering the frame makes it a truly "one-man mounting".



YES! IT'S THE CARSET JACKBIT



CARSET JACKBITS saved one shaft contractor 18 man-hours per foot of shaft.

Write for Form 4070. Get acquainted with the new Wagonjack.

Canadian Ingersoll-Rand Company Limited

620 CATHCART STREET, MONTREAL, QUEBEC.